

Collana Ricerche

The industrial organization of post-trading

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THE INDUSTRIAL ORGANIZATION OF POST-TRADING Europe versus US

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Abstract

The paper analyzes the industrial organization of post-trading, trying to understand its specificities (which are similar but not identical to those of trading), taking into account its interaction with the exchange sector. Post-trading exhibits network externalities on the demand side and scale economies on the supply side: both factors point to a highly concentrated market structure. Despite the potential efficiency gains from consolidation, several obstacles makes it difficult to reach a fully consolidated industry in Europe: (i) the existence of national boundaries, which still represent a major feature of the stock exchange industry; (ii) the complexity of the bargaining process during the merger phase; (iii) the natural vertical links that exist between exchanges and post-trading infrastructures. Therefore, regulatory authorities should take an active role, as the US experience shows. In this respect the recent initiatives of the ECB and European Commission are discussed. Particular attention is given to the low level of competition intrinsic in the market, the vertical silos that often characterize the industry, and the expansion of CSDs into the provision of banking services.

1. Introduction

While the market structure of the trading activity has been deeply analyzed in the economic literature, the industrial organization of post-trading did not receive much attention. This has been mainly due to the fact that this activity has been seen for long time as ancillary to trading: much of the post-trading infrastructures have been created by the exchanges or by the public sectors to support the provision of trading services.

Only recently clearing and settlement entities have become private independent and often for profit companies. Nevertheless, so far the scientific interest in post-trading had a narrow focus and considered this activity without regard to its links with the trading services, which still remain quite strong and very important. For example: Giddy – Saunders – Walter (1996) examine different organizational models for the clearing and settlement industry in Europe; Iori (2004) compares gross and net securities settlement architectures; Koepl – Monnet (2006) and Jackson – Manning (2006) focus on the role of central counterparties (CCP) and of clearing procedures; Russo – Hart – Malaguti – Papathanassiou (2004) cover the problem of governance of securities clearing and settlement systems; Holthausen – Tapking (2004) and Rochet (2005) analyze the competitive game between CSDs and custodian banks; Kauko (2005) tries to explain why CSDs establish idle links among them; a number of papers investigate the clearing and settlement in USA and Europe: among them Lannoo – Levin (2001), Giovannini Group (2001), NERA European Consulting (2004).

The object of this paper is to analyze the industrial organization of post-trading, trying to understand its specificities (which are similar but not identical to those of trading) without forgetting its interaction with the exchange sector. Actually, post-trading may be seen as an input to trading; alternatively, they may be seen as strictly complementary services: in both cases, the organization of one sector is heavily influenced by the organization of the other one. A widespread feature of the exchange industry are actually vertical links: each and every exchange has at least a special agreement with a post-trading infrastructure or they belong to the same group and so they provide the whole range of services, covering trading and post-trading as well.

The starting point of our analysis will be to recognize that post-trading (as well as trading) services are network goods: the utility of each participant (traders and

issuers) is increasing in the number of other participants to the same market infrastructure. Economies of scale on the demand side – together with those on the production side – point to the need of a very concentrated industry structure: efficiency is maximized when a single supplier is present. When several service providers survive, compatibility between them is a desirable property but not easily reachable.

Despite the fact that trading shares the above mentioned features with post trading, there are significant differences between their market structures. In the trading sector some degree of competition is sometimes present: in the past regional exchanges succeeded to enter other geographical markets¹; more recently dominant exchanges compete with alternative ones (ATS) and more and more often with financial intermediaries. To the contrary, in the post-trading sector there are no cases of new entries and national monopolies do not have any competitor, at least in their core business² (the reasons for this will be addressed below). Furthermore it is very expensive for clients to move their clearing and especially their settlement activity from one infrastructure to another. In addition the registry function of the issuers' CSDs allows them to enjoy a legal monopoly in the provision of depository/settlement services. Finally, as previously mentioned, the existing links between stock exchanges and "their" infrastructures seem to play an important role. These links are originated by the need/opportunity of the exchanges to offer better straight-through services to their clients. So vertical restraints are a relevant characteristic of the exchange industry: not only ownership links, but also exclusive arrangements are a universal practice. These links create a paramount obstacle to entry by potential competitors. So the introduction of competition in the post trading industry seems to be much more difficult than it is in the trading sector.

Within this framework it is interesting to compare the USA experience with the European one. In USA, an almost duopoly is the current equilibrium in the business of securities trading, with NASDAQ and NYSE being the dominant players. This outcome, that arise from historical reasons³, may be explained by the ability of NASDAQ to differentiate its service in terms of technology and quotation rules; however, pushed by a tough regulation, such differentiation has recently significantly weakened, making competition much stronger and the industry equilibrium more fragile⁴. Post-trading services are provided by a single infrastructure: the DTCC; the concentration process however took more than twenty years and it required a strong intervention by the regulatory authorities. In Europe, national monopolies have been prevailing so far both at the trading and post-trading levels, but horizontal integration has recently gained momentum (see for example Euronext and the OMX Group). However these horizontally integrated markets continue to have special links with other (horizontally integrated) post-trading structures (e.g. Euroclear and LCH-Clearnet).

¹ *In the Us case, an interesting example is given by the rivalry between the NYSE and the Consolidated Stock Exchange from 1885 to 1926 (see Brown, Mulherin and Weidenmier 2006); more recently regional exchanges gained some significant market shares at the expense of major exchanges (see Arnold et al. 1999). In the European case, for instance, LSE tried to provide trading services on Dutch shares in competition with Euronext; Virt-x tried to attract trading on UK shares competing with LSE.*

² *The only exception is given by Euroclear and Clearstream, which from the beginning were competing for the Eurobond clearing and settlement. See Appendix 2.*

³ *The NASDAQ was created to give a certain level of transparency to the exchanges of stocks that were negotiated over the counter between dealers and had not the requirement to be quoted on the NYSE.*

⁴ *Authers and Cohen (2006) offer an excellent overview of the high level of competition currently present in the US securities industry.*

Both the US and European experiences provide evidence that the process of a horizontal consolidation is difficult and it may take a long time. A first explanation for that relies in the difficulties of achieving an agreement among the different parties: the adoption of a single post-trading platform, among several ones, implies that some players have to be compensated for their lost business, and this may require a complex bargaining process. In Europe, a second important obstacle to integration derives from national boundaries, which still represent a major feature of the stock exchange industry. In particular, national stock exchanges rely on national CSDs for the registry function, and issuers have a home bias in the choice of the stock exchange and consequently of the CSD: so, on the issuers' side, markets are still highly fragmented; given the two-sided nature of the industry – with issuers and investors as final users – this is a relevant obstacle to cross-border integration of post-trading structures, despite the international diversification of investors' portfolios.

Obviously, given the mentioned links between the industrial organization of trading and post trading, the recent discussions over a trans-Atlantic versus a trans-European merger of stock exchanges offer interesting elements of debate on the consolidation process in the European post trading system.

In the next section we will look at how the industrial organization of the post-trading industry can be interpreted taking a network approach and try to understand what equilibrium could be reached. In section 3 we outline the current situation in the US exchange industry and try to see how the European post trading industry could evolve to a more efficient equilibrium. In Section 4 we draw some policy implications and discuss the current initiatives of the ECB and the European Commission. Appendix 1 looks more deeply into the history of the US post trading infrastructures and Appendix 2 in the consolidation process in Europe.

2. The I.O. of post-trading: a network approach

Post-trading services may be split into the following steps: clearing, registry/settlement, and custody⁵. We begin this section by showing that the demand for such services exhibits network externalities. Then we analyze how the network effect may push the industry towards a highly concentrated market structure, where it is difficult for potential entrants to challenge the incumbents' position. However we also underline the forces pushing to an oligopolistic equilibrium. Finally, the issue of compatibility among different service providers is briefly discussed.

2.1 Post-trading as a network good

Let us first consider the clearing function. We make use of an example – visualized in Figure 1 – to make our point. There are three traders involved: i, j, z ; i sells 10 shares to j and – say five minutes later – he buys 5 shares of the same category from z . Suppose momentarily that j and z are members of two different Clearing Houses: CH-A and CH-B respectively. The first consequence of this assumption is that i has to be a member of both CHs, as he wants to trade with both j and z . Second, the two clearing procedures give rise to two distinct obligations, as far as i is concerned: he has a debit position (10) with CH-A and a credit (5) with CH-B. In addition, j has a credit (10) with CH-A and z has a debit (5) with CH-B.

Now, let us turn to the alternative assumption that both j and z are members of the same CH. As a consequence, i has to be a member of only one CH. The second – and presumably more important – effect is that his two trades may be netted, so that he has only one obligation: a debit (5) with the CH (while the obligations of j and z are unaffected).

⁵ **Clearing.** This is the first step after trading, and its purpose is the exact definition of the obligations of each trader. First, the orders of the market participants must be checked so to avoid mistakes (matching). Second, a netting procedure is normally applied: for each trader, the balance of his orders relative to a security is computed, producing a debit/credit position. The Clearing House (CH) may also provide a central counter-party function (CCP), meaning that each participant has to deliver/receive securities to the CH, which becomes the counter-party of all traders.

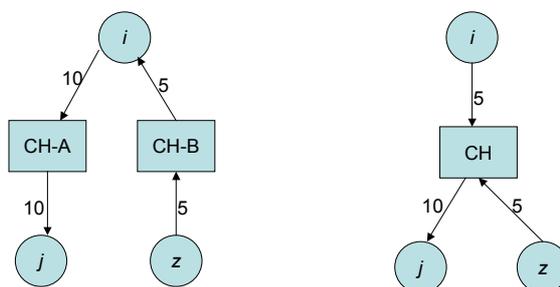
Registry. When issued, securities are registered on an issuer's account with a Central Security Depository (CSD). This institution keeps record of the ownership of securities: these, due to dematerialization, are entries on the book of the CSD.

Settlement. This label refers to the transfer of securities from sellers to buyers. Actually, where netting is at work only the balance of trades – computed during the clearing procedure – has to be settled. The same applies to the cash leg of transactions, which is settled through the payment system (however, we are not interested in this side of the issue, as we focus only on the transfers of securities).

The registry and settlement functions are so strictly linked that we may consider them two components of the same activity: the transfer of a security from seller to buyer implies a change of ownership, which must be recorded on the book of the institution entitled to be the registry; typically a CSD performs both functions.

Custody. Securities are deposited by their holders on deposit accounts with financial institutions (custodians), which normally provide related services – like corporate actions and tax procedures.

**Fig. 1 – Clearing House
(CCP and netting)**



This simple example shows a basic principle: the membership of traders j and z to the same CH has a positive effect on another trader (i), as the cost of clearing for the latter is lowered – relative to the opposite case where j and z are members of different CHs. This cost saving comes from two sources: (i) a lower number of CHs where i has to be a member; (ii) a lower number of obligations to be settled, thanks to the netting procedure. Therefore, *for each trader the clearing cost is minimized if all traders are members of the same CH.*⁶

Coming to the registry function, let us consider the case where some securities are registered with CSD-A and others with CSD-B. A bank holding both types of securities – on its own behalf or acting as custodian for a client – has three alternatives: (i) it holds accounts with both CSDs; (ii) it holds accounts with one CSD – say CSD-A – and with another custodian, which in turn holds accounts with CSD-B; (iii) it holds accounts with one CSD only, exploiting the link between the two CSDs, which makes possible a “transfer” of securities between them⁷. It is evident that the splitting of the registry function between two (or even more) CSDs implies a duplication of costs, whichever of the three alternatives is chosen. Such *additional costs are avoided if all issuers rely on the same CSD as registry for their securities.*

A similar argument applies to the settlement function. If both seller and buyer hold accounts with the same CSD, the transfer of a security involves only debiting and crediting such accounts. To the contrary, if they rely on different CSDs, additional operations are needed: the links between them have to be activated; alternatively, the account of a custodian – acting on behalf of the buyer – has to be credited⁸. Thus, *transaction costs are minimized if all traders rely on the same CSD for settlement purposes.*

⁶ Lusignani and Onado (?) suggest that a single CH should operate in the European financial market. Schmiedel and Schonenberg (2005) point to an excessive fragmentation of the securities industry in Europe, with regard to both trading and post-trading services. Jackson – Manning (2006) show – through simulations – the gains from multilateral netting and clearing through a CCP, in terms of cost and risk reduction; they also show that a consolidated multi-product CCP enables traders to implement a more efficient use of collateral, obtaining further gains. These issues are also addressed by Bliss – Papathanassiou (2006) and Koepl – Monnet (2006).

⁷ A “transfer” of securities from CSD-B (where the issuer’s account is) to CSD-A is implemented through the creation of Depository Receipts at CSD-A, which synthetically reproduce the securities held by CSD-A on its own account with CSD-B.

⁸ Actually, the use of custodians is by far the most frequently adopted solution in Europe. See Linciano – Siciliano – Trovatore (2005) for a more detailed description of settlement procedures for cross-country trades in Europe.

2.2 Horizontal consolidation: a natural outcome?

The above arguments point to the benefits of *consolidation* in the post-trading industry. A market structure with a single provider maximizes the positive network externalities enjoyed by customers, i.e. issuers and investors. This is a standard result in the economics of networks⁹: all consumers buying from the same supplier is an efficient equilibrium, as it makes the size of the network as large as possible, to the benefit of consumers' utility.

One may ask if such an equilibrium is a natural outcome of the competitive game among firms. The literature on networks tells us that the answer is positive, in general. This result – known as “market tipping” – is fairly intuitive: when a player becomes dominant, all consumers prefer the product he offers, as they gain the maximum level of utility from it, in terms of network size; therefore minor players tend to disappear – except in cases where they are able to sharply differentiate their product. An example is the position reached by Microsoft Windows in the sector of computer operating systems – where other players retain only a minor market share.

As a consequence, in network industries competition is typically *for* the market, rather than *in* the market. Firms compete to become dominant in the provision of a specific product/service. During this phase they engage in aggressive marketing and pricing policies, since to be successful a firm must reach a critical mass of customers: this is the minimum number of buyers, necessary to give buyers themselves a positive utility – net of price. The outcome of the competitive game is heavily conditioned by self-fulfilling expectations: if consumers believe that a supplier is going to succeed in attracting a critical mass of customers, all of them are induced to buy from that supplier, so he becomes indeed the winner of the game.

Once a player has been successful in driving competitors out of business, he gains a rent enabling him to recover the initial investment. The incumbent in a network industry enjoys a very strong position, thanks to an installed base of customers: everybody knows that his network size has reached the critical mass threshold. To the contrary, an entrant has to convince potential customers that his network will eventually reach the critical mass size, possibly by inducing some customers of the incumbent to switch. Thus, expectations and switching costs may act as a barrier to entry, protecting the incumbent's rent and preventing a more efficient entrant to successfully challenge his dominant position. The inertia of the equilibrium points to the “first-mover effect”: the first supplier able to reach a critical mass of customers gains a strategic advantage over competitors, as he is able to condition buyers' expectations in a favorable way.¹⁰

Similar results have been found in the theory of financial exchanges and of markets in general.¹¹ Traders concentrate in a single trading venue to enhance liquidity; equilibria where more than one market exist are possible but very fragile, as a slight change in expectations makes traders shift and all go to the market with higher liquidity. In the provision of trading services the incumbent's

⁹ *Overviews of the literature on network industries are provided by Shy (2001), Shapiro – Varian (1999), Katz – Shapiro (1994).*

¹⁰ *Exclusionary pricing strategies possibly exploited by incumbents in network industries are analyzed by Farrell – Saloner (1986) and Fudenberg – Tirole (2000). Penetrating pricing strategies employed by entrants are addressed by Rohlfs (1974) and Katz – Shapiro (1986).*

¹¹ *See Pagano (1989) and Economides – Siow (1988).*

advantage comes from the fact that a new market, with lower liquidity, might not be able to attract enough trades, so entry becomes a failure¹².

Economies of scale are present in the exchange industry not only on the demand side (network externalities), but also on the supply side: with high fixed costs and low marginal costs, the unit cost of a transaction is sharply decreasing in the volume of business¹³. This effect strengthens the competitive advantage of an incumbent: a new entrant typically starts from a lower size, so from a larger unit cost – unless he is able to exploit a superior technology.

In equilibrium, the number of active firms in a network industry may however be one (monopoly) or a few ones (oligopoly), depending on the nature of the network good. In particular, Katz – Shapiro (1985) show that, in a Cournot oligopoly with network externalities, the number of firms is decreasing in the relative importance of the network effect: the stronger the impact of the network externality on consumers' utility, compared with other benefits from consuming a product, the lower the equilibrium number of firms; a very strong network effect may lead the market to converge towards a monopolistic equilibrium. If for example the utility of having only one CSD in Europe, offering basic services, is lower than the utility provided by a number of domestic CSDs, offering more sophisticated services, an oligopolistic equilibrium could be more efficient.

In the stock exchange industry, another factor explaining why an oligopolistic – rather than monopolistic – outcome might prevail relies in the difficulties of achieving an agreement during the merger phase. The consolidation of post-trading institutions implies that one over several headquarters, managements and platforms must be selected for operation, while the owners of the other headquarters, managements and platforms have to be compensated (with side payments and/or an ownership stake in the consolidated structure) for giving up some profitable business. The bargaining process is complex and it might not reach a successful outcome, in particular when informational asymmetries among players are present¹⁴. The infinite discussions between the managements of European post trading utilities is a proof of the importance of this aspect.

A further factor, perhaps even more important than the previous ones in explaining why a monopoly equilibrium could be so difficult to reach in the post-trading industry, relies in the special links that exist between trading and post-trading. Suppose, for example, that the trading market is characterized by an oligopolistic structure; then, given the need of every single market to differentiate and its exclusive relation with the post-trading structure, it is probably quite difficult to reach a monopolistic equilibrium in the clearing and settlement structures, even if optimal, without a public authority intervention. Vice versa if the exchange market is characterized by a monopolistic structure, then it is quite obvious that the post-trading sector will be characterized by a monopolistic organization as well¹⁵.

¹² UK Competition Commission (2005 – Appendix H) reports seven cases of failed entry into the European stock exchange sector during the last decade.

¹³ Economies of scale in the production of clearing and settlement services are documented in several studies, surveyed by Schmiedel and Schonenberg (2005).

¹⁴ Koepl – Monnet (2005) show that an efficient horizontal consolidation of trading and post-trading structures may be prevented by asymmetric information about the cost of settlement: each participant has an incentive to overstate his cost, in order to get a larger share of the surplus created by the agreement.

¹⁵ Obviously also the post-trading structure could influence the trading structures, for example by allowing the entry of new players and so increasing the level of competition between exchanges. For some comments on these aspects, see section 4.

2.3 Incentives to compatibility

When the extreme outcome of complete horizontal consolidation is not achieved in a network industry, the issue of *compatibility* among a few available networks arises. Again, consumers benefit from compatibility, as it enlarges the size of the network. Think, for example, of two competing wireless phone service providers: compatibility enables the customers of one provider to place calls with the customers of the other provider. However, the private incentives of producers to reach compatibility are typically lower than the social benefit. Such incentives depend on: (i) the ability of suppliers to collectively retain (some of) the surplus generated by compatibility, avoiding that consumers eat all the pie; (ii) whether they reach an agreement about how the collective gain (if any) should be split among themselves, determining individual gains. As for point (i), it is crucial that the enhanced competition, due to higher substitutability, does not completely trades-off the increased willingness to pay of buyers. As for point (ii), conflicts among producers of different dimensions might block the way towards an agreement¹⁶.

This kind of problem is indeed present in the post-trading sector. CHs and CSDs typically enjoy monopoly rents at domestic levels. A compatibility agreement could undermine such rents, without giving each participant assurance that it will get a large enough share of the efficiency gains generated by the new regime. Evidence of these difficulties comes from the experience of links among CSDs. Although many links have been created – connecting most CSDs – their use is actually discouraged by CSDs themselves, through the application of high usage fees. Such behavior, in turn, is explained by the fear of each CSD – say the domestic CSD in country A – that its business is “steered” by another (foreign) CSD, able to internalize the registry/settlement of securities issued in country A¹⁷. This is a clear example of a general principle: the owner of a proprietary network lacks the incentive to give open access to competitors, even at reciprocity conditions, fearing to lose a consolidated position.

The seventeen barriers identified by the Giovannini Group (2001, 2003), and the difficulties found so far in removing them, are another proof of the difficulties in reaching compatibility between the European post-trading infrastructures.

¹⁶ See, for example, Katz – Shapiro (1985), Economides (1996), DePalma – Leruth (1996).

¹⁷ See Kauko (2005) for an analysis of competition among CSDs. Milne (2005) shows that CSDs have weak incentives to introduce common standards so to open the way towards interoperability.

3. The current equilibrium in US and European exchange industry

Still recently, market tipping in the European stock exchange industry has almost only taken place at the national level. In each country one stock exchange enjoys a strong dominant position, with alternative trading systems having marginal market shares; in some countries the industry consolidation has taken place through the merger among regional exchanges and among cash and derivatives markets (e.g. in Germany, Spain, Portugal, and Greece)¹⁸. At the national level the same monopolistic structure is present in the post-trading sector, both in the clearing and in the registry/settlement businesses (see Table 1 in Appendix 2). Historically the creation of national CSDs in the European countries has seen the involvement of public authorities: for example the central bank in UK and Italy, and the Government in Germany and France.¹⁹

However what used to be a sequence of national monopolies at national level is slowly becoming an oligopoly at European level, as far as the introduction of the Euro is prompting the process of financial integration. So the process of horizontal consolidation at the cross-country level has recently started, but it is still limited to some countries: see Euronext (with its post-trading structures Euroclear and LCH-Clearnet) and the OMX Group. All the attempts to build a true Pan-European stock exchange has for the time being failed, while transatlantic mergers seem to come out (see the cases of the NASDAQ with the LSE and of the NYSE with Euronext). From one side these could be interpreted as the consequence of the process of globalization of the world financial markets, from the other side as a defensive move of the local management.

To the contrary, the consolidation of post-trading structures has been completed in the USA by the end of 90'; however, the merging process has been lengthy and strongly supported by the authorities.

Figures 2 and 3 give an illustration of the current situations in Europe and USA respectively: the European industry structure is still mainly designed upon national boundaries, with monopolistic exchanges (T stands for trading platform) relying on domestic post-trading infrastructures (PT), in some cases with a vertical silo and in some others with vertical links; some limited groups of countries share the same stock exchanges (like countries 1,2,3 in the picture). In USA the two dominant securities exchanges share a common post-trading facility (the DTCC)²⁰.

¹⁸ See Schmiedel and Schonenberg (2005).

¹⁹ Moreover in these two countries CSDs were set up in a non liberal period: in 1937 during the Nazi dictatorship in Germany, and in 1941 during the German occupation in France (see Appendix 2).

²⁰ To be more precise in US we have four CSDs, notwithstanding the role played by the Federal Reserve for the government bonds. However the DTC holds 99% of all stocks and non-federal bonds. More details about the US and European experiences are provided in Appendix 1 and 2 respectively.

Fig. 2 – Europe

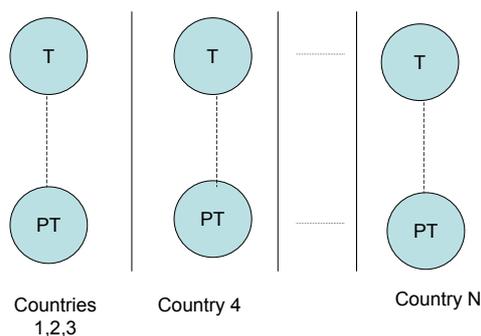
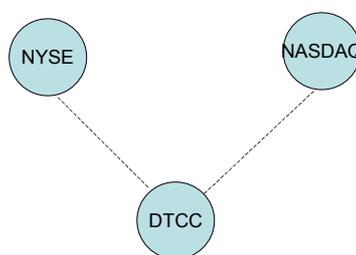


Fig. 3 – USA



As seen before, there are several factors explaining the difficulty in achieving a full horizontal consolidation in the stock exchange industry – and in the post-trading sector in particular. We already mentioned (in the preceding section) a couple of reasons. First, the natural outcome of the competitive process in a network industry might be an oligopolistic market structure, rather than a monopoly. This implies that the network externality generated at the global level might not be so strong, relative to the network effect present at the local level – i.e. in each market. So the gain from a European post-trading structure might be relevant, but not so much as to prevail over national networks. A second explanation comes from the complexity of the bargaining process among the participants in a merger process. Reaching an agreement is even more difficult due to vertical integration: the existing links between trading and post-trading infrastructures make necessary to agree on the allocation of the whole range of business among participants.

Moreover, the registry/settlement function points directly to a feature that securities markets share with other network industries: they are “two-sided markets”²¹. Indeed, the industry structure emerges from the interaction between two categories of users: issuers and investors; an infrastructure has to attract both categories to do its business. The persistent fragmentation of this sector in Europe may be in part due to the fact that in each country issuers typically rely on

²¹ This term has been introduced by Rochet – Tirole (2003), and it refers to many network industries, like payment cards (where card-holders and merchants are the two sides), videogames (gamers and software developers), media (readers/viewers and advertisers).

their domestic CSD (often for legal reasons); thus, one side of the market is still framed upon the national boundaries, preventing the emergence of a single European infrastructure.

Certainly the path and the speed of consolidation of the European post-trading structures will depend crucially on the path and the speed of the consolidation of the trading industry. For example if the major European stock exchanges merge together, then it is quite likely that the process of consolidation among the post-trading structures will follow quickly. In the meantime the existence of a large number of CSDs may be a relevant obstacle to competition among European exchanges.

Nevertheless if we use the US case as benchmark it is not difficult to predict that in absence of a strong political intervention the consolidation process of the European post-trading sector will take a long time and probably will never be completed. This is even more true if we remember that US is a single country, with a common regulatory framework, a single securities regulator, and a dominant market centre (New York).

Finally, let us briefly consider the current wave of merger activity in the stock exchange sector. Two different – although not necessarily mutually exclusive – forces are at work: one is the concentration process within Europe and the other is the chance of cross-border deals between USA and Europe. The analysis of this paper provides elements to understand the consequences of these trends: the integration among European stock exchanges would open the way towards a common infrastructure for post-trading services, namely a single CCP and a single CSD, allowing greater efficiency and lower transaction costs in European financial markets. To the contrary, a USA-Europe merger could generate very limited synergies at the post-trading level.

4. Policy implications

The above analysis shows that the post-trading industry has much to gain from horizontal consolidation: this increases the efficiency of clearing and settlement services, due to economies of scale on the demand side (network externalities) and on the supply side (cost reductions). The present situation in Europe is not fully efficient, as national monopolies are still prevalent – with a few and limited exceptions of real cross-border integration. A further consolidation of the industry in Europe could be beneficial and able to reduce the existing barriers and cost of cross-border transactions, which still remains quite high – relative to domestic trades and to the US. Market forces alone are not likely to bring about such a full interoperability of the systems or a consolidation process in a reasonable time horizon, as both the US and the European experiences show. Therefore, an intervention of public authorities is needed, to lead the convergence process towards a single European CCP and CSD²².

Under this regard, the ECB has recently announced the possibility of offering a new service, aiming at providing a single platform for the settlement of securities trades in the euro-area²³. This service, called TARGET 2 Securities (T2S), will be offered to CSDs. More precisely, only the settlement function is supposed to be provided by T2S, whereas other CSD functions (such as safekeeping, custody, administration, corporate actions) will remain with the CSDs. The initiative has certainly the merit of pushing the industry towards a desirable outcome, stimulating private initiatives and providing a public common infrastructure to European stock exchanges. However the plan will take a long time to produce effective results and at the beginning will be limited to real time settlement. Moreover it is not clear if the CSDs, that in the meantime have invested in their own platforms, will use extensively the ECB's system.

The position taken by the European Commission is much softer, as far as the market structure of post-trading is concerned²⁴. The focus of the Commission has been placed on price transparency²⁵ and unbundling, supported by the separate accounting of different activities (trading, clearing, settlement). These targets are however left to the market forces / self regulation, since they should be implemented through a code of conduct. On top of this the Market in Financial Instruments Directive requires that all regulated markets offer their

²² *Giddy – Saunders – Walter (1996) support the view that the consolidation of the European post-trading providers into one "Eurohub" would be beneficial, although they acknowledge the difficulties in achieving this outcome through a market-driven process. More recently Taping – Yang (2004) call for an integration among European CSDs, in order to reduce the cost of cross-border settlements.*

²³ *See the press release of 7 July 2006 and Goddefroy (2006). One of the reasons motivating the ECB in this direction was the difficulties to conciliate the different models in place in the European countries, relative to the use of central bank money for the settling of securities. In particular the problem emerges in those countries, notably France, where the National Central Bank outsources all the processing activities to the Securities Settlement System, which operates directly on the behalf of the central bank. See ECB (2004). (This point has been made by Mr. Tresoldi).*

²⁴ *See the speech by Commissioner McCreevy at the European Parliament, 11 July 2006.*

²⁵ *More precisely by the end of 2006 a number of measures should be in place. Between them: 1) the price of each service must be public; 2) the content of each service must be specified and made public; 3) there must be a full disclosure of discount schemes and rebate schemes.*

members the right to choose its preferred provider of post-trading services²⁶. These provisions have the purpose of creating a competitive environment among suppliers, increasing the efficiency and reducing the cost of post-trading services. However, as we have seen before, in this area the market forces do not seem sufficient to guarantee a real competition and to reach an efficient equilibrium, given the presence of high switching costs, high cost of entry for potential competitors, vertical links between trading and post-trading structures. Therefore a regulatory intervention is needed which goes beyond antitrust policy; this is even more true if a fully consolidated market structure is to be achieved.

The attention given by the Commission to vertical restraints seems to be insufficient. On one side the accounting separation is the weakest form of regulation: organizational, corporate or even ownership separation would be more effective, also considering that accounting separation is actually already in place in all the European institutions. On the other side exchanges can obtain the same result as vertical integration through agreements and links.

The issue of vertical silos deserves more careful attention. Vertical integration is a powerful tool for limiting the scope of competition. An exchange with a relevant ownership stake in its own post-trading infrastructure might force the post-trading provider to apply a higher price to competing exchanges, or even to foreclose competitors from the access to the post-trading platform: this behavior would limit competition in the provision of trading services. Moreover, by offering a bundle of services an exchange organized as a vertical silo might exclude potential entrants from the post-trading business. Therefore, the regulator should monitor the pricing and the access rules to the post-trading infrastructures, in order to avoid discriminatory practices; in addition the bundling of services provided by a vertical silo should be avoided, for its exclusionary potential. Antitrust concerns might even induce the authorities to impose the break-up of a vertical structure²⁷.

It is true that vertical integration may allow some efficiency gains: for example straight-through-processing (STP), enabling intermediaries to reduce the cost of back-office. However this should possibly be implemented through technical arrangements, without implying vertical restraints. It is also true that the merger of two producers, positioned along the vertical chain, might avoid an inefficient double marginalization²⁸; however this argument applies to the case of two monopolist firms, while it is less relevant in our context where some competition should be preserved – at least at the trading level.

²⁶ *In order to give market participants the effective option to choose the CCP and the CSD, some basic conditions need to be met: 1) trading platforms must have an obligation to enter into contractual arrangements with CCPs and CSDs; 2) CCPs must have the obligation to enter into contractual arrangements with CSDs; 3) CCPs and CSDs must have the option of access on a fair, transparent and non discriminatory basis.*

²⁷ *This is the view taken in the Report of the UK Competition Commission (2005), relative to the proposed mergers between LSE and either Euronext or the Deutsche Borse. The authorization has been subordinated to the implementation of (structural and behavioral) remedies, aimed at removing the vertical control of Euronext and DB over their post-trading infrastructures: such vertical control has been judged able to jeopardize competition in the trading sector – through foreclosure.*

²⁸ *Intuitively, when the two of them are separate entities, each one sets his own price by applying a mark-up: in particular, the upstream firm applies a mark-up to his own production cost; the downstream firm in turn takes this price as a given input cost and applies his mark-up; as a result, the final price is higher than the optimal monopolistic price, with a welfare loss for both producers and consumers. This inefficiency is eliminated by merging the two firms, so that a single mark-up is applied. For a technical exposition of this point, see for example Motta (2005) and Shy (1995); the latter shows how the same argument applies to the provision of complementary goods.*

A particular kind of vertical integration takes place when CSDs expand their business into banking services (e.g. securities and cash lending, corporate actions), or when large custodian banks provide settlement services through the internalization of orders on their own books (they still have to rely on CSDs, which retain the registry function). As a consequence, the institution entitled with the registry function is at the same time a (monopolist) service provider and a competitor for custodian banks. Under this regard, the competitive advantage of a CSD over custodian banks parallels the one enjoyed by the owner (say Company T) of a telephone wire network, competing in the provision of retail telephone services with other companies, which have to channel their calls through the wires owned by Company T itself. The special nature of CSDs creates an incentive for them to implement pricing schemes aimed at penalizing custodian banks²⁹. Public intervention in this area should at least monitor the pricing policy followed by CSDs. A stronger form of intervention would require the separation between core business (registry/settlement) and banking services, which may be graduated from accounting to organizational, corporate and ownership separation.

²⁹ *Holthausen – Tapking (2004) and Rochet (2005) discuss the case for a regulatory intervention in this area.*

Appendix 1 - A brief history of US clearing and settlement institutions³⁰

In this appendix we will look at the foundation process of US clearing and settlement institutions, that generally are considered particularly cheap and efficient. The history of these institutions seems remarkably interesting for several reasons. First of all, because it shows that CSDs and CCPs were established in response to a severe systematic crisis (the so call “paperwork crisis”). Second, because originally every exchange had developed its clearing and settlement infrastructures; in other words, every single exchange had created its vertical silo. The process of consolidation was initiated as a matter of public policy by the Congress, which directed the SEC to facilitate the establishment of a unified national system for post-trading. Only in a second time, under the pressure of market intermediaries and of regulatory authorities, the horizontal consolidation of the different CSDs and CCPs took place. The SEC took a strong view: it was less concerned about competition among infrastructure providers than ensuring that there was an efficient, robust national infrastructure. Nevertheless the process of consolidation took a couple of decades, even in a single country environment like the US, with a common regulatory framework, a single securities regulator, and one dominant market centre like New York. Patience seems a pre-requisite for building a financial market infrastructure! Involved institutions had always put in place a strong opposition to this consolidation process, even at that time in which none of them were for profit organization. But let start from the beginning.

A1.1 The paperwork crisis and the foundation of vertical silos

In the late 1960s brokers still exchanged physical certificates and checks for each trade, while hundreds of messengers scurried through Wall Street clutching bags of checks and securities. A sharp increase in trading led to a growing number of trades to fail. The paperwork crisis was so severe that, in order to help reduce the backlog, the exchanges closed every Wednesday and shortened trading hours on the other days.

In 1961 the NYSE, together with several major custodian banks, had already successfully run a one-year “Pilot Operation for Central Handling of Securities”. Beginning with 15 securities and 31 firms, deliveries were made between members via book-entry and without the physical movement of certificates. In 1968, the Central Certificate Service (CCS) was established by the NYSE to immobilize share certificates, and the foundation of a national depository system had begun.

By the beginning of 1970, numerous studies of the problems of the US securities industry were under way. A common conclusion was that long-term solutions would require market-led efforts, and an inter-industry organization, the Banking and Securities Industry Committee (BASIC) was formed. The paperwork crisis brought the whole securities industry together, out of self-interest, to find a common solution to achieve efficiency. BASIC's work led to the creation of The Depository Trust Company (DTC), a limited-purpose trust company that would immobilize securities for broker-dealers and banks, complete the book-entry delivery of those securities, and handle the myriad operational tasks required to provide centralized, automated processing. In 1973 DTC assumed the operations

³⁰ Information contained in this appendix has been obtained from DTC (1998), DTCC (2000, 2003, 2004), SIA (2005), City Research Series (2005), Tapking, J. Yang (2004) AFEI/Assosim/FBF/LIBA/SSDA (2005, 2006)

of CCS and focused on custodial services for banks, brokers and other institutions.

Meanwhile a second approach to solving the paperwork crisis was taken, the so-called multilateral netting, through the creation of a Central Counter Party (CCP). At first, the NYSE, American Stock Exchange and NASD all had their own clearing corporations to settle trades that took place in their markets. In 1976 they were merged into a new organization: National Securities Clearing Corporation (NSCC). Other regional stock exchanges, such as those in Boston, Philadelphia, Chicago, etc. each owned its respective clearing and settlement vehicles. In 1975 there were still seven vertical silos.

A1.2. The regulatory framework

In the first few years the CCS and the DTC started to work despite the legal uncertainty. It was only in 1975 that the Securities Acts Amendments – aimed to promote a unified national market in trading, clearing and settlement – was passed. Congress' policy was not to mandate a fixed market structure, but to direct the SEC to facilitate the establishment of the unified national system through five flexible objectives: efficiency, competition, price transparency, best execution and order interaction. The SEC, however, was less concerned about competition among infrastructure providers than ensuring that there was an efficient, robust national infrastructure. CCPs and CSDs were required to apply for SEC registration as clearing agencies; this was the first time that these entities were regulated. Moreover regulated free interfaces between regional infrastructures were to form the heart of the national market system.

It is worth noting that the SEC was able to promote a national system for clearing and settlement, while leaving open the possibility for any organization wishing to compete. Any trading space wishing to clear and settle without going directly to the national infrastructures is free to do so as long as it meets the standards set by the SEC. In addition, any organization can apply for approval and registration as a clearing agency (although in the cash equities markets no new entrant since the late 1970s has so far chosen to do so, and the existing entities have been consolidated and integrated).

Although competition forces were allowed to shape market structure, a single regulator exercised its regulatory authority to act when necessary to address problems or practices that could stand in the way of achieving the objectives that Congress had set for the national market system. Where competition might not be sufficient, the SEC was empowered to act promptly and effectively to ensure that the rules and essential mechanisms were put in place as rapidly as possible. The SEC was also in a position to prompt, encourage and facilitate the securities industry to create solutions that furthered the unified national market objectives. Because the SEC's mandate from Congress spanned all three securities market functions of trading, clearing and settlement, it could take action in a holistic manner that fulfilled the national market objectives.

The common regulatory framework put in place since 1975 facilitated the consolidation which gradually happened over the next twenty years.

A1.3 The horizontal consolidation

During the 1976, about a year after the SEC released a report on the cost savings that CCP consolidation would bring to the market, the NSCC was formed through the merger of the individual CCPs of the NYSE, the American Stock Exchange and NASD. Also in the same year, all CSDs affiliated with the individual stock

exchanges were interlinked to form a national system. This was accomplished by CSDs opening accounts with each other. Market participants could then trade the stock of a company on any exchange and hold their shares in their home CSD. The regional stock exchanges' vertically-integrated CCPs and CSDs were gradually absorbed into NSCC and DTC respectively: a twenty-year process that began in 1976 and ended with the last integration taking place in 1997.

Opposition to consolidation, also out of self-interest, came from the infrastructures. At that time the regional stock exchanges that owned the CCPs and CSDs were typically not-for-profit market utilities owned by users. Nonetheless in most cases the CCPs accounted for a significant component of the revenue of their affiliated exchange, and both the exchanges and the CCPs opposed any integration unless theirs was the single remaining institution. When the NYSE, American Stock Exchange and NASD finally agreed to merge their CCPs to form NSCC in 1976, the affiliated exchanges received a per-trade fee for several years to compensate them for revenues lost after the merger.

The ownership and governance of NSCC and DTC were from the outset those typical of market utilities. DTC had a trust company charter under New York State banking law and Federal Reserve membership; it did not combine infrastructure CSD and commercial banking services.

By the mid-1980s the divestment of the CCPs and the CSDs from the remaining vertical silos and their consolidation into NSCC and DTC went under way. NSCC and DTC subsequently became subsidiaries of DTCC in 1999; this further integration resulted in a holding company with two separate operating subsidiaries. The integration of NSCC and DTC was driven by market necessity. While the complementary functions of these two institutions resulted in many collaborative efforts over the two decades of their separate existence, by the late 1990's deregulation and evolutionary changes in the US financial industry meant that, as both companies extended their services beyond their core functions, they were beginning to overlap and in danger of creating unnecessary conflicts, complexity and costs for their industry constituents.

Appendix 2 – A brief history of the european post trading structures

In some European countries, like Germany and France, the origins of CSDs are much older than in the US. More precisely they were set up in a non liberal period (in 1937 during the Nazi dictatorship in Germany and in 1941 during the German occupation in France). In fact the creation of a CSD was not only seen as a way to increase efficiency and to reduce the cost of handling securities exchanges but also as a mean of controlling the ownership of firms. Only by the end of the second world war they were transformed into a system exclusively at the service of market forces. So they were transformed into a mutualistic structure. By the mid-seventies the major European countries established one or more CSDs, with the aim of facilitating securities holding and transfers. In most cases the exchange markets and public authorities – in particular the National Central Banks – played a very substantial role during the building period. The only exceptions were the ICSD, that were build up exclusively for handling the Eurobond Market. Over the past ten years, there has been a significant reduction in the number of post trading systems in Europe. But this has happened at national, not European level: systems have been merged within individual countries, to the point where in most European countries there is now just one CSD for all securities and one clearing house (see Table 1).

In terms of ownership, two contrasting trends have recently emerged. In some countries ownership of clearing and settlement has moved out of the control of exchanges (for example in UK, where CREST, a user-owned organisation, replaced the Talisman system previously operated by the London Stock Exchange; in Finland and Sweden where the OMX sold their domestic CSDs to form the Nordic CSD). In other countries, exchanges have taken control of clearing and/or settlement organizations to create “vertical” structures: examples are Italy, Spain and Germany (see Table 2).

In **Germany**, on the basis of the provisions of the Securities Deposit Act, in 1937 the 'Reichsminister' created the German securities clearing and deposit banks ('Kassenvereine'). In 1942 they were all merged into Deutsche Reichsbank, turning it into the only securities clearing and deposit bank. It was not a coincidence that these events happened in a non liberal period, i.e. when the Nazi were in power and the second world war was in place. In fact at this time the creation of a CSD was not only seen as a way to increase efficiency but also a mean of controlling the ownership of firms.

After the end of World War II, in a much more liberal and market friendly atmosphere, it was not the regional Bundesbank offices (Landeszentralbanken) that took on the function of a securities clearing and deposit bank, but the 'Kassenvereine' that had been newly founded by the banking sector with the legal structure of a public limited company (these included: Bayerischer Kassenverein AG, Munich; Berliner Kassenverein AG, Berlin; Frankfurter Kassenverein AG, Frankfurt am Main; Niedersächsischer Kassenverein AG, Hannover; Norddeutscher Kassenverein AG, Hamburg; Wertpapiersammelbank Baden-Württemberg AG, Stuttgart; Wertpapiersammelbank Nordrhein-Westfalen AG, Düsseldorf). The 'Kassenvereine' were owned by the shareholders of the major local custodian banks. Under the aegis of Frankfurter Kassenverein, all seven 'Kassenvereine' were merged into Deutscher Kassenverein (DKV) in 1989. At his time the shareholder structure reflected the ownership structure of the former seven 'Kassenvereine'. However in 1992 the Deutsche Börse bought the DKV and became its sole shareholder .

Meanwhile, prompted by German financial institutions whose main operations concentrated on international securities business, Deutsche Auslandskassenverein AG (AKV) was founded in 1970, in order to remove the difficulties such institutions faced regarding the settlement of securities transactions. AKV at that time was owned for the most part by the same shareholders as DKV (i.e. large and private banks, brokers). In 1996, AKV merged with DKV, turning Deutsche Börse AG into the sole shareholder of DKV/AKV, which in October 1997 was renamed Deutsche Börse Clearing AG as a distinctive indication of the new structure.

In January 2000 Deutsche Börse Clearing joined forces with CEDEL International, now trading under the name of Clearstream Banking AG. Clearstream Banking AG, Frankfurt (CSD) and Clearstream Banking S.A., Luxembourg (ICSD) are subsidiaries of Clearstream International, one half of which is owned by shareholders of former CEDEL and the other half by Deutsche Börse AG. However, since July 2002 Clearstream International is a wholly-owned subsidiary of Deutsche Börse AG.

In **France** the CCDVT (Caisse Centrale de Dépôts e de Virements de Titres) was created by the Vichy government in 1941, during the period of German occupation³¹. The banks and all the other financial intermediaries had to deposit all the securities they held on CCDVT's accounts. Just few months before a new law imposed that all securities issued or exchanged in France should be nominative or deposited in a securities account opened by a financial institution. Clearly public opinion – which at that time had no voice – did not like these measures, that were seen as an expropriation and a way to give the fiscal authorities an important tool to control private wealth. Moreover in a non liberal environment they allowed the government to have a better control of the ownership of French industries. However these measures also facilitated the exchanges of securities and reduced the cost of dividend payments and of all the other corporate actions. The big fall in the value of stocks, following the 1929 crises, had often made the costs of custody and coupons payments higher than the revenues they provided.

In 1949, after the war, the public opinion saw the CCDVT and all the related measures as the product of the Nazi occupation. So the new government created the SICOVAN (Société Interprofessionnelle pour la Composition de Valeurs Mobilières) that incorporated the old CCDVT, and abolished the obligation to deposit securities at a financial institution. However the new entity was able to keep the efficiencies created the CCDVT. The SICOVAN started to provide all CSD services, together with ancillary services (such as the identification of owners of bearer shares, or the distribution of dividends or interest on behalf of issuers). The SICOVAN was characterized by the refusal to carry out banking activities. New regulations implemented in 1999 provide that the CSD shall be licensed by the CMF, which ensures that all envisaged activities are compatible with the functions of a CSD. Sicovam SA, denominated Euroclear France since its takeover by Euroclear Bank, has been licensed as a CSD in 2000 and it does not provide services other than settlement and CSD services.

The **UK** had an account system, called Talisman and managed by the LSE, which acted as a central clearing house for all the equities transactions. By the end of the eighties this computerized system, handled at the LSE, should have been replaced by a new system called Taurus, which would have abandoned the monthly settlement cycle and the share certificates. After three separate starting dates for the new system were announced and cancelled, the project was

³¹ Chabrolles and Juvin pour Médiace (1992).

cancelled by the LSE in the 1993. At that time the Bank of England, at the request of the LSE, establishes a Task Force to improve the UK equity settlement. The Task Force recommended the introduction of rolling settlement and a new settlement service to be called CREST. The CRESTCo Limited, owned by 70 shareholders representing all sectors of the equity market, was responsible for the finance and management of the CREST development, and it owned and operated the CREST system. However the Bank of England held the only voting shares until the inauguration of CREST in July 1996. In 1999 CRESTCo took control of the Central Gilts Office (CGO) from the Bank of England, and in 2000 of Central Money Markets Offices (CMO). In 2001 the London Stock Exchange, CRESTCo and London Clearing House (LCH) introduced a central counterparty service for the Exchange's electronic order book. Meanwhile shareholder rebalancing resulted in an increase to 96 shareholders, including all major international securities firms, as well as stock exchanges, banks, registrars and local brokers in Ireland and the UK.

CRESTCo does not hold securities, unlike other CSDs. It is more appropriately considered as a securities settlement system (SSS), and pursuant to the new Uncertificated Securities regulations (2001) as an operator of a settlement system. In this respect, CRESTCo does not hold paper certificates on a centralized basis, but accepts the deposit of certificates for those securities capable of being held in uncertificated form.

In 2002 CRESTCo and Euroclear decided to merge in order to create the Europe's premier securities settlement system for both equity and fixed income transactions. In 1994 the Euroclear group completes its corporate restructuring, designed to maximise client protection against systemic risk and improve transparency in inter-company service delivery and cost allocations. CRESTCo, Euroclear Bank, Euroclear France and Euroclear Nederland are now sister subsidiaries of each other, all under the ownership of Euroclear SA/NV. CRESTCo remains responsible for providing settlement and related services to its clients.

In **Italy** Monte Titoli was established in 1978 as a trust company on the initiative of Bank of Italy, the Italian Stockbrokers' Association and the Interbank Convention for Automation Problems. Operations effectively began in 1981 with centralization of the first share issues, but only in 1986 the Italian Parliament approved the Law no. 289 laying down the basis for the widespread use of Monte Titoli system. Operations expanded significantly in 1991, following the introduction of the centralization requirement for securities listed on Italian regulated markets: all transactions settled through *Liquidazione dei Titoli* (the multilateral net clearing procedure managed by Bank of Italy) must be concluded exclusively through the accounting transfer securities settlement system at Monte Titoli. However the centralized custody and administration of Italian government bonds remained until 2000 in the hands of Bank of Italy. In the same year Bank of Italy and CONSOB authorized Monte Titoli to exclusively manage clearing and settlement services on a net and gross basis, and Monte Titoli introduced Express, the real-time gross settlement system; later on Monte Titoli starts up Express II, the clearing platform that integrates in a single environment the clearing processes on net and gross basis. Meanwhile, in 2002, Monte Titoli joined Gruppo Borsa Italiana which included the clearing house, Cassa di Compensazione e Garanzia.

Euroclear was founded in 1968 in Brussels by Morgan Guaranty Trust to handle the growing market of Eurobonds, that were issued mainly by European companies (this was the consequence of the Interest Equalization Tax introduced in the US in 1963). From its creation to the end of 2000, the Euroclear System was operated by the Morgan Guaranty Trust Company of New York, via the

Belgian branch of that establishment, which had a branch of activities (“Euroclear Operations Centre”) specially dedicated to the operation of the Euroclear System. Morgan Guaranty Trust transferred this branch of activities to Euroclear Bank, a new Belgian credit institution that was set up in 2000 to operate the Euroclear System.

Euroclear has a non-exclusive partnership with Euronext (resulting from the merger of the stock exchanges of Paris, Amsterdam, and Brussels), which enabled Euroclear in 2001 to acquire 100% of the capital of Sicovam, the French CSD, and in 2002 100% of the capital of Necigef, the Dutch CSD. On this occasion, Euroclear also took a 20% stake in the capital of Clearnet, the French credit institution responsible for the clearing of Euronext transactions, and in 2004 Euroclear acquired most of the settlement and custody business of CIK, the Belgian CSD. Since December 2000, Euroclear has also assumed responsibility for the settlement of Irish government bonds (Gilts), following the decision of the Irish government and the Central Bank of Ireland to delegate this activity to Euroclear. In September 2002, Euroclear Bank acquired 100% of the capital of CRESTCo, the British CSD which settles UK, Irish, and international securities. Since January 2005, Euroclear **S.A./N.V.** is the holding company owning the national CSDs of France, Netherlands, Belgium and the United Kingdom, and the ICSD Euroclear Bank. Euroclear S.A./N.V. itself is owned by Euroclear plc, a company organized under the laws of England and Wales. The shareholders of Euroclear plc are former shareholders of some of the merged companies, including Euronext, and users of Euroclear services.

Cedel International (Centrale de livraison de valeurs mobilières) was founded in Luxemburg in 1970 by 77 banks of 11 countries³². Their purpose was to compete with Euroclear, that was built up a couple of years before in Brussels. At this time most Eurobonds were quoted in the Luxemburg stock exchange and people there were afraid that this market could move to Belgium. In 2000 **Clearstream** group was formed through the merger of Cedel International (the Luxemburg-based ICSD) and Clearstream Banking Frankfurt (the German CSD). Deutsche Börse initially held a 50% stake in Clearstream International, but acquired Cedel’s 50% stake in 2002. Clearstream International also holds the Luxemburg CSD, LuxClear, which holds the register of Luxemburg securities and provides settlement services for Luxemburg securities trades executed on the Luxemburg stock exchange.

³² *Israel (1994)*

Tab. 1 – One country, one market, one CSD

Country	Stock Exchange	CSD
Austria	Vienna Stock Exchange	OeKB
Belgium	Euronext Brussels	Euroclear group
Cyprus	Cyprus Stock Exchange	CSE
Czech Republic	Prague Stock Exchange RM-System	Unyvic RM System
Denmark	Copenhagen Stock Exchange	VP A/S
Estonia	Tallinn Stock Exchange OMX	ECSD
Finland	Helsinki Stock Exchange OMX	APK, part of NCSD
France	Euronext Paris	Euroclear France
Germany	Frankfurt Stock Exchange DEUTSCHE BORSE Berlin-Bremen Stock Exchange Düsseldorf Stock Exchange Hamburg Hanseatic Stock Exchange Lower Saxony Stock Exchange Bavarian Stock Exchange Baden-Württemberg Stock Exchange	Clearstream Banking Frankfurt
Greece	Athens Exchange	Central Securities Depository S.A. (CSD)
Hungary	Budapest Stock Exchange	Keler
Ireland	Irish Stock Exchange	Euroclear
Italy	Borsa Italiana	Monte Titoli spa
Latvia	Riga Stock Exchange	LCD
Lithuania	Vilnius Stock Exchange OMX	LCVPD
Luxembourg	Luxembourg Stock Exchange	LuxClear (Clearstream)
Malta	Malta Stock Exchange	MSE
Netherlands	Euronext Amsterdam	Euroclear Nederland
Poland	Warsaw Stock Exchange	KDPW
Portugal	Euronext Lisbon	Interbolsa
Slovakia	Bratislava Stock Exchange	CDCP SR
Slovenia	Ljubljana Stock Exchange	KDD
Spain	Bolsas Y Mercados Españoles	IBERCLEAR
Sweden	Stockholm Stock Exchange OMX	VPC part of NCSD
United Kingdom	LSE	CRESTCo Euroclear

Tab. 2 – Still public entities and exchanges play a crucial role in ownership structure of european union CSDs

Ownership Structure	Number	Member State (CSD)
Exchange owned	14	Cyprus (CDCR), Czech Republic (UNIVYC), Czech Republic (RM-System), Estonia (ECSD), Germany (Clearstream), Greece (CSD), Hungary (KELER),* Italy (Monte Titoli), Latvia (LDC-DENOS), Luxemburg (Clearstream), Malta (CSD), Portugal (Euronext- Interbolsa), Slovakia (BSSE), Spain (Iberclear).
Public owned	7	Belgium (NBB SSS), Czech Republic (SKD), Latvia (VNS), Poland (CRBS-SKARBNET), Slovakia (NBS-CR, SC) Slovenia (FEBSS), Poland (KDPW)**
User owned	10	Austria (OeKB), Belgium (Euroclear), Denmark (VP S/A), France (Euroclear), Ireland (Euroclear), Netherlands (Euroclear) , Slovenia (KDD), Sweden (VPC), Finland (APK)***, United Kingdom (Euroclear-Crest)
Other	1	Lithuania (LCVPD)****

* 50% Owned by the NCB, 25% by the Budapest Stock-Exchange and 25% by the Budapest Commodities Exchange.

** Owned in equal parts by the State Treasury, Warsaw Stock Exchange and Narodowy Bank Polski..

*** Recently sealed to the Swedish CSD (VPC) to form the Nordic CSD??.

**** Owned by Lietuvos bankas (majority shareholder), the Ministry of Finance and the National Stock Exchange of Lithuania and OMX

Source: Russo, Hart, Malaguti, Papathanassiou (2004); Report commissioned from London Economics by DG Competition, Securities Trading, Clearing, Central Counterparties and Settlement in EU 25 – An Overview of Current Arrangements, June 2005. http://europa.eu.int/comm/competition/general_info/securities/report_june_2005_en.pdf

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