"MEASURING SCALE ECONOMIES IN A HETEROGENEOUS INDUSTRY: THE CASE OF EUROPEAN SETTLEMENT INSTITUTIONS"
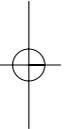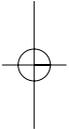
by
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MEASURING SCALE ECONOMIES IN A HETEROGENEOUS INDUSTRY: THE CASE OF EUROPEAN SETTLEMENT INSTITUTIONS[*]

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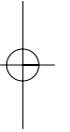
Abstract

We examine whether the European settlement institutions are technically efficient. This is done by means of estimating a translog cost function, and investigating whether scale economies are fully exploited. Since the sample is quite heterogeneous, fixed effects regression is introduced. From the results obtained, there clearly are economies of scale in this industry throughout all output ranges. This implies that further consolidation in this industry probably is ahead.

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1.   Introduction

Nowadays, the securities settlement and safekeeping industry is subject to much debate. More in particular, the discussion concerns the way in which the industry should be organised 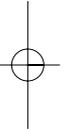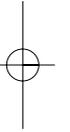in the future. Compared to the American market, the European one still is quite fragmented. Basically, there was one central securities depository (CSD) institution in each country that would also offer settlement services for domestic securities. Only recently some cross-border CSDs consolidation has taken place, but several national institutions continue to co-exist, mainly due to the existence of different systems, legal procedures, fiscal regimes, etc. This fragmentation might give rise to additional costs and risks, and therefore a reduction of the number of settlement and safekeeping institutions might be welfare increasing.

More in particular, the issue is whether consolidation should be encouraged, and if so, what kind of consolidation is preferable. In Europe, two consolidation trends can be observed. These trends are shown in figure 1.

First, there was a vertical consolidation movement. Here, the institutions that are active in the trading, clearing, settlement and safekeeping process have been integrated into one single institution. An example of this structure, which is sometimes called a vertical silo, is Deutsche Börse, which incorporates the trading platform, the clearing institution (Eurex Clearing) and the settlement and safekeeping institution (Clearstream) into one holding.

The second type of consolidation that has taken place was horizontal, implying a cross-border integration and cooperation between institutions that provide similar services and products. An example of this is Euronext at the level of securities trading, and Euroclear at the level of settlement and safekeeping. The first is a merger of the French, Belgian, Dutch and Portuguese stock exchanges, while the latter acts as a Central Securities Depository (CSD) for France, Belgium, UK, Ireland and the Netherlands.

Efficiency

Further consolidation in this industry might give rise to higher efficiency and lower operating costs. The present contribution investigates whether this reduction in operating costs is feasible, and whether the current structure of

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Figure 1: Consoliation Trends in Europe
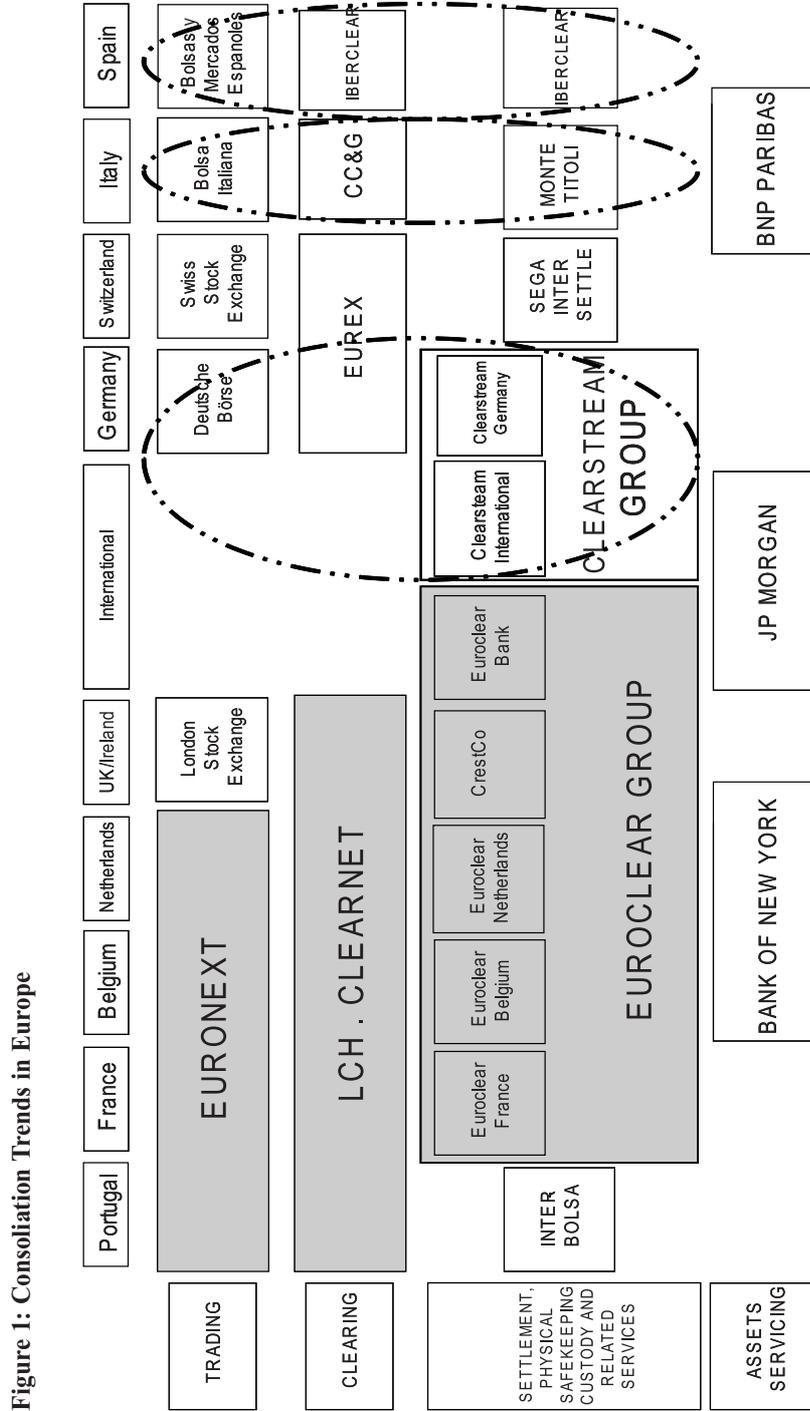
the industry is efficient or not. In the last case, further consolidation is to be expected.

Consolidation in this industry however raises many questions regarding competition, that is allocative efficiency. For example, exchanges and CSDs work together very tightly. More in particular, all trades that are concluded at an exchange are settled most of the time by only one CSD. This implies that, in order to be able to trade, all members of an exchange need either a securities account with the CSD or to appoint an agent bank that has an account with the CSD. These holdings therefore occur directly or through an intermediary. Whenever two members of an exchange want to respectively buy and sell, the CSD receives automatically (often through a central counterparty that will perform clearing and netting activities) an instruction to debit the securities account of the seller and to credit the buyer's securities account. This process is called straight through processing. Of course, over time, this relation between the exchange and the CSD can change, and depending on the magnitude of the switching costs could lead to alternating arrangements. In a theoretical paper, Tapking and Yang (2004) conclude that, under certain assumptions, a horizontal integration of CSDs lead to a higher welfare than a vertical integration of exchanges and CSDs, while the vertical integration seems to provide a higher welfare than a completely separated industry configuration.

Also Van Cayseele (2005) comes to the conclusion that further horizontal consolidation of the European clearing and settlement industry should be encouraged. He introduces the two-sidedness of the market by investigating a model of platform competition in the spirit of Rochet and Tirole (2003), and shows that both investors and issuers gain from consolidation. Finally, Köppl and Monnet (2004) use mechanism design to investigate the incentives for further consolidation. Clearly then most, if not all, of the results of economic modelling favour further horizontal consolidation. But whether technical efficiency gains will reinforce this conclusion is a different question, which only can be answered by empirical analysis.

Schmiedel, Malkamäki and Tarkka (2002) provide an empirical analysis of the industry by estimating a cost function. However, as will be discussed in section 3, they obtain some remarkable results. For one thing, the estimates of the coefficients of the translog cost function specification come with the signs opposite of the ones expected (this would for example lead to the counterintuitive conclusion that total costs decrease when output is increased), although they are often not statistically significant. By applying

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OLS estimation to a panel data set, Schmiedel et al. do not exploit "between" and "within" variation in the observations as a source of differences in decision making of the players in the sample. In the present contribution, we investigate the possibilities of taking into account the information that an observation has been generated by a particular CSD rather than by another, by applying fixed effects regression to the problem.

Safety

It should also be noted that in order to guide policy making, it is not sufficient to look at efficiency alone. One should also take into consideration the safety of the settlement procedure. As discussed in the Bank of International Settlements report (1992), the so-called "Delivery versus Payment" procedure is preferred when trades are settled. This procedure ensures that securities are transferred if and only if payment occurs. In this way, the principal risk, which is the risk that the seller of a security delivers a security but does not receive payment or that the buyer of a security makes payment but does not receive the security, is avoided. This risk is the largest source of credit risk in securities settlement.

Delivery versus Payment does not eliminate other sources of risk which are the replacement cost risk and the liquidity risk. The former is the risk that a counterparty to an outstanding transaction for completion at a future date will fail to perform on the settlement date. The latter implies that a counterparty will not settle an obligation for full value when due, but on some unspecified date thereafter. It could be expected that when consolidation takes place, these risks can be reduced because given the size of these institutions these kind of defaults are less likely to take place and may be internalised to a further extent.

Besides academic interest, the clearing and settlement industry also has attracted the attention of policy makers, notably the European Commission. In the "Communication to the Council and the European Parliament" (2004), the Commission states that an integrated and efficient capital market is essential for Europe. A crucial element in this process is the safety and efficiency of the procedures that occur to finalise a security transaction. The Commission argues that the clearing and settlement process is therefore fundamental for the proper functioning of securities markets. In this Communication, the Commission also proposes some actions it wants to take in order to improve the clearing and settlement arrangements and to tackle the barriers that are identified by the Giovannini reports (2001, 2003).

The Committee on Payment and Settlement Systems (CPSS) together with the Technical Committee of the International Organization of Securities Commissions (IOSCO) make in their Consultative Report (2001) a number of recommendations for securities settlement systems. One of these recommendations concerns efficiency. It states that: *"while maintaining safe and secure operations, securities settlement systems should be cost effective in meeting the requirements of the users"* (Recommendation 15, p.20).

Also, the report argues that when the efficiency of settlement systems is considered: *"the needs of the users and the costs imposed to them must be carefully balanced with the requirement that the system meets appropriate standards of safety and security"*. For instance, if a system is inefficient, this might give rise to distortion on financial markets, while an unsafe settlement system will not attract any participants. Therefore, efficiency of securities settlement is an important issue, but a stable and safe environment is also required. Regarding the latter, there might be a role for the regulatory authorities. They could impose the standards to which every institution has to comply. In this way, safety and stability can be enhanced, for instance by setting deposit insurance and reserve requirements. A high level of these requirements can however be inefficient, and thus the institutions incur additional costs in complying with these regulations. The institutions in turn then might pass these additional costs on to their customers, resulting in higher fees. Therefore, a trade-off between safety and efficiency needs to be made. Currently, various forms of taxes or regulation continue to co-exist in the European Union, which again possibly and plausibly increase operating costs.

CPSS has also published some reports with respect to payment systems. A first one (2001) discusses the core principles for important payment systems. It states that a well functioning payment system is essential for a financial system to work appropriately. Therefore, 10 core principles to which a payment system should comply are formulated. Another report (2005) discusses some new developments in large-value payment systems. Clearly, since new or enhanced features make the technical infrastructure of these payments systems much more complex and the analysis of risks and efficiency more difficult, these evolutions make investments in infrastructure inevitable, and as a result, technical innovation will have a effect on operating costs, and thus on the cost function.

The remainder of the present contribution is organised as follows. In the next section, a brief discussion is given of what clearing, settlement and

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safekeeping involves. Thereafter, a short overview of the existing literature is given. In the fourth section, we explain the econometric approach that will be followed, while in section 5 the data that are used are discussed. The empirical results are given in section 6. Finally, section 7 concludes.
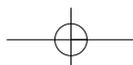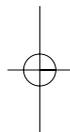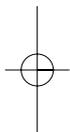
2. The European clearing, settlement and safekeeping industry

In the literature, a lot of attention has been paid to the way in which trades at an exchange are realised. However, little attention has been given to the processes that occur after the completion of a trade. Before we proceed, it might therefore be useful to explain what the processes performed by the institutions in the clearing, settlement and safekeeping industry exactly are.

After a trade has been realised, basically three processes occur. The first one is the clearing process. In the clearing stage, the obligations of the buyer and the seller are determined. When trading is effected, sellers have the obligation of delivering securities and the right of receiving cash, and buyers have the obligation of paying cash and the right of receiving securities. The transactions in financial markets can be cleared by a number of institutions, for instance by a clearinghouse.

A clearinghouse is a central location or central processing mechanism through which financial institutions agree to exchange payment instructions or other financial obligations, such as securities obligations generated by trading on an exchange. Clearing can occur either on gross or on net positions. If the latter is the case, a process of netting takes place. This is an agreed offsetting of positions or obligations by trading partners or participants. The netting reduces a large number of individual positions or obligations to a smaller number of positions or obligations. More in particular, all gross positions are offset against each other so that all outstanding positions in one given security are converted to a single debit or credit.

It is also possible to trade with a central counterparty, which imposes itself in between the buyer and the seller (novation). In this way, the different parties remain anonymous to each other, and the parties don't have to worry about the credit risk of the respective counterparty. The IOSCO report (2004) contains a number of recommendations with respect to central counterparties. Given the large and growing role of these intermediaries in securities settlement systems, the *"central counterparties should be cost-effective in meeting the requirements of participants while maintaining safe and secure operations"* (Recommendation 12, p.43). However, as argued in the report, an assessment of the efficiency of these counterparties is very difficult, because

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of among other things the low level of competition and the possible existence of barriers to entry. A more comprehensive discussion of this problem can be found in the CPSS report.

The focus of the present contribution however is on the next two processes, namely settlement and safekeeping. During the settlement process, a transfer of money is made from the buyer to the seller, while the delivery of the securities goes in the opposite direction. Since most of the securities are dematerialised nowadays, this delivery of money and securities is done through book-entries instead of through physical delivery. The delivery is typically executed by a Central Securities Depository (CSD) or an International Central Securities Depository (ICSD), although local agent banks can settle trades internally when a trade takes place between investors who happen to use the same local agent bank. The main difference between a CSD and an ICSD is that the latter acts as issuer-CSD (central depository) for international securities, while the former is the issuer-CSD for domestic securities.

In the past, there was one CSD for each country. Recently, however, some horizontal consolidation has taken place. Examples are Euroclear, which now acts as the CSD for France, Belgium, the Netherlands and the United Kingdom, and Nordic Central Securities Depository, which was established at the end of 2004 as a consolidation between the Swedish and Finnish CSD.

The last process is the so-called safekeeping of securities. When the stock of a company has been sold from investor A to investor B, B now holds a claim on this company, while A does not hold one anymore. So the positions of both A and B have changed. Both investors might also hold positions in stocks of other companies in which they do not trade. So it is necessary to keep track of all positions at each point in time, so as to enable a company to interact with the entire group of its shareholders. This service is called custody and concerns the safekeeping of the physical securities as well as the administration on behalf of companies and investors (sometimes also called assets servicing). Custody entails more than just keeping record of positions. Sometimes assets needs to be serviced, for instance in the case of dividend payments, stock splits, the emission of additional shares, etc. Often the custody service is provided by the same institutions that also do the settlement, namely the CSDs, ICSDs or any intermediary along the holding chain. One can wonder whether this constitution should remain as it is, and some have argued that in the case of CSDs and ICSDs it is preferable that the settlement and safekeeping activities are separated. Based upon econometric analysis, we will among other things try to find an answer to this issue.

It can be argued that institutions that combine settlement and safekeeping basically combine a two-sided network with a one-sided network, in the sense of Economides and White (1994). Settlement is a two-sided network, since the only way in which a transaction can be realised is by interaction between the settlement institution and the investor on the one hand, and between the investor and the settlement institution on the other. Asset servicing on the other hand is a one-sided network, because a product involves the interaction of two different parties, viz. an issuer and an investor – for instance, when a company gives the CSD an instruction to pay a dividend. Van Cayseele and Wuyts (2005) provide a more detailed explanation on this issue. They argue that a combination of the two types of networks might lead to increased efficiency and network externalities. However, whether this is the case has to be investigated empirically.
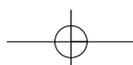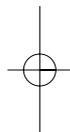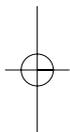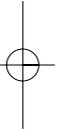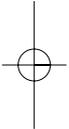
3.   Review of the literature

The literature survey can be short, since up to now little empirical research has been done regarding the organisation of the European settlement and safekeeping industry. Before dealing with the scarce contributions, it should be noted that there are some papers that set up a theoretical model in order to find an indication of the future structure of the industry, see for instance Van Cayseele (2005), Tapking and Yang (2004), Rochet (2005), Holthausen and Tapking (2004) and Kauko (2005). From a policy perspective, the Committee on Payment and Settlement Systems (CPSS) has written a number of extensive reports concerning payments systems (2001, 2005), while CPSS together with the Technical Committee of the International Organization of Securities Commissions (IOSCO) have made a number of recommendations for securities settlement systems (2001). Also, the European Commission (2004) has proposed a number of measures and policies in order to improve clearing and settlement arrangements.

Currently, only two empirical papers have been written with respect to this industry. The seminal empirical paper was written by Schmiedel, Malkamäki and Tarkka (2002). They estimate a translog cost function to examine whether or not economies of scale are present in this industry. To capture output, they use the number of securities settled as a proxy for the settlement services provided by a CSD, while the safekeeping service is approximated by the value of securities deposited in the system. As an input price, they use GDP per capita of the country in which the CSD is active. The results obtained are remarkable. More in particular, the estimated coefficients of the output variables have a negative sign, which implies that total costs decrease as output increases. Such results are at odds with received microeconomic theory. The input price variable also has a negative sign. In addition, estimates are very insignificant, so it is hard to draw any conclusions at all. Nevertheless, based upon their results, they indicate that economies of scale are present in this industry, especially for the smaller institutions.

Van Cayseele and Wuyts (2005) attack the problems that emerged in the work by Schmiedel et al. by using alternative output variables and input prices. As output variables, they use the number of clients of a CSD to capture the settlement service, while the number of securities held is used as a measure of safekeeping. As argued above, this is closer to economic modelling of the industry. Russo et al. (2004) already indicate that the account management

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and hence the number of accounts is related to the safekeeping activities of settlement institutions.

As input prices, the price for labour is seen to equal the labour bill divided by the number of employees, and the ratio of GDP relative to a fixed base year is used to get a price indication of other inputs used in the settlement and safekeeping process. Van Cayseele and Wuyts also estimate a translog cost function, and obtain that total operating expenses of the CSDs increase with both output variables, of which one is highly significant. Moreover, they find evidence that large economies of scale exist with respect to the output variables. Van Cayseele and Wuyts also examine whether economies of scope are present. More in particular, they investigate whether the joint production of settlement and safekeeping gives rise to efficiency gains. Since the translog cost function is not stable to verify this property (see Röller (1990a) and Röller (1990b)), they estimate a constant elasticity of substitution – quadratic (or CES-Q) cost function. The results indicate that the separation of settlement and safekeeping activities causes a cost increase for the institutions.

Another important remark that needs to be made is the fact that CSDs are very heterogeneous. First of all, they perform the settlement and safekeeping activities on quite a different scale. This can be seen below when the descriptive statistics of the sample are discussed (see table 2). Moreover, the CSDs might execute the before mentioned activities in a different way. Thus, their technologies may differ, for instance because of a different legal and institutional framework. This implies that their production function might not be exactly the same. This can be seen from figure 2, where the ICSDs are clearly on a different average cost curve. To control for this sample heterogeneity, it is possible to apply a fixed effects regression, since adding dummies and then apply OLS is not best econometric practice.

In the fixed effects model the firm-specific effects are estimated as constant numbers. More in particular, the differences across institutions are captured in differences in the constant term. It might be that these constant terms are correlated with the exogenous variables. As is well known in the literature, the fixed effects estimators are not influenced by heterogeneity bias. A more detailed description of this estimation technique is provided in section 4.2.2.