

Switzerland's Financial Infrastructure: Today and Tomorrow*

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Summary: This paper delves into the question of the driving forces behind financial infrastructure developments, both in Switzerland and globally. Firstly, the case of the „Swiss value chain“, its home market and its pan-European reach, will be presented. As the case of virt-x or Eurex demonstrates, the domicile of trading platforms at the case of, is no longer bound to a traditional home market. We then proceed to a broad discussion of the economic factors that shape the European landscape. Liquidity and network effects are pushing trading platforms towards centralisation. For clearing and settlement providers and their reliance on regulatory framework conditions, mobility is more restrained, at least in the case of Switzerland. Market imperfections on both the supply and demand sides provide a multilayered picture of the driving forces of evolving market structures. In view of the significant implications of imperfect competition, the role of government is then discussed. Finally, future issues and challenges for Switzerland's globally oriented financial infrastructure are analysed. Transparency of pricing structures and free access to infrastructure providers remain important challenges for government policies.

Zusammenfassung: Dieser Artikel untersucht die für die Entwicklung der Finanzmarktinfrastrukturen bedeutenden Faktoren unter besonderer Berücksichtigung des Schweizer Finanzsektors. Als erstes wird die sog. „Swiss Value Chain“, d.h. der Handel und die Abwicklung von Wertpapiergeschäften und ihre Einbettung im europäischen Umfeld veranschaulicht. Mit virt-x und Eurex befinden sich zwei wichtige Handelsplattformen des Schweizer Finanzsektors im Ausland. Anschließend werden die ökonomischen Faktoren diskutiert, die auf die Entwicklung der Finanzmarktinfrastrukturen einen prägenden Einfluss ausüben. Eine größtmögliche Liquidität sowie die Existenz substantieller Netzwerkeffekte ergeben einen Druck in Richtung Zentralisierung des Wertschriftenhandels. Beim Clearing und Settlement ist die Mobilität der Anbieter – zumindest für den Fall der Schweiz – aufgrund ihrer Abhängigkeit von den regulatorischen Rahmenbedingungen eingeschränkt. Marktunvollkommenheiten und Marktversagen auf der Angebots- wie auch auf der Nachfrageseite haben zur Folge, dass der Wettbewerb nur in einem beschränkten Maß funktioniert. Daher wird im Weiteren die Rolle des Staates als Regulator im Bereich der Finanzmarktinfrastuktur diskutiert. Der Artikel schließt mit einer Darstellung der künftigen Herausforderungen, denen sich die international orientierte Schweizer Finanzmarktinfrastuktur zu stellen hat. Transparenz in der Preisfestlegung und der freie Zugang zur Infrastruktur stellen dabei wichtige Anforderungen an die Wirtschaftspolitik dar.

* The views expressed do not necessarily reflect the official position of the office or federal department. The authors themselves are responsible for the assumptions and any errors that may be contained in the work. This paper is based on a longer study by the authors (see references).

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1 Introduction and Political Implications

Forming the backbone of securities and derivatives transactions as well as of financial asset gathering and management, financial market infrastructure is a key element of Switzerland's financial system. Ongoing disintermediation¹ in the financial sector has increased the importance of financial infrastructure in recent years. The goal of this article consists of presenting an overview to this topic. The analysis is based on an evaluation of relevant literature in this area and on interviews with representatives of infrastructure providers, regulators, banks and insurance companies. Financial market infrastructure consists basically of three elements: the stock exchange, the clearing and settlement provider and the gross settlement payment system. The larger network includes banks and their customers.

Given the role of national flagships, there is a risk that politics tend to intervene in the consolidation of financial market infrastructure. It is, however, desirable that consolidation be primarily market-led, with the role of government restricted to the supervisory tasks mentioned below. Technology opens up new avenues for competition between financial infrastructures, at least at a European level. The complex interaction of different economic factors, such as network effects, sunk costs, externalities, returns to scale and scope, the principal agent problem, public goods aspects of stability, home bias and technological progress causes constant and unpredictable change, leading to a situation where no one single business model can claim superiority. The existence of differing organisational structures and full transparency (in pricing for example) can contribute to a competitive environment only to a certain degree. This highlights the need for a comprehensive anti-trust policy and also for enlarged cooperation between competition and regulatory authorities for the transfer of know-how.

This article is structured as follows: the second section describes the financial market infrastructure in Switzerland with its vertical and horizontal interlinkages, its main functions and the issue of corporate governance. Section Three deals with economic characteristics of the infrastructure, on the supply as well as on the demand side. Market failures such as the natural monopoly characteristics of infrastructure services, externalities or asymmetric information, point to the need for some form of regulation and surveillance. In Section Four we therefore go on to examine the role of government as the incumbent regulator. Finally, section Five highlights some important issues for future consideration. This article concludes with a discussion of optimal size, domicile of infrastructure service providers, corporate government issues, and the growing importance of international interlinkages in light of increased volume of cross-border transactions.

2 The "Swiss Value Chain"

In terms of stock market capitalisation, the Swiss Performance Index has grown from CHF 261 billion in 1989 to CHF 780 billion in 2004. In an international comparison of market capitalisation, Switzerland ranks 10th (by turnover 9th).² Switzerland is home to some of

¹ Definition of disintermediation: the removal of an intermediary from a transaction. For example, capital markets represent a substitute for the traditional bank lending and savings function. Financial infrastructure provides part of the logistics for capital markets. Investment banking, which is based on capital market transactions, stands therefore in competition with the traditional bank-lending model.

² Source: SWX at weblink: www.swx.com/market/statistics/annual_data/securities_en.html

the world's largest multinational companies, which cover a large part of their capital requirements through the Swiss financial infrastructure. The stocks of the five largest Swiss multinationals by market capitalisation generated almost 60% of total turnover in 2004.³ As a global financial centre, assets under management in 2004 amounted to almost 3,500 billion Swiss francs, of which approximately 57% belong to foreign customers.⁴ The Swiss financial centre and its financial infrastructure are of international significance in the distribution of financial assets. Employment in the three main financial infrastructure utilities totals approximately 1.6% of total financial sector employment⁵ that is, 3,000 full-time jobs.⁶

Infrastructure services in Switzerland are provided by three independent entities (see Figure 1 below). However, ownership structure is more or less the same for all of the three entities. Infrastructure providers were originally established by banks in order to reap economies of scale with the underlying idea that customers (i.e. banks) are owners and owners are customers. This kind of vertical integration of services is not so different from a "silo" approach where all infrastructure services are provided by one single firm as e.g. in Germany with the one important difference being, that the main business objective of Swiss infrastructure providers' is cost minimisation rather than profit maximisation.⁷

In general, the rules of interaction between the stakeholders of financial infrastructure have undergone changes in recent years, reflecting a shift in the competitive environment among banks caused by technological progress and disintermediation. Previously banks had, in most cases, joint control over financial infrastructure elements. This model has come under pressure recently, resulting in a series of demutualisations. A certain degree of homogeneity of interests is a pre-condition for the functioning of a mutual. In an environment without common commercial interests, it is almost impossible for mutuals to make strategic decisions. In extreme cases mutuals operate on unanimity. Another source of pressure on established governance structures comes from institutional investors, such as pension funds or insurance companies.

At the trading level, three providers operate jointly under the roof of SWX-Group⁸, an incorporated company owned by an association of banks. Whereas the Zurich-based Swiss Exchange (SWX) trades mainly Swiss small and mid caps, warrants and bonds, the Swiss blue chips are traded on the London-based virt-x. An important reason for the creation of a Swiss stock exchange offshore was the avoidance of the stamp duty levied on the sales/purchases of securities in Switzerland. Another reason was to halt the trend of secondary trading of Swiss blue chips on the London Stock Exchange. The third element is Eurex, a

3 Source SWX: Nestlé, Novartis, UBS, Roche and Credit Suisse Group

4 G10-Report on Consolidation in the Financial Sector, BIS (2001).

5 I.e. 183'900, ref. "Figures on Switzerland as a location for financial services", Swiss Federal Department of Finance, Bern 2005, webpage: www.efd.admin.ch/e/dok/zahlen/finanzplatz/index.htm

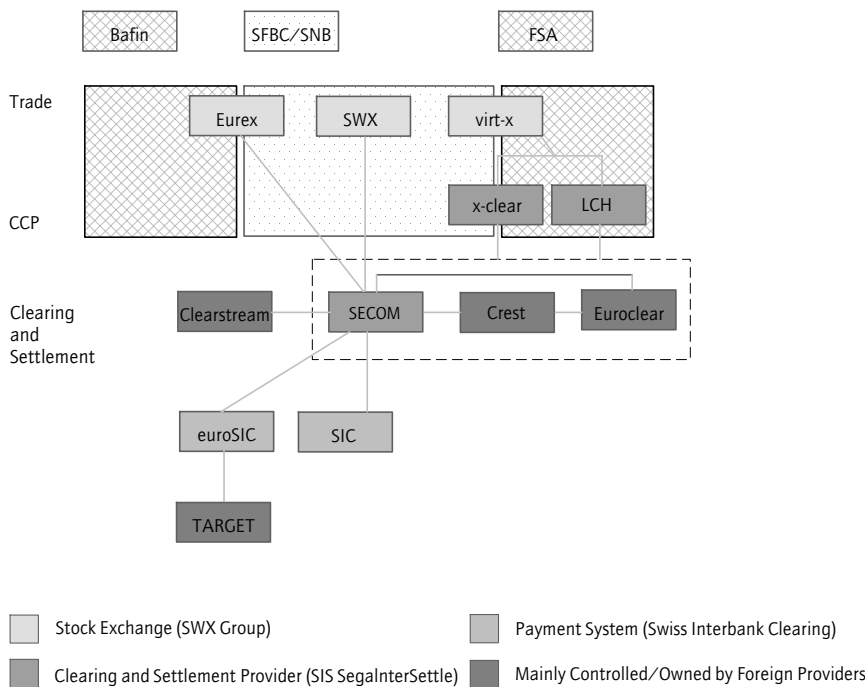
6 Annual Reports of SWX, FSG and Telekurs Group (2004).

7 In competitive markets, profit maximisation implies automatic pressure to lower costs in order to maximize profits.

8 In 1995, the stock exchanges of Basel, Geneva and Zurich merged into the Swiss Exchange based in Zurich. In 2003, virt-x, the Swiss trading platform for blue chips, was founded in London. SWX and Deutsche Börse co-own Eurex, the world's largest derivative trading platform. The 'BX Berne eXchange' is a local exchange, which since 2002 has been running an electronic platform recognised by the Swiss Federal Banking Commission (SFBC) as an organisation similar to stock exchanges.

Figure 1

Swiss Value Chain and International Supervisory Arrangements of the Trade Infrastructure



Abbreviations: Bafin = Bundesaufsichtsamt für Wertpapierhandel, SFBC = Swiss Federal Banking Commission, SNB = Swiss National Bank, FSA = Financial Services Authority, CCP = Central Counterparty, LCH = London Clearing House.

Source: Authors.

joint venture with Deutsche Börse located in Frankfurt. Eurex has become the largest trading platform in the world for derivatives and repurchase agreements (“repos”).

Domestic transactions, consisting of sales or purchases executed on SWX, are cleared and settled by SECOM.⁹ The execution of a securities transaction is vertically integrated. In contrast, investors trading on virt-x can either choose x-clear or the London Clearing House (LCH) for clearing and choose SECOM, Crest or Euroclear for settlement. X-clear, which is a subsidiary of SegalInterSettle (SIS), acts as a central counterparty (CCP). A CCP is an entity that interposes itself as buyer to every seller and as seller to every buyer. A CCP reduces risk for buyers and sellers and thus allows for a smooth functioning of the market. Settlement within the Swiss infrastructure is mostly conducted by the Central Securities Depository (CSD), an entity which holds and administers securities and enables

⁹ Clearing is the process of transmitting, reconciling and, in some cases, confirming payment orders or security transfer instructions prior to settlement, possibly including netting of instructions and the establishment of final positions for settlement. Settlement is the act which discharges obligations with respect to funds or securities. Source ‘Giovannini Group’ (2003).

securities transactions to be processed by book entry. The main function of the CSD is the safekeeping of securities, which are registered under the name of an intermediary (e.g. banks). Whereas the CSD plays the role of custodian for intermediaries, safekeeping and the administration of financial assets on behalf of the end-customer is not carried out by the CSD, but by custodians downstream, such as banks. As asset management plays a crucial role in Switzerland, it goes without saying that the CSD is of paramount importance to the Swiss financial sector.

Swiss Interbank Clearing (SIC) is the third element of the Swiss financial infrastructure. With EuroSIC, which is based in Frankfurt, SIC has a link to TARGET, the trans-European automated real-time gross settlement transfer system.

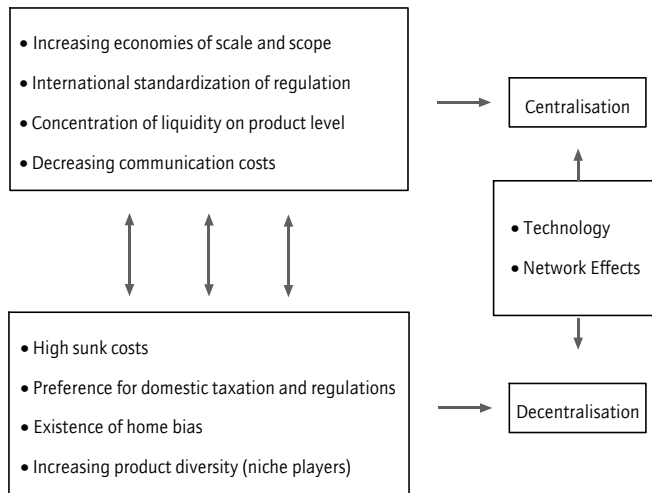
Trading, clearing and settlement are closely interconnected. The Swiss value chain provides a technologically sophisticated package for their clients where all the necessary steps, from the purchase or sales order to the completion of the securities transaction, are executed in *straight-through real time processing*. From a technical point of view, this procedure is highly efficient and makes an important contribution to the competitiveness of the Swiss financial sector. Furthermore, the Swiss value chain allows for straight-through processing, which in turn, minimises risks related to securities transactions, such as liquidity or credit risk. The Swiss financial market infrastructure is a mixture of a vertically-integrated architecture (domestic transactions) and an open architecture (transactions on virt-x). The Swiss value chain is well linked to important infrastructure systems abroad. Overall, Switzerland's financial infrastructure entities enjoy a relatively strong position, however, the environment is rapidly changing. The fact that investors have become more internationally-oriented leads to increased pressure on costs. Therefore, the consolidation of infrastructure on the European level has gathered momentum in recent years. The next chapter illustrates the main drivers of market structures in order to prepare the ground for analysis of future trends and challenges.

3 Market Failures and Imperfections

One approach to defining financial infrastructure consists of identifying a set of common market imperfections, (or, as the case may be, market failures) that can lead to monopolistic (or quasi-monopolistic) market structures. Natural monopoly features have to be distinguished from 'normal' monopolistic competition, although in practice this distinction is not always clear-cut. The main factors for a strong natural monopoly case are increasing returns to scale and, to a lesser degree, network characteristics. Other market imperfections, such as barriers to entry, can lead to monopolistic windfall gains, producing a sub-optimal outcome. There is a complex interaction of different market imperfections that can be reinforcing or can cancel each other out. Figure 2 gives an outline of the forces shaping the pan-European infrastructure network. Network effects and technology tend to push in both directions, toward centralisation and decentralisation. For example, alternative trading systems (indicative of decentralisation) are prolific in the United States but not in Europe. In the case of the latter, exchanges have incorporated new technology faster than in USA, making possible lowered restrictions on membership. This has allowed European exchanges to gain a first mover advantage. In effect, the use of new technologies simultaneously increased decentralisation in the United States (where alternative trading systems are dominant), while fostering centralization in Europe (where remote members

Figure 2

Drivers of the Pan-European Market Structure



Source: Authors

dominate). Furthermore, product proliferation leaves room for niche players on a pan-European level.

3.1 Supply Side

Increasing returns to scale

This occurs where, in supplying a good or service, the average production cost declines as production increases. A replication of inputs leads to more than a doubling of outputs. When increasing returns to scale are significant, optimally only one service provider should operate in this particular market.¹⁰ Capacity constraints can lead to a situation where increasing returns to scale occur in practice only within a specific quantitative range of production. The bank of banks concept, where a large bank seeks to provide infrastructure services to other banks, is one such example. The need for a critical mass in order to generate positive externalities partly explains market inertia in response to new information technology. The SWX Group has, for example, achieved one of its initial objectives with virt-x – namely, the improvement of scale effects. It has gained back all liquidity of Swiss blue chips trading previously lost to the London Stock Exchange.

Economies of scope and transaction costs

Economies of scope are present in cases where the average cost of a provider declines with an increasing product range. An example is the advantage of one-stop shops in financial services in areas where customers would otherwise face high transaction costs. The

¹⁰ Lanno and Levin (2003) point to significant economies of scale in clearing (CCP) and settlement (CSD). Malkamäki and Topi (1999) show economies of scale in trading.

maintenance of a price system is the main task of a stock exchange, and as such, entails relatively high transaction costs. These have declined considerably as a result of technological progress. There is a tendency for financial intermediaries to spread fixed transaction costs and seek economies of scope by offering a whole range of services. High fixed transaction costs per customer relationship works to increase the effects of economies of scope.¹¹

Sunk costs

A recovery of costs originally incurred in the setting-up of a financial infrastructure is not possible when a company exits the market. This is an example of sunk costs. Market contestability and its positive effects on competition are mitigated by this inhibitor, which can lead to some degree of monopolistic power. In financial infrastructure, sunk costs hinder consolidation between stock exchanges and clearing and settlement systems. Financial networks need common standards in order to operate effectively. This is the case of stock exchange IT-platforms and their interlinkage with the trading back-offices of banks, for example. In the merger of two stock exchanges, one of them must write down its technological assets (such as IT) to zero and incur sunk costs. Furthermore, all broker connections would, in such a scenario, have to be renewed. In an environment where banks are owners of financial infrastructure entities, sunk costs represent an important inhibitor to consolidation.

Network effects as a positive externality

The consumption utility of a good increases when the good is used by an increasing number of individuals. This results in a positive externality, where the willingness to pay depends on the number of other consumers in the market. This is the case, for example, with stock exchanges. Network effects enhance market liquidity and are therefore an important factor in strengthening price continuity. An important aspect of network externalities is the attainment of a critical mass. This implies that a supplier of a service has to generate a certain turnover in order to keep the service going. The failure to achieve a critical mass explains why new providers often fail even if their services are superior to a potential competitor. The need to attain a critical mass is an important barrier to entry, which in itself fosters the so-called 'first mover advantage'. Virt-x has failed in its objective to become a pan-European stock exchange. Support from brokers and banks has not been strong enough to gain a critical mass in setting up a trading book of European blue chips. This example shows that banks and brokers are an integral and crucial part of an exchange network.

Network effects and monopolistic characteristics depend on the interconnectivity of the network. Closed networks without access to other providers foster monopolistic structures through their barriers-to-entry effect. Traditional stock exchanges are not interconnected, but operate on a stand-alone basis. However, access for remote members creates a certain degree of competition, albeit insufficient to overcome network effects. Networks generate

11 Regulation often entails fixed costs. In a context of anti-money laundering laws, the required extensive financial information gathering exercise for each customer causes an increase in fixed costs. To set up a trading account for a customer the bank has to incur this cost.

positive externalities in a competitive environment, where access is available to different providers.

Systemic risks as negative externalities

Financial stability has the characteristics of a public good. Private sector solutions and the freerider problem (i.e. the impossibility of exclusion) can lead to an undersupply of a service. Parts of financial infrastructure are, by definition, systemically important.¹² The implications of instability for reputation increase the potential damage to the financial system.

3.2 Demand Side: Home Bias

In order to optimise risk/return ratios, modern portfolio management theory would be likely to predict stronger (although declining) international asset diversification than that which exists today. One reason brought forward to explain this home bias is information asymmetries on the part of investors. The closer the investment target is geographically to the investor, the easier it is to access relevant information. The efficiency of modern financial infrastructure has, to a certain extent, achieved lower transaction costs. However, regulation and, even more notably, taxation, still differ from one country to another. Capital investment restrictions for pension funds restrict full global diversification to some extent. Taxation issues limit the use of a single EU passport for financial service providers. These are factors that limit, at least in part, the potential gains to be had from rapid consolidation of financial infrastructure in Europe.

4 The Role of Government

The role of government has to be seen against the background of the previous discussion on market failure and imperfections. Financial markets in general are tightly regulated. Swiss, German and British legislation, self-regulation, international standards, EU-directives and taxation all influence the business environment of, for example, Swiss financial infrastructure companies. A special challenge for national regulators is the dynamic of international cooperation (see Figure 1). Note that virt-x is supervised jointly by the Swiss Federal Banking Commission (SFBC) and the Financial Services Authority (FSA), while Eurex is overseen by the SFBC and Bafin. In view of the complexities of a changing competitive environment, the role of non-financial sector specialised anti-trust authorities has become increasingly important. In the case of Switzerland, this role is fulfilled by the Competition Commission. The three main issues for government can be summarised as follows:

- Firstly, as the discussion in Section Two on market failures and imperfections has demonstrated, elements of a natural monopoly can play a role in the provision of infrastructure services, although the degree of natural monopoly depends on the kind of service provided, technological progress and regulation. This calls for an appropriate supervision of infrastructure providers according to the competition authority. Equal access to infrastructure services for market participants and prosecution in case of exploitation of

¹² See Swiss National Bank (2005: 38 et seq.).

monopolistic power are key issues here. Furthermore, aspects of competition are also relevant for bank-for-banks services, as large banks might exploit their market power in this segment.

- Secondly, the systemic importance of a clearing, settlement and payment system points to the problem of external costs for the whole economy in case of a breakdown of such a system. The main feature of these systems is that they may trigger or channel the spread of a systemic crisis and thus jeopardise the stability of the financial system, as a whole. Therefore, SECOM, SIC and the central counterparty x-clear are of systemic importance. The smooth functioning of these systemically important infrastructure elements is a key prerequisite for the implementation of monetary policy. The financial market does not fully assure the stability of the financial system, as infrastructure providers might not take all the necessary precautionary measures to prevent such a breakdown, since they would not incur all costs involved in case of a system failure. It is therefore incumbent upon an independent regulatory body to take up this task. In Switzerland's case, it is mainly the central bank (SNB)¹³ that is responsible for supervision in this area.
- Thirdly, asymmetric information is an issue not only in the financial sector in general, but also in the provision of infrastructure services. For this reason, banking supervision (by the SFBC) extends to infrastructure providers. SIS SegaInterSettle, the operator of SECOM, and SIS x-clear are licensed as Swiss banks and thus supervised by the SFBC.

5 Future Issues and Challenges

The landscape of financial market infrastructure is rapidly changing. With its open architecture on the virt-x side, the Swiss infrastructure has a significant advantage. Future trends in financial markets are tending in the direction of a more horizontally-open infrastructure, a structure that allows for more competition in this area. Nevertheless, one important issue is optimal size, which is closely related to the question of the actual location of the financial market infrastructure. Stock exchanges, which endeavour to attain a critical mass in order to exploit economies of scale and scope, are currently under more pressure to consolidate than are the fragmented clearing and settlement systems (which are still somewhat protected by technical, regulatory and fiscal barriers). As trading and post-trading activities are closely interlinked, a merger between SWX and another stock exchange could have a significant impact on the Swiss clearing and settlement provider SIS¹⁴. If, for example, SWX merged with a stock exchange owning a vertically integrated structure, a substantial risk could arise that trades executed on the merged stock exchange would be cleared and settled within this silo. As a result, SIS would lose volume. The recent discussion of a possible merger with Deutsche Börse could have gone in this direction. Moreover, a merger with a profit-oriented business model such as Deutsche Börse, had it taken place, would have raised issues of corporate governance and would have emphasised the need for strengthening anti-trust policy.

¹³ Supervision of systemic stability is as well a responsibility of the SFBC.

¹⁴ See Ammann (2004).

A further challenge stems from the fact that the SWX Group is a self regulatory body. In practice it may be difficult to eliminate cross-subsidisation between regulatory and commercial activities. Cross-subsidisation is even more problematic where factors such as natural monopoly, profit maximisation and vertical integration coincide. In a natural monopoly environment, cost minimisation represents a counter-force to possible rent seeking behavioural tendencies on the part of the provider. Discussions of the cost of securities transactions have to take into account the fact that the provision of services by banks makes up the bulk of overall transaction costs. Therefore, not only characteristics of infrastructure have to be considered, but also the degree of competition of banking services related to securities transactions.

Given the fact that infrastructure services providers enjoy a natural monopoly to some extent, the question of taking appropriate measures to counterbalance monopolistic power arises. In Switzerland, the idea that users of infrastructure are its owners aims at containing possible monopolistic behaviour. However, some categories of users, such as pension funds and insurance companies, are not included in the ownership of infrastructure entities. Furthermore, conflicts of interest among owners, for example between internationally and domestically oriented banks, may weaken the position of ownership vis-à-vis the management. This may give rise to principal agent problems. Furthermore, adequate regulation should be established to ensure equal access to infrastructure services and price transparency. The latter pertains not only to infrastructure services, but also to services provided by banks related to securities transactions, especially in the retail business.

Another aspect that should be considered in conjunction with the consolidation of infrastructure in Europe is the issue of the provider's domicile. As virt-x and Eurex have demonstrated, the location of a trade platform is not a key question for the Swiss financial sector. If access is ensured for Swiss users and quality and price of services are competitive, there is no need for a Swiss domicile. However, a stock exchange located abroad entails an increased dependency on foreign regulation. As asset management plays an important role within the Swiss financial sector, a possible relocation of clearing and settlement abroad could be disadvantageous, as a CSD domiciled abroad would be subject to foreign regulation. This in turn would increase the vulnerability of an important segment of the Swiss financial sector, in view of the fact that the role played by the central securities depository is of crucial importance given the weightiness of asset management in the Swiss financial sector.

Last but not least, the increasing importance of cross-border transactions emphasises the relevance of developments in the area of financial market infrastructure abroad. Therefore, the recent initiative of the European Commission can be anticipated to impact the Swiss infrastructure providers.¹⁵ Although the creation of a level playing field among the differ-

15 European Commission (2004), the Commission emphasises that cost-efficient and safe cross-border clearing and settlement is a prerequisite for a genuine single market in securities in the European Union. As the landscape of clearing and settlement in Europe is still highly fragmented due to differences in the legal, fiscal and regulatory framework and a lack of technical standardization, the Commission aims at liberalising and integrating existing clearing and settlement systems, particularly by providing access rights and removing barriers to cross-border clearing and settlement. Furthermore, the Commission proposes to remove restrictive market practices, to monitor industry consolidation in accordance with the requirements of competition policy and to adopt a common regulatory and supervisory framework. Finally, appropriate governance arrangements should be implemented.

ent providers of clearing and settlement services in the EU will probably be a lengthy and complex process, therefore taking time, interlinkages and competition will nonetheless be enhanced. Direct links to providers abroad are of paramount importance for SIS.¹⁶ As Switzerland is not a member of the EU, there is some risk that SIS might face a competitive disadvantage in comparison with providers domiciled in the EU. However, SIS's counterparts in the EU are expected to have an interest in improving the mutual interlinkages of the systems, as positive externalities can be exploited due to network effects. In sum, trends in financial market infrastructure point to an enhanced interconnectedness in Europe.

References

- Ammann, Christoph (2004): Bankkundengeheimnis und Infrastruktur bedroht. *Schweizer Bank*, 08/04.
- Bruchez, Pierre-Alain, Martin Gisiger and Werner Weber (2004): *Die Schweizer Finanzmarktinfrastuktur und die Rolle des Staates*. Ökonometeam Eidg. Finanzverwaltung Working Paper. 3. Bern.
- Di Noia, Carmine (1998): *Competition and Integration among Stock Exchanges in Europe: Network Effects, Implicit Mergers and Remote Access*. The Wharton Financial Institutions Center Working Paper. 98-03. Philadelphia, PA.
- Domowitz, Ian and Benn Steil (1998): *Automation, Trading Costs, and the Structure of the Trading Industry*. Brookings-Wharton Papers on Financial Services. 33-92. Philadelphia, PA.
- Economides, Nicholas (1993): Network Economics with Application to Finance. *Financial Markets, Institutions & Instruments*, 2 (5), 89–97.
- Economides, Nicholas (1996): The Economics of Networks. *International Journal of Industrial Organisation*, 16 (4), 673–699.
- European Commission (2004): Communication from the Commission to the Council and the European Parliament. Clearing and Settlement in the European Union – The way forward. COM(2004) 312 final. Brussels.
- Financial Services Authority (2000): *The FSA's Approach to Regulation of the Market Infrastructure*. Discussion Paper. London.
- Fischer, Urs and Roger M. Kunz (2001): Structural Changes for Stock Exchanges – Background and Trends. Credit Suisse Economic Briefing. 26.
- Fumeaux, Stéphane and Daniel Heller (1999): Risiken und Kosten in Zahlungs- und Abwicklungssystemen. *Swiss National Bank Quartalsheft*, 3, 34–41.
- Giovannini Group (2001): *Cross-Border Clearing and Settlement Arrangements in the European Union*. Brussels.
- Giovannini Group (2003): *Second Report on EU Clearing and Settlement Arrangements*. Brussels.
- Group of Ten (2001): Report on Consolidation in the Financial Sector. Basel.
- Lannoo, Karel and Mattias Levin (2003): *Clearing und Settlement in der EU: Strukturen und politische Optionen*. Deutsche Bank Research. 258. Frankfurt.

16 SIS is already a direct settlement member of its counterparts in Austria and Denmark and of CREST, Euroclear and Clearstream. SIS intends to establish direct links to other providers. Direct links are more cost-efficient as no intermediaries stand in-between.

- Lannoo, Karel and Mattias Levin (2001): *Clearing und Settlement Industry in the EU. Structure, Costs and the Way Forward*. Centre for European Policy Studies Research Report. Brussels.
- Lee, Ruben (2002): *The Future of Securities Exchanges*. The Wharton Financial Institutions Center Working Paper 02/14. Philadelphia, PA.
- Llewellyn, David (1999): *The Economic Rationale for Financial Regulation*. Financial Services Authority Occasional Paper Series. 1. London.
- Malkamäki, Markku (1999): *Are there Economics of Scale in Stock Exchange Activities?* Bank of Finland Discussion Paper 4/99. Helsinki.
- Malkamäki, Markku and Jukka Topi (1999): *Strategic Challenges for Exchange and Securities Settlement*. Bank of Finland Discussion Paper 21/99. Helsinki.
- Malkamäki, Markku, Heiko Schmiedel and Juha Tarkka (2002): *Economies of Scale and Technological Developments in Securities Depository and Settlement Systems*. Bank of Finland Discussion Paper 26/02. Helsinki.
- NERA Economic Consulting (2004): *The Direct Costs of Clearing and Settlement: An EU-US Comparison*. City Research Series.1. London.
- Swiss National Bank (2005). *Financial Stability Report 2005*. Zurich.
- Werner, Swen (2003): *Interoperabilität und Vernetzung: Perspektiven für die Clearing- und Settlement-Landschaft*. Deutsche Bank Research. 258. Frankfurt.