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## Competition in EU Trading and Post-Trading Service Markets

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The structure of trading service markets is a fundamental determinant of the cost of capital for business. Competition has an important role to play in delivering efficiencies, particularly in the context of inherited fragmentation that characterizes the European Union, and to this end regulation and competition policy need to go hand in hand. Despite the complexity of the sector, competition authorities need to be alert to the problems that it poses. We argue that competition between trading platforms is welfare-enhancing but often foreclosed, both by private and state measures. In clearing, we take the view that compatibility is needed but unlikely to arise endogenously. In settlement, finally, we tentatively conclude that agency does not influence rents available to central securities depositories (CSDs), but may add value by keeping custody markets contestable.

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## I. Introduction

As in many other areas, the European Union has inherited financial market structures that are characterized both by national infrastructures and a lack of cross-border integration.

Behind these structures lie the financial markets themselves. Financial markets play a key role in the modern economy, both in ensuring efficient capital allocation and in overcoming principal-agent problems for large, diversified corporations by giving transparency to value creation. The free movement of capital not only enhances welfare, but is one of the core freedoms under the EC Treaties. Studies have suggested that integrated financial markets could add the order of one percent to EU GDP, even on a conservative estimate. For this reason, achieving integrated markets is one of the core goals that the European Union has set for itself in the framework of its Lisbon growth agenda.

Firms that organize markets provide services in a market which is obviously distinct from the markets that they organize. Such “trading services markets” typically display network effects, economies of scale and scope, and two- or multi-sidedness. These characteristics may be shared by some of the traditional utilities that have been the focus of past and ongoing liberalization efforts in the European Union, which suggests looking here for inspiration. However, there are also important differences. Unlike in telephony, energy, water, and railways, existing infrastructure operators face low incremental costs in deploying their infrastructure to serve new markets if they can overcome other barriers to entry. The services provided across this infrastructure are also inseparable from the infrastructure itself. While various services can be provided across telephone and electricity networks and it is possible merely to operate the infrastructure, an exchange offers a complete value proposition in terms of its market model, that is hardwired into the infrastructure design. Finally, most exchanges and post-trading infrastructures historically have been mutual organizations, while there has been a more recent trend towards demutualization, particularly at the exchange level—state involvement is significant in terms of regulation, but rare in terms of ownership. This is, of course, similar to the situation of utilities in the United States.

Because the traditional utilities offer commodity products and require a local presence to provide local delivery, cross-border demand is purely wholesale in nature. Thus, no consumer demands foreign energy or water as such, and consumers demand foreign telephony and railways only in order to reach people or places located in (or beyond) the corresponding foreign territory. In order to solve this problem, traditional utilities negotiate terms to access each others’ network. By contrast, consumers of financial services regularly seek to trade instruments that can only be traded on foreign infrastructures, even if this demand is significantly attenuated by the high costs of cross-border clearing and settlement. Because there is usually no home network either with which to negotiate whole-

sale access fees or that is demanding access, consumers use a variety of costly workarounds: essentially they would need to incur sunk costs in every market while the volume of their activity in that market may not justify this. These sunk costs are often imposed on prudential grounds by foreign infrastructures, or form part of the pricing model those infrastructures have selected. Because of this, the use of intermediaries to access foreign markets, that can spread the fixed costs over a wider base, is common (it should, however, be noted that a central securities depository (CSD) can sometimes act as an intermediary in this way).

Before we analyze the problems the industry poses, we describe, in broad lines, how it operates.

## II. The Role and Functioning of Trading and Post-Trading Service Markets

### A. TRADING AND POST-TRADING SERVICES GENERALLY

The problem solved by the trading and post-trading services industry is simple and archetypal: how to allow potential sellers and buyers of a given instrument to trade that instrument between each other at least cost. Financial instruments confer title, or the right to obtain or abrogate title at a given price, to financial assets such as company equity, company and government debt, and currencies, or commodities such as oil, aluminum, or wheat. Because of their commodity nature, markets in such instruments can be extremely efficient. However, there are also many systems that resemble them and that might be similarly analyzed:

- those that exist to enable trading of less commoditized instruments in respect of which information asymmetries and transport costs may be important (for example eBay);
- those that trade rights, such as carbon dioxide emission rights;
- those that allow hedging against non-financial future events, such as the weather or political outcomes;
- wholesale trading systems in fields like insurance; and
- personal networking schemes.

The common feature of all these systems is that they reduce the search and contracting costs faced by persons wishing to enter into a certain type of transaction. In this way, they are no different, in principle, from the organizer of a mediaeval marketplace and many other physical markets today. In such a marketplace:

- Traders come together to trade among themselves or with the public, and the public comes in order to trade, thereby realizing economies of scope (reducing search costs on both the demand and the supply side);

- The terms of trade may be wholly or partly regulated by the marketplace operator. It may offer additional guarantees to those offered by the trader, thereby underwriting the trade risk, it may offer a mediation service, which may even be binding, or it may undertake to expel unreliable traders. In these ways, it reduces contracting cost on the demand side, namely the risk of adverse selection (obtaining inferior quality due to information asymmetries) and of failure to conclude the trade.
- Demand-side contracting cost may also be reduced endogenously in such a marketplace due to reputational considerations (interactions are repeated and reputations built rapidly and efficiently).
- The marketplace operator also might underwrite the credit risk, especially in an inter-dealer market, if trades are not settled immediately, thereby reducing contracting cost also on the supply side. By doing so, it also adds liquidity because dealers can trade during the day without worrying about their net cash position. More trades occur, therefore more value is created, and the operator can capture more of this value for itself. However, it also generates a risk that unscrupulous, reckless, inexperienced, or even simply unlucky dealers are unable to settle trades at the end of the day. Traders may gain collectively from this facility, but individually they will want to offload this risk that the marketplace operator must then underwrite.

Recall that risks matter because risk has a cost, and therefore, leads to a spread between prices offered and bid. The existence of this spread discourages some potential traders from trading, namely all those who value the instrument within the spread. A wider spread reduces the overall volume of transactions offered and concluded on the market, meaning that the fixed costs of running the market increase in per-unit terms, leading to a vicious circle as even higher costs reduce trading further. Similarly, there is a virtuous circle in the other direction, meaning that trading platforms may have an incentive to subsidize the supply of liquidity (as we shall see shortly).

The components of the spread are as follows:

- Transaction costs, both traders' costs of trading and the cost of the market infrastructure itself, known as market friction;
- The premium required to assume adverse selection risk (i.e., having traded when ex-post one would wish to have avoided doing so); and
- The premium required to assume inventory risk (this is the flipside of adverse selection risk, namely the risk of the market moving against a position held by dealers before they can trade out of that position).

## B. SPECIFICITIES OF TRADING IN CASH SECURITIES

In what follows, we consider only so-called cash markets, which have been the focus of DG Competition's work so far. These are the markets for immediate transactions in equities and bonds (despite the name, they have nothing to do with currency). While infinitely many option positions can be constructed by any third party, cash trading relies on the presence in the market of underlying instruments issued by firms or governments. These instruments are present in the market only if they have been sold in a given quantity to initial investors, in what is termed the "primary market." Subsequent trading in these instruments between investors has no direct financial consequences for the issuers (at least until individual equity holdings reach levels that have consequences for governance). However, the cost of trading in the secondary market is anticipated by purchasers in the primary market, giving rise to what is termed an "illiquidity discount." As a result, firms raise less from their bond and equity issues than they otherwise would, meaning that their cost of capital is increased. When the cost of capital rises, economic activity contracts as marginally profitable projects are abandoned. Within the European Union, at least, this is no insignificant phenomenon. Estimates are that the illiquidity discount raises the cost of capital for listed firms by about 2.5 percent in relative terms, or the cost of equity by 0.5 percent in absolute terms.<sup>1</sup>

Since dealers in open markets make irrevocable offers to trade on trading platforms, and not only in relation to clients, their prices on-exchange already reflect their costs and inventory risks, but the prices that they quote to final investors may include a further markup. Final investors themselves, of course, internalize transaction and inventory costs in their turn. Dissuaded from implementing what would be profitable investment strategies in a frictionless world, this is the ultimate source of illiquidity.

As mentioned, illiquidity, represented by the bid/ask spread, has various components of which transaction costs are only one. This means that market quality and so-called microstructure (trading rules such as tick size and order preferencing) cannot be neglected. However, the transaction costs in the bid/ask spread, especially as faced by final investors, constitute a very significant part of the total. These costs arise partly in the infrastructures themselves (in the form of fees charged to brokers), but mainly in the brokerage layer itself.<sup>2</sup> Moreover, since the needs of final investors are the reason why markets exist, it would be wrong to view illiquidity costs as only arising at the wholesale level. The reasons

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1 London Economics, *Quantification of the macro-economic impact of integration of EU financial markets*, Report to the European Commission (Nov. 2002), available at [http://europa.eu.int/comm/internal\\_market/securities/docs/studies/report-londonecon\\_en.zip](http://europa.eu.int/comm/internal_market/securities/docs/studies/report-londonecon_en.zip).

2 Eurogroup Consulting, *Analyse comparative du coût des opérations sur titres en Europe et aux USA*, Report commissioned by the international group AFTI (Nov. 5, 2002), available at [http://www.telekurs.fr/lesplus/downloads/Etudecomparative/01-Rapport\\_COUTS\\_VF.pdf](http://www.telekurs.fr/lesplus/downloads/Etudecomparative/01-Rapport_COUTS_VF.pdf).

for high brokerage costs are not fully clear, but they certainly include the costs of intermediation in foreign markets and of maintaining duplicate infrastructure and links and, thus, partly reflect and magnify the inefficiencies existing at the infrastructure level.

So what does this industry look like? It is important to bear in mind the regulatory and self-regulatory environment of exchanges, which exists in order to limit the risk of default and/or insider trading on financial markets, but which can have competition implications.

Exchange membership is limited by the exchange in order to manage this risk. For this reason, individuals and most investment firms have no direct access to the exchange (although systems provided by their brokers may look like direct access, trading on such systems is obviously independently priced). Similar restrictions arise in clearing and settlement.

However, investors do not only trade through intermediaries because they are excluded from exchange membership. Exchanges do not own the shares that they trade, and by themselves are as useless as a marketplace without any stallholders. Dealers arise in these markets because investors (and hence also issuers) value liquidity, that is to say, the ability to execute trades immediately. However, orders to buy and sell do not arrive simultaneously and would not arrive at all if the investor could not be confident of the price she would pay, at least within a certain range. Because of asynchronous supply and demand, the ability to execute immediately is only available if some market participants act as buffers and hold securities as inventory. Such dealers, however, usually have no fundamental knowledge of the value of securities and no wish to hold them per se. On the contrary, they are exposed to an inventory risk because prices may move against their positions. For this reason, they must discover prices that balance supply and demand in the short term. The exchange facilitates this and allows dealers to manage their inventory positions. As an inter-dealer market, it adds liquidity by reducing inventory risk. When a dealer wishes to dispose of an inventory position on the exchange, or acquire such a position in order to meet its obligations, it may demand liquidity.

IT IS IMPORTANT TO BEAR IN MIND THE REGULATORY AND SELF-REGULATORY ENVIRONMENT OF EXCHANGES, WHICH EXISTS IN ORDER TO LIMIT THE RISK OF DEFAULT AND/OR INSIDER TRADING ON FINANCIAL MARKETS, BUT WHICH CAN HAVE COMPETITION IMPLICATIONS.

Dealers, then, interact with investors and with each other in what we term the “market for liquidity.” In this market, demand comes from both dealers and investors, whereas only dealers can cost-effectively supply. This can be likened to the market for antiques, in which private persons may wish to acquire or dispose of items, but they cannot offer to do so directly because of foregone economies of scope (high search costs) and the adverse selection risks they would

incur or impose on counterparties. Dealers also wish to acquire items for sale against known customer demand and dispose of items in their inventory for which local demand is weak. Therefore, they supply private investors with liquidity while competing against them by demanding liquidity. This competition, of course, is potentially one-sided because private investors often do not have access to inter-dealer markets and certainly do not have such access in the case of securities. Exchange rules endeavor to manage this conflict of interest.

Exchange members are not only dealers. Some members never take a position in anything and simply pass orders on to dealers or to the exchange. These are known as brokers. Finally, some players with investment, speculative, hedging, or arbitrage motives do have direct access to the exchange—typically these are banks who are also broker-dealers.

Since membership is restricted, we are led to the conclusion that trading services markets are effectively segmented into fully distinct markets from the demand standpoint. What we can call the “central” trading services markets provide these services to the members of the trading platform or of post-trading infrastructures. There are then “peripheral” markets that provide trading services to institutional and private investors, as well as to those potential consumers of central trading services who are not served in that market and, therefore, seek intermediated access. The peripheral market is dependent for its existence on the ability of the central market efficiently to form prices and pool risk. The exchange, or any other trading system in the central markets, brings together suppliers and demanders of liquidity. By contrast, automated trading systems in the peripheral markets, where they exist, are operated by suppliers of liquidity and serve demanders alone. Although online order entry is increasing, the peripheral markets still make extensive use of manual systems to place orders.

### III. The Organization of EU Trading and Post-Trading Services

#### A. EXCHANGES AND ALTERNATIVE TRADING PLATFORMS

Trading platforms can be divided into regulated markets and multilateral trading facilities (MTFs)—also referred to as Alternative Trading Systems (ATs). The difference between regulated markets and MTFs is one of regulation. Although there are many important differences between the market models implemented by exchanges, these days they almost always operate using an electronic order book. The principal characteristic of this system is that counterparties cannot be selected by suppliers of liquidity, whose offers are free to be hit by any member of the exchange. There is more variety in the market model of MTFs, ranging from mere bulletin boards that do not arrange trades at all, to crossing systems that trade large blocks at prices derived from the exchange, to fully-fledged alterna-



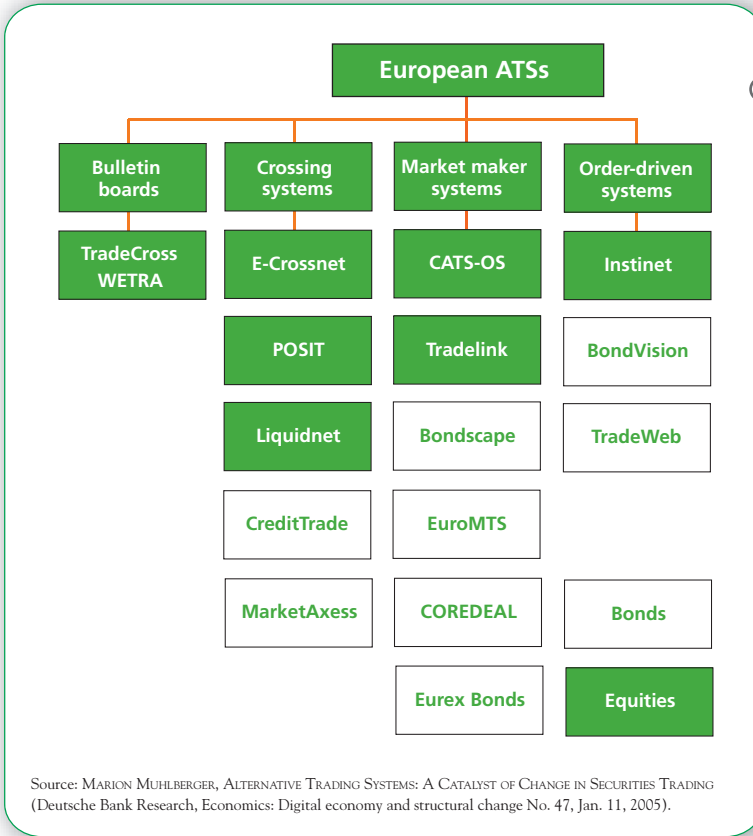


Figure 1

European MTFs

tive order books with price discovery. In addition to a possible price advantage over the exchange, such systems may have other advantages, such as after-hours trading, ease of trading larger blocks of shares, and alternative or more flexible settlement arrangements. In the equity arena, MTFs are believed to have limited market share (although data on this is lacking), but they are much more important for bonds. Many exchanges also operate what are technically MTFs with different or hybrid market models for less liquid shares.<sup>3</sup>

The most important EU exchanges are:

- The London Stock Exchange plc (LSE);
- Deutsche Börse AG (DBAG), which operates the Frankfurt exchange as well as the Eurex options exchange; and,
- Euronext nv, which operates the Paris, Amsterdam, Brussels, and Lisbon equity markets as well as the London international financial futures exchange (Liffe).

<sup>3</sup> The list of regulated markets pursuant to the EU's Investment Services Directive is kept by the Commission and available on its website.

Each EU member state has a cash equity exchange and several have more than one. In the next tier by size, we have the Spanish and Italian markets and the Scandinavian markets operated by OMX.

Technically, the most important MTF is probably EuroMTS, operator of EU bond markets, which is only a regulated market for its Italian and Portuguese government bond segments. Others are shown in Figure 1.

## **B. MANAGING DEFAULT RISK AND THE ROLE OF CENTRAL COUNTERPARTIES**

Once a trade occurs—that is to say, once two counterparties are matched on the trading platform—it is necessary to ensure that the actual securities involved in the trade are exchanged and payment takes place. For various reasons, no trading system offers real-time gross payment (i.e., immediate payment and immediate delivery of the corresponding security each time a trade occurs). Typically, the obligation actually to exchange the securities and make payment only arises three days after the trade has been entered into. This arrangement serves, in particular, to add liquidity by relaxing cash flow constraints, but it creates a risk of defaulting on trades. It may be that during the settlement period one of the original counterparties has become insolvent and so is unable to honor her commitment, or it may be that at the moment of delivery the selling party does not have the security in question, or the buying party does not have sufficient cash at hand, or one of the parties has an incentive to default because of price movements in the meanwhile. If this were to happen, it would severely damage confidence in the market. Therefore, exchanges are under a statutory requirement to ensure that trades can be expected to clear and settle, and other trading platforms have a similar incentive.

The major exchanges have responded to this challenge by introducing a central counterparty (CCP) into their market model. The CCP reduces the risk of default by interposing itself on both sides of each trade, so that it guarantees settlement. In other words, it becomes the seller to every buyer and the buyer to every seller. A CCP has other advantages too. By reducing the number of bilateral exposures by a log factor of two, it is able to net positions much as a payments clearinghouse does, meaning that many fewer settlement operations need to take place. By interposing itself in every trade, it also allows market participants to retain their anonymity relative to each other, which is a positive feature of market design because it aids liquidity provision and reduces volatility (this is because it disables inferences on adverse selection from the identity of the counterparty). A CCP does need to call for collateral to cover the positions to which it is exposed, but in this respect it also realizes economies by allowing offsetting positions to be netted. This is particularly significant when it can operate across cash and derivative markets or markets for other asset classes. The CCP does have consequences for competition in the trading services market, which we will discuss shortly. Most ambiguous is whether the CCP actually provides a service to the exchange or to its own clear-

ing members. These are a subset of exchange members, since some members may choose to clear (and settle) through an intermediary.

A CCP is not necessarily limited to providing services only to an exchange—it can also be an obligatory or optional part of trading on other platforms and be used for bilateral trades. When it does provide services in the same security for trades realized on different platforms, the question of full fungibility arises (i.e. whether the positions of a single member on both platforms can be offset against each other to produce a single collateral position and a single position for settlement). If they cannot, the attractiveness of the second platform may decline. However, in practice, CCPs may be constrained in providing fungibility by conditions in their contracts with exchanges or by the exercise of direct control.

In the European Union, CCPs are vertically integrated with the exchange in Italy and effectively in Germany (Eurex Clearing), whereas there is no CCP in Scandinavia or in Spain. The only independent player in the European Union, LCH.Clearnet, has minority exchange ownership and is otherwise owned by banks. In fact, LCH.Clearnet consists of two CCPs, one serving the LSE and the other the continental markets. LCH.Clearnet also clears for MTS. While a for-profit corporation, there are limits on the profits it can retain.<sup>4</sup> The Depository Trust & Clearing Corporation (DTCC), the U.S. clearer, is also sometimes cited as a possible competitor for EU CCPs. DTCC is vertically integrated with settlement.

### C. CENTRAL SECURITIES DEPOSITARIES

Regardless of the trading platform, eventually all positions accumulated that cannot be netted against each other have to be settled. In equities, this implies an irreplaceable role for so-called Central Securities Depositories (CSDs) owing to the need to keep track of ownership. In Eurobonds, the CSD functions are generally provided by the two so-called International Central Securities Depositories (ICSDs), Euroclear and Clearstream, which settle in commercial bank money, provide lending facilities to guarantee settlement, and also offer custody services. The certificates of deposit behind bonds are normally lodged with a national CSD when issued for trading on exchange, or with so-called “common depositories” (banks) in other cases. These entities also manage any changes in the net positions of the two ICSDs. The CSD for government bonds is occasionally the central bank.

Settlement is inseparable from custody, but custody has to take place even if there is no trading. This is because the owner of a bond may need to be traced in

4 Once LCH.Clearnet’s EBIT exceeds 150 million in any given year, 70 percent of this excess is to be for the benefit of users, in a manner to be determined by the LCH.Clearnet Board. See Announcement, Euronext, Clearnet and LCH to merge to form the LCH.Clearnet Group (Jun. 25, 2003), at [http://www.euronext.com/vgn/images/portal/cit\\_88313/16/33/377913248LCHCLEARNET\\_en.pdf](http://www.euronext.com/vgn/images/portal/cit_88313/16/33/377913248LCHCLEARNET_en.pdf) (last visited Feb. 9, 2006).

**Figure 2**

Overview of principal European financial market infrastructures

	Derivatives Trading	Cash equities trading	Clearing house	Settlement system
<i>Sweden</i>	<b>OMX</b> (also owns other Nordic and Baltic exchanges) (Quoted company)		<b>OMX Clearing</b> (Derivatives only)	<b>NCS</b> (formed when VPC in Sweden acquired APK in Finland) (Owned 19.8% by OMX, the rest by banks)
<i>Finland</i>				
<i>Norway</i>	<b>Oslo Bears</b> (Quoted company)		<b>NOS</b> (Derivatives only)	<b>VPS</b> (Quoted company)
<i>United Kingdom</i>	<b>EDX</b> (Owned by London Stock Exchange and PMX) <b>London Stock Exchange</b> (Quoted Company)		<b>LCH.Clearnet</b> (Owned 45% by users, 10% by Euroclear, 45% by exchanges, of which Eurotext's voting rights are limited to 24.9%)	<b>CREST</b> (Owned by Euroclear SA)
<i>France</i>	<b>Euronext.LIFE</b> (Owned by Euronext)	<b>Euronext</b> (Quoted company)		<b>Euroclear France</b> (Owned by Euroclear SA)
<i>Netherlands</i>				<b>Euroclear Nederland</b> (Owned by Euroclear SA)
<i>Switzerland</i>	<b>Eurex</b> (Owned equally by SWX and Deutsche Börse, but the latter has an 85% economic interest)	<b>SWX Swiss Exchange</b> (Owned by Swiss banks)	<b>x-clear</b> (Owned by SIS)	<b>SIS Segalntersettle</b> (Owned mainly by Swiss banks)
<i>Germany</i>		<b>Deutsche Börse</b> (Quoted company)	<b>Eurex Clearing</b> (Owned by Eurex)	<b>Clearstream Banking Frankfurt</b> (Owned by Deutsche Börse)
<i>Italy</i>	<b>IDEM</b> (Owned by Borsa Italiana)	<b>Borsa Italiana</b> (Owned by banks and intermediaries)	<b>Cassa di Compensazione e Garanzia</b> (Owned by Borsa Italiana)	<b>Monte Titoli</b> (Owned by Borsa Italiana)
<i>Spain</i>	<b>MEFF</b> (Owned by BME)	<b>Bolsas y Mercados Españoles (BME)</b> (Owned by Spanish banks)	<b>MEFFCLEAR</b> (Owned by MEFF)	<b>Iberclear</b> (Owned by BME)

<b>Key:</b>	Owned by users	Owned by users but with plans for flotation	Publicly quoted companies and their subsidiaries
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Source: Adapted from BOURSE CONSULT, THE FUTURE OF CLEARING AND SETTLEMENT IN EUROPE (Corporation of London, City Research Series No. 7, Dec. 2005).

order to credit the holder with a coupon payment or the repayment of the principal on maturity. The same applies to dividend payments to equity holders, with added complications such as stock splits, takeovers, and voting rights. Even if an instrument is not traded, someone owns it and so this function needs to be assured.

An individual exchange trade is not necessarily settled in the CSD or an ICSD because of settlement netting. Settlement netting is implied by the presence of a CCP, but it can also be influenced by the use of an agent for settlement. As mentioned, not all trading members of the exchange are necessarily clearing members of the CCP, and the same applies to settlement. If an agent is used, its own trades may be netted in the CCP with those of the parties for whom it is acting as an agent and only a net position will be settled. From the standpoint of the trader using a settlement agent, her net trades effectively settle in the books of that agent rather than in the CSD, but may require the agent itself to settle with the CSD.<sup>5</sup> Settlement is a necessary corollary of any trade and not only of trades on-exchange.

An overview of all the European Union structures we have discussed is provided in Figure 2.

Euroclear is owned by banks and in turn owns the equity CSDs of France, the Netherlands, the United Kingdom, and Belgium. Clearstream is owned by DBAG and in turn owns the German equity CSD, Clearstream Banking Frankfurt (CBF). The settlement infrastructure is also vertically integrated with the exchange in Spain and Italy, while the exchange only has a minority stake in the Scandinavian equity CSD holding VPC (operated commercially under the label NCSD).

## IV. The Economics of Trading and Post-Trading Services

### A. TWO-SIDEDNESS OF TRADING SERVICES MARKETS

From the brief discussion of industry organization above, we see that the issue of complementarity in the value chain trading - clearing - settlement (- custody) is anything but simple. A further complication is the existence and implications of two-sidedness.

Rochet and Tirole (2005) define a market as two-sided if two groups of customers can be identified such that the volume of transactions realized is sensitive to the division of the price between them.<sup>6</sup>

Several authors have suggested that an exchange is such a two-sided market as between buyers and sellers of securities. In our view, however, this is incorrect. Buyers and sellers do meet on exchanges, but they have the same demand function. No exchange, to our knowledge, offers different fees to buyers as opposed to sellers—nor does any broker. Of course, there is a spread in prices, but there is also a

5 In the majority of cases, CSDs separate own account from client account for settlement agents.

6 J.-C., ROCHET & J. TIROLE, TWO-SIDED MARKETS: AN OVERVIEW, (U. Toulouse, IDEI Working Paper, 2005), available at [http://idei.fr/doc/conf/tsm/rochet\\_tirole.pdf](http://idei.fr/doc/conf/tsm/rochet_tirole.pdf).

pass-through mechanism. If the price charged on one side of this putative two-sided market were to change, it would be immediately reflected in the price of the security. This means that, if buyers and sellers are the two sides, then the Rochet-Tirole definition of a two-sided market is not met, because price structure is irrelevant.

Trading platforms, however, do operate in a two-sided market, but the relevant distinction is between suppliers and demanders of liquidity. It is important to be clear that supplying liquidity is not the same thing as offering securities for sale. Because securities, unlike antiques, are commodities, it is possible also to offer a firm price for purchase and not only for sale. Therefore, suppliers of liquidity offer “two-way” prices. Similarly, those who demand liquidity may want to buy or to sell. Here also, whether they want to buy or to sell is not important.

The relevance of this distinction arises from the fact that an unconditional offer either to buy or sell on exchange creates a free option in the market, whereas accepting the offer cancels that option. This is a real difference. The option to buy benefits everyone, but it is not possible for the provider to charge everyone for it. Entering an order or displaying a quote also has an administrative cost, which (unless the supply of liquidity is directly remunerated) can only be recuperated on profits made on orders that are subsequently “hit” (i.e., that find a counterparty). For this reason, there is a consumption externality and the price structure is, in fact, relevant to the equilibrium level of transactions. Suppliers of liquidity must receive a price that subsidizes the option value or liquidity will be undersupplied. Through the platform, demanders of liquidity jointly subsidize its supply.

Note that the situation we are describing is, in a sense, perfectly mundane. The standard retail practice of attaching a price tag to products offered for sale, and indeed offering them for sale at all, represents a concession of option value to consumers (although it, of course, may have countervailing efficiencies). In a store,

ANY ANTITRUST ANALYSIS OF PRICING MUST AVOID FALLING INTO THE TRAP OF CONSIDERING EITHER SIDE OF THE MARKET IN ISOLATION FROM THE OTHER.

the retailer is vertically integrated with the “marketplace provider”, itself, so there is no need to address the incentive to supply goods. In other situations, such as shopping malls or trade fairs, it is also likely, as an empirical matter, that liquidity supply does not need to be subsidized either because there are offsetting externalities or because competition for demand competes

away any attempted subsidy to the supply side. In the trading world, however, market power combined with the market structure does make this relevant.

This has two consequences. One, obviously, is that any antitrust analysis of pricing must avoid falling into the trap of considering either side of the market in isolation from the other. This, as has been frequently pointed out, would be an error of analysis. The second consequence is more subtle, since it has to do with determining the optimal pricing strategy under various vertical structures—the components of which display demand complementarities.

## B. COMPLEMENTARITY IN THE VERTICAL CHAIN

In order to assess the efficiencies associated with vertical relationships, it is necessary to discuss the complementarities that exist between trading and post-trading services. However, this subject is far from trivial.

### 1. Complementarity between Trading and Central Counterparty Clearing

Where a CCP exists, its services are a perfect and one-for-one complement to exchange trading from the standpoint of demanders of liquidity. However, liquidity suppliers will consume the CCP's services in a lower proportion, namely only to the extent that the trades they offer are matched. Thus, one side of the trading market consumes these services in varying, rather than fixed, proportions. This means that the CCP's pricing has a different effect on demand on the two sides of the market, and implicitly it contributes to the balance between the two sides that needs to be considered by the exchange in setting an optimal price.

In addition to the problem of varying proportions, when a CCP receives a matched trade from an exchange, it has, as a practical matter, no way of telling which party to the trade first offered to trade, and as a result, it cannot price-discriminate on this basis. Therefore, it must charge the same price to the two exchange customer groups, regardless of the fact that it effectively is charging liquidity suppliers less on a per-transaction basis. Of course, the exchange feed to the CCP could include this information if it wanted to, but to the best of our knowledge no CCP differentiates its prices in this way. This means that the two-sidedness extant at the trading level does not extend to clearing, nor, by extension, to settlement, and these layers are unable to take it into account.

### 2. Complementarity of Settlement Services

Settlement services, as we have shown earlier in this paper, are complementary to trading and clearing, but in a variable proportion to both. Settlement providers are unable to internalize the distinction between supply and demand of liquidity, but in addition, when there is settlement netting in the CCP, the settlement price affects traders differently depending on the intensity of their trading during any given clearing period. Once again, the CSD normally has no means to internalize this difference unless it can first-degree price discriminate. However, we note the situation with Crest in the United Kingdom (part of the Euroclear group) which, because it has a role in clearing, is able to, and in fact does, price settlement on a gross (i.e., pre-netting) basis.

## C. IMPLICATIONS OF GOVERNANCE

Finally, governance arrangements may influence the extent to which actors at each level may effectively seek to profit-maximize.

In a static monopoly setting, it is clear that perfect user governance can eliminate rents, essentially because any rents achieved are rebated as dividends to users in proportion to their use, and thus, have no net economic effect. The effective price is the billed price less the dividends. However, it is obvious that the lack of a genuine profit motive also has costs associated with it. These include classic elements such as a lack of incentive to innovate, persistent X-inefficiency, and absent incentives to engage in industry consolidation, as well as more subtle elements such as the claim that a user-owned CCP does not have an incentive to encourage the socially optimal level of trading because it imports risk-aversion from its owners.<sup>7</sup> A further element to consider is the ability of a subset of users to exploit ownership of essential facilities to raise rivals' costs, thereby, at a minimum, impeding entry, and potentially underpinning a cartel. There is also increasing awareness of the difficulties that user-governed entities have to overcome principal-agent problems, not only because of the difficulty of aligning agent incentives, but also because principals themselves face a coordination problem and will be tempted to free-ride given that, individually, none of them internalizes the full benefit of their governance efforts.

These elements mean that we need to be cautious when it comes to prescribing user governance as a remedy to market failures. It should be recalled that exchanges come from a background of mutual ownership in which markets were perfectly segmented. Almost all positive developments in the industry since then can be tied to the efforts of private firms to seek out and capture new sources of value. Turning the clock back is not a self-evident strategy.

#### D. EFFICIENCY OF VERTICAL ARRANGEMENTS

All of these characteristics of the market need to be kept in mind in considering whether there are intrinsic efficiency problems in the trading chain and, if there are, whether vertical integration or other vertical contracting relationships solve, or potentially exacerbate, the problems.

In addition to the classical issue of double (or triple) marginalization, we also need to consider the impact of complementarity on the two-sidedness faced by the trading platform, recalling that this two-sidedness is fundamental since it impacts the supply of liquidity.<sup>8</sup>

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7 T. Köppl & C. Monnet, *Central Counterparties* (May 2005) (preliminary draft), available at [http://www.cass.city.ac.uk/conferences/clearingandsettlement/koeppel\\_monnet.pdf](http://www.cass.city.ac.uk/conferences/clearingandsettlement/koeppel_monnet.pdf).

8 This paper does not consider whether vertical integration realizes economies of scope or scale or efficiently solves technical contracting problems. However, it seems probable that any gains of this kind would be comparatively minor in comparison to gains from more efficient pricing.



## 1. Monopoly Rents

The first point to emphasize is that any market structure is likely to realize monopoly rents, since all three services are complementary to at least some degree, and as long as any single layer is a monopoly that seeks to profit-maximize, there will be monopoly rents in the entire chain. Absent the ability to perfectly price-discriminate, this will further lead to deadweight losses, and deadweight losses in the industry will translate to macroeconomic losses via a multiplier of uncertain, but very significant, size.

It should be pointed out that the estimates of savings from market integration that have been carried out have been based on making cross-border transactions as easy and as cheap as domestic ones are today. This is certainly an important goal to pursue. However, it says nothing about additional gains that might result if the entire market were competitive and realizing only normal profits. We would not expect any market to be realizing only normal profits and to be free of X-inefficiency today.<sup>9</sup>

A second issue which is interesting to consider, is whether, given complementarity in varying proportions, it is worse to have a monopoly in one layer rather than another. It appears that, from this angle, a trading monopoly is likely to be the most welfare-reducing. This is because the players at the other levels, when they set their privately optimal price, impact only a part of the transactions. It should be acknowledged that, in some circumstances, competing two-sided networks might be unable to address two-sidedness as efficiently as a monopolist. However, it seems that this is not true of trading platforms, because they can individually internalize the externality created by the supply of liquidity. Ideally, on both these conjectures, more rigorous analysis should be performed.

## 2. Double Marginalization

Given pricing interdependencies, it is clear that there is potentially a coordination problem to be solved in the vertical chain. A vertically integrated structure has access to all the information available to optimize pricing, not only through the chain, but also across the two sides of the trading market. This might be difficult to reproduce contractually. The main question is whether, even with this information, the problem is tractable. As an empirical matter, it seems that there are considerable pricing rigidities that need to be explained. Thus, we are not aware of a vertical silo adopting a pricing model that either charges settlement in proportion to gross rather than net trading or differentiates in clearing charges between supply and demand of liquidity. Therefore, it is not obvious that the

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9 X-inefficiency refers to the failure to maximize profits due to private benefits which actors within the firm obtain from reduced effort or discretionary expenditure. As a result, observed rates of return on assets may not fully reflect the rents being earned relative to a competitive industry. In essence, some of the market power rents, rather than accruing to shareholders, are consumed as benefits in kind by employees.

overall pricing package has optimized anything more than a non-integrated structure could do.

At the same time, it is conceivable that vertical integration might generate a range of inefficiencies, particularly in the CCP layer. Since CCPs realize economies of scope and scale, their optimum pricing function shifts as they serve more markets. However, a vertically integrated CCP may have less incentive to realize these economies—particularly through consolidation if it would result in weakening of control by the parent company. Similarly, it is a less attractive partner for other trading platforms if it would reduce the cost of the parent exchange challenging in their markets. Finally, as we will discuss in the next section, control of the clearing and settlement layers of a vertical silo offers opportunities for foreclosure of competition in trading.

We also need to bear in mind that user governance may limit the rent-seeking behavior of some clearing and settlement organizations. Where this is so, the problem of double marginalization does not arise.

In light of these considerations, we are skeptical of any net gains from vertical integration imputable to the elimination of double marginalization. This means we need to view efficiencies in the market in a wider framework.

### 3. Two-Sided Pricing

It is obvious that vertical integration is one way to solve the problem of achieving an efficient two-sided price for trading, in the presence of complementarity with clearing and settlement and market power in those layers. As already indicated, a vertically integrated structure has the advantage, in theory, of having full information allowing it privately to optimize its overall pricing structure.

This problem, however, can also be solved in a non-integrated structure if the trading platform prices last (provided, perhaps, that negative prices on the liquidity-supplying side of the market are possible). In current market structures, an incumbent exchange is unlikely to price last of its own volition, but the same effect could be achieved if the exchange is able to exercise control over clearing and settlement prices and price structures. Moreover, a trading platform that challenges the market is, in fact, likely to price last—it takes the clearing and settlement prices as given. Similarly, if there is competition in trading, then platforms cannot set an overall supra-competitive price, but because there are no cross-platform transactions, they can freely set the pricing mix across the two sides of the market. It follows that, if trading is competitive, the lack of vertical integration does not form an impediment to efficient two-sided pricing.

## E. STANDARD-SETTING

A last issue to consider is whether industry structures are such as to make efficient standard-setting arise endogenously. In general, there are two ways stan-

dards can arise: through eventual triumph of one standard after a period of competition, and through coordination. The first route is obviously tributary of the degree of competition in the market, and since we are largely interested here in standards as a vehicle for competition rather than outcome of it, we do not need to consider it further. The literature shows that private firms may have an incentive to cooperate on standards in certain circumstances, and may also be able to overcome coordination problems to do so. This result notably arises in network industries when the cooperating parties can internalize a part of the additional network externalities generated by compatibility. It is argued, for instance, that this explains the endogenous origin of computer hardware compatibility (it is also noted that this outcome maximizes social welfare, but may adversely affect consumer welfare when considered alone).<sup>10</sup>

Then the question that arises is whether trading and post-trading markets share similar characteristics such that standards will arise endogenously. As an empirical matter, it does not seem that they do, since little progress has been made in standard setting despite this being identified as a key obstacle to further market integration in the 2001 report by the Giovannini Group.<sup>11</sup> But, on theoretical grounds, we also believe this is not to be expected. The reason is that computer hardware manufacturers compete among each other whether or not there is compatibility. This gives smaller players an incentive to provide compatibility, even unilaterally (assuming this is not impeded by unknown specifications or intellectual property rights). Subsequently, large players have no incentive to reestablish incompatibility unless consumers value it more than the foregone network externalities. By contrast, trading and post-trading infrastructures do not normally compete against each other. Only in the trading-to-user space would there appear to be an incentive for smaller competitors to mimic established interface protocols in order to minimize switching costs for target customers. The same motivation (among others) leads competing trading platforms to seek compatible clearing and settlement arrangements to an incumbent which is, as we will discuss in the next section, more akin to the first route towards establishing standards. But on the whole, we see no economic grounds on which trading and post-trading institutions, at least if they are profit-seeking, will spontaneously pursue shared standards that enable competition, nor do we believe there are any examples of this occurring in practice.

A related question is whether there is a potential market failure in the provision of smart order routing tools. It makes more sense to consider this, however, once we have discussed the conditions determining competition between trading platforms.

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10 O. SHY, *THE ECONOMICS OF NETWORK INDUSTRIES* ch. 2 (2001).

11 The Giovanni Group, *Cross-Border Clearing and Settlement Arrangements in the European Union* (Nov. 2001), available at [http://europa.eu.int/comm/economy\\_finance/publications/giovannini/clearing1101\\_en.pdf](http://europa.eu.int/comm/economy_finance/publications/giovannini/clearing1101_en.pdf).

## V. What Kind of Competition Adds Value and What Prevents It from Occurring?

### A. COMPETITION BETWEEN TRADING PLATFORMS

With the adoption of the Markets in Financial Instruments Directive,<sup>12</sup> the European Union committed itself to competition between different forms of trading. Available evidence, although it may be thin, points to benefits from such competition both for fees and for market efficiency:

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“Competition has discovered that diverse traders are willing to support a diversity of trading systems, each of which has evolved to provide low cost service to some constituency . . . . There are strong reasons to believe that the current fragmentation of markets is not particularly costly relative to the service benefits that it provides to diverse clienteles. The widespread availability of market quote and trade data, the ability to route orders to the best prices , and the activities of arbitrageurs all act to integrate fragmented markets.”<sup>13</sup>

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This is particularly likely to be the case when the fixed costs are sunk because of current market fragmentation, and therefore, do not need to be incurred again in order to offer a competing service. In fact, the marginal cost of launching a competing service may be very low and it may break even on very low market shares.

The question that then arises is whether barriers to entry exist in the form of foreclosure strategies available to the incumbent or from other characteristics of the market.

In this section, we consider two possible barriers to entry: restricted access to the CCP or to the CSD, and the non-availability of market reconstitution technologies. We then close the section with a brief comment on the dominance of incumbents with regard to Article 82 of the EC Treaty.

#### 1. Effective Access to Clearing and Settlement

For competition between trading platforms to develop, a variety of conditions need to be met. These include access to, and fungibility in, clearing and settle-

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12 Council Directive (EC) No. 39/2004 on markets in financial instruments (Apr. 21, 2004).

13 L. Harris, *The Economics of Best Execution* (Mar. 9, 1996, U. S. Cal.) (preliminary draft), available at <http://www-rcf.usc.edu/~lharris/ACROBAT/BESTEXEC.PDF>.

ment. So it is interesting to ask under what conditions CCPs and CSDs will or will not grant this fungibility and whether an incumbent has the means and incentive to foreclose by refusing fungible access.

When the clearinghouse or settlement infrastructure is owned by an incumbent exchange which is under no legal obligation to provide access outside competition law, it does not seem very likely that it will voluntarily do so on non-discriminatory terms. This is because the entrant will compete head-on with the incumbent. Entry is unlikely to grow the market significantly, and competition is likely to be on Bertrand terms, thus destroying industry profits. If the entrant is more efficient, it might even drive the incumbent out entirely.

Admittedly, the incumbent still would control the monopoly post-trading infrastructure, and if the trading segment is competitive, then it could still capture the entire monopoly rent, only incurring the cost of writing off the trading assets. However, this and foregone private benefits are, with high probability, more than sufficient to exclude this outcome from being considered. A corollary of the single monopoly profit is that the vertically integrated structure has no incentive whatsoever to provide access to clearing and settlement, because it cannot boost its profits in any way by doing so.

In conclusion, a vertically integrated structure has both the means and incentive to foreclose. Moreover, even if a new entrant could try to use an alternative clearing provider at a competitive disadvantage, which is difficult enough, it has no chance to avoid the incumbent CSD, while the incumbent has every incentive to concentrate rent capture there. Thus, it is certain that the single monopoly profit will accrue entirely to the incumbent until such time as the entrant has sufficient market share to extract some of it for itself. In a vertical silo, competition in trading is likely to be foreclosed.

IT IS CERTAIN THAT THE SINGLE MONOPOLY PROFIT WILL ACCRUE ENTIRELY TO THE INCUMBENT UNTIL SUCH TIME AS THE ENTRANT HAS SUFFICIENT MARKET SHARE TO EXTRACT SOME OF IT FOR ITSELF. IN A VERTICAL SILO, COMPETITION IN TRADING IS LIKELY TO BE FORECLOSED.

When the CCP is independent and either run for profit or user-owned, it has an incentive to enable entry at the trading level and offer fungibility. This is because, where there is a single player at each level, it is the exchange that typically has the strongest bargaining power in capturing the available monopoly rents. This is seen in both the retrocession fee provided from Clearent to Euronext and the price auction for clearing services held by LSE. When there are alternative trading platforms, however, the threat of the primary platform replacing the clearing provider is much less existential, since users with a vested interest in not changing clearing provider (e.g. because they use the same provider on other markets or they have incurred high sunk costs in interconnecting systems) can more credibly threaten to switch all or part of their trading to the alterna-

tive platform. This alters the bargaining power in the clearinghouse's favor, or in users' favor if users own the clearinghouse. The CCP, therefore, has an incentive to sponsor and facilitate entry.

However, even when the CCP is independent, it may not be free in its actions. This is because it can invite entry only when it enjoys incumbency. However, in order to attain incumbency, it must be awarded it by the exchange. Therefore, the exchange can, and has an incentive to, specify contractual conditions that exclude fungibility or, at the very least, render it more difficult to achieve. The order of moves in the game matters, and the CCP, moving second, is disadvantaged so that an apparent strategy disappears. Of course, it might reappear if the CCP had sufficient power in other markets such that users would switch to it or retain it and start trading on a new trading platform, rather than incur the cost of changing CCP in the first market. But this is not how the market presently works.

On this analysis, it might appear that competition in trading will always be foreclosed if there is a CCP, even if it is independent. This, however, is not true if effective access to the CCP is assured as a consequence of applying competition law. This is either because the CCP, in refusing fungible access, would infringe the dominance provision of Article 82 of the EC Treaty, or because a contractual arrangement with the incumbent exchange preventing the CCP from granting such access might be void under Article 81 of the EC Treaty. If the latter were the case, an independent CCP would then have the means to encourage competition among trading platforms.

As there is little precedent in applying Article 82 in this industry,<sup>14</sup> we limit ourselves to some general considerations. Any obligation to supply pursuant to Article 82 can be established only after close scrutiny of the facts in a given case. This starts from the principle that dominant suppliers, as any undertaking, are usually free to determine whom to supply, and that a refusal to supply may infringe Article 82 only if it has a likely anticompetitive effect on the market that is detrimental to consumer welfare.

Relevant case law normally requires the supplier to have a dominant position in an upstream or related market and to be able to control an input needed to compete in a downstream market.<sup>15</sup> Although a CCP provides services in the first place to its clearing members, it is also a supplier to the exchange since it enables

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14 Commission Decision, Case DG COMP/38.096, Clearstream (Clearing and Settlement) (Jun. 2, 2004, not yet reported), available at <http://europa.eu.int/comm/competition/antitrust/cases/decisions/38096/en.pdf>. That decision found that Clearstream, the German CSD owned by Deutsche Börse, had infringed Article 82 by refusing to supply input services to a customer (Euroclear) who competed with a company belonging to the Clearstream group in the downstream market for agent settlement.

15 Case C-7/97, Oscar Bronner GmbH & Co. KG v. Mediaprint Zeitungs- und Zeitschriftenverlag GmbH & Co., 1998 E.C.R. I-7791 and Case C-418/01, IMS Health GmbH & Co. OHG v. NDC Health GmbH & Co. KG, 2004 E.C.R. I-5039.

the latter to complete the trades made on its platform. The fact that the London Stock Exchange organized a bidding process for its clearing contract illustrates the existence of a supplier-customer relationship. Even where the CCP is vertically integrated with the exchange and its input is supplied exclusively to its owner, it seems justified to assume the existence of a potential market since demand for that input may arise if a newly competing exchange also requires access.

It would also seem likely that the CCP's input (fungible access) is indispensable for a trading platform to compete effectively with the incumbent exchange downstream. Episodes of competition between exchanges that involved both fungible clearing and remote clearing arrangements appear to confirm that only the former will enable an entrant to compete effectively on price.<sup>16</sup> More specifically, the prospect that an entrant could turn to an alternative supplier or duplicate the CCP is clearly excluded in most cases. Because of economies of scope in clearing, lack of fungibility constitutes a significant impediment to an entrant. While a refusal to grant such access would not completely foreclose a competing trading platform, it is likely to have a significant negative effect on the level of competition in the downstream trading market which, as instances of actual entry show, can reduce trading fees significantly if supported by fungible clearing arrangements.

Similar considerations could be made in assessing an exclusive contractual arrangement between the incumbent exchange and an independent CCP under Article 81. Whether the exchange imposes exclusivity on the CCP or puts in place arrangements that have a similar effect (e.g., a right of first refusal), such arrangements may appreciably restrict competition if they foreclose or significantly impede competition at the trading level.

Any refusal to supply, therefore, would need to be objectively justified by efficiencies, both under Article 82 and under the exemption clause of Article 81. Whether investment incentives could justify the exclusion of an entrant from access to the CCP, at least for a certain period, may have to be considered on a case-by-case basis. However, even within a vertically integrated structure, this is not obvious. The comparison with non-integrated infrastructures suggests that a CCP can achieve significant efficiencies even where it serves different trading platforms.

Of course, it may be argued that competition between trading platforms would be a rather relative gain, since a significant chunk of the monopoly profit previously present in the trading layer would not be competed away, but would merely migrate to the CCP. If the CCP is owned by the community of users in proportion to their use, then this problem would not arise because it will rebate its profit to users. If it is operated for profit, however, then this objection would have more force. If it is owned by a subset of users, then those users can potentially raise rivals' costs by setting high clearing fees that will then be partly rebated to

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<sup>16</sup> One example is the trading services offered by the London Stock Exchange and Deutsche Börse for Dutch cash equities in competition with the incumbent, Euronext.

the owners in the form of dividends, giving them a cost advantage. In this case, the welfare gain depends on how competitive the market composed of the user-owners is, compared to potential entrants that are excluded. Clearly if this market is perfectly competitive then there are no welfare effects from this strategy (it may even raise welfare by preventing inefficient entry), but if it is oligopolistic then the monopoly rent is indeed recaptured in part.

## 2. The Provision of Market Reconstitution Technology

Broker-dealers will only look at liquidity furnished on alternative trading platforms if there is a concrete and compelling reason to trade there, or if they can quickly and easily compare quotes across platforms from the standpoint of total trading costs. This implies the existence of a technology layer which reintegrates the underlying fragmentation from a user perspective.

In the United States, best execution requirements on brokers require them to perform this comparison. As a result, this technology exists and is operational there. In other words, it was not necessary to determine if the market would spontaneously deliver it because demand for it was regulated into existence. In EU markets, this kind of technology is rare. Apparently it is a chicken-and-egg conundrum—the lack of such technology dissuades entry while, absent entry, there is no incentive to develop the technology.

Because of the diversity of the user community, it may be hard for them to solve the hold-up problem. Of course, this depends in the final analysis on how expensive the technology is compared to the benefit it brings to individual users. Clearly, it brings no benefit at all if there is no underlying choice of platforms. But even if there is such choice, its adoption still faces a prisoners' dilemma because the value of the technology is proportional to the degree of liquidity on the alternative platform, which in turn depends on the installed base of the technology. Collectively, there is an incentive to adopt it, but individually there is none. Discounting this, technology providers will not invest in developing it (it is, for various reasons, not a trivial matter simply to redeploy the technology developed for the United States).

This raises the question of whether an entrant can solve the problem by, for example, integrating with a technology provider or otherwise subsidizing the development of the technology.

## 3. Dominance in Trading Service Markets

As we have considered this issue elsewhere,<sup>17</sup> we briefly state our hypotheses here. Incumbent exchanges currently may possess dominant positions over trading services in the instruments that they trade. This possibility arises notably because of

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17 S. Greenaway, *Competition between Stock Exchanges: findings from DG Competition's investigation into trading in Dutch equities*, 3 COMPETITION POL'Y NEWSL. 69-71 (Autumn 2005).



the exclusion of off-exchange alternatives from the relevant market due to the fact that, at least in the case of Dutch equity trading that the Commission investigated, they did not appear to constitute a significant competitive restraint. Similar conclusions on MTFs were reached by the U.K. Competition Commission in their investigation of possible bids for the London Stock Exchange.<sup>18</sup>

#### 4. Incentives to Enter and Entry Inefficiencies

Even if barriers to entry can be overcome, there are still a couple of issues relating to potential competition between exchanges.

First, there may be strategic reasons to avoid entry. These arise because of the characteristics of the market post-entry and, in the case of an incumbent in another geography, the risk of retaliatory entry in the home market.

On the assumption that trading is largely a commodity business, it is expected that comparable players (such as two exchanges) would compete *ex-post* in prices, resulting in the Bertrand outcome, namely competing away of profit. A potential entrant might discount this outcome and realize that profits in the market post-entry will be insufficient to recuperate the costs of entry, even if these are quite low. Therefore, only the prospect of ejecting the incumbent entirely will induce entry.

In this respect, the level of pre-entry rents being earned by the incumbent does not matter. Their level will neither induce entry, nor, by corollary, will the threat of entry discipline pricing. The reason for this is that, in a classical industry, capacity constraints limit the pricing response of an incumbent monopolist, so that post-entry, rents persist for at least a time even if goods are undifferentiated. In exchange trading, prices can be bid down to zero after entry because of the fear of massive liquidity shifts over a short space of time.

Even if the incumbent might be ejected, the prize might still not be worth the cost. If the challenger's home market is contestable, an incumbent facing price competition has an incentive to enter that market if it believes it has a lower overall level of fixed costs. If it fails to do so, the challenger can win the market even if it is less efficient, because it can fully subsidize its activity in the new market on the profits of the old. Anticipating retaliatory entry, a potential challenger may not enter, particularly if it does not believe it is intrinsically more effi-

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COMPETITIVE RESTRAINT.

<sup>18</sup> See *Competition Commission – Inquiry – London Stock Exchange plc*, at <http://www.competition-commission.org.uk/inquiries/ref2005/lse/index.htm> (last visited Feb. 9, 2006).

cient. Even if it does believe that it could win a war of attrition, victory is likely to come with a hefty price tag in lost earnings, as the wounded incumbent would continue to cover its variable costs even at a very low price level and, thus, would not immediately exit. Compared to this scenario, a merger or takeover—if it wins regulatory approval—is likely to be less painful.

A corollary to this is what happens when a challenger enters on the basis of a home-market position that is not contestable. In this case, it can behave very aggressively. It will be unexposed to losses in the contested market and, regardless of whether it is more efficient or not, it can effectively bleed the incumbent until it withdraws. Since it has no need or use for the incumbent's assets—all it wants is its market position—it may achieve in this way the benefits of a takeover without paying anything at all. This outcome improves static welfare relative to two segmented markets and would have dynamic benefits as well, but if the challenger is not more efficient than the incumbent, then this outcome is not the best that can be achieved. Then the question that arises is whether the aggressive pricing behavior of the challenger is compatible with competition law. While this behavior looks predatory, it might very well not require pricing below any traditional cost standard, and so an assessment of its compatibility would necessarily lead into new territory. This would merit further debate.

## **B. COMPETITION IN CLEARING**

In respect of clearing, two models are sometimes advanced. One is competition for the market, the other competition in the market. The latter implies interoperability between CCPs. We offer a couple of further thoughts.

First, with regards to competition for the market, this model seems difficult to apply because there is no public authority to organize the competition. Where there are instances of such competition, the possibility cannot be ignored that, at least to some extent, it might have helped transfer monopoly rents from clearing to trading. As just demonstrated, the power of trading over clearing can be used to prevent competition in trading, or at least result in no such competition occurring in practice. Further reinforcing these powers, therefore, may be unwise. Moreover, any such competition would not necessarily have anything to do with the service provided to users. It is not evident that, under these circumstances, investment by the incumbent clearer would occur when it is socially optimal to do so. The need to write assets off over a shorter time span might result in higher prices. Also, the exchange may have an incentive to change clearer when users have none, imposing costs on them. Obviously, it is even less realistic to expect competition to occur in a vertical silo. Therefore, current formulations of possible competition for the market appear naïve.

Interoperability of CCPs could be achieved and would bring benefits, although it would seem to only amount to competition in the market to a limited degree. The major benefit of achieving interoperability of CCPs would be that it would

allow non-clearing members of foreign exchanges to clear their trades through their customary CCP rather than through a foreign agent bank. By clearing more trades through a single CCP, average collateral costs would fall at the same time as the foreign agency costs would be avoided. Having this option available might also induce more trading on foreign platforms, thereby deepening liquidity.

The costs of this solution would be considerably lower than sometimes alleged. Since any single user would have an account at a single CCP, all its exposure would be in relation to that CCP and the suggested solution would not increase collateral costs, even absent additional trading within CCP scope. It would not decrease netting efficiency either, because the CCPs could net their residual positions against each other. Doubtless, this solution requires technical standards and appropriate oversight to avoid moral hazard when a single CCP does not internalize the full risk of dealing with its members. Intuitively, however, this should be possible, although, as we have argued, it is unlikely to emerge simply under market conditions.

Interoperability of CCPs, of course, will only be of value if exchanges are required to route trades to the CCP of the user's choice. When the CCP is independent of the exchange and exchanges are unable to contractually foreclose competition in trading by the means described, greater competition at the clearing level should allow exchanges to capture greater rents than they otherwise would and so they may have an incentive to facilitate CCP interoperability. They would also internalize the benefit of wider access to their platform and the virtuous circle of increased liquidity. A vertical silo would probably not have this incentive because it is already able to capture all rents in its domestic market, and so it might be necessary to regulate in order to achieve full interoperability.

As already discussed, the problem of duplicating infrastructure costs does not arise because these are already sunk due to the current fragmentation of markets. A process leading to interoperability may, of course, eventually lead to full consolidation. It must be stated, though, that consolidation is not an alternative to interoperability since even already consolidated entities such as LCH.Clearnet and Euroclear still have not achieved full interoperability among their constituent historical components. Arguably, consolidation may make the path to interoperability smoother.

It remains to be discussed whether this scenario is real competition. As is apparent in the case of Virt-X—which does offer two CCPs—the choice of CCP by any given member is largely predictable. Thus, even under interoperability, we would expect bilateral monopoly largely to prevail. This may, however, not be the case for the largest players who presently use more than one CCP and could select any of them as their home CCP under interoperability. These players would achieve a significant advantage under this scenario.

### C. COMPETITION IN SETTLEMENT

Turning to settlement, the option to internalize settlement or make use of an agent does not constitute a net competitive constraint on the pricing of a CSD. The same is true for settlement netting, except insofar as this may influence the share of the monopoly profit that the CCP is able to obtain and, hence, the share that remains for the CSD.

As we prove in the Annex (Section VII of this paper), it can be shown that CCP netting does not affect the CSD's profits. This result has a powerful corollary, since it implies that the presence or absence of a CCP does not influence the profit of the CSD. It is, in other words, irrelevant how many transactions the CSD has to process—settlement efficiencies do not influence its equilibrium

THIS RESULT HAS A POWERFUL COROLLARY, SINCE IT IMPLIES THAT THE PRESENCE OR ABSENCE OF A CCP DOES NOT INFLUENCE THE PROFIT OF THE CSD.

level of profit. Note that it does still need to know the netting efficiency to set its price—this variable has not become irrelevant to its decision—but its profits remain unaltered.

This result gives a taste for the intuition that also lies behind the conclusion on settlement agency. However, the inability of settlement agency to disrupt the profit level of the CSD (if it is profit-maximizing) should not be taken to mean that the option to settle through an agent has no value at all. Settlement agents provide value-added services in respect of securities custody and, because of their ability to offer a broader bundled offering, may be convenient in other respects. In this paper, we have not explored competition in custody and any conclusions in this respect would be premature.<sup>19</sup>

## VI. Conclusions

In discussing trading and post-trading markets, there is sometimes a tendency to generate theoretical solutions that take no account of inherited structures. This is, at best, unrealistic. When we take the existing landscape as our starting point and consider how it can be pragmatically improved, the role of competition in generating incremental efficiencies may take on greater importance than in a world in which economic analysis can leapfrog to theoretically optimal market structures. This would then justify increased attention on the part of competition authorities to the problems that the sector poses, even if they may appear complex. This, of course, is certainly not to say that regulation is unimportant—it may even be critical.

19 See, e.g., J.-C. Rochet, *The Welfare Effects of Vertical Integration in the Securities Clearing and Settlement Industry*, (preliminary draft, IDEI, University of Toulouse) (Jun. 2005), available at <http://www.cass.city.ac.uk/conferences/clearingandsettlement/Rochet.pdf>.

In looking at current industry structures and incentives to achieve greater efficiency, there are both a number of possible market failures that may necessitate regulation, and a number of instances in which market players appear to have an incentive to adopt arrangements that might be considered under competition law. Whether the observed limited degree of competition, consolidation, and interoperability can be ascribed to such behavior and such market failures, is clearly more of a moot point. Given the macroeconomic issues at stake though, monitoring of the sector by competition authorities is a necessary accompaniment of regulatory efforts to achieve closer integration.

## VII. Annex: CCP Netting and CSD Profits

For this analysis, assume a world in which the price charged for trading by the exchange and by the CCP is set first and the CSD then responds. (This analysis ignores fixed and ad valorem fees and assumes that each layer sets only a per-transaction fee. It also ignores exchange fees for unmatched trades.) There are  $n$  similar exchange members, all of which are also members of the CCP and CSD. They trade a single share between each other and their individual demand for trading in one clearing cycle is Poisson-distributed with mean equal to  $M - p$ , where  $M$  is a constant,  $p = p_{TC} + p_s^*$  is the total price charged by all three layers, and  $p_s^*$  is the expected effective unit settlement price (i.e., the net settlement price divided by the number of transactions that are netted). Trading is possible only in single blocks of a given size. As a result, in each clearing cycle, there are on average  $(M - p)n$  transactions, resulting in  $cn$  net positions where the CCP is creditor or debtor corresponding to each of the members with  $c(p_s) \leq 1$ . These net positions are then forwarded to the CSD for settlement. Knowing the realization of the trading and clearing prices and of the residual demand function, the CSD then sets its price to maximize profits.

On the realistic assumption that the CSD has negligible variable costs, its objective function is simply to set  $p_s$  such that it maximizes  $E(p_s cn)$ , which is obviously the same value as maximizes  $E(p_s c)$  given that  $n$  is known and positive.  $c$ , however, is the probability that any given member trades at least once. Given the Poisson probability distribution, it can be shown that it is equal to  $1 - e^{-p} = e^{p_{TC} + p_s^* - M}$ . Since  $p_s^* = p_s / (M - p)$ , and setting  $A = M - p_{TC}$ , then  $p_s^* = p_s / (A - p_s^*)$ . Since this is recursive, the math quickly becomes complex. However, it is not necessary to solve the first order condition, since it is enough to show that, when certain characteristics of the model are changed, the maximization problem faced by the CSD does not change.

Now assume there is lesser efficiency of netting in the CCP. In this case, instead of passing through  $cn$  settlement instructions to the CSD, it passes through a multiple of this, say  $kcn$  where  $k > 1$ . (For the proof, it is not important to consider why, if at all, such inefficiency could arise in practice, but it could be, for instance, the case if the CCP served two platforms and there was no fungibility—although in this case  $c$  would also change). In this case, the CSD will collect  $kcp_s'$  per member in revenue and this is the amount it will try to maximize. It is clear that it chooses  $p_s' = p_s / k$  because, in this case, the expected average unit cost of settlement is unchanged and it is this that determines  $c$ . Total revenue per user is then  $kp_s' = p_s$ , which is divided over the total number of trades per user,  $(M - p)c$ , to give exactly the same formula for  $p_s^*$  as before. ▼