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Competition on Financial Markets: Does Market Design Matter?

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Lecture

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By

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Mijnheer de Rector Magnificus,
Dames en heren,

I. Introduction

The organizational structure of a financial market specifies the procedures and rules that may lead to order flow and trades on its trading system. The industrial organization of financial markets, however, also determines how public and private information gets incorporated into prices, and how market participants strategically interact with each other. Ultimately, market design and market regulation shape the degree of investor participation, the competitiveness of financial markets, economic growth and social welfare. Therefore the question "Competition on Financial Markets: Does Market Design Matter?" deserves academic interest and insights from academic papers should be translated into policy and underpin policy decisions. On November 30, 2006, the Committee on Capital Markets Regulation in the US released its interim report showing that US financial markets have lost market share after a number of fraudulent cases as well as the introduction of the Sarbanes-Oxley Act. While in the past, many non-US companies raised capital or were listed in the US, lately, US markets have lost attractiveness in an international perspective.
In this paper, we will focus on stock markets. but do not deal explicitly with the issue of competition for listings (see the Interim Report of the Committee on Capital Markets Regulation for a recent discussion).[1]

The field that studies market design of financial markets is called "Market Microstructure". Garman (1976) was the first to introduce this terminology when writing his paper on market making and inventory holding costs entitled "Market Microstructure". Market microstructure deals with the economic forces behind trades, quotes and prices on markets in general and financial markets in particular. One of the main topics in the market-microstructure literature is to analyze

[1] For recent empirical work on bond markets see e.g. Bessembinder et al (2005), or Biais, Declerck, Dow, Portes and von Thadden (2006).

how the rules of the game can be designed such that the impact of market frictions is reduced. However, the design of markets may also determine the role of market frictions. But auction-academics will immediately bring up: who cares? Don't we have the revenue equivalence theorem by Vickrey (1961), later generalized by Myerson (1981) and Riley and Samuelson (1981), for which Vickrey by the way was awarded the Nobel Prize in 1996? The review of some theoretical and empirical work below will illustrate that market design as well as regulation and supervision do play a role.

Nowadays investors face a bewildering menu of choices for executing their trades. Stocks are not only cross-listed on several regular markets, but may also trade on new trading platforms. Particularly topical in Europe is the implementation of the Markets in Financial Instruments Directive (MiFID) that should take place by November 2007. This Directive seems to squeeze stock exchanges from two sides. Regulators call for further transparency concerning for example clearing and settlement of trades, trading interests, and actual trades (see e.g. the Economist November 2006), but also the exchanges' clients clamour for lower fees and threaten the exchanges with erecting new trading platforms (see the initiative of seven large investment banks to setup a new trading venue), as now allowed by MiFID in all European countries.

Understanding how intermarket competition works will therefore become more and more important, also in Europe. While the market-microstructure literature has extensively dealt with single markets (more references can be found later on in this paper), the theoretical literature on intermarket competition where traders can trade simultaneously on several continuous markets is still limited. In this paper, we are not able to deal with all aspects of this exciting literature but we will stress one particular combination of markets, being crossing networks and dealer markets (given our own past research). However, we do not neglect the impact of other trading platforms on traditional markets. These insights from the theoretical and empirical academic literature are then employed to highlight some of the to-be-expected implications from MiFID. In particular, we deal with the issues of fragmentation and investor protection, market access, and the role of transparency for the functioning of financial markets.

Financial markets, together with banks, play a key role in the functioning of financial systems. In this paper, we do not aim to provide a complete overview of the conduct and regulation of financial systems and all the implications this may have on the economy (see e.g. Allen and Gale (2000) for "comparing financial systems", or Degryse and Ongena (2004, 2006) for an analysis of the impact of technology and regulation in retail banking markets). While the role of banking regulation is quite well understood, this is less the case for regulation and supervision of financial markets. This will be an area of research where the *TILEC-AFM Research Network on Financial Market Regulation* will be active. Along the way, we aim to point out some open issues that deserve further academic and policy attention.
The remainder of the paper is organized as follows. In Section II, we briefly discuss some typology of financial markets' microstructure. Section III deals with the impact of intermarket competition. Section IV goes into issues related to Market Design and the expected impact of MiFID. Section V provides a policy discussion and concludes.

II. Typology of Financial Markets

The objective of this Section is to discuss how different financial market organizations can be classified. We describe first the typology of traditional financial markets. Afterwards we turn towards intermarket competition, where we deal extensively with the combination of crossing networks and dealer markets.

II.1. Typology of Traditional Financial Markets

The market-microstructure literature has typically divided traditional financial markets into *dealer markets, auction markets,* and *hybrid markets* (for a review of the market-microstructure literature, see O'Hara (1995), Spulber (1999), Madhavan (2000), Harris (2002), Biais, Glosten and Spatt (2005), or De Jong and Rindi (forthcoming)). A dealer market is also called "quote driven" as the designated liquidity suppliers or market makers are the only providers of liquidity and the trades are based on the prevailing quotes in the markets. Market makers or dealers are counterparty in all transactions and quote two prices: the bid price, at which they are willing to buy securities and the ask price, at which they will sell. The difference between those two prices is the market maker's spread. This spread hinges on the degree of asymmetric information between the dealer and informed traders, inventory costs and the remuneration for the service of providing immediacy (see Glosten and Milgrom (1985), Ho and Stoll (1981) and Demsetz (1968), respectively). Sometimes it is possible to negotiate better prices than those quoted by dealers (see e.g. Degryse (1999)). Motivations for these better prices than those displayed on the screens stem for example from a long-lasting relationship between dealer and investor (Desgranges and Foucault (2005)), or quantity discounts. Examples of dealer markets are Nasdaq, and some segments of the London Stock Exchange.

Auction markets or order driven markets are driven by orders, as the prices at which trades occur are determined by the orders' arrival to the financial market. On order driven markets, investors trade directly with each other or with the intervention of a broker dealer acting as an agency trader only. All unexecuted orders are gathered in a limit order book. Market orders consume liquidity. Limit orders that do not execute immediately, supply liquidity and could therefore be seen as free (short-lived) options against which market orders can be executed. Examples of auction markets are Euronext, the Toronto Stock Exchange, but when taking a broader view, may also include the ECNs (electronic communication networks), we will discuss later in the paper. Within order driven markets, we can distinguish between call markets and continuous markets. In call markets, orders are entered into the trading system until the batch auction takes place. Batch auctions are typically employed at the opening. A number of European markets have also introduced batch auctions to close the market (for more details see De Jong and Rindi (forthcoming)). In continuous auction markets, trades can take place at any time during the trading day provided that limit orders are available in the limit order book.

Hybrid markets are markets where different elements from quote and order driven markets are combined. Markets are called hybrid markets for two reasons. The first is that players or the design of a particularly organized segment of the market exhibit characteristics that stem from another market organization. For example, the specialist on the NYSE has the obligation to make the market and to provide liquidity by trading on own account, but this market is organized as a continuous auction market. Second, an entire market is called hybrid when it offers simultaneously an auction and order driven segment. For example, the London Stock Exchange offers a variety of market organizations like SETS (a continuous auction market), and SEAQ (a dealer market).

II.2. Alternative trading systems[2]

Next to traditional markets, there is a wide variety in *alternative trading systems* (ATS). In referring to ATS we exclude the established market places such as the traditional exchanges. A typical aspect of ATS concerns the fact that buyers and sellers meet on an agency basis, i.e. there are no market makers that commit capital or that commit to provide liquidity. Within the ATS, we distinguish three groups of networks for which we will present a brief description of their typical features.

A first important category is *Electronic Communication Networks* (ECNs). Weston (2002) describes ECNs as "electronic trading systems that allow investors to clear trades through an open limit order book. Rather than place orders with a specialist or dealer, traders on ECNs may anonymously submit orders and trade with each other directly." ECNs allow traders to submit priced trades, i.e. limit orders. Therefore, ECNs have the potential to contribute to price discovery. Most ECNs guarantee pre- and post-trade anonymity. Examples of ECNs are Island, Instinet, Archipelago, and Redibook.

A second category of ATS are *Crossing Networks* (CNs). The SEC (2000) defines crossing networks as "systems that cross multiple orders at a single price and that do not allow orders to be crossed or executed outside of the specified times". Crossing networks or crossing systems

2 This part is mainly based upon Degryse and Van Achter (2002).

thus only trade at scheduled times, as opposed to the continuous trading of exchanges or other ATS. Since traders enter unpriced buy or sell orders, crossing systems do not contribute to price discovery. Execution risk remains at crossing-networks since the trade is not executed in the absence of counterparties. In this case there is excess demand or supply. The advantage of a crossing network is that it minimizes market impact. Trades are typically executed at the midpoint of the bid-offer spread in the base market. According to Salomon Smith Barney (2001), crossing networks cater to institutional investors placing larger-sized orders in less liquid securities. Examples of crossing networks for Europe include ITG's POSIT or E-Crossnet (which was absorbed by ITG POSIT in February 2005). In November 2006, Nasdaq planned to start a crossing system called Nasdaq Crossing Network (see Table 2 for more details). Crossing Networks aim to maximize the matched volume on their system. In contrast to auction markets, CNs cannot change the price to obtain equilibrium. The price at which trades happen is not determined in the Crossing Network but stems from the main market.[3]

CNs originated in the early 1970s as private phone-based networks in between buyside traders. Later on, in the 1980s, they went electronic with the introduction of Instinet and POSIT (Plexusgroup (2004)) Next to the differences with regular trading systems presented in Table 1, individual CNs may also diverge one from another. Each CN uses a proprietary algorithm to match buy and sell orders. These specific rules are often opaque. All CNs aim at maximizing trading volume or the value of matched orders. For example, Xetra XXL, a crossing network for block trades at Deutsche Börse, implements a volume/time priority rule. An overview of the sponsor, allocation rules and crossing prices of a number of major CNs can be found in Table 2. Note that the main organizers of CNs can be both "traditional" exchanges (e.g. NYSE, Xetra) as well as private institutions (e.g. ITG, Barclays).

3 While de Jong and Rindi (2007) include crossing networks in their typology of auction markets, we exclude crossing networks from auction markets, as we view crossing networks as systems that free-ride on other markets for their price formation and that therefore cannot be separately categorized as auction markets.

Table 1. Trading Systems: Overview

	NYSE	**Euronext**	**ECNs**	**Crossing Network**	**FOREX**
Continuous	X	X	X		X
Floor-based	X				
Limit order book	X	X	X		
Dealer	X				X
Pre-trade prices	X	X	X		
Post-Trade Information	X	X	X		

Note: This table provides the main characteristics of the different markets. Euronext may have a specialist for very small stocks to guarantee liquidity. This is, however, a decision at the discretion of the listed firm. FOREX markets have indicative pre-trade prices but these are not binding, in contrast to a specialist's quotes on the NYSE. Crossing Networks have a book in which orders are stored, but this book only contains orders specifying a quantity and not a price in contrast to limit orders in a limit order book. Most ECNs guarantee pre- and post-trade anonymity, but may deliver pre-trade prices and post-trade information on executed order sizes and prices.

Table 2. Crossing Networks: Overview

Crossing Network	Sponsor	Allocation Rule	Crossing Price
POSIT	ITG	Pro rata	Average of bid and ask price, taken at a random time within 7 minutes after the cross
Instinet Last Daily Cross	Instinet	Minimum quantity to all orders, remainders pro rata	Closing price for exchange-listed stocks, average closing bid and ask price for Nasdaq stocks
Instinet Intraday Cross	Instinet	Pro Rata	Spread midpoint
After Hours Trading Session	NYSE	Precedence based on order type and time precedence	NYSE closing price
Barclays Internal CN	Barclays Global Investors	Pro rata	Closing price main market
Liquidnet	Liquidnet Inc.	Peer-to-peer volume-based matching	Direct price negotiations between both involved parties (typically the current average of bid and ask price)
Xetra XXL	Xetra, Deutsche Börse	Volume/time priority	Spread midpoint
Nasdaq Crossing Network	Nasdaq	Pro rata	Spread midpoint

Note: This table presents an overview of the sponsors, allocation rules and crossing prices of some major crossing networks.

An important aspect of the design of CNs is handling the risk associated with manipulation of price discovery in the base market in order to obtain a better price at the CN. For example, right before the CN aims to cross buyers and sellers, investors might be buying in the base market in order to raise the midpoint price used to sell their standing orders in the CN. This risk is greater the less liquid the base market is and the larger the overall percentage of volume in the CN. CNs' institutional design, however, has been adapted to dampen this risk: they typically select the midprice at a random time within a 5- or 7-minute interval immediately following the scheduled cross time.[4]

A third type of ATS applies *Smart order routing technology* (SORT). These are systems developed by a variety of market participants that are used to route orders to centralized markets based on trading criteria that seek to provide best execution for the client. This execution can be on a traditional exchange, on an electronic communication network, or both. The trading criteria can be price improvement or execution speed (see Foucault and Menkveld (2006) for implications of SORT with application to Euronext Amsterdam and EuroSETS). Smart order routing technology can only work when traders have (non-discriminatory) access to all markets, an issue we turn to when discussing the Markets in Financial Instruments Directive (MiFID).

III. Intermarket Competition: Theory

The analysis of competition *within* a particular market design received considerable attention. Issues of market design such as transparency, tick size, call versus continuous markets, who should supply liquidity, all shape the competitiveness of markets. We refer the interested reader to e.g. Biais, Glosten and Spatt (2005) for an overview of these issues.

As financial securities may trade simultaneously on one or several traditional markets and on ATSs, a trader has to decide how to allocate her orders *across* the different trading venues. As a result, all

4 Note that the risk remains, especially with respect to broker agreements to transact at a closing price for index funds.

these trading venues compete for order flow. The question then is how intermarket competition affects market quality. The analysis of intermarket competition is related to the literature on the competition between traditional financial markets (see e.g. Pagano (1989), Chowdry and Nanda (1991), Glosten (1994), Easley, Kiefer and O'Hara (1996), Bessembinder and Kaufman (1997), or Parlour and Seppi (2003)).

III.1. Costs and benefits of market fragmentation

Pagano (1989), Chowdry and Nanda (1991), and Admati and Pfleiderer (1991) argue that due to liquidity externalities, trading has a natural tendency to concentrate on the market that is already most liquid. Therefore, it is difficult to "move liquidity" from one trading system to another even when the new trading system is intrinsically better. This finding is similar to the one in the network effects literature, where markets can be stuck in the "wrong" equilibrium due to network effects. The "trade-through rule" in the US implies that orders for listed companies should be executed at the best price – implying that SORT is enforced by law. A trade-through happens when an order executes on a market despite there is a better price available on another market. The NYSE, enjoying a liquidity externality, therefore, did not face much competition as all orders are forced to go to the most liquid exchange (Regulation NMS in 1994 in the US has imposed this trade-through rule for all automated quotations that can be automatically accessed). The literature that shows that consolidated markets should arise in equilibrium argues that there are *costs to fragmentation*. With fragmentation, bid-ask spreads tend to widen and exhibit greater price volatility (Harris (1993)). However, heterogeneity in investor's tastes (e.g. willingness to trade, degree of immediacy, portfolio composition effects, informed versus liquidity traders) suggests that order flow may not be homogeneous. Then, some traders may search for differently organized trading systems that better satisfy their needs, leading to fragmentation (see e.g. Madhavan (1995)). Also, cream skimming may take place in that one market attracts the "uninformed" order flow. In this event, limit orders on the main market face more adverse selection problems and spreads may widen.

A potential *benefit of increasing competition* is that market quality may increase, for example, because bid-ask spreads become narrower. Beneficial effects occur when liquidity suppliers on the "incumbent" exchange enjoy market power. Then, the introduction of an additional market introduces competitive pressures on the incumbent exchange. Also, while the depth on the main market may decrease, the joint depth of both markets may increase (Glosten (1998)).

III.2. Intermarket Competition: Crossing Networks and Dealer Markets[5]

The specific nature of CNs introduces some important differences: CNs do not actively contribute to price discovery, nor do orders have a price impact. To our knowledge, the specificities of the competition between a CN and a traditional market are investigated in three studies only. It was first analyzed in a static context in the seminal paper by Hendershott and Mendelson (2000). Dönges and Heinemann (2004) extend this analysis. A dynamic model, which allows for analyzing order submission patterns over time, is presented in Degryse, Van Achter and Wuyts (2006).

III.2.1. Static models

Hendershott and Mendelson (2000) model the liquidity-based intermarket competition between a CN and a Dealer Market (DM). Their aim is to investigate the trade-off between the benefits of increasing competition between markets and the potential costs of order flow fragmentation due to the introduction of CNs. They show that the effects of CNs on market performance are subtle and complex. In their model, a random number of informed and liquidity traders simultaneously decide to submit single-unit orders to one market. This choice depends on trader specific characteristics, such as their valuation of the stock and their impatience to trade, as well as on market parameters (submission and execution costs at the CN, dealer's half spread, CN's probability of execution). Each trader determines her best response given her expectation of all other traders' strategies. Hendershott and Mendelson (2000) discuss four possible strategies: (i) not trading, (ii) exclusive CN trading, (iii) exclusive DM trading

5 This Section is mainly based on Degryse, Van Achter and Wuyts (2007).

and (iv) opportunistic CN trading. The latter reflects the possibility to relay orders to the DM upon non-execution at the CN.

Hendershott and Mendelson show that different trading venues may coexist. This happens when the population of traders is heterogeneous, for instance in the degree of impatience. Each market caters to the specific needs of particular classes of investors resulting in order flow fragmentation. DMs are influenced in two opposite ways by competition from the CN. On the one hand, there is risk sharing as dealers' inventory and adverse selection costs are lowered by exclusive CN traders, resulting in narrower spreads. On the other hand, opportunistic CN trading (i.e. using the DM as "market of last resort") may widen the DM-spread. The reasoning is that, in this case, the CN is skimming off part of the uninformed traders. Consequently, this fraction of uninformed traders cannot be "used" anymore by dealers to compensate their losses to informed traders. Within the CN, also two opposite forces are at work. First, a positive liquidity externality, as an increase in CN trading volume benefits all CN traders and attracts additional liquidity. Second, when the CN becomes sufficiently liquid, this liquidity externality may be dominated by a negative crowding externality: low-liquidity preference traders compete with the higher-liquidity value traders on the same market side. Combined with the competition effect, the resulting overall impact remains ambiguous. The emergence of the additional CN trading venue benefits some traders, while harming others.

Expanding on this paper, Dönges and Heinemann (2004) focus on some game theoretic refinements to reduce the multiplicity of equilibria in the coordination game. In particular, they model intermarket competition between a DM and a CN as a coordination game among traders and investigate under which circumstances these markets can coexist. If the disutility from unexecuted orders sufficiently differs across individuals, both markets coexist and order flow is fragmented. Market shares are determined by the distribution of disutilities.

III.2.2. Dynamic model of CN-DM interaction

In Degryse, Van Achter and Wuyts (2006), we investigate the interaction of a CN and a continuous (one-tick) DM. More specifically, we analyze the impact on the composition and dynamics of the order flow on both systems. We contribute to previous work on CNs by explicitly introducing dynamics into the analysis. These dynamics are important: a typical characteristic of a CN is that it "matches" orders at a specified time during the trading day, while the other market simultaneously operates in a continuous fashion. We develop the analysis for three different informational settings: (i) transparency, (ii) complete opaqueness, and (iii) partial opaqueness. The benchmark transparency case reflects that traders are fully informed about past order flow and hence observe the prevailing state of the CN's order book before determining their strategy. This results in pre- and post-trade transparency. However, in reality CNs are rather opaque. We incorporate this by analyzing two different degrees of opaqueness: partial and complete. While partial opaqueness implies that traders observe previous trades at the DM but not submissions to the CN, complete opaqueness entails that traders are uninformed on both past CN and DM order flow.

The general setup of our model is as follows. Traders are assumed to arrive randomly and sequentially. Upon her arrival, a trader knows whether she is a buyer or a seller, observes the bid and ask price of the dealer, the state of the CN's order book, and her willingness to trade. Moreover, she knows the time remaining to the cross, the distribution of buyers and sellers and the distribution of their willingness to trade. Trading in the DM implies a one-tick spread. Trading at the CN implies trading at the midprice, derived from the DM (so CNs do not actively contribute to price discovery). The cross takes place at the end of the trading day. When both trading systems coexist, traders can obtain guaranteed and immediate execution in the DM. They can also opt for cheaper (since they save the half spread), but later and (possibly) uncertain execution on the CN. Order flow to the CN is gathered in an order book where time priority is assumed. The implication is that at the cross, the orders that are submitted last at the excess market side do not obtain execution. Execution is then only certain when upon arrival, a trader is able to join the strictly shorter queue. In all other cases, the execution probability is lower than one.

Finally, a trader can also refrain from trading. We assume opportunistic CN trading to be very costly and therefore it cannot be an equilibrium strategy. Investors trade at most one unit.

We explicitly introduce dynamics into the analysis, as most markets nowadays operate in a continuous fashion. In particular, we model how a trader's decision hinges on the state of the CN's order book (when transparent) and her expectation on the behavior of future traders until the cross determines her submission strategy. Important to note is that these strategies are time dependent and non-stationary. The number of periods left until the time of the cross is one important aspect. The crucial element in the choice between a CN order and a DM trade, though, is the execution probability at the CN, since this determines expected profits. When an arriving trader submits a CN order, she changes the imbalance in the CN. This affects the execution probabilities of future CN orders and hence also the strategies chosen by future traders. When determining her optimal strategy, she must take these effects of her order into account.

Our findings can be summarized as follows. First, in common to the three informational settings, we find that an increase in the DM's relative spread augments the CN's order flow. Therefore, we expect that CNs will be more successful in markets where spreads are substantial. At the same time price discovery should be sufficiently informative as the CN "free rides" on information about prices from the DM. Second, a CN and a DM cater to different types of traders. Investors with a high willingness to trade are more likely to opt for immediacy and prefer to trade at a DM. The existence of a CN results in "order creation": investors with a low willingness to trade submit orders to a CN whereas they would never trade at a DM. Third, we also show that the execution probability at a CN is endogenous. It depends on the state of the CN's order book (if transparent), the observed order flow, and the expectations for past and future orders. Hence, although we start from dealers willing to provide liquidity at exogenously given bid and ask prices, we partly endogenize liquidity supply and demand by looking at traders submitting orders for potential execution at a CN. Fourth, the transparency and partial opaqueness settings produce systematic patterns in order flow. In particular, for the transparency case, we find that the probability of observing a CN order at the same side of the market is smaller after such an order than if it was not. Also, the probability of observing a sell at the DM decreases and the probability of a buyer trading on the DM increases when the previous order was a CN buy. Fifth, our results highlight that it is important to take into account the interaction between trading systems when measuring "normal" order flow. For example, when looking at an individual trading system, some order or trade flow sequences could wrongly be interpreted as being driven by information events, whereas they are caused by the interaction of trading systems.

IV. Market Design: What to expect from MiFID based on US and EU experience?

On April 21, 2004, the European Parliament and Council adopted the Markets in Financial Instruments Directive (MiFID), which is expected to be implemented in all EU-Member countries by November 2007. The objective of MiFID is to foster a fair, competitive, transparent, efficient and integrated European financial market, by providing a regulatory environment that (i) offers high quality investor protection and (ii) allows for the creation of new markets and services. The MiFID (as well as its US-counterpart Reg NMS [6]) intend to create a fair level playing field between the different types of trading platforms. The regulatory process of MiFID follows the Lamfalussy process that distinguishes four successive "levels" of implementation. MiFID itself is the so-called "Level 1", providing the legislative framework. "Level 2" provides the implementing measures and details how the MiFID will work in practice. The Committee of European Securities Regulators (CESR) plays an important role in the entire process. For example, CESR assists in "level 3" by translating the first two levels

6 Reg NMS should come into effect somewhere during the last quarter of 2006. RegNMS divides trading venues in so-called "fast markets" and "slow markets". The "trade-through rule"(i.e. the Order Protection Rule) only applies for fast markets., i.e. an order can be executed on a fast market even though a better price was available on a slow market. Gomber and Gsell (2007) argue that this gives incentives for slow markets to change into fast markets. For an analysis of Reg NMS, see Gentzoglanis (2007).

into national law and keeping an eye on harmonisation. Finally, "level 4" supervises the consistent application of these laws (more details in Gomber and Gsell (2007)).

The MiFID is part of the Financial Services Action Plan (FSAP) and "replaces" the 1993 Investment Services Directive (ISD). Under the ISD, countries were allowed to have the so-called "concentration rule" (Art 14(3) of the 1993 ISD) implying that retail orders had to be executed on a "regulated market", limiting competition for the existing exchanges. Davies, Dufour and Scott-Quinn (2005) review the trading systems in five big European countries and look at the implications of MiFID. They show that the development of financial markets in France, Spain and Italy is heavily influenced by the concentration rule. The concentration rule does not apply anymore in the Netherlands since October 2001, but trading in Dutch stocks mainly occurred on Euronext Amsterdam; remind however initiatives like SEAQ International and EuroSETS in London that aimed to actively trade Dutch securities. In the absence of the concentration rule, trades can be executed on any trading platform such as the previously discussed alternative trading systems or internalisers – systems where financial institutions execute orders on a proprietary trading platform (and possibly against own inventory). Other countries like Germany have a "default rule" which requires financial intermediaries to execute orders on an exchange unless an investor opts-out (see Gomber and Gsell (2007)). This again gives an advantage to the incumbent market.

The existence of multiple trading venues clearly provides the investor a choice where to execute its trades. Some investors prefer one trading venue to another, as trading venues offer different characteristics, and therefore cater to different types of traders. As argued above, some theories suggest that competition between trading venues may be harsher than competition within a particular trading venue. In this event, the coexistence of multiple trading venues may be beneficial to investors. However, when different trading venues coexist, markets become fragmented and investors have lower incentives to submit orders as the probability that their orders are executed is lowered. This is the consolidation-fragmentation discussion as introduced by

Hamilton (1979) (see e.g. Stoll (2001) for an application to the US-markets).

The MiFID aims to establish a comprehensive regulatory regime governing the execution of transactions in financial instruments irrespective of the trading methods used to conclude those transactions so as to (i) ensure a high quality of execution of investor transactions and (ii) uphold the integrity and overall efficiency of the financial system. The MiFID allows that regulated markets and other alternative market centers compete for order flow. The Directive distinguishes three categories of trading services. The first two, “Regulated Markets” and “Multilateral Trading Facilities”, are “multilateral systems operated and/or managed by a market operator, which brings together or facilitates the bringing together of multiple third-party buying and selling interests in financial instruments…” (op. cit. Official Journal of the European Union L245/10). A regulated market, moreover, has clear and transparent rules regarding the admission of financial instruments to trading. The third system is a “systematic internaliser”. This is an “investment firm, which on an organised, frequent and systematic basis deals on own account by executing client orders outside a regulated market or multilateral trading facility”. How do those three types of market centers fit into our typology discussed in Section II? The three types of market centers can be auction markets, dealership markets or hybrid markets. Typically, we put the multilateral trading facilities and systematic internalisers with the alternative trading systems, as these are “entrants” that threaten the position of the “incumbent” regulated markets.

The MiFID is concerned with three issues: investor protection, market access and transparency. We first review the existing academic empirical literature on each of these issues. In the next Section, we formulate our expectation about MiFID.

IV.1. Investor protection: market fragmentation and the impact on market quality? [7]

When trading is concentrated, and given adequate trading rules, regulators need to worry less about investor protection, at least in the short run. More attention towards investor protection is required when allowing for market fragmentation. MiFID indeed mandates the adoption by investment firms of adequate procedures for conducting their business, also related to potential conflicts of interest. The above discussion about theoretical contributions on intermarket competition has identified potential costs and benefits of market fragmentation. What can we learn from previous *empirical studies* in the US and Europe?

IV.1.1 Electronic Communication Networks and traditional markets

Most ECNs started operating in the late nineties after the introduction of the “Order Handling Rules” in 1997 (Sussman (2005b)). They have jointly attracted about 42% of market share in Nasdaq securities, and 3% in NYSE listed stocks (2004 numbers; see Stoll (2005)). According to Weston (2000), two causes can be discerned for this growth pattern. First, the changing SEC regulations are an important determinant. For instance the order handling rules increased competition because public limit orders were since then allowed to compete directly with Nasdaq market makers. Also market makers posting orders on ECNs were since then obligated to make those orders available for the public as well. This forced dealers to provide greater access to ECNs for investors. Moreover, ECNs have been more successful in attracting trade from Nasdaq. The intuition is that ECNs allows investors to trade directly with each other, eliminating the spread charged by dealers. The NYSE is already an auction market (with a specialist) and enjoys an incumbency advantage due to the liquidity externality, and the prevailing “trade-through provision”. Secondly, the advances in technology have played a tremendous role. The US-based trading systems were less advanced compared to many European exchanges.

7 This is partly based on Degryse and Van Achter (2002) and Degryse, Van Achter and Wuyts (2007).

This allows the ECNs to attract a significant part of the market.

There are already some studies describing the behavior of ECNs and their impact on the market quality on traditional exchanges for the US. These include the following: Huang (2002), Hendershott and Mendelson (2000), Simaan, Weaver and Whitcomb (2003), Domowitz (2001), Barclay, Hendershott and McCormick (2003), Weston (2000), Conrad, Johnson, and Wahal (2003), Benhamou and Serval (2000), Domowitz, Glen and Madhavan (2001), Domowitz and Steil (1999) and Naes and Ødegaard (2006). In most of these studies, the traditional market under consideration is Nasdaq as ECNs have proven to perform best for securities traded on this exchange (see below). We now briefly describe and compare the main results of some of these studies for four aspects of market quality, namely bid-ask spreads, depth of the market, informational efficiency and price discovery.[8]

Weston (2002) investigates whether the increased market share of ECNs leads to tighter *bid-ask spreads* (monthly average quoted, effective and relative spreads for stock i in month t), i.e. whether ECNs have a significant negative impact on spreads on traditional markets. For this purpose, he performs the following regression using a long time-series and large sample of firms[9] :

$$\ln(Spread)_{it} = \alpha_i + \beta_1 (ECN\ Market\ share)_{it} + \beta_2 \ln(Reforms)_{it} + \beta_3 \ln(Size)_{it} + \beta_4 \ln(Turnover)_{it} + \beta_5 \ln(Volatility)_{it} + \beta_6 (numberoftrades)_{it} + \epsilon_{it}.$$

The variable "ECN market share" allows to test for the effect of ECN activity on spreads. The variable "Reforms" is included to capture possible spread effects of any market reforms (i.e. Order Handling Rules). The independent (control) variables in this model were chosen according to Wahal (1997). They are used to capture well-known determinants of bid-ask spreads, and of execution costs in general.
For instance, the selected size variable controls for the fact that orders that are large relative to normal trading volume are likely to have higher

8 See Degryse et al (2005) for an analysis of resiliency of a limit order market.

9 This is a multivariate fixed-effect model that allows for within-firm variation in the parameters to account for unobserved heterogeneity in liquidity for the sample of firms.

execution costs because of adverse selection effects. Log transformations of these variables are used to reduce the skewness.

The β_1- coefficient is of interest to us. It is consistently negative and statistically and economically significant for all specifications (i.e. for the three kinds of spreads). This implies that ECNs are in fact effective low-cost competitors to the traditional Nasdaq dealers. The β_1-coefficient indicates that a one percent increase in ECN market share lowers the average quoted spread by 1.6%. Weston argues that these results are particularly strong because the data used actually give an underestimation of the true impact due to the manner in which volumes are reported to Nasdaq. Note, however, that they are only valid for small trades, not for block trades. Thus, in addition to regulatory market reforms, the growth of ECNs has helped to significantly lower trading costs. As such, it has mitigated the negative effects of the suspected imperfect competition among Nasdaq dealers(e.g. Huang and Stoll (1996), Christie and Schultz (1994), Weston (2002))[10].

Domowitz (2001) constructs an American sample by gathering data from institutional investors. For this dataset, total trading costs for executions by institutional investors through ECNs and through traditional brokers and markets are compared. Calculated yearly savings from 1993 through 1996 using automated systems vary from 31 to 65 percent, relative to trades executed by traditional brokers or dealers.[11] Domowitz also manages to invalidate the conventional wisdom that automated trading venues are cheaper only because “easier” trades are more often sent to them as he proves that even for more difficult trades, savings from automated execution are evident[12].

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10 This is supposed to be due to practices such as payment for order flow and preferenced trading used by traditional dealers to attract order flow through non-price competition. Thus, large spreads are prevented from being competed away (Weston (2000)).

11 Average savings amount to 46 percent.

12 Domowitz defines more difficult trades as having above median values of trade size and volatility, or having below average market capitalization (firm size), i.e. the controls used above.

This empirical evidence is also consistent with Conrad, Johnson and Wahal (2003), although they use a somewhat different approach. They determine what the difference in realized execution costs is between crossing networks (POSIT or an after-hours cross on Instinet), ECNs (Instinet) and traditional markets (NYSE, Amex or Nasdaq). These three trading systems are engaged in a competition for order flow. In their dataset[13], the distinction is made between single and multiple mechanism orders, which are respectively orders that are completely executed by a single trading system (91 percent of all orders) and those in which trades are filled by more than one trading system (9 percent of all orders). Note that there is considerable time series variation, but no trend in the distribution of single mechanism orders.

Further, the data show substantial differences in size between orders executed on the three mechanisms. Order fill rates are lowest for crossing systems as it concerns a mere function of liquidity on the system (cfr. contra-side depth), which is exogenous to the trader. As traders on ECNs and on traditional broker systems can trade anonymously, they endogenously increase the probability of a fill. Evidently, multiple mechanism orders have the largest execution costs, as they are most difficult to fill.

As in Domowitz (2001), total execution costs are measured as the sum of implicit and explicit costs. Obviously, comparing execution costs between different trading systems univariately can be quite misleading as the trading mechanisms may represent varying degrees of aggressiveness on the part of the institution[14]. One needs to take the differences in order characteristics between these systems into account. For instance, variation in order difficulty and other characteristics influence liquidity and thus trading costs. These are controlled for

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13 Note that only to describe ECN activity, only data for Instinet were used as the remaining ECNs only commenced operations after the end of their sample period.

14 Conrad et al. (2003) offer the following ranking on aggressiveness: external crosses < ECN-executions < broker-dealer operations. These differences result in a natural sorting of order difficulty across the categories.

using two methods, i.e. a "matched-sample" approach[15] and a regression-based approach[16] as in Weston[17]. Both these methods yield quite similar results. Compared to traditional brokers, execution costs on crossing systems are substantially lower. For ECNs, this cost advantage is even more pronounced. Note that these results are quite robust and that the differences can be primarily attributed to distinct implicit costs.

Conrad, Johnson and Wahal (2003) note, however, that an endogeneity problem may arise as the choice of trading mechanism could be endogenous to (ex post) realized execution costs. More difficult-to-fill orders that incur higher ex-post execution costs are more likely to be sent to mechanisms guaranteeing a high fill rate. This issue, which leads to inconsistent estimates, is not accounted for in the above mentioned methods and therefore needs to be addressed by using a two-stage procedure ("endogenous switching regression method") following Madhavan and Cheng (1997). The cost differentials described above seem to persist when applying this model, in fact they are even more pronounced.

Weston (2002) also investigates whether the increase in ECN market share leads to greater *depths*. For this purpose, he performs the following regression:

$$Depth_{it} = \alpha_0 + \alpha_1\, ECNactivity_{it} + \alpha_2 \ln(volume)_{it} + \alpha_3 \ln(Price)_{it} + \alpha_4 In(volatility)_{it} + \alpha_5 \ln(MarketConcentration)_{it} + \alpha_6 (TimeDummy)_t + \epsilon_{it}.$$

The presence of an ECN does seem to increase the quoted depth.

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15 Which controls for trade direction, order instruction, order size, exchange listing and market capitalization without imposing any functional form restrictions.

16 Control variables: order size, inverse of stock price, logarithm of market capitalization, exchange listing, return volatility, cumulative size-decile adjusted return, institution-specific indicator variables, indicator variables for external crosses and ECN-executed orders.

17 Note that another possibility for comparing execution costs is focusing on multiple mechanism orders, as order characteristics by definition are held constant across the trades. Also the investor chooses how to break up the order, and where and in what sequence to place the order.

Weston's results suggest that a 1% increase in ECNactivity increases depths by 5.1%. These conclusions, however, are disputed by Barclay, Hendershott and McCormick (2003) who study transactions data for June 2000 and conclude that ECN trading lowers quoted depths. Weston (2000) investigates *informational efficiency* and suggests that ECNs do impose higher adverse selection costs on traditional markets through more anonymous trading[18]. An increase in anonymity through ECN trading may therefore increase information costs, urging intermediaries to charge larger spreads (Amihud and Mendelson (1986), Glosten and Harris (1988)). So, although ECNs lower trading costs, they reduce the informational efficiency of prices. Note that this conjecture does not hold if the ECN functions as a separate market. In this case the presence of an ECN reduces the amount of information asymmetry in a dealer market by providing an alternative venue for information-based trades. Weston performs a test on the change in anonymity of trading on the Nasdaq due to ECN trading, i.e. estimating the adverse selection component of spread (Huang and Stoll (1996)) and regressing this measure on the level of ECN activity and a group of control variables[19]. An increase in adverse selection costs linked to ECN trading is noticed, confirming the first conjecture stated above. However, these costs are outweighed by benefit of lower overall transaction costs.

Conrad, Johnson and Wahal (2003) describe the link between the efficiency of the base markets' *price discovery* mechanism and the success of ECNs. For the United States, it has been extensively proven that transaction costs are significantly lower on the NYSE than on Nasdaq (for ex. Hasbrouck (1995), Huang and Stoll (1996)). An obvious rationale for this difference is the distinction in trading mechanisms that are employed on both markets, i.e. auction markets provide more adequate price discovery than the dealership markets.

[18] Intermediaries face uncertainty on the type of trader they deal with, i.e. informed or uninformed ones.

[19] These control variables include market capitalization, share turnover, return volatility and market concentration, and are also suspected to affect information costs.

In their study, they refer to Hendershott and Mendelson (2000), who state two necessary conditions for crossing systems to be successful when co-existing with a dealer market. Firstly, as these systems do not provide active price discovery themselves, they need to rely on a primary market providing an adequate price discovery mechanism. Secondly, the crossing network initially needs to attract at least a minimum threshold of volume from this primary market so that the pool of liquidity is sufficiently large[20]. Based on these conditions, one could postulate that crossing networks will be more successful in competing for NYSE shares and therefore primarily focus on listed securities. ECNs on the other hand, engage themselves in active price discovery, and will therefore rather compete with primary markets with higher transaction costs and fragmented order flow. In fact, their success is inversely related to the efficiency of the primary market, i.e. if bid-ask spreads are higher on the primary market, ECNs become a truly competitive alternative. Clearly, external crossing systems and ECNs compete for order flow in different dimensions as certain clientele effects arise. Empirical evidence seems to support both these conjectures as 90 percent of all orders executed on external crossing systems are for NYSE securities and 80 percent of all ECN-executed orders are for Nasdaq securities (sample by Conrad, Johnson and Wahal (2003)).

IV.1.2 Crossing Networks and traditional markets

The empirical literature analyzing CNs contains only a few studies. The main reason is that these proprietary systems often do not reveal detailed information. In this section, we summarize the results of five empirical studies we are aware of. We also present a practitioner's view on CNs.

Gresse (2006) studies the impact of the POSIT CN on the liquidity of the dealer market segment of the London Stock Exchange (SEAQ) for

[20] Referring to the Hendershott and Mendelson paper, Conrad et al. quote that "Volume on crossing systems that provide no price discovery function has a natural upper bound since the system cannot exist independent of the primary price-setting mechanism, whether it be an auction or dealer market. To the extent that other systems (such as ECNs) provide a price discovery mechanism, they can exist and grow independently."

two 6-months periods during 2001 for a cross-section of UK and Irish mid-cap stocks. She finds that POSIT has a market share of total trading volume in these stocks of about one to two percent. Its probability of execution, though, is still low (2-4%). Furthermore, she reports that activity at POSIT does not have a detrimental effect on liquidity in the considered DM: there is no significant increase in adverse selection or inventory risk on the DM. Hence, empirically, no dominating negative fragmentation effect is detected. Instead, spreads decrease due to increased competition and to risk sharing.

Conrad, Johnson and Wahal (2003) use proprietary data for a total of $1.6 trillion in equity trades from 1996:1 to 1998:1 by 59 institutional investors in the U.S. who are able to choose between three trading platforms: CNs, Electronic Communication Networks and traditional brokers. They distinguish orders that are entirely filled by one trading system (single-mechanism orders) and orders that use more than one trading system (multiple-mechanism orders). While controlling for variation in order and security characteristics as well as for endogeneity in the choice of trading venue, they find that crosses have substantially lower realized execution costs as compared to brokers (the average cost differential ranges from 14 to 30 basis points). Most of these economically significant differences could be attributed to the lower commissions on CNs, but more importantly also to the absence of spread costs and direct price impact costs. However, the cost differential is expected to decrease in the future, due to additional competition. For the multiple-mechanism orders, they indeed find that most traders opt for brokers as last method of execution ("market of last resort" as in Hendershott and Mendelson (2000)).

Næs and Ødegaard (2006) examine the trades of a single institution, the Norwegian Petroleum Fund for a 6-month period: 4200 orders that are sent first to CNs and, in case of non-execution, subsequently to brokers (i.e. an opportunistic trading strategy). Their results show that although the Conrad et al. (2003) cost differential is confirmed, it is not clear that this differential persists if the presence of private information (which may affect the probability of crossing) is accounted for. Hence, measured low costs in CNs may be fully offset by substantial costs of non-trading due to adverse selection in the CNs.

Næs and Skjeltorp (2003) extend this analysis using the same data set. They investigate the nature of competition between a principal exchange and a CN with respect to the primary market's liquidity. Past empirical evidence shows that CNs primarily compete in the most liquid stocks. Næs and Skjeltorp argue that if stocks that are not supplied in CNs are less liquid in general, then these stocks need a higher return to induce investors to hold them. Consequently, the abnormal performance of the non-crossed stocks found in Næs and Ødegaard (2006) may be explained by a liquidity premium. They find significant differences in liquidity between stocks that are traded on CNs and stocks that have to be bought in the market. This potentially indicates the presence of informed trading in the non-executed CN stocks. However, they also find that there are systematic differences in liquidity between the two groups of stocks on other dates than the trading dates of the actual crossing strategy, suggesting that there are systematic differences in the characteristics of the two groups of stocks that are unrelated to private information.

Fong, Madhavan and Swan (2004) focus on the price impact of block trades on different trading venues, i.e. a limit order book, a CN and an upstairs market for data from the Australian Stock Exchange. They find that competition from the two latter markets imposes no adverse effect on the liquidity of the limit order book. Hence, there is no evidence of a liquidity drain from the downstairs market. CNs and upstairs markets are even shown to be beneficial. Moreover, they argue that the migration of trades to the upstairs market is not responsible for the high asymmetric information problems in downstairs markets. As compared to Gresse (2006), they argue that this benefit is caused by an improvement of counterparty search, rather than by the cream-skimming of informed traders or by the risk-sharing explanations.

We start the discussion on the *practitioner's view* by providing some recent market shares of the different CNs. Employing a broad CN definition, by including Liquidnet, Sussman (2005a) estimates the market share of the CN business in the US for the second quarter of 2005. With a share of 47%, Liquidnet outranks POSIT (35%).[21] Instinet follows both market leaders at a reasonable distance with a share of 10%. Other smaller systems account for the remaining 8%. According to Tabb (2004) reporting on institutional equity trading in America, about 90% of all large investment management firms state using a CN.[22] Within the medium or small segment of firms, this rate is somewhat lower, 86% and 60% respectively. In the next couple of years, these numbers, as well as the intensity of usage, are still expected to increase as order flow keeps on migrating toward these cheaper venues. The two main stated reasons for using CNs are first the ability to find pooled sources of liquidity and second to anonymously execute large blocks while limiting market impact and information leakage.[23] In fact, this partly explains the lower popularity among small firms, as they on average have smaller positions to trade. Hence, they care less about potential market impact or information leakages and are able to use the traditional markets more effectively. In contrast, large institutional investors strive to hide their liquidity to avoid these undesirable outcomes. While CNs are eager to comply with this crave for anonymity by lowering their transparency level, it also causes market fragmentation. This shows that transparency and critical mass are also mentioned as concerns by practitioners.

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21 Note that it is the first time Liquidnet's volume outgrows that of POSIT.

22 The sample they used was constructed on the basis of conversations with 52 head and senior traders of investment management firms and hedge funds. The large group, 10 in total, represents those firms in the sample with an Assets Under Management (AUM) over US $50 billion.

23 For instance, the average trade size in the traditional U.S. markets (NYSE, NASDAQ, NSX and ArcaEx) early 2004 was approximately 500 shares, while Liquidnet's average trade size in the same period approximately equaled 47,000 shares. Hence, filling a large block order takes longer on the traditional markets as it requires more transactions and is more likely to induce adverse market impact. Note that the number for the traditional markets used to be higher (e.g. more than 1400 shares in 1997), but experienced a significant (liquidity) decrease due to the introduction of Order Handling Rules in 1997 mandating the development of electronic execution and the implementation of a decimalized price grid in 2000 which fragments liquidity across price points.

In particular, the main disadvantages of using CNs are stated to be (i) the low liquidity level due to the current low fill rates which results in a high opportunity cost[24], (ii) the lack of ex-post market data provision, and (iii) the low transparency level. These factors still impede their widespread usage and prevent CNs from attaining critical mass. To increase their fill rates, most CNs are currently adapting their market design. POSIT and Pipeline Trading (a block-trading alternative which only started early 2005) are trying to capture liquidity from broker-dealers at the sell side.[25] In reaction, Liquidnet focuses on bringing in retail-size order flow to match against the existing wholesale liquidity pool by implementing a new initiative "Liquidnet H2O". Thus, it tries to bring together two pools of liquidity, institutional and retail, while still remaining faithful to its buy-side only strategy.

IV.2. Market access

The MiFID, in line with the ISD, establishes a EU-passport for investment firms. Member States have to ensure that investment firms authorised from other member states have the right to access (1) the regulated markets in their country, and (2) the clearing and settlement systems. MiFID also imposes best-execution obligations to investment firms. For professional clients, an investment firm is free to define in its execution policy what factors it will take into account. For retail clients, investment firms are required to deliver the best possible result in terms of price and costs; a regulation closely in line with the trade-through rule in the US. The economic rationale for trade-through prohibition is that this would discourage liquidity provision

24 A joint study by Plexus Group and Financial Insights indicated this opportunity cost (i.e. the cost of delayed or even failed execution due to for instance an adverse price movement) by far exceeds the other implicit and explicit costs of trade execution, which is a confirmation of the Næs and Ødegaard (2006) results.

25 More specifically, POSIT enhances its system to capture new features that address criticisms of Liquidnet with the introduction of "POSIT Now" (formerly TriAct, a continuous CN similar to Liquidnet) and "POSIT Alert" (which alerts the client of trading opportunities before they are visible in the market, i.e. matching of signals on desired trades), beside the existing "POSIT match" (which trades at set intervals).

Important in this respect is also whether investors have equal market access, and how smart order routing technology may bring markets together by providing technology that optimally executes orders on several markets. Foucault and Menkveld (2006) study a theoretical model where two exchanges compete and where only a fraction of brokers implements SORT to fulfil the trade-through rules. Their model shows that joint depths will increase since submitting orders to another exchange somehow allows overcoming time priority. Also the presence of more smart routers leads to more liquidity at the entrant market. They bring their model to the data by analyzing Dutch stocks with the introduction of EuroSETS next to Euronext Amsterdam. They find that joint depth has increased after the introduction of EuroSETS. They also find that bid-ask spreads are lower on EuroSETs for stocks exhibiting more smart routers. Market access to new trading platforms induced by smart routers seems a key input for success.

IV.3. Transparency

The degree of transparency on financial markets influences traders' submission strategies. Greater transparency has the tendency to equalize information across market participants. A distinction is made between pre-trade transparency and post-trade transparency. Pre-trade transparency refers to the availability of information on outstanding order flow accumulated in the order book or dealer's quotes before orders are submitted. This information is about quotes and trading interest, and can contain information on different trading platforms. Post-trade transparency deals with the availability of information about executed trades.

Stock exchanges differ to a great extent on the transparency degree of their financial markets. The MiFID in Europe also regulates what information should be disclosed to market participants for stocks that are listed on regulated markets. In particular, MiFID requires that for the "multilateral trading facilities" and the "regulated markets", real time interests are made available to investors. For quote driven markets, this is the best bid and offer of every market maker, while for order driven markets these are the five best bids and offers. Also systematic internalisers need to provide quotes to market participants for the most liquid stocks. Post-trade information needs to be submitted real time and contain the time stamp, the instrument traded, the price, the quantity and the execution venue.[26]

Pagano and Roëll (1996) have shown that *pre-trade transparency* is an important determinant of the competitiveness of a financial market. They find that, when considering a single trading system, greater transparency typically generates lower average trading costs for uninformed traders (see also Baruch (2005)). The revelation of traders' identities, however, may induce opposite effects (see Foucault et al. (2006), or Rindi (2003)). Also, transparency of the limit order book implies that limit orders may become free options, such that the willingness to submit limit orders may decrease. Bloomfield and O'Hara (2000) show that in a dynamic trading environment, transparency has ambiguous consequences. When markets are opaque, only the liquidity supplier gets informed. Therefore, competition is harsh initially but comes at the cost of lower liquidity later on, as non-informed liquidity suppliers now face a "double" adverse selection from both the informed trader and the informed liquidity supplier.

Post-trade transparency of large trades may make it difficult for market makers to unwind their inventories. Naik et al. (1999), however, argue that post-trade transparency may be beneficial for market makers even when trading with informed traders. The intuition is that, when large trades are disclosed, this new information is immediately revealed in the market, enhancing risk-sharing possibilities of market makers.

But how does transparency affect intermarket competition? In contrast to ECNs which basically function as a transparent limit order book, CNs are in practice extremely opaque trading systems, both in terms of pre-trade and post-trade transparency. Pre-trade transparency on one market allows for "free-riding" behavior of other markets and by crossing networks in particular (Hendershott and Mendelson (2000)). Degryse, Van Achter and Wuyts (2006) show that the degree of opaqueness determines traders' willingness to opt for the CN.

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[26] See e.g. AFM website http: //www.afm.nl

They highlight the first point of the following trade-off. On the one hand, a pre-trade transparent CN invites traders to hit visible market liquidity. Also, investors may be more willing to opt for the CN as they anticipate their order will invite counterparties to benefit from the created and visible liquidity. On the other hand, opaque CN systems allow for trading anonymously. Large order imbalances in the CN then do not alarm the base market and do not generate an adverse price impact.

There are only a few empirical studies that investigate the impact of transparency changes. A first paper finds negative market-quality effects of more pre-trade transparency. Madhavan et al (2005) study the dissemination on the Toronto Stock Exchange of Limit Order book data on April 12, 1990. At that date, the stock exchange started to display limit order book data on the “floor” trading segment and the “automatic trading segment” (CATS). They find a negative impact on market quality. The bid-ask spreads increase on the Toronto Stock Exchange; however, more so for “floor trading” than for “CATS”. Also the adverse selection component of the bid-ask spread increases in both “floor” and “CATS” stocks. While depth remains unaffected, there is a significant increase in volatility. Finally, Madhavan et al (2005)report a negative stock market reaction as there was a decline in stock prices.

Other papers have found a positive impact of pre-trade transparency on market quality. Boehmer, Saar and Yu (2005) study the introduction of the OpenBook on the NYSE of January 2002. This greater transparency implies that traders off the NYSE floor observe depth in the limit order book in real time at each price level. Boehmer, Saar and Yu (2005) find that this has an impact on trading strategies in that traders seem to manage the exposure of their orders (higher cancellation rates and shorter time-to-cancellation) and that the specialist” participation declines. The informational efficiency of prices increases as there are smaller deviations of transaction prices from the efficient price. Finally, liquidity increases as effective spreads decline and limit order book depth augments.

One paper looks at the impact a pre-trade transparency change in one market has on other markets. In particular, Hendershott and Jones (2005) study the situation where Island decided to remove the display of the limit order book and "to go dark" in the three most-active Exchange Traded Funds on September 23, 2002, to avoid the Regulation ATS. This regulation implied that when limit order book data are made available to some players, it had to be made available to all interested parties. Island was at that time the most important trading venue in these instruments. The impact of Island going dark was a drop of its market share of about half, and price discovery shifting to other markets (Instinet, Archipelago, AMEX, NYSE). The effective and realized spreads increased on Island and decreased on the other markets, with the net overall effect being ambiguous. On October 31, 2003, Island decided to redisplay the quotes. Spreads fell but not back to their original level.

Gemmill (1996) investigates changes in post-trade transparency on the London Stock Exchange. He studies the liquidity for three different publication regimes. From 1987 to 1988, dealers had to immediately report their block trades, while from 1991 to 1992 they had to do so within 90 minutes, and from 1989 to 1990 they had 24 hours to do so. The disclosure regime seems not to affect liquidity on the London Stock Exchange.

V. Policy Discussion and Concluding Remarks: What to expect from MiFID?

In this paper, we reviewed the theoretical arguments and empirical evidence for stock markets related to intermarket competition, market access and transparency. The empirical evidence, mainly stemming from the US, shows that, in general, the competition effect of coexisting financial trading systems seems to dominate the fragmentation effect. That is market quality (i.e. bid-ask spreads, depth, informational efficiency and price discovery) improves when financial markets coexist. This result is particularly strong for competition between ECNs and dealer markets like Nasdaq; however, it is less strong for competition between CNs and other trading system. To the extent that the empirical results can be applied for Europe, we can expect that competition from new trading platforms will, to say the least, not be harmful in terms of market quality or investor protection. However, most continental European financial markets as well as the most liquid segment on the LSE (SETS) already exhibit an auction market design employing a limit order book. Competition from alternative trading systems with the NYSE, which also employs a limit order book, has not been so successful since the "trade-through rule" applies, implying that orders need to go to the most liquid market. Since MiFID imposes a best-execution rule, this might suggest that new trading platforms in Europe have a lower probability of success. Also, one needs to be concerned about the empirical evidence in that this positive effect of fragmentation might simply reflect a sample selection bias: fragmentation is only observed when it improves liquidity. Moreover, some recent attempts, like Virt-X, have not been very successful in competing with established markets.

A new trading platform or alternative trading system will only attract a considerable market share and become liquid when it is able to (1) move liquidity from the existing regulated markets to the new trading platform, and/or (2) serve new groups of customers by offering an alternative market design. On November 14, 2006, seven large banks – Citigroup, Credit Suisse, Deutsche Bank, Goldman Sachs, Merrill Lynch, Morgan Stanley and UBS – announced that they will create a new trading platform spanning Europe, and will ask other banks to join. These seven large banks cover about half of all trades in Europe. To the extent that this trading platform can create liquidity, and financial institutions can interpret the best-execution rules such that they can execute their investors' order flow on the new trading platform (see also below), they seem to be able to fulfill condition (1) above. If this were to happen, this new trading platform can become a serious competitor for Euronext, Deutsche Börse, the London Stock Exchange as well as other European exchanges. However, switches from liquidity in one market to another market have been scarce (see however the switch in liquidity from Liffe to Eurex in the German Bund in 1998 – also called in the Industrial Organization literature "Market Tipping"). At the time of writing this piece, no details are available concerning the design of the trading platform, and an answer on whether condition (2) of above holds can not be provided.

European exchanges react to the new MiFID regulation and new competitive threats in a number of ways. A first reaction is by mergers and acquisitions among themselves.[27] The demutualization of stock exchanges and their public listing allows exchanges to merge more easily. Almost all possible combinations between exchanges have been on the radar screen but mergers between Euronext-NYSE and the LSE-Nasdaq seem to have the highest chance of success (at least at the time of writing this piece), in line with predictions in Degryse and Van Achter (2001). The two major markets in the US also have reacted to the competitive threats of alternative trading systems by mergers and acquisitions. Nasdaq acquired two major competing ECNs (Brass Utility in September 2004 and Reuter's Instinet in December 2005), and is trying to acquire the London Stock Exchange. The NYSE acquired Archipelago and aims to merge with Euronext. A second reaction by the incumbent exchanges is to "preempt" the market by changing their market design to cater to different types of traders, i.e. by product proliferation. Recent history has shown that the incumbent markets have been able to survive competitors (see e.g. SEAQ-International at the end of the 1980s, EuroSETS for Dutch stocks). Many exchanges in Europe and the US offer a full range of different trading platforms and have become hybrid markets. For example, both the NYSE and Nasdaq have installed Crossing Networks. An open question in the market-microstructure literature is how the policy recommendations would differ when comparing competition between several markets with different trading systems versus one exchange that offers multiple trading systems. A third strategic reaction is to lower trading fees. For example, Euronext's reaction to the announced plans of the seven large banks as well as other entrants could be to lower fees, in order to predate entrants. This is exactly what happened when London's EuroSETS was created: Euronext responded by lowering the fees. Competition authorities and financial supervisors and regulators should follow closely this behavior as a lowering of fees might reflect predatory pricing (see for example the EU-investigation of Euronext's lowering trading fees for Dutch securities). A countervailing force, however, is that most incumbent

27 See Engelen (2007) for a complete description of the changes in the securities trading landscape in Europe and the US.

markets are now publicly listed themselves: shareholders put pressure on exchanges not to lower fees too much. This contrasts with the prelisted environment where the member firms typically were also the most important shareholder of the exchanges. Davis et al (2005) have argued that the countries where the concentration rule applied (e.g. France, Italy, and Spain) will be most affected by MiFID.

The day-to-day interpretation of the best-execution rule will be important for the potential of new trading platforms (see also Gomber and Gsell (2007)). MiFID requires investment firms to specify an order execution policy that includes "information on the different venues where the investment firm executes its client orders and the factors affecting the choice of execution venue (op cit European Union (2004), Article 21 (3)). Moreover, investment firms do not need to connect to every trading venue at any cost. Gomber and Gsell (2007) mention two possible interpretations of the best-execution rule. The first is "best execution as a process", implying that orders are routed to the cheapest execution venue on a consistent basis. Investment firms can then exclude certain trading platforms and specify a limited set of trading venues in their execution policy. The second interpretation is on an order-by-order basis. Foucault and Menkveld (2006) show that market access is important to give incentives to liquidity suppliers. A strict (absolute) interpretation of the best-execution rule combined with full transparency and market access introduces two opposing forces. On the one hand, such a combination gives incumbent markets an important liquidity advantage as orders need to go to the most liquid market. On the other hand, as Foucault and Menkveld (2006) argue, a new trading system gives investors the opportunity to jump time-priority by submitting orders to the new trading system and becoming first in the queue. This might improve overall liquidity of markets.

The empirical results on transparency were not clear-cut. Earlier studies show negative effects of greater transparency whereas the most recent evidence suggests that greater transparency promotes liquidity. One explanation for the diverging results might be the greater availability of technology. The current technology allows investors the possibility to monitor the limit order book closely. As argued by Davis et al (2005), the impact of greater transparency might be most at work in the UK and Germany. We expect that greater transparency will improve market quality. However the results will need to be closely monitored by regulators and supervisors (see also Davis et al. (2005)).

We conclude the discussion by making two additional points. First, US evidence shows that the regulation that requires the publication of execution market quality affects order routing. The SEC requires market centers to publish monthly market quality reports. Boehmer, Jennings and Wei (2005) find that the sensitivity of market share to execution quality increased after this regulation. European supervisors and regulators might want to follow this example. Second, Shkilko, Van Ness and Van Ness (2006) show that, for the US, the National Best Bid and Offer for an average active stock is non-positive 10.58% and 4.05% of the time on, respectively, the Nasdaq and the NYSE inter-markets. They attribute these non-positive spreads to competitive trading practices in contemporary fragmented markets. When European financial markets become more fragmented due to the creation of new trading facilities and internalisers, similar situations might occur. This will confront academics, practitioners, investors, as well as supervisors with new issues. Examples are, how to define best execution; how to detect anti-competitive behavior, how to detect insider trading? It should be clear from this lecture that supervisors, regulators, and academics face some interesting challenges, giving all of us an exciting future.

Ik heb gezegd.

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