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# Efficient Systems for the Securities Transaction Industry - A Framework for the European Union

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# Efficient Systems for the Securities Transaction Industry - A Framework for the European Union *

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**Abstract**

This paper provides a framework for the securities transaction industry in the EU to understand the functions performed, the institutions involved and the parameters concerned that shape market and ownership structure. Of particular interest are microeconomic incentives of the industry players that can be in contradiction to social welfare. We evaluate the three functions and the strategic parameters - the boundary decision, the communication standard employed and the governance implemented - along the lines of three efficiency concepts. By structuring the main factors that influence these concepts and by describing the underlying trade-offs among them, we provide insight into a highly complex industry. Applying our framework, the paper describes and analyzes three consistent systems for the securities transaction industry. We point out that one of the systems, denoted as 'contestable monopolies', demonstrates a superior overall efficiency while it might be the most sensitive in terms of configuration accuracy and thus difficult to achieve and sustain.

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# 1 Introduction

The developments within the securities transaction industry in the EU have become a subject of academic awareness. Of particular interest are the consequences on market structure and firm strategy with the increasing volume in cross-border transactions which is mainly accountable to the shift from a domestic towards a more international approach in the investors' investment activity.

While the current trading, clearing and settlement structure in the EU is highly cost-efficient for domestic securities transactions this does not hold for cross-border activities.[1] Although exact figures are difficult to obtain, former research as well as the pricing tables of international central securities depositories (ICSDs) indicate clearing and settlement costs for these trades being several times higher than for domestic transactions.

We suppose that this is mainly due to the underlying economies in the industry, namely strong network externalities and economies of scale and scope. These effects are more or less fully exploited and observable on the domestic trading level by utilizing a monopolistic, regulated structure for securities transactions. In many European countries one major trading and one major clearing and settlement institution service the lion's share of domestic transactions. In some countries, such as Germany, the whole transaction process, i.e. trading, clearing and settlement is even vertically integrated into one entity, thereby enabling straight-through processing possibilities.

If the perspective is on the European level, we observe several of these institutions.[2] Thus, the typical cross-border trade requires substantial interaction among the pertaining different trading, clearing and settlement systems which can only be effectively dealt with by a large number of intermediaries acting as (sub)custodians in the settlement process. This extends the length of the value chain and thereby increases the costs for the investors. More interaction requirement is also more risky due to the higher complexity of the trade and a higher likelihood of failures. Higher risks usually mean additional collateral requirements which is a further cost driver. In summary, securities transaction costs can be significantly higher in the cross-border context.[3]

As EU officials and big institutional clients express their desire for a fully integrated European financial market in order to reach full mobility of capital, most experts believe that the underlying economies of the market will lead to some form of consolidation in the years to come. Nevertheless, only relative slow progress is made in this respect which is blamed on several barriers in the fields of diverging technical requirements, market practices, taxation practices and legal issues.[4]

Our analysis of the industry focuses on purely economic issues and largely ignores the non-economic barriers for an efficient solution.[5] We present a framework that captures the major factors influencing the securities transaction industry and derive possible sensible industry settings out of it.

One of the first academic contributions in this area is by Giddy, Saunders, and Walter (1996): They analyze four alternative models for the European clearing

[1] Confer Lannoo and Levin (2001, p. 26).

[2] Despite recent consolidation efforts by Euronext, which was originally formed by the merger of three European exchanges, and Euroclear, the major CSD for this exchange, there are still several providers for trading, clearing and settlement existent in Europe.

[3] Lannoo and Levin (2001, p. 14 - 30) and Deutsche Börse Group and Clearstream International (2002, p. 15 - 29) present a cost analysis of cross-border transactions.

[4] The Giovannini Group (2001) identifies fifteen barriers to an integrated market, that are examined further in their follow-up report, Giovannini Group (2003).

[5] However, we are aware that a first-best solution (as it might be possible when building the industry from scratch) is hardly feasible in reality due to the existing history and the associated restructuring costs which in some cases would be higher than the expected future benefits from restructuring.

and settlement market mainly from the perspective of the users of these services. Differences between their models exist in the way that linkages between the CSDs are structured. Our approach is similar to theirs in respect to evaluating trading, clearing and settlement along three dimensions and deriving distinct systems for a future industry setting. Unlike their approach, we take microeconomic incentives of the key industry players in more detail into account and base the analysis of possible systems on sounder foundations regarding these aspects.

**The framework and structure of this paper** In the first part of this paper, we develop a framework to analyze the advantages and disadvantages of certain industry outcomes. We evaluate the efficiency of the securities transaction system along three dimensions - static, dynamic and systemic efficiency - discussed in detail in section 2.

As the first class of components in our framework, we identify three activities along the value chain, namely trading, clearing and settlement (TCS). After giving a brief description, we explain the underlying economies of the activities at each level of the value chain and the interdependencies across the whole chain in section 3.

The activities are performed and used by three different classes of institutions in the industry - the providers of the infrastructure, the users and the regulators - and will be set forth in section 4. Readers familiar with the activities and institutions in the securities transaction industry might want to skip these sections.

In section 5, we regard possible strategies and associated actions to highlight the microeconomic incentives of the institutions. Three different decisions have to be made - where to set the boundaries, whether to adopt an industry-wide standard and how to assign ownership rights in these governance structures. We focus on the action set of the infrastructure providers only, i.e. one class of the institutions, due to conciseness reasons. However, the interdependencies between the three institutions that result in certain decision patterns and the decisions' impact on the users and regulators are highlighted where necessary. Figure 1 gives an overview of our framework.

Using our framework, we show in the second part possible consistent TCS-systems in section 6 that are efficient from the viewpoint of social welfare. Its individual components are complementary and thus reinforcing each other. Potential drawbacks and implications for social welfare are discussed. We conclude that the particular system, denoted as *contestable monopolies*, shows superior results when analyzed with our efficiency concepts. However, this system might be more difficult to achieve given the starting situation in the European Union, while also being more fragile and difficult to sustain. Section 7 describes a possible transition path to an appropriate system for the pan-European securities transaction industry and concludes.

# 2 Three concepts for evaluation

While in many (academic) discussions the term efficiency is merely set equal to cost efficiency or cost effectiveness, we would like to stress also other important parameters in the context of our paper that are important for (1) evaluating the generated economic rents and (2) measuring the resulting efficiency. Economic rents are created through 'good' investment decisions by the various constituencies and allocated to these institutions through 'good' distribution rules. This interplay between ex ante incentives and ex post distribution determines the efficiency of possible TCS-systems. We analyze efficiency along three lines: static efficiency, dynamic efficiency and systemic efficiency. We shortly describe each concept and potential trade-offs between them.

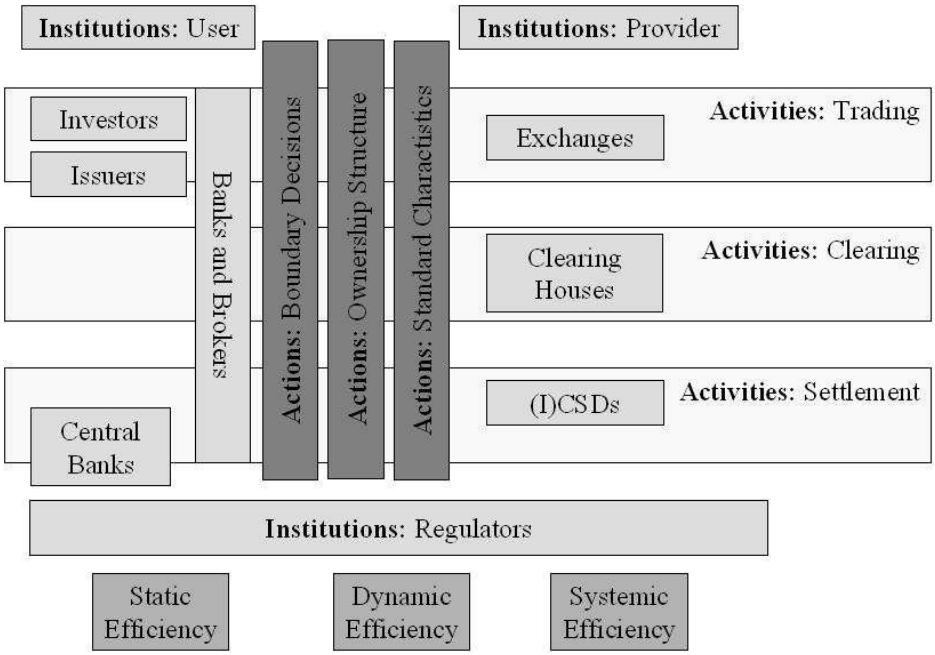


Figure 1: TCS-Framework

## 2.1 Static efficiency

A certain activity is performed in a *statically efficient* way if there is no solution that would allow a less costly implementation. It is under this notion that the commonly used concept of cost efficiency is considered. Parameters influencing the static efficiency are the costs of production which in turn are influenced by the underlying technologies and the economies arising from these. In the securities transaction industry, network externalities[6] are prevalent. They lead in many areas, like the trading of a single derivative instrument or the settlement of a particular stock, to an efficient market structure that is a natural monopoly.

Static efficiency thus increases if the number of companies conducting business along the securities transaction value chain decreases due to the underlying economies. However, the resulting loss in competition and the costs of regulation that has to be set up to keep the remaining companies and their rent-extracting potential in check might lead to a lowering of static efficiency.

## 2.2 Dynamic efficiency

Activities are performed in a *dynamically efficient* way if today's structures and investments do not hamper the performance of these activities in the future. By investing in a certain technology or by institutionalizing a certain industry structure, the ability to change and to adapt becomes affected. Particularly the dominance of the market by a network provider or the sponsor of a network - as Economides calls it - may have detrimental effects on the innovativeness of the market.[7] Industry structures and processes that do not allow for innovation and for quality improvement in future thus are not efficient under our notion of dynamic efficiency.

[6]For a detailed discussion on network externalities confer Shapiro and Varian (1999, p. 173 - 225).

[7]See Economides (1993, p. 92).

Competition in the market usually helps to alleviate problems such as low innovativeness, poor quality of the goods and services whereas the absence of competition may lead to complacency and to less innovation as it is common in a monopolistic environment. For measuring dynamic efficiency key parameters are (1) the industry structure that determines the difficulty of entering the TCS-industry, (2) the rate of technological innovation - which is to a certain degree exogenous to the securities transaction industry - and (3) the propensity of all institutions to invest and the resulting sum of all investments.

## 2.3 Systemic efficiency

Our third evaluation concept, which we denote *systemic efficiency*, should provide insight on systemic risk issues that are inherent on various stages of the value chain. Our goal is to take into account the stability of the TCS-industry to adverse systemic events. We define systemic efficiency as the degree of robustness of the activities in the securities transaction industry to systemic risks that are borne from strong adverse systemic events.[8] A systemic event occurs when a 'bad event' for one or more market participant(s) has subsequently negative repercussions on other market participants. Such an event may vary in severity, ranging from a delay in payment or delivery of the securities in question to a full-blown failure of a party to meet the agreed-upon obligations. Potential contagion effects have to be taken seriously most notably in cases of strong negative systemic events like a failure of an institution. Systemic risk issues are treated with great care by public and private entities. Both ex ante (crisis prevention) and ex post (crisis management) measures have to be introduced in order to deal with systemic risks. 'Good' regulation has to ensure this.

## 2.4 Interdependencies

Note that the three concepts of efficiency are interdependent: (1) The static efficient solution of a monopoly conveys only minor incentives to innovate whereas a few players in an oligopoly can interact in heavy competition and try to develop better products and processes thereby increasing dynamic efficiency. They also compete for monopoly rents, that are non-existent in a perfect-competition-environment where the users of the infrastructure reap the main part of economic rents. The potential profit that can be gained is therefore a big enough carrot to undertake the large technological investments needed up-front. (2) Static efficiency can decline when measures are taken to increase systemic efficiency: The provision of collateral e.g. increases the stability of the industry against adverse shocks but levies opportunity costs on the market participants. The existence of economic rents also facilitates the build-up of a financial buffer that allows these companies to be more stable in times of systemic crises. (3) Perfect competition would contribute potentially more in terms of innovativeness thereby increasing dynamic efficiency but the systemic efficiency could be damaged since a more fragmented structure may impose more work on regulators to keep the overall system sound.

[8] The terminology used in this paragraph is adapted from de Bandt and Hartmann (2000) albeit the authors discuss this issue in much greater depth. See de Bandt and Hartmann (2000, p. 10 - 17) for further details.

# 3 Three classes of activities - The securities transaction value chain

For the purposes of analyzing the financial services and the efficiency with which these are employed we define the *securities transaction value chain*. This value chain has three main activities. Securities need to be traded, the results of the trade have to be confirmed by a clearing process and the delivery of money and paper to the parties to a trade has to be settled.[9] In the following we characterize each class of activity and analyze them from the aforementioned efficiency-concepts perspective. We will consider three different security classes (stocks, bonds and derivatives) and make explicit distinctions when necessary.

## 3.1 Trading

The process of *trading* can be characterized as a contractual agreement between a buyer and an accordant seller to exchange a certain amount of securities for a certain amount of money at a certain point in time. We identify intermediation and liquidity costs as the relevant trading costs for the investors.

Intermediation costs exist as a regular investor does not have direct access to a securities trading system. She rather channels her orders via an intermediary such as a broker or a bank who is member of the trading system. Intermediation costs include most notably brokerage fees and exchange-related fees.

Liquidity costs describe costs that are a function of liquidity. Liquidity can be characterized along four dimensions, namely width, depth, immediacy and resilience.[10] The general rule is that these costs decrease when a security becomes more liquid.[11]

When focusing on the group of institutional investors, being a large contributor to total securities transaction activity, intermediation costs appear to be of minor importance as they represent a relatively small fraction of transaction costs whereas liquidity costs account for a large chunk of the total transaction costs.[12] Therefore, liquidity plays a pivotal role for the choice of the trading location.

Further relevant aspects of trading that are beyond the scope of this paper include but are not limited to issues such as centralized versus decentralized trading[13], continuous trading versus call markets[14], floor-based versus automated trading[15] and the internalization[16] of trades.

[9] Custody functions follow the settlement process. These ensue the distribution of coupon payments, the implementation of corporate actions and the lending of securities besides the trading-induced transfer of ownership. We will subsume these transaction-induced custody aspects under the settlement activity and ignore the other services in custody. Taking into account all aspects of custody would add to the complexity of our framework, while providing only limited value-added for our purposes.

[10] See Harris (1991, p. 3).

[11] Liquidity costs can be observed as spread costs and market impact costs. Spread costs are generally measured as the difference between the bid and ask price of a security while market impact costs relate to an adverse price movement when a large transaction affects the price of a security.

[12] See Deutsche Börse Group and Clearstream International (2002, p. 17 - 22) for a detailed transaction cost analysis of retail and institutional investors.

[13] See Thygerson (1993, p. 142) and Fabozzi, Modigliani, and Ferri (1994, p. 6 - 7).

[14] Fabozzi, Modigliani, and Ferri (1994, p. 309 - 310).

[15] See Domowitz and Steil (1999).

[16] Schwarz-Schilling and Wahrenburg (2003, p. 8) describe this issue in more detail. For an economic analysis of order internalization see also Theissen (2002).

## 3.2 Clearing

The *clearing* process can generally be described as the establishment of obligations that result from a trade for the respective buyer and seller of a security. In specific, the process determines the number of securities that have to be delivered by the latter and specifies the amount to be paid by the former at a certain point in time. Clearing is a prerequisite for the settlement of a trade. While the determination of obligations to each party after the trading process occurs only once for stocks and bonds, this is different for most derivatives instruments. Derivatives contracts usually possess an additional time dimension, i.e. the actual execution of the agreed-upon transaction lies in the future. Consequently, the obligation of the parties may change over time since the contract's underlying asset may change in value. Thus, the clearing process for derivatives resembles a continuous calculation of obligations between the two trading parties.

Clearing can be done either on a bilateral or on a multilateral basis. Bilateral clearing means the establishment of respective claims and obligations between two trading partners. Multilateral clearing incorporates more than two market participants and determines the respective credits and debits of each party to other parties. An important variation of multilateral clearing is the use of a central counterparty (CCP) who steps between the trading partners and becomes the counterparty to every transaction thereby lowering the exposure to risk.

Clearing can be performed on a gross or on a net basis. The former stands for a - usually continuous - compilation of individual obligations for each market participant on a trade-by-trade basis. Using the latter method means the establishment of usually one daily net delivery and payment obligation for each participant after having cancelled out payment and delivery obligation streams to other market participants.[17] Since this means a single net claim or obligation amount for each participant, the netting process results in reduced credit risk exposure and lower capital provision requirements and thus lower opportunity costs in comparison to gross clearing.

## 3.3 Settlement

*Settlement* follows the clearing process in the securities transaction value chain and represents the finalization of the trade between the two involved parties. In comparison to pure cash settlement systems between financial institutions, where money is the only settlement 'currency', the settlement of securities adds a second stream between the trading parties, namely the delivery of the securities. Generally, the buyer of a security has to provide the funds while the seller has to deliver the securities according to the agreed-upon conditions. During the settlement process, cash and securities instructions of the respective trading party are approved for settlement. After the approval, the actual settlement usually occurs via a book-entry system in which funds and securities are reposted according to the transaction. On this interface, settlement is closely related with custody aspects.

There are different approaches with regard to the sequence of settlement, i.e. when the actual payment of funds and delivery of securities occurs. We want to mention two settlement methods here: The *delivery-free-of-payment* (DFP)-method means a sequential delivery of securities and funds where the former is delivered first. In contrast to this method the *delivery-versus-payment* (DVP)-approach delivers securities and funds simultaneously. It is a "mechanism which ensures that the final transfer of one asset occurs if and only if the final transfer of the other asset has occurred"[18] and is generally regarded as the safer method. As in clearing, securities

[17] See Giovannini Group (2001, p. 5).
[18] European Monetary Institute (1997, p. 42).

settlement can be executed on a gross or net basis and show differences in both costs and risk exposure.[19]

## 3.4 Efficiency analysis

### 3.4.1 Trading

**Static efficiency** When analyzing the static efficiency of trading, the focus is on the underlying economies both from the user's and the provider's side. Strong network externalities for the trading in one type of security and economies of scope for different types of securities are present for users while strong economies of scale and economies of scope exist for the providers of trading services.

**Economies of scale and network effects in one security** Large volume (institutional) investors, that want to execute a securities transaction, have a strong preference for low liquidity costs over low intermediation costs. Investors seek a trading place with the highest possible liquidity in a certain security. As a new investor allocates his trading volume to the location with the highest liquidity he provides additional liquidity to all other investors that are trading there. Thus liquidity creates positive network externalities for the investors and is self-reinforcing.

Network effects are also a major incentive for another group of users, namely the issuers, because a network of investors can absorb the issuers' need for fresh capital more easily the larger this network is. Again, this effect is self-reinforcing as the larger the investor base the more capital raising firms will be attracted.

On the service provider's side, economies of scale are exploitable since the setup costs for a trading platform have a large portion of fixed costs. Thus, an increase in trading volume requires only relatively low incremental costs once a trading platform is established. This view is empirically confirmed by Malkamäki's investigation on the processing of trades at stock exchanges.[20] As a result, the exchange reaching high volumes of trading will be able to offer lower transaction costs to users than low-volume competitors. For floor-based trading systems this effect is probably not as pronounced as for automated trading systems since the ratio of fix costs to variable costs is higher for the computerized system.

Taken the mutually reinforcing effects on both the user's and provider's side together, the market for a single security resembles a 'winner takes it all' market and has natural monopoly tendencies once a provider has reached a critical mass of volume and liquidity. Thus, a concentration of trading activities in one security at one provider pledges high static efficiency.

**Economies of scope when offering more than one security** Taking the exchange's point of view, economies of scope are realizable when trading in more than merely one type of security is offered as this can be realized with low incremental costs due to the already existing network of buyers and sellers.

For the users on the other hand, it is also economically beneficial to bundle their trading activities on only few market places as this saves them access and back office costs to different trading infrastructures.

We thus have mutually reinforcing economies of scope effects on both sides that favor the existence of very few trading platforms for different types of securities in order to reach a high level of static efficiency.

[19] See Kahn, McAndrews, and Roberds (2003) for an analysis of gross and net settlement from a moral hazard perspective.

[20] However, he confines his findings for very large stock exchanges. See Malkamäki (1999) for further details.

**Dynamic efficiency** Static efficiency favors a rather monopolistic structure which in turn hurts dynamic efficiency as the latter falls with the decreasing levels of competition. High network externalities in the trading of a security function as a barrier to entry and offer established trading platforms some protection from competitors.[21] Nevertheless, high levels of dynamic efficiency in trading can be achieved if the market for securities transactions is contestable, i.e. if competitive and innovative infrastructure providers can gain market share at the expense of established competitors. The diversion of trading volume is likelier the more of the following aspects coincide: (1) A competing provider offers a significantly better service for both user groups, i.e. to investors and issuers. This may be realized by a better technology which could manifest in faster, more reliable or more convenient transaction handling. Another differentiation point could be lower listing standards for a security which means less strict and thus less costly public disclosure requirements for the securities issuer. (2) The competitor demands lower fees and thus investors benefit by saving intermediation costs. Domowitz and Steil (1999, p. 8 - 9) give several examples of this behavior. (3) The competitor offers new products or services which have not been supplied and therefore 'monopolized' by an established provider yet. (4) Additionally, over-the-counter trading and internalization of order flow by banks are also activities that divert trading volume from established providers.

Concluding, we can state that, due to the strong network externalities and economies of scale and scope in trading which offer significant protection to established competitors, it is likely that a certain level of dynamic inefficiency will prevail and will not be exploitable by competitors unless a significantly better service is offerable to the users. Thus, established providers that wish to stay in business have to maintain service levels that are at least close to state of the art.

### 3.4.2 Clearing and settlement

**Static efficiency** In the following, we will discuss the economic characteristics of clearing and settlement together because of their largely similar character. In analogy to trading, again an analysis of existing economies of scale, economies of scope and network externalities play the main role in evaluating static efficiency. These economies are existent just as in the trading process while - additionally - cost aspects for risk management play a pronounced role here.

**Economies of scale and network externalities** Clearing and settlement providers are both required to invest significant amounts into the infrastructure of their facilities. Thus, the lion's share of operating costs are fixed in nature which implies that - once a provider is established - variable costs represent a small fraction of total costs only. Hence, due to fixed costs degression average costs fall with increasing transaction volume. This effect is stronger for electronically-powered clearing and settlement infrastructures than for humanly-interfaced facilities due to an even higher fix costs portion of total costs of the former. This intuition is ascertained by findings of Schmiedel, Malkamäki, and Tarkka (2002) who measure significant economies of scale for settlement systems empirically.

As in trading there are viable positive network externalities on the user side for both clearing and settlement. A single network enables all transactions to be cleared and settled within the same system. It thereby increases the utility of all users because no further links have to be established when relying on this monopoly

[21] This view is shared by Economides (1993, p. 92 - 93). He states that as a consequence of the reinforcing nature, a financial "network exhibits positive critical mass". A further consequence of networks "is that history matters [...] because of significant switching costs" which protect established players in the market.

solution. This is faster and less costly in comparison to processes which require the interaction with several clearing and settlement systems. Additionally, if netting mechanisms are used, the users will enjoy reduced capital provision requirements and therefore lower opportunity costs.

Economies of scale are also present in counterparty risk management. Especially if a central couterparty (CCP) is used in the clearing stage, the users of the facility can save resources for the management and control of counterparty risks as this task is centralized at the CCP. By pooling risk management facilities at the CCP, the CCP can save costs by risk management specialization effects.[22] As a consequence, scale economies may be even more pronounced in clearing than in the settlement stage.

**Economies of scope** Comparable to the trading process there are potential economies of scope for both providers and users. The former are able to clear and settle different types of securities on the same platform while incurring only relatively low incremental costs. The users on the other hand can save access and back office costs by focusing their activities on few providers.

Clearing facilities that process different classes of securities such as stocks, bonds, and derivatives have additional leeway for scope economies as they are able to implement innovative risk management procedures such as cross-collateralizing along different securities classes. This would lead to an overall decrease in capital provision requirements to the users and would consequently save costs.

As with trading, we again have mutually reinforcing economies of scope effects on both sides. We thus observe high levels of static efficiency when the respective activities are concentrated in few institutions.

**Dynamic efficiency** Dynamic efficiency rises with the level of competition. The economies of both clearing and settlement clearly favor a highly concentrated market from a static efficiency perspective which in return may hurt dynamic efficiency due to fewer competitive elements. The contestability of the market is therefore again the key measure for the dynamic efficiency of the market. The question thus arises, how difficult it is for new market entrants to divert volume from an established institution. We believe that due to the aforementioned economies this is only possible when competitors offer substantially better services.[23] A superior offer to potential users would probably include but not be limited to faster processing, lower transaction fees and lower capital provision requirements. The last aspect may be a matter of regulatory concern as competing institutions might want to apply less stringent and costly risk management in order to be able to successfully underbid the fee structure of established competitors. This may lead to a 'race-to-the-bottom' in terms of risk management quality which would undermine the systemic efficiency of the whole TCS-industry.[24]

**Systemic efficiency** Systemic efficiency is particularly relevant in the clearing and settlement of securities and appendant funds. There are several sources of and alleviation efforts to systemic risks. Clearing and settlement institutions have developed risk management tools that attempt to alleviate both ex ante and ex post the various types of settlement risk. Since the various types of systemic risks such as counterparty, custody and cross-border risks have been elaborated in other

[22] Confer also section 4.1.2.

[23] The contestability may also be hampered by the boundary decision of the established firm: If the upstream institution such as a trading platform also owns and controls institutions downstream, it can route its orders to its own subsidiaries and therefore prevent other CS-institutions from effectively competing for these transaction flows. Confer section 5.1 for this issue.

[24] See more on this topic under sections 4.3 and 6.

papers in detail[25] our paper focuses on the relationship between systemic efficiency and market concentration.

The relationship between the degree of consolidation and systemic efficiency in the clearing and settlement industry is far from straight-forward. Both a fragmented and a consolidated industry structure have to deal with trade-offs.

A concentrated industry can exploit economies in centralizing risk management efforts as it is more cost efficient to have one party collect the information and to monitor the other parties instead of having all parties monitoring each other. Thus, a central risk manager will be more cost efficient and more sophisticated. However, the central risk manager may bank too strongly on its dominant position and believe that public entities would bail him out in case of a failure. Moral hazard may materialize in the form of reduced monitoring efforts. Therefore regulatory effort - albeit rather easy as only one institution has to be controlled - might be necessary.[26] Additionally, a higher degree of consolidation leads to less complexity in the interaction between the providers and thus reduces the probability of failures in communication and asset transfers.

A fragmented industry structure on the other hand may provide systemic efficiency that is superior to a concentrated market. More industry players will usually lead to higher levels of competition. A possible parameter in the competition may be the provision of the safest and most stable transaction system among providers and may boost systemic efficiency. Another positive aspect of fragmentation is the existence of redundancies which - if communication protocols between different transaction systems are compatible - can be used to reroute transactions from a failed to an intact system. Multiple transaction systems may thus increase the robustness of the industry although potential contagion effects between the providers may weaken this advantage.

### 3.4.3 Vertical interdependencies

**Vertical integration and efficiency** Historically, the dominant trading institution in each country often also exercised control in the activities further downstream, i.e. the exchange vertically integrated into the domestic clearing and settlement activities. This setting was mainly driven by efficiency motives as it enabled to process straight-through the whole transaction activity in a faster, more cost efficient and safer manner. Straight-through-processing (STP) at a single institution offered significant economies to both users and providers in comparison to the processing between separate entities as: (1) It lowered communication costs between the respective activities which means an improvement in static efficiency. Since the whole transaction was processed in-house, it was no longer necessary for a trading institution to transmit the details of the trade by mail or telephone but merely to hand over the transaction details to the clearing and settlement department of the same institution instead. (2) Innovations concerning the processing of transactions were easier to implement since coordination efforts with other providers along the value chain were not necessary. This shortened the implementation period and therefore increased dynamic efficiency. (3) It made transaction failures less frequent since the data transmission process could be optimized in-house, for example by implementing own communication standards. This represented an improvement in systemic efficiency.

Nowadays, with the decline in IT-infrastructure costs, the arguments for vertical integration are probably not as strong as they had been some ten years ago as

[25] See Giovannini Group (2001, p. 18 - 19) and de Bandt and Hartmann (2000).

[26] This phenomenon is generally called 'too big to fail'. Confer de Bandt and Hartmann (2000, p. 17) for further details.

transmission costs to outside institutions are now significantly less costly and not necessarily higher than in-house transmission costs.

Furthermore, as trading habits of investors gradually shift from a domestic towards a more international approach, the national 'silos', as the vertically integrated entities are also called, not only no longer represent the investor's scope of transaction activities but are even said to hamper frictionless processing of cross-border transactions in Europe. This is due to their incompatible proprietary communication standards which each national silo had developed to communicate along its own controlled value chain. This makes communication between silos a highly complex and inefficient task.

Differing communication standards between vertical silos also de facto impede the contestability of the respective downstream activities, i.e. clearing and settlement markets. They represent an effective entry-barrier against foreign providers that strive to enter the market of an established domestic silo. They are unable to do so because once a trade is made on the established trading platform, competitors are restricted to offer their services for the downstream functions due to the existing proprietary communication standard of the established provider. Therefore, clearing and settlement activities of the established provider are protected by its trading activity and are thus barely subject to contestability. This may result in dynamic inefficiencies.

**Effects of net clearing on trading and settlement** The use of net clearing instead of gross clearing procedures in the clearing stage has ambiguous effects on activities both up- and downstream the value chain. While netting of obligations is likely to boost trading activity due to an overall decrease in capital provision requirement and thus freed-up capital it may also result *ceteris paribus* in less settlement activity as only 'non-nettable' instructions are transmitted from clearing to settlement.[27] Yet, empirical analysis cannot verify with certainty whether the increase in trading activity is large enough to make up for the initial decrease in settlement transactions due to netting.[28] This issue is of practical relevance for settlement institutions as the introduction of a CCP with netting facilities can be regarded as a threat to their revenues. Depending on whether the settlement institution also controls the upstream clearing facility or not, the entity may want to embrace or prevent such a clearing method. This means for vertical silos that - as their revenues are merely shifted from settlement to clearing - netting is unlikely to be rejected. In the contrary, a settlement-only institution may want to oppose the implementation of netting.

# 4 Three classes of institutions - The relevant players

We distinguish three classes of institutions in our framework: (1) the institutions that *provide* the infrastructure and services related to the three activities described before, (2) the institutions that *use* these trading, clearing and settlement possibilities and (3) the institutions that *regulate* the other two classes on various activity levels.

[27] The National Securities Clearing Corporation, the US clearing institution, for example netted roughly 95% of all transactions in recent years after introducing a CCP and netting procedures. See http://www.dtcc.com for further details.

[28] See Global Custodian (2003) for a survey of empirical reports on this matter.

## 4.1 Providers of infrastructure and service

The main institutions in this class are exchanges, clearing houses and (international) central securities depositories that provide single or multiple activities of the securities value chain. We briefly characterize all three in the following.

### 4.1.1 Exchanges

Exchanges are the main institutions where trading takes place. Their history points back to the occasional meeting of merchants at fairs at a particular place at a predetermined time.[29] Today's exchanges mostly operate with a floor-based trading system that is supported by an electronic order system or they have taken the next logical step and use an electronic order book as the sole device for trading. Floor-based systems used to be the norm until the late 1980s when more and more exchanges developed electronically based systems that first supported these trading activities and later substituted for them by establishing an electronic order book. Exchanges that resisted these forces for whatever reason soon found their dominant position eroded and their competitive advantage gained in the past unsustainable.

Technology became a significant differentiation factor for trading platforms and enabled technologically sophisticated competitors a relatively easy entry into markets that were dominated by technologically less pronounced competitors. Technological advances also supported the emergence of electronic trading networks that are sponsored by information providers like Reuters and new entrants like the Swedish OM Gruppen, that successfully established the first electronic derivatives exchange in 1985.

Further changes are currently happening in the area of regulation of exchanges as the balance between public oversight and private self-regulation changes. We will deal with these issues in the section on regulation.

### 4.1.2 Clearinghouses

**Why do clearing houses exist?** For a typical over-the-counter transaction the clearing process between buyer and seller is merely a bilateral agreement on mutual obligations. While this process may be unproblematic if the two parties know their counterparty's solvency and trust each other with respect to contract fulfillment, it represents a source of credit risk when performing transactions multilaterally at an exchange with only limited information on other market participants. Thus, a reliable transaction process calls for supervision of the trading partners' creditworthiness during clearing.

Clearing houses are institutions that perform this function. They ensure frictionless clearing as their customers, that are allowed to clear their own or their clients' transactions, have to meet certain creditworthiness standards like trading volume-dependent capital provision requirements. By effectively managing the risks inherent in clearing, these institutions increase the efficiency and strengthen the integrity of the financial markets.

**Clearing with a central counterparty** Traditionally, the clearing process is performed among the market participants that have both obligations and claims against each other. This method has two major drawbacks for them: First, although capital provision requirements are mandatory to clearing members, there nevertheless exist different levels of credit risk among the participants. Second, they are not able to remain anonymous during the clearing process.

[29] For a comprehensive history of financial markets and the advantages of agglomeration see Holtfrerich (1999). A comprehensive elaboration on exchanges and the way they conduct business can be found in Lee (1998).

A central counterparty (CCP) can mitigate these problems by interposing itself legally between the buyer and seller of a transaction. By stepping between the original trading partners, the CCP becomes the buyer to every seller and the seller to every buyer and thus ensures anonymity among market participants. This so-called 'novation' process also helps to reduce counterparty risk as the CCP can effectively apply sophisticated centralized risk management tools. When the CCP uses the aforementioned netting mechanisms, the clearing members can also benefit from lower overall capital requirements.[30]

### 4.1.3 Central securities depositories

Central securities depositories (CSDs) are institutions that centrally record and monitor holdings of physical or dematerialized securities and that provide mechanisms for their transfer by exchanging securities for cash. CSDs ensure that cash and securities are promptly and effectively delivered between the parties to a trade, and that customers are notified of the rights and obligations attached to the securities they keep under the custody of the central securities depositories. CSDs take care for the timely and secure transfer of ownership of the securities and the matching payment. They furthermore offer securities lending for those trading partners that want to sell securities short. Collateral and margin calls are also handled by these institutions.

Whenever there is no immediate exchange of paper for money, problems in the settlement can arise. These lead to risks that the contract partner have to bear. Especially troublesome are financial claims that explicitly involve a longer time dimension like derivative instruments.

A special breed of CSDs are the two International Central Securities Depositories (ICSDs) that were originally established to manage the clearing and settlement of the Eurobonds for which there was no supporting market infrastructure. These institutions perform settlement services across national boundaries and connect distinct markets via a so-called 'bridge' between them.

## 4.2 Users

The main institutions in this class are banks and brokers as the immediate users of the infrastructure provided as well as securities issuers and investors as indirect users. Banks play a pivotal role in the securities transaction value chain for institutional as well as retail investors on the one side and for companies with their underwriting business on the other side.

### 4.2.1 Banks and brokers

Banks or any other institution that want to use the infrastructure provided by exchanges, clearing houses or central securities depositories usually have to undertake significant investments. These investments are highly specific to a particular infrastructure provider implying high switching costs and tremendously diminished ex post competition. This induces strategic interactions between banks and brokers. The co-specialized investments necessary for an efficient use of the infrastructure provided and the degree of this specificity in each bank is a means for banks to compete with each other. Since network effects play a crucial role in the TCS industry, the bigger banks, which can more easily afford to undertake these specific investments, can foreclose the market for smaller banks for which such an investment is

[30] See Van Cauwenberge (2003, p. 94).

not worthwhile. By internalizing security transactions and by acting as subcustodians, banks are to a certain degree also direct competitors to the infrastructure providers.[31]

Additionally, banks are especially concerned about the financial health of their counterparty since they have to provide an adequate capital as a buffer against possible risks. Risk management tools can reduce such risks. Another risk mitigating instrument is a central counterparty which provides the task of monitoring the creditworthiness of the parties related to a trade much like the banks themselves act as delegated monitors for their lenders.[32]

### 4.2.2 Securities issuers and investors

Two other constituencies in the class of users are the issuers of securities and the investors. Issuers list their securities on exchanges to establish a secondary market in it. This increases the attractiveness of the securities for potential investors and therefore also increases the capital that can be raised by the issuers. The settlement of securities, especially the custody part of it, are of concern to the issuers: Depending on the type of the security, they have to know the investor to invite to general meetings for example. Investors - institutional as well as retail - are mostly interested in the prices they have to pay for securities transactions and the reliability with which the trade is executed and settled.

Unlike banks and brokers, investors do not have to make any co-specialized investments to the infrastructure, so they can switch with ease to the platform that performs in the most efficient way. This forces the infrastructure provider, in the case that there is competition, to reduce costs and to innovate thereby increasing static as well as dynamic efficiency.

## 4.3 Regulators

Efficient trading, clearing and settlement of securities is important for the functioning of the whole economy. Companies need to get access to finance and private households need a vehicle by which they can save their financial surpluses. This assigns financial markets in general and the TCS-industry in particular a pivotal role. The well-being of other industries and many people depends on it. Adverse effects spill over into other parts of the economy thereby implying negative externalities. Therefore, regulation of the TCS-industry is a means to avoid or to mitigate these external effects.

These spill-over effects are very material in the settlement stage of the securities transaction value chain when the payment system is involved. A failure of one party to meet its obligations might lead to contagion effects that have negative effects on the liquidity of the banking system and threatening the economy by this transmission channel. The central bank as lender of last resort therefore has an incentive to deal with these regulatory issues. It therefore needs to be - and also is - one of the key regulating institutions since central bank money is frequently involved in settling the cash side of securities transactions. Other regulatory bodies are concerned with different aspects: For example, the performance of each activity for all users - which are of a considerable heterogeneous degree - in a fair manner needs to be ensured, i.e. access to the infrastructure must be open and in an undiscriminating way. The European Commission with various reports - the Lamfalussy Report, the two reports of the Giovannini Group and the Investment Services Directive for example - is committed to this task in the Single European Market. National agencies

[31] A model on the competitive relationship between CSDs and custodians can be found in Holthausen and Tapking (2003).

[32] See Diamond (1984).

implement actions to put these aspects into practice today. Regulators often join their forces to set standards after consulting the relevant industry players, e.g. the joint working group set up by the ECB and the Committee of European Securities Regulators (CESR). A single European Financial Services Authority might one day take over this job. In all cases, the right balance between static, dynamic and systemic efficiency must be chosen by regulators.

The question arises how this regulatory body will be structured or how the existing agencies will work together and communicate with each other. How large and how important is, for example, the involvement of regulators in the payment system and in the paper settlement system? In the former, interdependencies with other payments that do not stem from transactions in securities have to be taken into account as well.

The setting of the right incentive structure and the right allocation of decision and control rights is a major task that needs thorough analysis that is beyond the scope of this paper. The same holds for the implementation to achieve a good and workable regulation that enhances and promotes the overall economy by ensuring a smooth and efficient functioning of the TCS-industry. One large regulator can take into account all interdependencies between the different stages of the securities transaction value chain as described in section 3. However, such a super-regulator is prone to lose its focus in a web of different interest groups. Local information might best be dealt with in a more decentralized structure. This makes a situation where there are different regulators for each activity and for the paper and the payment side attractive. In such a setting, different approaches to regulation like self-regulation and the tightness of regulation can be fine-tuned for each specific task. The flip-side here is to ensure that necessary communication between these regulators takes place and that no regulatory arbitrage is undertaken which would lead to a race to the bottom.

Regulation lowers static efficiency since it is costly to set up a bureaucracy - or a publicly owned entity in the extreme - to achieve the performance of the three activities in the securities transaction value chain. The 'out-sourcing' of regulation to the providers and to the users of the infrastructure could be a cost-efficient alternative. Possible means for this outsourcing lie in the self-regulation by the infrastructure provider. Whenever they can compete on quality as many exchanges do with different market segments and the attached regulatory conditions, regulation need not be of the costly public variant. As a second means, the ownership of the providers of infrastructure can be in the hands of the users. In this setting, the club of users writes its own rules. Whenever little entry in this club is required, this can again be better than publicly provided regulation.

# 5 Three parameters in the action set - strategic conduct of the institutions

In this section we analyze three key parameters that the providers of the infrastructure, the users and the regulating institutions can use to interact strategically in the securities transaction industry. The focus is on the providers of the infrastructure, but possible actions and reactions of the other two classes of institutions are taken into account whenever necessary. The three parameters in the action set that we look at are (1) the *boundary* decision of the infrastructure providers, (2) the decision whether to adopt an open standard or to develop a proprietary *communication* tool and (3) the *governance* of the infrastructure providers.

## 5.1 Boundary decision

The institutions providing the infrastructure for trading, clearing and settling the different financial instruments face the problem whether to integrate different aspects under the institutional roof of one firm or whether to concentrate on just one function or one specific financial instrument. There are two dimensions to this problem: The first is the horizontal decision. It requires an answer to the question if the facilities should be only for one type of financial instrument or for different sorts of financial instruments such as stocks, bonds and derivatives. As described in sections 3.4.1 and 3.4.2, there are potential economies of scope in pooling individual activities of different types of financial instruments. The second dimension is the vertical decision. It requires an answer to the question if different activity stages of the securities transaction value chain should be integrated in one institution.

The following discussion on the providers' boundary decision concentrates on the characteristics of the vertical dimension. We describe two distinct business models - the vertically integrated silo and the vertically focused firm.

**The vertically integrated silo** The first business model is the vertical silo - the combination of trade, clearing and settlement under the roof of one firm. It is applied for example by Deutsche Börse AG. The advantage of such a model is that it allows to reap the benefits that derive from the economies of scope between the three functions as described in section 3.4.3. Communication is easier when the three functions are performed in close proximity within the same organization. Specific forms of data exchanges between the three stages of the value chain and straight-through processing allow for the emergence of economic rents.[33]

However, one of the adverse effects such a business model has, which might be a prevalent microeconomic motive behind this strategy, is the leverage of a (natural) monopoly on one stage of the value chain upstream or downstream to other stages. Particularly, a vertical silo may cross-subsidize its trading costs - and thereby attracting customers from other platforms - through its monopoly profits on the clearing and settlement stage or vice versa. By this strategy, an institution following the business model of vertical integration effectively strengthens its competitive position. Furthermore, the vertical silo forecloses the market for competitors: By restricting access for them in one activity, users can be forced also to 'buy' the solution for another activity from the same institution. If there is no choice for them but to deal with the same provider, a monopoly rent can be extracted from the users further increasing the economic rents generated in this model due to the specificity inherent in it.

Therefore, the interesting question arises whether Clearstream and Deutsche Börse can deliver their promises given that they control upstream activities and de facto can foreclose the market due to their monopoly on the previous stage in the value chain. When faced with the specific and co-specialized investments they have to undertake, banks and brokers could be reluctant to join in this venture.

**The vertically focused firm** The other business model that has promising features is that of more focused infrastructure providers and the use of market mechanisms between them. A prominent example for this industry setting was used in England, where the three independent institutions, namely London Stock Exchange, London Clearing House and Crest, provided infrastructure services only for one stage of the value chain, respectively.[34] If a solution for the communication problem of data transfer between the three activities of the securities transaction

[33] See Williamson (1985) for the role of specificity in explaining vertical integration.

[34] The London Clearing House has recently teamed up with Euronext's Clearnet, whereas Crest has merged with Euroclear in 2002.

value chain could be found, this model has appeal because it does not give too much power into the hands of few institutions that can control access to their infrastructure - an infrastructure that exhibits strong network effects. For each activity, the users can choose the best institution that provides it in the most efficient way - from the static point of view as well as from the dynamic perspective. Competition forces less efficient institutions out of business and sets high-powered incentives for the surviving. As such firms do not have to worry about any interdependencies between their different lines of business, they are more eager to adopt new and better technologies and processes. Any cannibalization of value propositions within the same firm cannot happen. These institutions increase therefore static and dynamic efficiency. A possible drawback which might be taken into account by the regulators is less systemic stability that too high-powered incentives might induce. How the problem of establishing a market mechanism for the intermediate goods - the information transfer from one stage to the next in the value chain - can be dealt with is the topic of the next section.

## 5.2 Communication standards and accessibility

The interaction between the stages of the value chain is of crucial importance to the way business is performed in the TCS industry. It necessitates the infrastructure providers to make decisions both on the information transfer mode, i.e. the type of communication standard, and the degree of accessibility of their activities to competitors.

**Proprietary versus open communication standards** *Proprietary standards* infer that the information format of the transactions cannot be interpreted without co-specialized investments so that competitors are discriminated whereas an *open standard* enables competitors to process the information and allows users to switch the providers more easily.[35]

The decision whether to adopt an open standard or to set up a proprietary system is intertwined with the vertical boundary decision. In the case of a vertically focused infrastructure provider, the case is trivial. Such an institution has to rely on the market for the performance of upstream and downstream activities, the communication protocol has to be in an open and understandable format.[36] The case is different for companies following the business model of a vertical silo: Such companies can develop a solution that allows them to keep the information that has to be passed along the securities transaction value chain private. By doing so, it can develop an idiosyncratic data exchange format that allows them to generate an economic rent due to the specific nature.

However, an economic rent could also be generated by foreclosing the market for an upstream or downstream activity. Users are forced to rely on the same institution and buy the bundled product in a one-stop shop. They have to invest in co-specialized computer systems that allow them to handle this proprietary data format. With an open communication standard between the different stages of the value chain a deconstruction becomes possible. There would be a choice for customers to deal with the best and most efficient institution.

Analyzing open and proprietary communication standards on the basis of our three efficiency concepts there are two major advantages for proprietary in compar-

[35]The battle for an unique communication standard and the different competing approaches are described in Weitzel, Martin, and König (2003).

[36]One could also imagine the case that a proprietary standard is used. In this case, the outcome would be a hybrid solution along the lines of Williamson (1985): Long-term contracts or strategic alliances are necessary to account for the hold-up problem since specific investments have to be made.

ison to open communication standards: (1) They can be more specific in relation to a certain financial instrument or a certain institution than open communication standards and thus be more statically efficient. (2) A higher dynamic efficiency can be reached since a proprietary communication standard allows for the complete appropriation of the economic rent that is generated by innovations. Additionally, the benefits of innovations made with open standards could be enjoyed by every participants without being obliged to invest into this innovation. Thus, underinvestment problems may arise with open standards.

However, proprietary communication has also two major drawbacks when compared to open standards: (1) Proprietary standards provide more incentives for strategic behavior to infrastructure providers which can be to the detriment of the users. Thus, market foreclosure strategies and mutual reinforcements of monopolies on different stages of the value chain can have a negative impact on users. Both static and dynamic efficiency may be impeded. A communication standard that is open to all market participants prevents or at least alleviates these strategic behaviors: It is easier for competitors of the infrastructure provider or for the users themselves by means of internalization to work around such a foreclosure. (2) Proprietary standards raise more regulatory concerns if a regulator wants to ensure the proper functioning of the market and access for other institutions. Therefore, static efficiency may be lowered due to the increased regulation costs. Additionally, systemic efficiency may be low if regulators do not control the proprietary standard properly.

**Restricted versus open accessibility** Accessibility in this context refers to interactions between competitors across different stages of the value chain, i.e. between trading and clearing or between clearing and settlement. *Open access* describes the ability of institutions to provide their services on one stage of a transaction although other stages of the value chain may be performed by competitors. This stands in contrast to transactions where access is *restricted* by a provider. Restriction of access is possible whenever a provider is able to leverage its dominant position on other stages of the value chain. This may for example occur when a dominant trading facility prevents other providers of downstream activities to receive the transaction and automatically route it to their own clearing facility instead. Another example for dominance can be found in the opposite direction, when a settlement provider has the monopoly on a certain security and refuses to accept transactions that are traded or cleared from anybody but its own upstream activity provider. Therefore restricted accessibility can strongly impede fair competition among providers in the TCS-industry.[37]

Accessibility as well as the standard decision primarily depend on the industry structure[38], the allocation of power between the three classes of institutions, and the governance and ownership of the providers of the infrastructure. Using (or being forced by a regulatory institution to use) a common means of communication technology, effectively opens markets. The power that is conveyed by open markets to users allows them to search for the best price and quality. This in turn eventually forces a redistribution of economic rents away from the incumbent providers who would otherwise hang on to an inefficient allocation of resources from a welfare perspective. It is to these governance aspects that we turn next.

[37] See also Milne (2002) who proposes to regulate access to the book transfer (which would fall into the settlement activity in our framework) as he identifies it as the natural monopoly within the clearing and settlement industry.

[38] There is a strong interdependency and complementarity between accessibility, communication standard and vertical boundary decision of the providers: We observe the tendency that a vertically integrated firm often employs a proprietary standard with restricted access while a vertically focused firm prefers open standards and open accessibility.

## 5.3 Ownership structure and governance

Ownership of a good is an incentive device: When residual decision rights are aligned with the rights to residual income, decisions are made in such a way as to maximize this share. The maximization of it optimizes social welfare whenever these decisions can be made independent of others. It therefore matters who ultimately has control over a certain good or resource. This is also the case for a firm - a much more complex 'good' and a whole bundle of resources. For our analysis, we take into account the ownership structure of a provider of the infrastructure in the securities transaction value chain to check whether economically sound decisions will be made by this institution. Three distinct forms of ownership can be identified: (1) A *for-profit firm* that operates to maximize the profit that is distributable to its shareholders as dividends, (2) a *non-profit mutual* that operates to maximize the utility of its members and (3) a *publicly-owned entity* that provides a good or service that would not be provided efficiently by a private firm due to its public good nature and the underlying external effects.

Public ownership of an infrastructure provider can be a means to deliver a service that must be provided by a natural monopolist. The public policymaker - acting in the interest of society as a whole - is not interested in narrow profit motives but rather tries to provide this service in the efficient quantity. This gain is however very likely to be offset by inefficiencies that public bodies bring with them. Without a profit motive the resulting incentives in the publicly owned 'firm' are weakened and inefficiencies are re-introduced.

In the last years, many publicly-owned monopolies in diverse industries were therefore privatized and for-profit firms were established instead. In this form of ownership - the standard capitalist form most commonly analyzed in economic theory - the residual decision rights are aligned with the residual claims and better incentives are thereby conveyed. The public interest of the provision of the right quantity for the correct price in these network industries is better served by a regulator that has less decision power (and less potential for meddling) than an outright publicly owned enterprise. The shift in control and power away from a public authority towards the private agents that use and provide the infrastructure increases overall welfare by nurturing better decisions because the resulting economic rents are exploitable by these decision makers.

The third point in the triangle of possible ownership arrangements is that of mutual ownership. In the mutual form, the users of the infrastructure also provide the necessary investments themselves so that the statically efficient quantity is produced for a price that is lower than the monopoly price. The direct users are members in the providing institution and take into account the supplementing function that the infrastructure has for their core business in which they ultimately want to generate economic rents. The amount of economic rent that is generated in such a mutually-owned institution is therefore lower compared to a for-profit firm while inefficiencies are reduced in comparison to a publicly-owned and over-regulated authority. Such a structure has its drawbacks however. The membership of the mutual can procrastinate and new entrants can be discouraged from using the same infrastructure. If the members are too heterogeneous between them, the governance of 'one member - one vote' instead of 'one share - one vote' can cause decisions to be distorted by the divergent interests and the larger players can be held up by the smaller institutions. In recent years there has been a wave of demutualizations, especially among exchanges, due to these problems. [39]

[39] See also Domowitz and Steil (1999, p. 14 - 16) on this issue.

**Why are ownership and governance aspects important?** The governance of the infrastructure providers is of particular importance for the efficiency with which securities transactions are performed. The Council of Institutional Investors - representing 130 pension funds holding 3 trillion dollars in assets in the USA - criticizes that of the three constituencies of the New York Stock Exchange - members (intermediaries like broker-dealers and specialists), listed companies and investors - only the members are allowed to vote and to choose the board. This structure has a potential negative effect on the self-regulation of the exchange since that is biased towards the members' interests.[40]

The governance structure also influences the ability of a firm to innovate and to be efficient in a more dynamic sense. Too much power in the wrong hands hinders the necessary innovation in the face of disruptive technologies. The introduction of electronic trading systems for example was heavily fought by floor-based brokers that have an important voice in the governance of exchanges. When these are not only the users of the infrastructure but can also exert power through a mutual ownership arrangement, they can block such innovations that would make them worse off but lead to big gains for other users.

## 5.4 Interdependencies between the parameters and its configurations

All three described action parameters are not independent of each other. We want to highlight some interdependencies here as a precursor to the analysis of the three systems compared in section 6.4.

**The relationship between the boundary decision and the communication standards** Open standards are a means to credibly commit an institution performing a certain function in the securities transaction value chain not to pursue a foreclosure strategy by vertical integration. The leveraging of a natural monopoly on one stage of the value chain for a certain financial instrument cannot be used to force customers to use the infrastructure of the same institution on the previous or next stage in the value chain as well. The choice for customers and the threat of market entry by upstarts do not allow institutions to use their power to extract more than their 'fair' share of economic rents generated by the activities of the securities transaction value chain. This makes a strategy of vertical integration less attractive. On the contrary, in such a setting it would be necessary for the integrated institution to compete with many focused firms that know their activity by heart. Any advantage in terms of higher economic rents these focused institutions can gain can only come from better service which leads them to pursue a strategy that puts a premium on innovation. Even if the vertically integrated firm also pursued aggressive R&D activities, it would be faced with the dilemma of cannibalizing its own success whenever it came across an innovation on one stage of the securities transaction value chain that would force it to restructure the relationship between the integrated stages. The need to meddle with transfer prices weakens incentives for middle managers or even leads to outright sabotage of the new product or process by the managers of the less innovative stage.

**The relationship between ownership structure and communication standard** Economic rents can be generated by for-profit firms by suitably using the ideas of industrial organization theory to structure the industry to make it more difficult to enter the market. One such tool is a proprietary standard probably in combination with a strategy of vertical integration. In the other two ownership

[40] See Economist (2003, p. 59) for this example.

forms we described - public and mutual ownership - these incentives to foreclose the market by opting for a proprietary communication standard are not that prominent since the appropriation possibilities of any rents generated are less good for the owners of such institutions. In the case of a publicly provided infrastructure of the natural monopoly functions this institution will settle on its own (proprietary) standard but fair access is usually granted by the provider of the public good. In the case of a mutual ownership structure the tendency is for an open communication standard because the users themselves will gain from less diversity between different providers since they then have to invest only in one system to cope with data from numerous institutions on the other stages of the securities transaction value chain. However, incentives to develop the common standard and to take account of better possibilities in data exchange through broadband connections and better encryption and decompression algorithms are needed. One possibility is the use of open source-like structures: Franck and Jungwirth (2002) see the advantage of such structures in donations that are made by interested institutions without a crowding out of valuable investments in the case of an emerging standard. Cooperatives are then a preferable institutional setting in the case establishing a standard without the effects of competition that would lead to a fragmentation or to a lock-in in an inefficient system.[41]

**The relationship between the boundary decision and ownership structure** Mutually owned institutions have their drawbacks in terms of slow decision making and weakened incentives due to the lack of the profit motive. Vertical integration augments this disadvantage by making the institution even more complex. The users of the infrastructure for the securities transaction value chain are therefore more likely to set up several cooperatives each one highly focused along the value chain that have probably different members and to rely on open standards for the exchange of information between them. The users themselves restrict the activities of a cooperative to the absolut necessary.

The solution of public ownership is more likely to be vertically integrated but a sensible and economically minded policy maker would again opt for a deconstruction of the value chain and a private provision for the activities where this is the best option. Unregulated private institutions run in the best interest of their shareholders, i.e. without ignoring incentives for managers to engage in empire-building activities, are very likely to pursue a strategy to shape the industry in their favor and to erect entry barriers whenever possible. As mentioned before, a foreclosure strategy of leveraging a monopoly position from one activity to the next makes perfect sense for such institutions. Privately owned companies are therefore likely to increase their scale and scope by actively integrating along the value chain when no countervailing forces prevail.

We have now outlined the constituents of our framework and discussed them in detail. In the following section we put these parameters together to concentrate on the systemic relationships between them that make some combinations of parameters in our framework better from an socially efficient viewpoint than others.

# 6 Three proposals for a sensible TCS-system

Systems in general consist of various modules. Between these modules or elements there can be a complementary relationship. Complementarity between any two such

[41] For a theoretical underpinning of cooperatives and their investment incentives in emerging standards see the work of Rey and Tirole (2001).

elements implies that the simultaneous increase in both elements leads to an overall superior performance. In the case that such a complementary relation between the elements of a system exists, the right configuration of these modules matters. Only if they are adjusted in a coherent fashion, the system in question will be internally consistent. Such a consistent system will perform better than any system in which deviations from the coherent configuration in one or a few parameters occur.[42]

This section presents three sensible and *idealized systems* where the configurations of selected elements, especially the parameters of the action set described above, are set thus that the complementary relationship is taken account for and the overall system is efficient from the viewpoint of a benevolent system designer. Small deviations from the configurations suggested lead to an overall less efficient solution.

## 6.1 System 1 - Regulated consolidation

**Description** The system of regulated consolidation has two distinct features implied by its name: (1) there is no competition in the provision of the activities on those levels of the securities transaction value chain that are consolidated and (2) the role of the regulating institutions is very pronounced in these stages. Usually the roles of regulators and providers are combined and the infrastructure is publicly owned.

The horizontally consolidated and possibly even vertically integrated structure can take several forms. We want to mention three idealized configurations here: (1) Model T: This structure is consolidated on both the clearing and settlement stage whereas trading remains fragmented. The approach comes quite close to the actual structure in the USA, where the Depositories Trust & Clearing Corporation is the monopoly for clearing and settlement activities and trading occurs on several exchanges. (2) Model I: This structure resembles a monopoly on all three stages. The institutions may or may not be vertically integrated. The structure comes close to the setting of the TCS-industry in many European countries a few years ago, i.e. before the introduction of the Single European Market integrated the various national markets. (3) Model X: This structure has one consolidated clearing institution which may also perform as a CCP. Both trading and settlement activities remain more fragmented. This approach for the future of the TCS-industry in the European Union was advocated by London Stock Exchange's former chairman, Don Cruickshank.[43]

For conciseness reasons, we will describe model I in detail as the most extreme version of regulated consolidation. Models T and X merely represent weaker versions of consolidation and thus could be described analogously.

The consolidation in each activity allows to reap economies of scale and scope along the securities transaction value chain. The public ownership and the lack of competition lead to low incentives to innovation activity. The threat of entry is subdued since the underlying economies as well as the publicly sanctioned role as the sole provider entrench this institution.

Vertical integration even enhances this entrenchment but leads also to the possibility of straight-through processing and an efficient use and dissemination of information from one stage of the value chain to the next. The low rate of innovation

[42] Mathematically, complementarity relates to a positive cross-derivative: The first-order returns for the increase in one element are still more enhanced if the second element is also increased. Consistency is the characteristic that any pairwise combination between any two elements has a non-negative cross-derivative - also referred to as a supermodular relationship - between them. See Milgrom and Roberts (1990) for an application of system theory in the context of modern manufacturing. See Hackethal (2000) and Topkis (1998) for a more mathematical approach.

[43] See http://www.londonstockexchange.com/newsroom/speeches/speech08.asp for a transcript of his speech, 07.09.2003

and the resulting stability in the industry makes it feasible to write detailed plans. The low innovation activity is also consistent with a low investment propensity of all players and low total investments. The users of the infrastructure are willing to undertake the necessary co-specialized investments. The standardization process is organized by the regulator which uses its powerful position to enforce and set the standard means of communication. The sum of total investments is low since no company can compete with such a vertically integrated, publicly owned institution that uses the underlying economies of scale and scope.

Figure 2 provides an illustration of the three idealized industry settings as well as the position of the power center between the three classes of institutions.

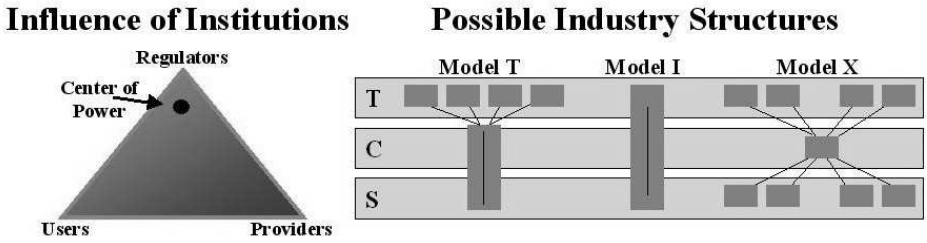


Figure 2: TCS-System 1: Regulated Consolidation

**Efficiency analysis** *Static efficiency* in these settings is relatively high due to the strong exploitation of network, scale and scope economies. The significant market power of the providers has its counterweight in the public ownership structure so that the inefficiencies of a monopoly does not prevail. However, the incentive structure within a big public agency brings also some costs in terms of lost efficiency. It depends on the actual processes and organizational structures of this body whether the combined effect is still positive.

*Dynamic efficiency* is rather low due to the lack of competition. The pressure for product or service innovations will remain limited to the detriment of the users. The overall investment activity is too low and potential competitors are deterred from entering the industry.

The analysis of *systemic efficiency* in these settings has a two-sided result. Consolidation enables the centralization of risk management at the infrastructure providers which can be more efficient than a decentralized risk management solution. However, as mentioned above, moral hazard aspects such as the reduction of risk management efforts due to a too-big-to-fail-feeling may endanger systemic efficiency in these settings.

The regulating institutions are the center of power in the system of regulated consolidation. Ideally, this should reduce potential moral hazard issues in risk management, ensure fair transaction prices for the users, i.e. the users should benefit from exploited scale economies. However, regulation itself is costly so that increasing systemic efficiency will lead to a loss in dynamic efficiency. This system is most notably interesting when static efficiency aspects outweigh dynamic considerations. This may be the case when disruptive innovations are expected to be rather rare in the future and the processes in the industry are settled and stable.

## 6.2 System 2 - Competitive fragmentation

**Description** In contrast to system 1 the market structure of system 2 is rather scattered, i.e. it features polypolistic characteristics including several providers for

trading, clearing and settlement. A high level of competition on all stages of the securities transaction value chain leads to a high rate of technological innovation. The fragmented industry structure necessitates the use of open standards since the users have to undertake co-specialized investments. Open standards and good access possibilities allow for new institutions to enter the market easily whenever they see fit. This is consistent with the high rate of innovation that is increased by such new entrants. The tendency to invest is high since it can be the basis of Schumpeterian rents. The resulting overall investment level is therefore possibly too high when too many uncoordinated investments are undertaken. Over-investment and a resulting bubble can lead to cycles of investments that exacerbate the economic cycle and the ups and downs of financial markets.

The ownership of these firms rests in private hands since that is the most efficient incentive tool to sustain the needed rate of technological progress to keep this system stable. The role of the regulators is very subdued: Any exaggerated activity by them would lead to a lowering of investment incentives for the private companies that then would have to fear a meddling of the regulators. The only activity they should engage in is to ensure the open access. Self-regulation by the competing providers is a means for them to differentiate themselves from their competitors and attract more users and a better competitive advantage. The epicenter of power lies with the privately owned providers or with the users. The tendency for vertically integrating the securities transaction value chain is low: Cross-subsidies from one stage to the next are not possible due to the fierce competition on each stage and the reluctance for change in such a vertically integrated institution that is faced with cannibalizing its own success whenever new processes or products occur makes it a suboptimal solution.

Figure 3 provides an illustration of the industry setting as well as the position of the power center.

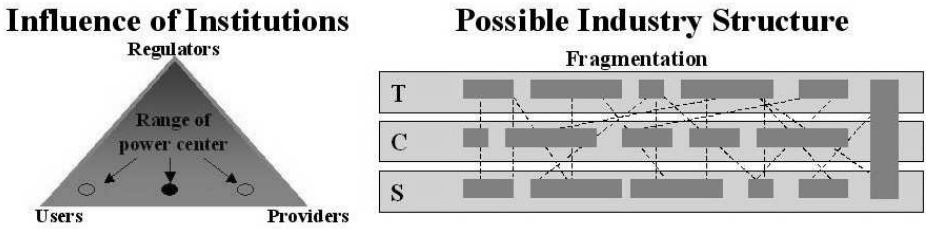


Figure 3: TCS-System 2: Competitive Fragmentation

**Efficiency analysis** *Static efficiency* is low in this setting. The relatively small size of the providers does not allow for the harvest of network, scale and scope economies. Consolidation efforts exist, but a constant stream of new industry entrants armed with new, innovative products and services prevent the creation of one dominant monopoly. A system with several relatively small market participants prevails.

*Dynamic efficiency* on the other hand is high due to fierce competition and low entry barriers of the market. Open communication standards ensure that providers with better services will be able to offer their service to users without being strongly hampered by established providers. Even users such as banks can effectively threat providers to internalize transactions should they not be satisfied with existing products and services. An exact configuration of the elements is necessary to keep this system stable between two countervailing forces. On the one hand, an industry

setting with open standards may not provide enough incentives for the providers to develop the standardized technology further due to free-riding inducements. On the other hand, uncoordinated investments can lead to value destruction when too much is invested in boom times of a cycle. The system has therefore to strike a delicate balance between this under- and overinvestment problem.

*Systemic efficiency* is rather high. Although this setting has no (public) regulator but is mainly self-regulated, the robustness in the provision of securities transaction possibilities is nevertheless quite high. The driving factor is the competition among providers, in this case, the competition for the most stable and secure transaction system. Thus, infrastructure providers have an incentive to compete on quality and create a safe TCS-environment for their clients. However, an important precondition for this scenario is the transparency of the providers' risk management efforts to the users. If it is difficult for the latter to evaluate the quality of risk management, the providers may have the adverse incentive to boost profitability by cutting down on costly risk management procedures and endanger systemic efficiency. This race-to-the-bottom effect may be prevented by a user-dominated governance structure.

Another positive aspect of the competitive fragmentation on systemic efficiency is that the fragmented market structure which is characterized by high levels of infrastructure redundancies and open standards enables a relatively easy re-routing of transactions in emergency cases. Ample substitution possibilities for the users and low switching costs due to open communication standards ensure systemic robustness in times of the failure of one institution. However, depending on the nature of an adverse systemic event, contagion between the different transaction systems may occur and thus neutralize the positive redundancy aspects.

A system of competitive fragmentation is particularly interesting in a dynamically changing environment when returns on innovations are high and static efficiency considerations are dominated by dynamic efficiency aspects.

## 6.3 System 3 - Contestable monopolies

**Description** There are two crucial characteristics to the third system we propose: (1) the market for infrastructure providers is more or less consolidated and (2) communication between the industry participants - both horizontally and vertically - is performed via open standards. New entrants into the market are able to communicate with the others and are granted access to established providers. The efficient size with respect to scale and scope economies limits the number of direct competitors on each horizontal stage and natural monopolies prevail. Vertical integration is rather detrimental in such a system since the monopoly positions on different stages could be used strategically by the providers to re-enforce rent extraction possibilities in other activities to the disadvantage of the users. Two possibilities exist by which such behavior can be ruled out: For one, a public regulator can ensure open access and can limit any vertical integration attempts. For the other, the users themselves can mutually own the necessary infrastructure and restrict such behavior by the management of the provider in question. Depending on which concept is used to restrict the infrastructure provider to capture too large a slice of the economic rents, the epicenter of power is somewhere between the regulators and the users.

Open standards and guaranteed access allow new entrants to enter the market and thereby limit the rent appropriation potential of the incumbent further. With better products or processes they are in a good position to challenge the incumbent and to gain the upper hand eventually. The rate of technological progress and innovation is therefore higher than in system 1 of a regulated monopoly. The investment propensity and also total investment are higher since the incumbent has to keep up with the innovative progress or risks to become obsolete and to lose his

position to an upstart. Again, self-regulation can be a means of competition with the better quality and stability gaining an advantage. This allows to reduce the public regulation and the costs associated with it.

Figure 4 shows three idealized industry settings in analogy to system 1. The firms with dashed lines illustrate potential new entrants into the industry.

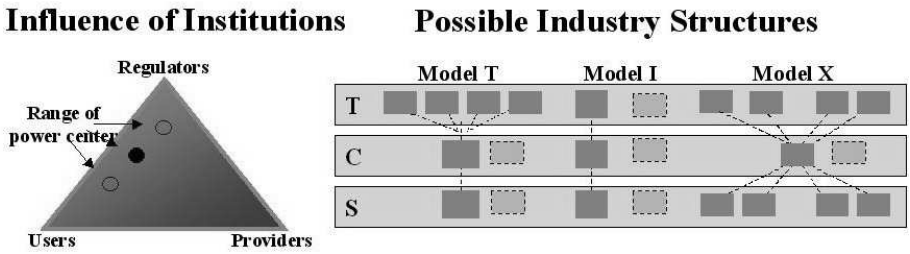


Figure 4: TCS-System 3: Contestable Monopolies

**Efficiency analysis** *Static efficiency* in a system of contestable monopolies is enhanced in this setting due to the high level of consolidation in the three stages of the value chain.[44] The existence of a quasi-monopolistic infrastructure enables full exploitation of existing economies of scale and scope and network effects. Static efficiency gains are passed on to the users in this system as each level on the value chain is contestable to market entries due to open communication standards. Furthermore, the costs of regulation can be kept to a minimum and is not distorting investment incentives for the providers.

*Dynamic efficiency* is also high and is achieved by the open standards architecture which results in contestability in each activity and low barriers to entry. This prevents the existing monopolist from appropriating large portions of a monopoly rent as potential entrants with better service offerings pose an effective threat. Nevertheless, some barriers to entry still exist such as liquidity in a certain security on the trading level, and allow a monopolist to reap rents from his dominant market position. These rents further ensure that the incumbent has a strong incentive to maintain this position and react to the incentives provided thereby. As mentioned in section 5.2, there are also some drawbacks to open communication standards with regard to dynamic efficiency aspects such as potential free-riding behavior in the development of innovations.

*Systemic efficiency* is high in this system. The setting benefits from its two main characteristics of being rather consolidated and having open communication standards. The former aspect enables the industry to centralize its risk management at one institution while the latter ensures competition for the most stable transaction system so that the quasi-monopolist is forced to maintain a high quality of risk management in order not to lose users to other providers. Additionally, open communication standards enable a wider proliferation of knowledge on the transmission of transaction data. As communication becomes common knowledge, it is likely that market participants react faster and better on systemic emergency events. However, contestability of the market may also bring along adverse aspects such as the aforementioned race-to-the-bottom incentives for the provider. An effective no-bail-out commitment by governments or central banks may prevent the monopolist from assuming himself to be too-big-to-fail.

[44] We again limit ourselves to analyze the efficiencies of model I as the findings hold also true for the less extreme models in a weaker manner.

## 6.4 Comparison of the systems

The three systems described above are all consistent systems that maximize social welfare in the sense that no small deviation from the configuration of its elements would lead to further improvements. In this section we compare the three systems and evaluate their relative merits and drawbacks. In particular we pose the following questions:

- How stable are these three systems when small deviations from the optimal configuration occur and how likely is a system to deteriorate into an inconsistent system that is inefficient given the micro-motives of the different institutions?
- Which of these three system dominates the other two systems when social welfare is to be maximized, i.e. which system is the global optimum?

**Stability of the systems and the threat of inefficient systems** The system of *regulated consolidation* is very stable and not in danger of falling apart easily once its elements are configured in a consistent way. By its ownership of the infrastructure providing institutions or by the power it devolved to its regulating institutions the government commits credibly to stay in this system. New entrants cannot upset this system and the incumbent monopolist has only weak incentives to engage in innovative activities. The stability itself puts a positive feedback into the system since long-range planning and routinization become possible that lower the cost imposed by regulation.

The system is little prone to deteriorate into an inefficient system: In many European countries dominant regulated monopolies along the securities transaction value chain ensured that the underlying economies of scale and scope could be reaped without incurring too big a social welfare loss due to efficient regulation. By striking the right balance between these costs, securities trading, clearing and settlement in national markets is highly efficient, at least from a static and systemic point of view. The past has shown that such a system needs a very big shock - like the integration of formerly apart financial markets into the single European one - to overcome its inertia.

The system of *competitive fragmentation* is not very stable and small deviations from the consistent configuration can lead to a deterioration into an inefficient setting. If, for example, too much uncoordinated investments are undertaken, the problem of over-investing arises. If a bubble builds and pops subsequently due to any sufficient macroeconomic shock, it can force these investors to sell many assets below their value. Many providers become insolvent and are forced to leave the industry. A consolidation process is started by the institutions that are in a better position.

These institutions start to consolidate horizontally to achieve greater economies of scale and increase the degree of static efficiency. They also integrate vertically to safeguard this horizontal expansion and to leverage the resulting market power. Since all institutions concentrate on getting financially sound again, the rate of technological innovation drops, new entry looks less attractive and the whole system can transire to one of the other systems or falls into inefficiency if no regulation is introduced, to keep the market contestable or if the ownership is reorganized to a more mutual structure (which is the less likely possibility). The surviving institutions can extract too much of the economic rent and their monopoly power is not compensated by a regulating institution.

The system of *contestable monopolies* is equally hard to sustain. A monopolist on one stage of the securities transaction value chain for example, might be tempted to integrate forwards or backwards. Such a merger of two dominant monopolies

might look good at first sight: By integrating the two institutions the communication between them can be streamlined and straight-through processing might be facilitated to the benefit of the users. Open access is guaranteed by the acquiring institution and formally assured by the small regulator. However, the realization in practice might look different and many potential entrants are deterred by the more entrenched position of the merged institution. The combined provider itself can therefore rest more easily and does not have to engage in as many development activities as would be necessary in a consistently configured system as described in section 6.3. The institution can instead divert its efforts towards rent-seeking and engage in investments in the 'open' communication standard that slightly favors its own business. If regulation is not adjusted accordingly towards a stronger regime, such an institution can lower the overall amount of economic rent that is generated thereby decreasing social welfare. At the same time it can gain an economic rent that is bigger than in a consistently configured system.

Like the system of competitive fragmentation the system of contestable monopolies is prone to deteriorate when even small deviations from the consistent configuration occur. The micro-motives of the infrastructure providing institutions will generally lead to a situation in which a monopoly prevails that is entrenched by vertical integration, a proprietary communication standard and an ownership structure that places too little weight on the benefit of the users and society as a whole. Such a mixture of different configurations will not maximize overall welfare.

**Evaluation of the systems and global optimum** Sofar we have not said if one of the idealized system is better than the others. Calculating an exact figure for social welfare in each of the three systems is nearly impossible: Too many parameters would need to be measured and too many errors would be made in measuring the efficiency of the involved institutions. We therefore restrict ourselves to indications only. Which of the three systems might be the global optimum that dominates the others? The system of regulated consolidation produces at an efficient level so that economies of scale and scope can be reaped. However, it fares poorly when dynamic aspects of efficiency are taken into account. No investment incentives are set and the cost of regulation or public ownership further decreases the overall welfare generated by this system.

The system of competitive fragmentation scores especially when these aspects of dynamic efficiency are important. However, due to the small scale of the providing institutions too little of the underlying economies are utilized. The system suffers also from the coordination problem between the many institutions so that too many duplicate and incompatible investments are undertaken. The system of contestable monopolies does not have these drawbacks once configured in a consistent way: The small number of institutions deploys the underlying economies of scale and scope and the limited role of the regulator ensures that these costs are kept to a minimum as well. The market stays open for new entrants so that improvements due to innovations need not to be forgone.

This guesstimate leads to the conclusion that the third system of contestable monopolies is the best and should be implemented when possible. A caveat however must be applied since this system is of rather instable nature and prone to slide down towards an inefficient system of unregulated monopoly.

# 7 The transition of the securities transaction industry in the EU

The introduction of the Single European Market was a strong catalyst that upset the system of regulated consolidation that many European countries had in place. Many features of the established system were suddenly and simultaneously changed. By simply opening the markets and leaving all else unchanged, the result however is inefficient. Too many inconsistent configurations of important elements are in place: Too many regulators increase the costs and thereby decrease social welfare. Publicly owned or heavily regulated institutions do not have the incentives to make the right decisions. And previously vertically integrated institutions can bar others from using parts of their infrastructure. Divergent objectives of the many regulators or even unhealthy competition between them decreases efficiency even further.

The response by many regulators was therefore to withdraw a bit and let the market mechanism work. The system in the securities industry in the European Union in the 1990s therefore had some characteristics of the system of competitive fragmentation: The rate of innovations like automated trading and the demutualization of exchanges increased dramatically and many new entrants tried to do business in the industry. The total amount of new investments was high and duplication of investments occurred in the process of battling for the dominant position in a segment of the market. The users were fully aware of the costs imposed by the incompatible communication standards between the national institutions and tried to shape the industry to their liking.

Now that the investment boom is over and the rate of technological progress has receded a bit, the securities industry in the European Union is again at a crossroads. The rate of consolidation - horizontally as well as vertically - remains high and many unsuccessful ventures were forced to close down and leave the industry. New entrants that could keep up the pressure to innovate are not to be seen. The surviving providers try to entrench their monopoly position by vertical integration and proprietary communication standards.

It is an open question how and if their rent appropriation possibilities will be countered either by tougher regulation that would put the European securities industry back to a system of regulated consolidation or whether the users of the infrastructure can ensure together with a cut-down regulatory institution that the system of contestable monopolies can be reached. It is very crucial that a consistent configuration of key parameters of our framework is achieved to avoid a system with a quasi-unregulated monopoly which might be preferred by infrastructure providers but certainly not by the users and society at large.

# References


de Bandt, O., and P. Hartmann (2000): "Systemic Risk: A Survey," *ECB Working Paper Series*, 35, 1 – 77.

Deutsche Börse Group and Clearstream International (2002): "Cross-Border Equity Trading, Clearing and Settlement in Europe," .

Diamond, D. (1984): "Financial Intermediation and Delegated Monitoring," *Review of Economic Studies*, 51, 393 – 414.

Domowitz, I., and B. Steil (1999): "Automation, Trading Costs, and the Structure of the Trading Services Industry," *Brookings-Wharton Papers on Financial Services*.

Economides, N. (1993): "Network Economics with Application to Finance," *Financial Markets, Institutions and Instruments*, 2, 89 – 97.

Economist (2003): "Plus ça change," *The Economist*, August $16^{th}$, 2003.

European Monetary Institute (1997): "The single monetary policy in stage three: Specification of the operational framework," Discussion paper, European Monetary Institute.

Fabozzi, F. J., F. Modigliani, and M. G. Ferri (1994): *Foundations of Financial Markets and Institutions*. Prentice Hall International Editions, London.

Franck, E., and C. Jungwirth (2002): "Reconciling investors and donators - The governance structure of open source," *Universität Zürich, Working Paper No. 8*.

Giddy, I., A. Saunders, and I. Walter (1996): "Alternative Models for Clearance and Settlement: The Case of the Single European Capital Market," *Journal of Money, Credit and Banking*, 28(4), 986 – 1000.

Giovannini Group (2001): "Cross-border clearing and settlement arrangements in the European Union," Discussion paper, European Commission.

——— (2003): "Second report on EU clearing and settlement arrangements," Discussion paper, European Commission.

Global Custodian (2003): "Who forgot that CCPs increase transaction costs?," *Global Custodian*, pp. 51 – 58.

Hackethal, A. (2000): *Banken, Unternehmensfinanzierung und Finanzsystem*. Peter Lang, Frankfurt/Main.

Harris, L. E. (1991): *Liquidity, Trading Rules, and Electronic Trading Systems*. New York University Salomon Center, New York.

Holtfrerich, C.-L. (1999): *Finanzplatz Frankfurt*. C.H.Beck.

Holthausen, C., and J. Tapking (2003): "Raising Rival's Costs in the Securities Settlement Industry," *European Central Bank Working Paper*.

Kahn, C. M., J. McAndrews, and W. Roberds (2003): "Settlement Risk under Gross and Net Settlement," *Journal of Money, Credit and Banking*, 35(4), 591 – 608.

Lannoo, K., and M. Levin (2001): "The securities settlement industry in the EU - Structure, costs and the way forward," *CEPS Research Report*.

Lee, R. (1998): *What is an Exchange? The Automation, Management, and Regulation of Financial Markets*. Oxford University Press, Oxford New York.

Malkamäki, M. (1999): "Are there Economies of Scale in Stock Exchange Activities?," *Bank of Finland Discussion Papers*.

Milgrom, P., and J. Roberts (1990): "The Economics of Modern Manufacturing: Technology, Strategy and Organisation," *American Economic Review*, 57, 511 – 528.

Milne, A. (2002): "Competition and the rationalisation of European securities clearing and settlement," *Working Paper City University Business School London*.

Rey, P., and J. Tirole (2001): "Financing and Access in Cooperatives," *Working Paper*.

Schmiedel, H., M. Malkamäki, and J. Tarkka (2002): "Economies of scale and technological development in securities depository and settlement systems," *Bank of Finland Discussion Papers*.

Schwarz-Schilling, C., and M. Wahrenburg (2003): *Regulating Competition between Stock Exchanges,* chap. in: Regulierung, Wettbewerb und Marktwirtschaft, Festschrift für Carl Christian von Weizsäcker, pp. 232 – 251. Verlag Vandenhoeck & Ruprecht.

Shapiro, C., and H. R. Varian (1999): *Information Rules*. Harvard Business School Press.

Theissen, E. (2002): "Internalisierung und Marktqualität: Was bringt XETRA Best?," *Kredit und Kapital*, 35, 550 – 71.

Thygerson, K. J. (1993): *Financial Markets and Institutions - A Managerial Approach*. Harper Collins College Publishers, New York.

Topkis, D. M. (1998): *Supermodularity and Complementarity*. Princeton University Press.

Van Cauwenberge, S. (2003): "New Structure for Clearing and Settlement Systems in the EU," *Financial Stability Review*, pp. 83 – 103.

Weitzel, T., S. V. Martin, and W. König (2003): "Straight Through Processing auf XML-Basis im Wertpapiergeschäft," *Wirtschaftsinformatik*, 4.

Williamson, O. E. (1985): *The Economic Institutions of Capitalsm*. The Free Press.

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