MiFID, Reg NMS and Competition Across Trading Venues in Europe and United States*

This draft: January 14, 2009

* I am grateful to Roberta Fusetti for providing part of the data used in this article as well as to Mario Anolli, Luisella Bosetti, Massimo De Masi, Luca Filippa and Mahen Nimalendran for useful comments and suggestions on previous drafts.

Structured Abstract

Purpose
To evaluate how MiFID Directive and Regulation NMS affect the competition for order flow among trading venues in, respectively, Europe and United States.

Design/methodology/approach
The article examines the differences between MiFID and Reg NMS and provides, based on market microstructure principles, insights as to their likely impact on European and US securities markets.

Findings
Although MiFID and Reg NMS share the common objective of enhancing competition in securities markets, they adopt different provisions with respect to three issues that strongly influence the competition for order flow among trading venues. Specifically, some of the provisions set forth by the US regulation with respect to the best execution duty, the consolidation of market data and the disclosure of execution quality information appear to be more effective, compared to the EU ones, in strengthening competition for order flow among trading venues.

Research limitations/implications
Regulatory factors can only partly explain the current structure of European and US securities markets. Technology and heterogeneity in traders' demand are other important factors that concur in shaping European and US markets.

Practical implications
The degree of competition for order flow among trading venues depends on (i.) how regulations define the best execution duty, (ii.) the availability of updated and consolidated pre trade (i.e., quotations) and post trade (i.e., transactions) information, (iii.) the efficiency of post trading infrastructures.

Originality/value
The paper addresses issues not yet investigated and provides valuable insights for financial intermediaries, incumbent and prospective exchanges as to the competition in the securities industry, and to regulators as to the likely impact of the new regulations.

Keywords
Regulation NMS; MiFID directive; Best execution; Fragmentation; Market data consolidation

Paper type
Research paper

JEL Codes
G15; G18; G24

I. INTRODUCTION

MiFID Directive[1] and Regulation NMS[2] (Reg NMS henceforth) are intended to promote competition among trading venues in, respectively, Europe and United States. Competition among trading centres may, however, lead to a fragmented marketplace and this may severely hurt market quality. The adoption of both pieces of regulation generated a wide debate, particularly in Europe where a concentration rule was still in place in France, Germany, and Italy when the MiFID directive was adopted (Köndgen and Theissen, 2006). One of the most controversial issues was the fragmentation/consolidation dispute: to what extent it is necessary to concentrate securities trading for sake of liquidity while penalizing competition among providers of trading services? Or, alternatively stated, to what extent we wish to increase competition among markets while risking to have less liquid markets and less informationally efficient prices?

Fragmentation of the order flow does not, however, necessarily imply poor market quality. The elasticity of the order flow (i.e., the possibility of directing the order flow towards the more efficient trading venue at each moment in time) plays a crucial role in determining the actual level of market quality: the more elastic is the order flow, the higher is the overall market quality. In turn, the elasticity of the order flow depends, among other factors, on how the regulation requires trades to be executed, market information to be disseminated, execution quality indicators to be disclosed.

This paper investigates how MiFID and Reg NMS affect the competition for order flow among trading venues in Europe and US. Specifically, the paper examines how differences in the regulation of the best execution duty, the consolidation of market data, and the publication of execution quality measures affect the trading process and the competition for order flow. The paper also provides an investigation of the degree of market fragmentation among incumbent exchanges and new trading venues in European and US securities markets, and suggests possible explanations for understanding the current macrostructure of such markets.

[1] Directive 2004/39/EC of the European Parliament and of the Council of 21 April 2004 on markets in financial instruments (MiFID).
[2] SEC Exchange Act Release No. 34-51808 (9 June 2005).

Under Reg NMS, markets are directly responsible to execute each order at the best available price and, if they cannot fill an order at the best price, they are expected to route it to a competing trading venue displaying better quotes. Under MiFID, by contrast, investment firms only are responsible for the best execution of their clients' orders and, consequently, markets do not need to be interconnected and route orders each other. Importantly, a wide array of execution characteristics (like, e.g., speed or likelihood of execution and settlement) defines order's best execution in Europe. Differently, in US price alone matters – provided that quotes are immediately executable – to comply with the best execution duty. This difference implies, on one side, that European trading venues may compete for order flow on other market quality characteristics beyond quotes and, on the other side, that it might be hard to identify the trading venue where to route an order in compliance with the best execution duty.

Reg NMS and MiFID also differ in terms of the market for trading data and the disclosure of trades' execution information. To facilitate competition across markets, the US regulation requires both markets and intermediaries to regularly disclose standardized information about trades' execution quality as well as the consolidation of trading information in a single system, while also allowing a free market for trading data. MiFID as well liberalises the market for trading information, allowing businesses to offer services to aggregate data from different trading venues, but it does not require either to consolidate trading information or trading venues to disclose statistics on execution quality. Both information consolidation and the disclosure of execution quality indicators might lower searching costs and, consequently, increase competition among trading venues.

The rest of the article is organized as follows: Section II discusses the public policy issues related to the competition for order flow and the risks of market fragmentation, Section III reviews the main provisions of MiFID and Reg NMS, Section IV examines the implications of different rules on the competition for order flow among trading venues, Section V provides an investigation of market fragmentation in European and US securities markets, and Section VI concludes with possible factors explaining the different degrees of market fragmentation in Europe and US.

II. COMPETITION FOR ORDER FLOW AND PUBLIC POLICY

Should public policy impose a consolidated market or promote competition among trading venues? Consolidation of order flow, which implies that a security can be traded in one market only, has positive effects for at least two reasons. First, on the supply side, a consolidated market enjoys economies of scale in processing transactions (i.e., the average cost of trading declines as the number of trades increases). Therefore, a dominant exchange has lower average costs than a satellite competitor using the same technology with a lower market share. Second, on the demand side, markets are networks. Like all networks, the attractiveness of a market depends on the number of traders: for both liquidity providers and liquidity demanders, the higher the number of traders, the higher is the probability of finding a counterparty. Consequently, network externalities, like economies of scale, lead to a first mover advantage. And this advantage protects incumbent exchanges' market share.

On the other hand, consolidation has negative effects as well or, equivalently, fragmentation of order flow has also positive effects. As Stoll (2003) points out, "The term fragmentation has a harmful connotation, but, in fact, fragmentation is just another word for competition". Competition across markets is positive because it fosters innovation. For example, the modernization of European stock markets since mid-1980s, including the switch to continuous trading and electronic markets, was spurred by the competitive pressure of the London based International SEAQ (Biais et al., 2002). A second positive effect associated with fragmentation is the possibility of serving different clienteles or satisfying different trading needs. In fact, traders differ because they need to solve different trading problems (large trades for institutional traders vs. small trades for retail traders; fast trades for informed traders vs. cheap trades for uninformed traders; etc.). This implies that market fragmentation may arise as a response to different trading needs.

However, when trading in a particular stock is fragmented across many trading venues, the quality of price discovery and the level of informational efficiency may

be impaired. Sirri (2007) concisely states that "We want the benefits of competition, but without the adverse effects of fragmentation".

In order to reduce the negative consequences of market fragmentation, Harris (2003) suggests that information needs to flow freely between trading venues and traders have to direct order flow towards the most liquid venues. The first condition ensures that the resulting market prices quickly incorporate all available information, regardless of the venue where the last trade was executed. The second condition implies that, because of the order flow externality, a pool of liquidity will form in the most efficient trading venue.

A fragmented market will naturally consolidate when the previous two conditions are met. Consequently, regulation needs to insure that (i.) information about trades and quotes for each trading venue is available quickly and cheaply, and that (ii.) traders always seek the best conditions for executing their orders. Pre trade (i.e., quote-related) and post trade (i.e., trade-related) transparency requirements set forth by regulation address the first condition, while the best execution provisions address the second one.

III. MiFID Vs Reg NMS

This Section reviews MiFID and Reg NMS provisions in order to evaluate how both pieces of regulation provide the conditions necessary to reduce the negative effects of market fragmentation, while making possible to enjoy the benefits of competition among trading venues[3].

III.A. MiFID

MiFID directive is designed to promote an integrated, competitive and transparent European financial market. To support cross-border activities across European

countries, MiFID provides a common, harmonized set of rules for the provision of investment services in each of the European Union member states.

MiFID removes the concentration rule by which member states required investment firms to route orders to regulated markets only. This implies that regulated markets are now exposed to competition from other trading venues and allows traders to choose the trading system that better fits their needs. In fact, under MiFID regime, trading may currently take place in regulated markets (RMs), multilateral trading facilities (MTFs) and through systematic internalisers (SIs) as well as market makers.

SIs are "investment firms which, on an organized, frequent and systematic basis, deals on own account by executing client orders outside a regulated market or an MTF" (article 4(7) of the Directive)[4]. In addition, article 27 of MiFID states that SIs must publish firm quotes "on a regular and continuous basis during normal trading hours" in the shares admitted to trading on an RM (i.) for which they act as SIs, (ii.) for which "there is a liquid market",[5] and (iii.) for orders up to the a specific quantity (this quantity is known as "standard market size", SMS). Therefore, an SI is a market maker with a special obligation to make a continuous market for retail quantities. As multiple trading venues may produce a fragmented market, internalization as well is a potential source of fragmentation for European markets. In fact, SIs may internalize ("cream-skim") uninformed order flow and leave the main market with a larger fraction of orders coming from informed traders[6].

MiFID is particularly concerned with the protection of investors in a potentially fragmented marketplace and includes provisions on best execution (article 21) and client order handling (article 22). Best execution obligation requires that investment firms, when executing client orders, must take all reasonable steps to obtain the "best possible result" for their client (best execution rule), taking into account "price, costs,

[3] Lannoo (2007) and Davies (2008) also offer comprehensive reviews of MiFID and Reg NMS regulations.
[4] A continuously updated list of investment firms registered as systematic internalizers is available at http://mifiddatabase.cesr.eu.
[5] For shares for which the market is not liquid, SIs disclose their quotes upon request.
[6] Anolli and Petrella (2007) simulate market making revenues for SIs using data for 57 liquid stocks traded on the Italian exchange and estimate that potential gross trading revenues from internalization are equivalent to 0.21% of the internalized turnover. In their simulation, spread (positioning) revenues

speed, likelihood of execution and settlement, size, nature or any other consideration relevant to the execution of the order". Relative to the previous European regulatory regime, MiFID definition of best execution has shifted the focus from a purely price-based rule to a more general definition encompassing several dimensions of order execution quality. Client order handling rules require that investment firms must immediately publish non marketable limit orders to facilitate their earliest possible execution. A marketable limit order is an order that can be executed immediately. That is, for a marketable limit buy order, when the limit price is at or above the best offer or, for a marketable limit sell order, when the limit price is at or below the best price. Consequently, a non marketable limit order is an order that cannot be executed immediately given its limit price, and stands in the limit order book waiting for possible execution. The immediate publication of non marketable limit orders to the entire market increases the probability of finding a counterparty and, thus, the probability of order execution.

III.B. Reg NMS

The current US securities market structure has been shaped in 1975 by the US Congress with the adoption of several amendments to the Securities Exchange Act of 1934 to establish a "National Market System" (NMS). US stocks are traded simultaneously at a variety of different trading venues that participate in the National Market System (NMS). Traditional trading venues include national (like NYSE) and regional securities exchanges, alternative trading systems ("ATSs"), market-making securities dealers and automated matching systems (SEC, 2005, p. 13)[7]. The Congress rejected the single unitary market model, which was the model then adopted

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are equivalent to 0.05% (0.16%) of the internalized turnover, accounting for 25% (75%) of the overall trading revenues, and exhibit significantly lower (higher) volatility than positioning (spread) revenues.

[7] A major recent development in the structure of US securities market is the rise of dark liquidity pools, usually organized as dark ATSs, which provide undisplayed liquidity to market participants. Dark pools are trading venues intended to facilitate the trading of large blocks anonymously and with little or no market impact (Carrie, 2008). The minimization of market impact has always been a primary objective for large traders. In the past, floor brokers and upstairs brokers manually worked orders to minimize market impact. Currently, dark pools have gained a substantial market share in block trading, mainly at the expense of broker-dealers.

in many other countries, instead it prescribed the linking of all trading venues through communication and data processing facilities[8].

Regulation NMS, adopted in June 2005 by the US SEC, fits into the NMS legislation. Reg NMS contains four key provisions (SEC, 2005): Order Protection Rule (OPR, Rule 611), Access Rule (AR, Rule 610), Sub-Penny Rule (SPR, Rule 612), Market Data Rules (MDRs, Rule 601 and Rule 603).

The OPR rule is designed to protect limit order traders and requires that investors get the best available price when such price is represented by quotations that are immediately accessible for automatic execution. This implies that a displayed best price cannot be "traded through". It is important to remark that, to be protected, a quotation must be immediately and automatically accessible. Thus, the rule does not protect hidden orders and, importantly, manual quotes such as those submitted by the NYSE specialist and floor brokers[9].

The AR is designed to establish a fair and efficient access to quotation in NMS (National Market System) stocks. Specifically, the rule sets forth new standards governing access to quotations in NMS stocks. First, in addition to mandating a collective linkage facility (such as the Inter-market Trading System or ITS), the rule enables the use of private linkages between broker-dealers and trading centres offered by a variety of connectivity providers to facilitate the necessary access to quotations. The Commission solution was mainly based on the success of private linkages among electronic markets for Nasdaq stocks contrasted with the failure of the ITS linkage for exchange-listed stocks. The Commission stated that the benefits of private linkages, including their flexibility to meet the needs of different market participants and the

[8] Information originating from the trading venues (trade reports, quotes, etc.) are disseminated under arrangements of consolidation and distribution. Organizations engaged in this activity must register as Securities Information Processors (SIPs). The most important SIPs are the Consolidated Tape Association (CTA) and Nasdaq. The CTA services primarily exchanges (but also includes some ECNs), while Nasdaq reports the activity of its own dealers.

[9] This rule eliminated any competitive advantage that manual markets (like NYSE) had under the previous regime. In particular, when an ECN receives a non marketable limit order, it revises its Nasdaq quote to reflect the new order. The exposition of a limit order in two markets (the Nasdaq and the ECN) is possible only if both markets are electronic. Otherwise the order might be executed twice (the risk of double execution is usually referred to as double jeopardy). As a matter of fact, the NYSE's slow trading system actually protected its market from ECNs competition.

scope they allow for competitive forces to determine linkages, justifies reliance on this model, while also keeping a single intermarket linkage.

Second, to address the potential biases caused by disparate fees, which might make very difficult to compare quotations from different market centres, the rule also limits the fee a trading centre can charge to access quotations to no more than $0.003 per share. The purpose of the fee limitation is to ensure the fairness and accuracy of displayed quotations by establishing an upper limit on the cost of accessing such quotations. For example, if the price of a protected offer to sell an NMS stock is displayed at $10.00, the total cost to access the offer and buy the stock will be $10.00 plus a fee of no more than $0.003. The adopted rule thereby assures order routers that displayed prices are, within a limited range, true prices.

The SPR is designed to prevent traders from stepping ahead of displayed limit orders by trivial amounts (i.e., a penny), otherwise the incentive to provide liquidity through limit orders would be shrinked by a significant risk of losing time priority. The rule therefore prohibits market participants from accepting, ranking, or displaying orders in a pricing increment smaller than a penny, unless the price is less than $1.00 per share.

The MDRs are designed to allocate market data revenue based more closely on the market centre's contribution to the best displayed quotations, in contrast to the former focus on the number of trade executed, regardless of trade size. These rules require the allocation of revenues generated from market data to a trade/quote value basis, rather than a per report basis. Specifically, the allocation plan will take into account the proportion of best bids and best offers displayed on the National Best Bid Offer (NBBO). MDRs are also designed to promote the wide availability of market data. Markets are in fact required to provide their best quotations and trades for consolidated dissemination through the three joint-industry Plans (the Consolidated Tape Association Plan or CTA, the Consolidated Quotation Plan or CQ, and the Nasdaq Unlisted Trading Privileges Plan or Nasdaq UTP), while also being free to distribute their own data independently.

IV. IMPLICATIONS FOR EUROPEAN AND US SECURITIES MARKETS

Although MiFID and Reg NMS share the common objective of enhancing competition in securities markets, they differently regulate the best execution duty, the consolidation of market data and the publication of execution quality measures. These differences are particularly relevant since they affect the competition for order flow across trading venues.

Under Reg NMS, as for the best execution provision, *trading centres* are directly responsible to execute the orders at the best – wherever available – price. This implies that they are expected to route orders to competing trading venues with better quotes if they cannot fill them at the best price and if the competing venue offers automated quotes. Therefore, under Reg NMS, it is the responsibility of the trading venue to pass on the order if it cannot fill it at the best price. This provision implies that market centres in the US need to link and route orders each other. Under MiFID, by contrast, investment firms only are responsible for the best execution of client orders. MiFID does not require trading centres to be responsible for best execution and, consequently, markets do not need to be interconnected.

The emphasis in Reg NMS is on strict price priority (no "trade-through rule") provided that the quote is automated (i.e., it is immediately executable). This rule implies that quotes from a non-automated market – like NYSE specialists and floor brokers – could be traded-through. Obviously, this rule creates a huge competitive gap between fast markets and slow – whose quotations can be traded-through – markets, and also generates opportunities for new trading venues to compete on the basis of price only, rather than relationships or other factors.

Price alone matters under Reg NMS to comply with the best execution duty. By contrast, MiFID considers an array of execution criteria and characteristics to define best execution. The European definition of best execution explicitly recognizes the multiple dimensions of market quality and also implies that heterogeneity in traders' needs is protected under MiFID. Consequently, European trading venues may

compete for order flow on other market quality characteristics beyond quotes. In fact, the definition of best execution under MiFID implies that more than one trading centre may be considered as the best venue for trading a stock at certain point in time: it simply depends on which dimensions of market quality (e.g., speed of execution or execution costs or probability of execution) the final customer cares more and, therefore, the broker needs to look at when deciding where to route the customer's order.

As for the consolidation of market data, a potential issue related with the fragmentation of the order flow is the dispersion of market information among several sources. In fact, prior to MiFID, equity quotes and trades data were effortlessly concentrated in just one exchange. Following MiFID implementation, quotes and trades information have been split between multiple trading venues and reporting platforms[10]. This multiplicity of sources may harm the price discovery process, unless appropriate systems to aggregate dispersed market data are in place. MiFID only requires trading venues to make public price, volume and time of trades as close to real time as possible "on a reasonable commercial basis". This approach liberalises the market for securities data and allows businesses to offer services to aggregate data from different trading venues.

By contrast, the US regulator takes a different stance: Reg NMS does liberalise the market for securities data while also mandating the consolidation of best quotes and trades in a single consolidator[11], with a complex method to allocate fees across contributors (i.e., the trading venues providing the data). Data consolidation is crucial to facilitate the price discovery process, but is also useful to comply with the best execution duty. The consolidation of best quotes and trades benefits investors, particularly retail investors, since it enables them to assess the quality of execution

[10] Under MiFID regime, transaction reporting can be made to the competent authority either by the investment firm itself, a third party acting on its behalf or by a reporting system approved by the competent authority or by the regulated market or MTF through whose systems the transaction was completed (article 25(5) of the Directive).

[11] For securities listed on the New York Stock Exchange (NYSE), American Stock Exchange (AMEX) or a regional exchange, data distribution is governed by the Consolidated Tape Association Plan (CTA) and the Consolidated Quotation Plan (CQ). For Nasdaq securities, data distribution is governed by the Nasdaq UTP Plan (Caglio and Mayhew, 2008).

prices and evaluate the best execution of their orders by obtaining data from a single source that is reliable and comprehensive.

Competition across markets will be effective in providing liquid markets and efficient prices if the order flow will be directed towards the venues offering the best quotes. In a fragmented marketplace traders need to choose the trading venue where to send their orders. This decision has to be based on a comparative analysis of the trading venues where the security is traded. To facilitate the comparison of execution costs across markets, Reg NMS Rule 605 (which simply restates Rule 11Ac 1-5, also known as "dash 5") requires market centres (such as exchanges, electronic communication networks, dealers) to publish, on a monthly basis, statistics of several dimensions of execution quality (probability of orders' execution, speed of execution, execution costs, price improvement) and Reg NMS Rule 606 (which restates Rule 11Ac 1-6, also known as "dash 6") requires intermediaries too to make public, on a quarterly basis, the market centres where they route the orders received from customers. Statistics on this double track – the markets receiving the order flow and the intermediaries routing the orders – allows traders to verify that more efficient markets actually receive larger shares of order flow.

MiFID does not require trading venues to publish statistics on execution quality. In addition, the definition of best execution under MiFID is multidimensional. In fact, best execution under MiFID also relates to costs, speed, likelihood of execution and settlement, size, nature or any other consideration relevant to the execution of the order[12]. By contrast, best execution under Reg NMS is just a matter of execution price. This difference of scope, coupled with the absence of mandatory statistics of execution quality, may strongly affect the competition across trading venues to attract order flow in Europe.

[12] The definition of best execution under MiFID also implies that any comparative assessment of trading venues has to disentangle various execution quality dimensions.

V. MARKET FRAGMENTATION IN EUROPE AND UNITED STATES

MiFID entered into force in Europe in November 2007, Reg NMS went into effect in the US for exchanges in March 2007, became operative for brokers in July 2007 and was fully implemented in October 2007. It is clearly too early to evaluate the long term effects of MiFID and Reg NMS on the European and US securities markets. This Section provides a simple snapshot of the current level of market fragmentation in European and US securities markets.

Figure 1 and 2 display market shares of competing trading venues for, respectively, NYSE-listed stocks and Nasdaq-listed stocks. In the US, all categories of trading venues (exchanges as well as ECNs) compete to attract order flow. Strikingly, NYSE market share in NYSE-listed stocks is down from 75% in July 2005 to 32% in April 2008[13]. No single market centre has currently a market share larger than 50% in trading its own listed stocks. This is clearly evidence of a fragmented marketplace, but it does not imply poor market quality.

The recent decline in the NYSE market share may be explained, among other factors, by the quality of its quotes relative to other markets. In the US, order flow moves very fast towards trading venues offering better quotes. In fact, in contrast to the 1999 findings of Bessembinder (2003), where the NYSE quotes were at the inside of both bid and ask 90% of the time, Jain, Upson and Wood (2008) find that by October 2007 NYSE had both the best bid and the best ask only 24% of the time. Simply stated, NYSE is no more offering the best prices and traders are diverting their order flow towards other venues. In order to attract order flow (and thus also to offer the best quotes), incumbent exchanges might need to adjust their pricing schemes. NYSE does not offer rebates for adding liquidity. In fact, it has currently a flat rate of $0.08/100 shares for market orders, without any rebate for liquidity providers[14]. BATS Trading doubled its market share in trading NYSE-listed stocks in September

[13] Even though NYSE market shares has been more than halved in less than three years, Sirri (2007) reports that NYSE is actually trading more shares in absolute terms because, in the same period, overall trading volume in NYSE-listed stocks strongly increased. A possible source of the increase in NYSE trading volume is the trading activity from electronic traders, who now find easier to trade NYSE stocks thanks to the shift to the fast Hybrid trading system.

2007 thanks to an "inverted" pricing scheme (only valid in September 2007 and up to 10 billion shares): a rebate of $0.34/100 shares for adding liquidity along with a charge of $0.24/100 shares for taking liquidity. Order flow in US markets is highly sensitive to the trading fees and may switch very fast from one market to another. This is evidence of market contestability, which also implies that there are small sunk costs when switching from one trading venue to another.

In terms of market quality, preliminary evidence about the effects of Reg NMS on US securities markets can be gained by looking at the introduction of the NYSE Hybrid trading system. In fact, the SEC's adoption of Reg NMS motivated a change in the NYSE market structure. Specifically, OPR stated that any trading venues whose posted quotes were not immediately executable would not be protected by trade-through. Therefore, non-automated NYSE specialists and floor brokers quotes could be simply ignored (i.e., traded through), even if such quotes were superior to those of any other trading venue. In such a case, the trade-through procedure would be allowed because the NYSE quotes were not immediately executable. In response to the SEC ruling, the NYSE introduced the Hybrid system beginning with a subset of securities in October 2006. In the previously operating NYSE trading system, orders had to be marked with a special code for automatic execution and, also if marked, these orders were capped at 1,099 shares. In the new NYSE Hybrid system, orders by default are marked for automatic execution and these orders have a limit of 1 million shares. In addition, the new Hybrid system also removes the restriction which required customers to wait 30 seconds between orders, and orders may now walk the book beyond best bid and offer.

Hendershott and Moulton (2008) examine the introduction of the NYSE Hybrid system and provide several interesting findings. First, the introduction of the Hybrid fast market significantly decreased floor trading activity. This result was largely expected: Reg NMS's Order Protection Rule (OPR or trade-through), by allowing fast markets to ignore slow markets' quotes, effectively precludes traditional (i.e., slow) floor trading. Second, the NYSE Hybrid's introduction, resulted in a considerable

[14] This fee structure came into effect in October 2007, after the BATS aggressive pricing scheme. Prior to this change, both liquidity providers and liquidity demanders at NYSE had a flat rate of $0.0275/100 shares.

increase in execution speed: the execution time for market orders reduces from 10 seconds to less than one second. Third, Hendershott and Moulton find that NYSE trading costs increase by 10 percent relative to their pre-Hybrid levels. Fourth, intraday volatility also increases in the post-Hybrid period, but the noise in the stock prices declines (i.e., prices are more informationally efficient).

Taken together, these findings highlight the existence of a trade-off between execution costs and speed. The Hybrid system represents a new position for the NYSE on the trade-off between these two dimensions of market quality. In fact, as a consequence of Hybrid's introduction (which in turn is a consequence of Reg NMS's Order Protection Rule), some traders who value speed of execution will be better off, while some traders who are more concerned with execution costs may be worse off. The increase in execution speed also leads to more information being quickly incorporated into prices, and this makes prices more efficient.

Figure 3 and 4 display market shares of, respectively, European new entrant trading venues and European primary (or incumbent) exchanges. One year after MiFID implementation, in November 2008, the average market share for primary exchanges is about 66%, 9 percentage points less than it was in November 2007, when MiFID came into effect. A fragmented landscape is therefore arising in Europe as well, especially in France, Germany and UK where the market share of primary exchanges is about 60 percent, as opposed to the Italian and the Spanish markets where the share of primary exchanges still ranges from 70 to 80 percent.

The regulatory framework introduced by MiFID is fostering competition among players in the trading industry in Europe. The new regulatory environment has in fact spurred a number of initiatives by market participants, particularly to create new trading venues competing with established incumbent exchanges. Broker and dealers have actually a strong incentive to divert order flow from incumbent exchanges and to channel business towards trading platforms where they hold a stake in order to catch part of the incumbent exchanges profits[15].

[15] On January 10, 2008, Instinet announced that it had reached an agreement with a consortium of brokers that will take a minority holding in Chi-X Europe. In the same spirit, the banks behind Project Turquoise have a strong incentive to channel order flow towards the trading venue that they partly own.

On the other side, incumbent exchanges risk of being replaced by new trading venues as long as they offer services that might be easily substituted. Electronic trading with low latency rates is just a matter of technology. New entrants also may provide fast execution at low costs. The price war is, in fact, a real threat in a business with low marginal costs and high fixed costs[16]. The volatility of market shares displayed in Figure 4 reveals that incumbent exchanges in Europe are no longer protected by the concentration rule.

VI. CONCLUSIONS

The long term effects of MiFID and Reg NMS on the European and the US securities markets depend on how these regulations affect the trading process. Although they are both intended to promote competition in securities markets, they adopt different provisions with respect to three issues that strongly influence the competition for order flow among trading venues. Specifically, some of the provisions set forth by the US regulation with respect to the best execution duty, the consolidation of market data and the disclosure of execution quality information appear to be more effective, compared to the EU ones, in strengthening competition for order flow among trading venues.

First, as for the best execution duty, under Reg NMS trading centres are directly responsible to execute the orders at the best available price, while MiFID requires that investment firms only are responsible for complying with the best execution duty. Second, Reg NMS liberalises the market for trading data, but still mandates the consolidation of trading information in a single system, while MiFID does not require any system to consolidate dispersed quote and trade information. Third, in order to facilitate comparisons across trading venues, the US regulation – differently from the

[16] The use of asymmetric fees to attract liquidity has become quite popular in Europe as well among newly established trading venues. In fact Chi-X, Turquoise and Equiduct have all decided to reward those market participants who provide liquidity through limit orders. Equiduct, for example, charges 0.30 bps to traders using market orders and rebates 0.15 bps to traders using limit orders.

European one – requires both markets and intermediaries to regularly disclose standardized information about trades' execution quality.

European and US securities markets currently display different degrees of fragmentation: the US marketplace is more fragmented than the EU counterparty. This difference derives from the interaction of structural and regulatory factors. Prior to Reg NMS, US markets were already fragmented and the trading floor played an important role at the NYSE, which was a slow market compared to fully electronic trading venues. Prior to MiFID, most European markets were already functioning as electronic limit order books and trading was largely consolidated in the main exchange. The new – and in some respect similar – regulatory regimes interacted with originally different market structures.

In the US, the adoption of Reg NMS promoted automated trading and resulted in faster execution and fiercer competition for order flow among trading centers. A key factor to explain the sensitivity of the order flow in the US is the definition of best execution under Reg NMS, coupled with the obligation for trading venues to route the order towards the market displaying the best quotes. Reg NMS Order Protection Rule protects in fact better-priced quotes in electronic markets from being traded through. Given this definition of best execution, electronic markets displaying best quotes are in fact attracting more order flow in the US, and publicly available execution quality indicators are actually used to direct the order flow towards the more efficient trading venues[17].

The speed of order flow fragmentation and competition across trading venues in Europe is also delayed by two additional factors. First, differently from the US, the industrial organization of post-trading infrastructures in some European markets may prevent or moderate order flow migrations across trading venues[18]. This is especially the case when both the trading platform and the clearing and settlement entity belong

[17] As shown in a recent study by Boehmer et al. (2007), routing decisions in the US market are associated with execution quality metrics: markets reporting lower execution costs and faster fill rates receive more orders in subsequent months.

[18] Currently, six main post-trading infrastructures operate in the US: the Depository Trust & Clearing Corporation (DTCC) for equities and bonds; the Options Clearing Corporation (OCC) for all US exchange-listed securities options; the CME Clearing House, the Clearing Corporation and the NYMEX Clearing House for futures. By contrast, for equities only, 29 entities presently provide post-trading services in Europe.

to the same firm (i.e., for vertically integrated structures which adopts the silo approach). However, the importance of this factor is expected to decline in the next few years as long as the ECB's (Target 2 Securities, T2S) and EU's (Code of Conduct) initiatives will deploy their effects. Second, 2007-2008 financial crisis helped to protect the incumbent exchanges' market share. When markets are under stress, traders typically prefer to trade in the primary market where most of the order flow converges, since adverse market conditions make liquidity more important and increase the demand for liquidity (Amihud and Mendelson, 2004). The preference towards primary exchanges has been even stronger during the last financial crisis because of the higher perceived counterparty risk, especially when trading with financial institutions.

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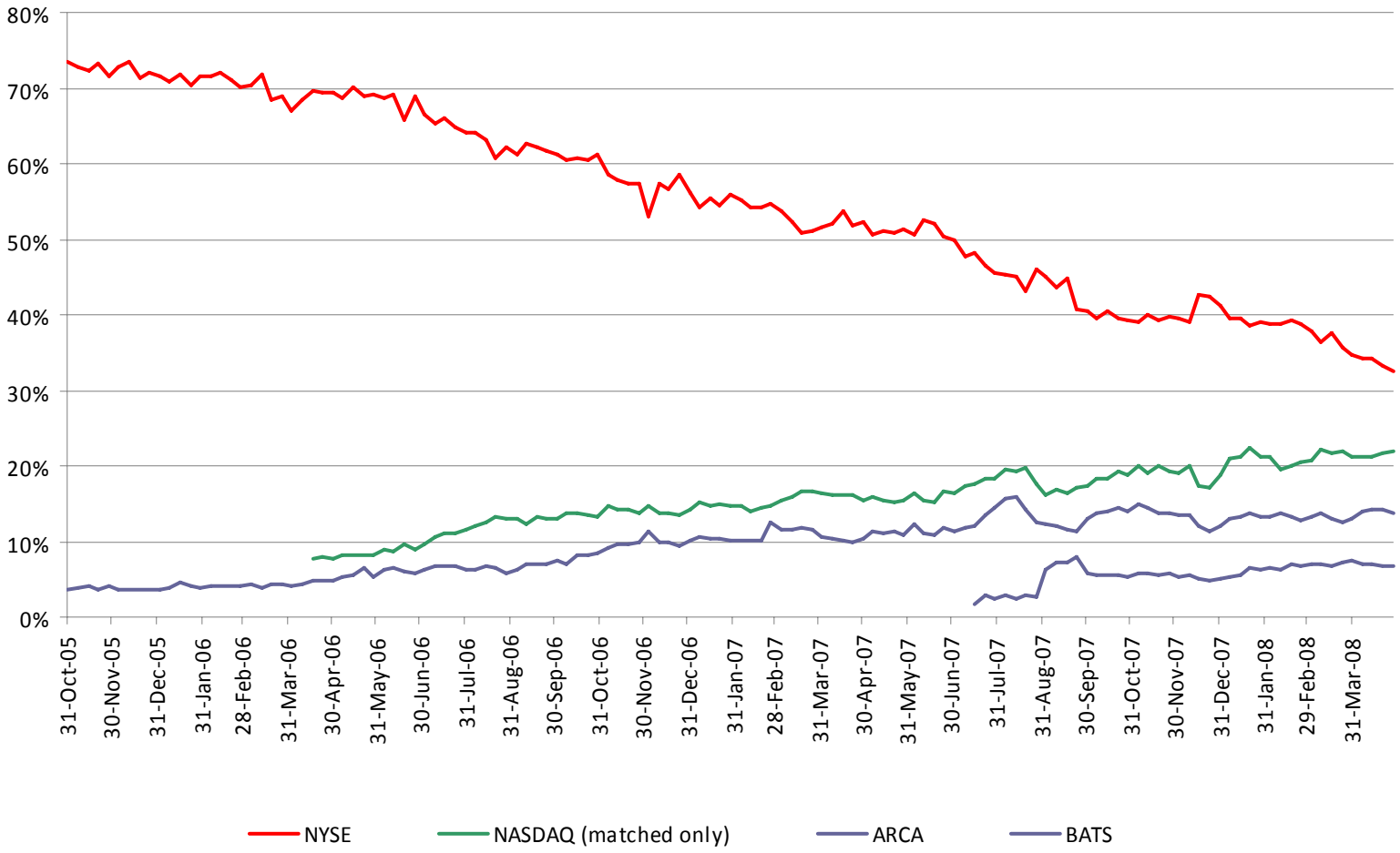
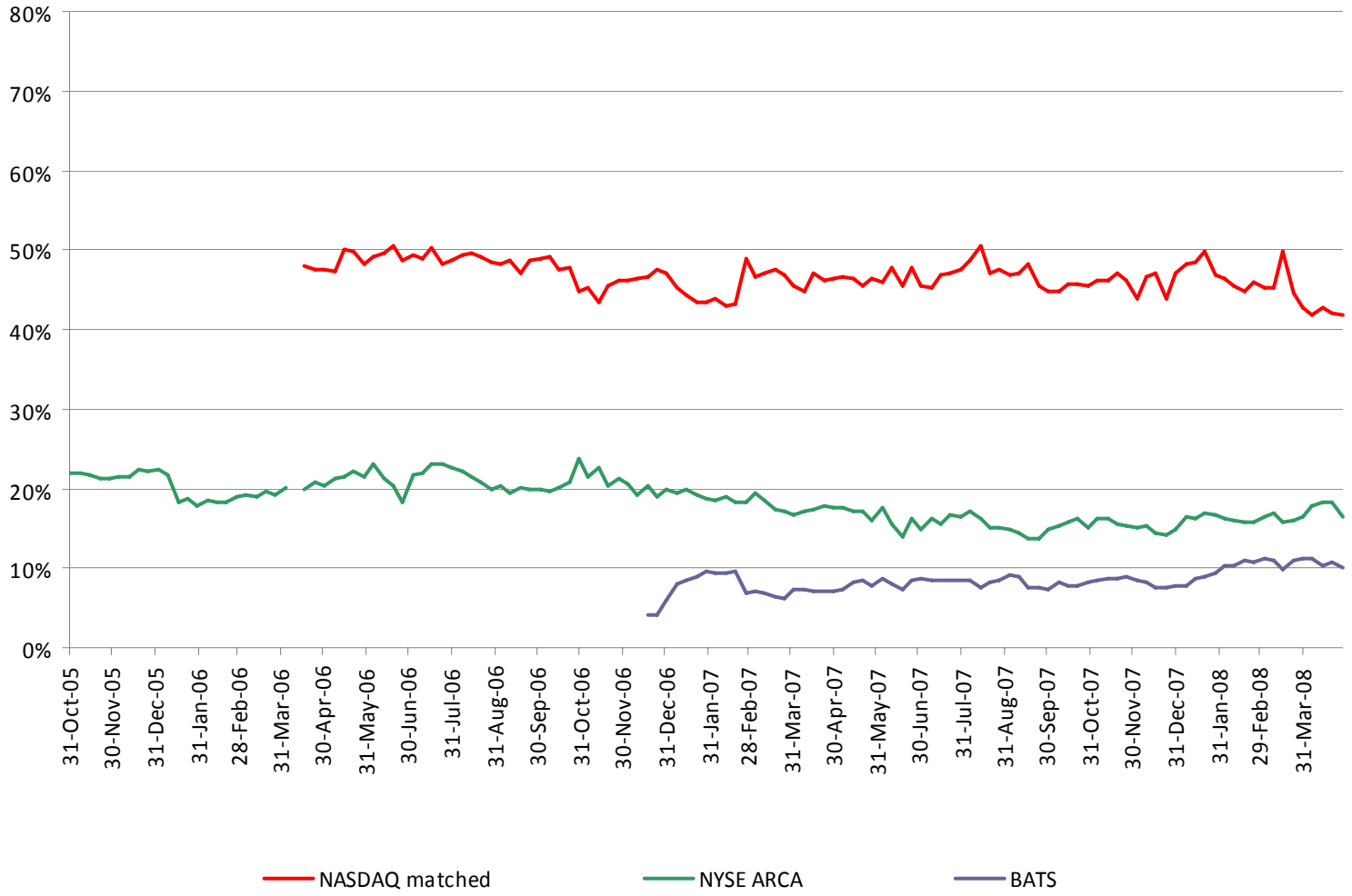
Figure 1 – Market shares for NYSE-listed stocks



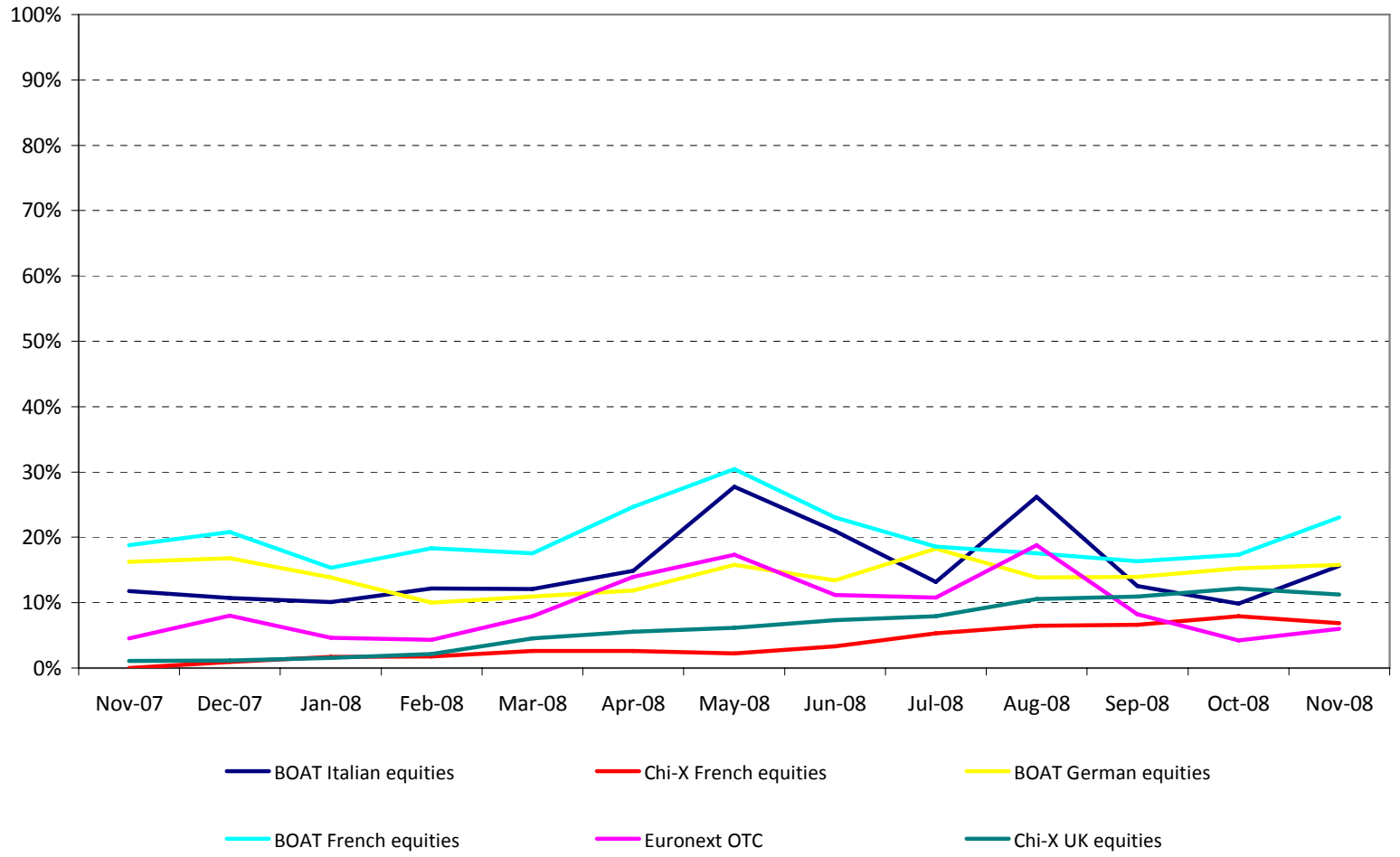
Source: based on data from Lehman Brothers, "Exchanges Weekly Volume Analysis", various issues

Figure 2 – Market shares for Nasdaq-listed stocks



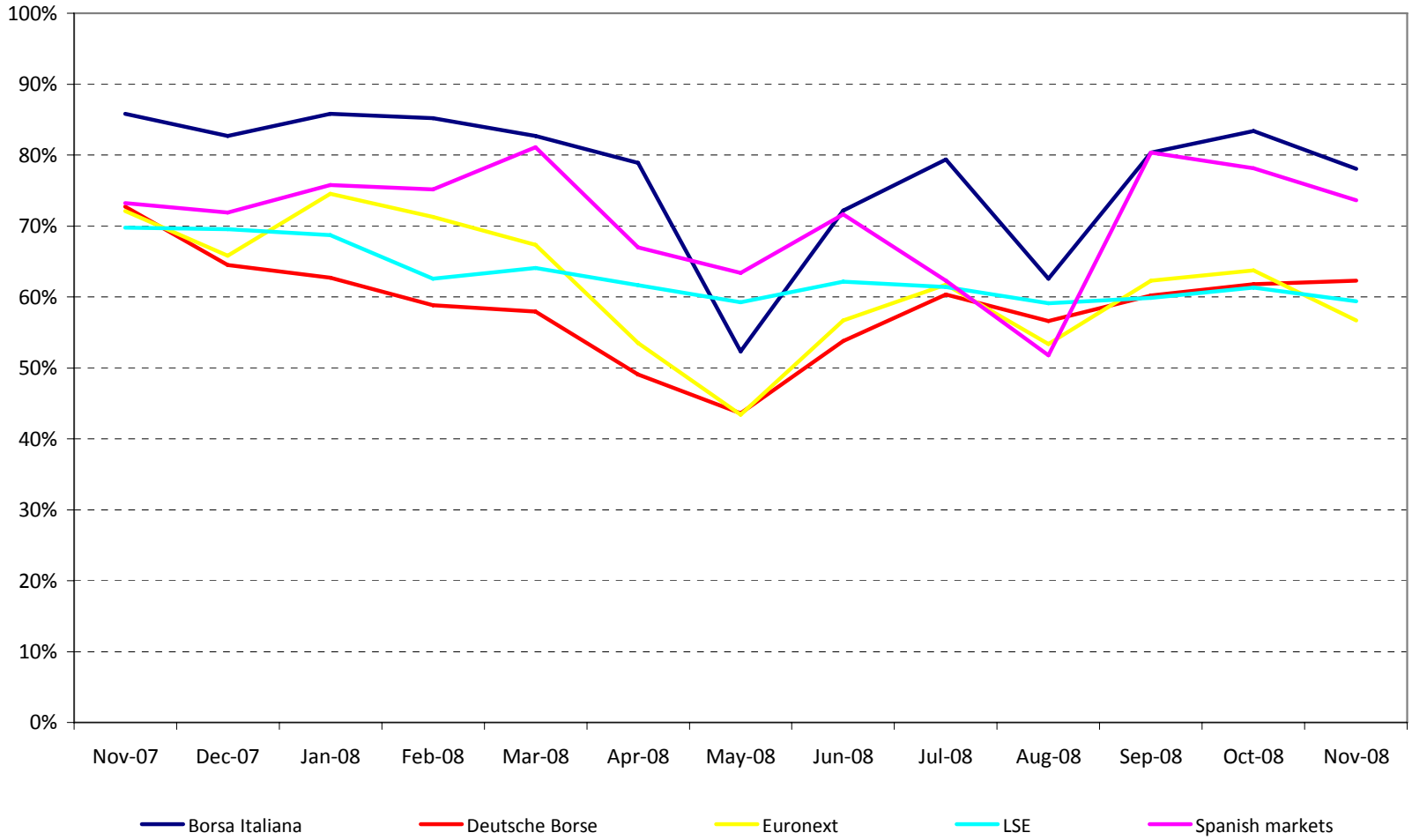
Source: based on data from Lehman Brothers, "Exchanges Weekly Volume Analysis", various issues

Figure 3 – Market shares of European new entrants exchanges



Source: based on data from Thomson Reuters

Figure 4 – Market shares of European incumbent exchanges



Source: based on data from Thomson Reuters