ESSAYS ON TECHNOLOGICAL DEVELOPMENT AND COMPETITION IN LOCAL BANK MARKETS

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Turku, June 16, 2008

Aki Koponen

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ESSAY V

AN INTRODUCTION TO ESSAYS ON TECHNOLOGICAL DEVELOPMENT AND COMPETITION IN LOCAL BANK MARKETS

1 INTRODUCTION

The banking industry in Finland has gone through major structural changes since the 1990s. It has also altered due to rapid technological developments which have created new ways of providing financial services. This thesis includes five essays that analyze different aspects of banking. The topics are varied but have the common factor of technological development and adjustments within markets at local or regional level behind each paper. In essence, the different phenomena considered in the essays can be seen as an outcome of the competitive process between the banks and other kinds of financial institutions like insurance companies, brokerages, and investment and savings businesses. Since new, remote access technologies have had a considerable impact on the regional or local nature of banking and bank competition, the regional aspect is present in every essay.

The purpose of this essay is to introduce the reader to the theme of the thesis as well as to the topics analyzed in the five independent essays included to the thesis.

This essay is organized as follows. First, section 2 provides an overview of the development of the banking industry in Finland. It aims to show how the branch networks have developed along with telebanking agreements. However, the development of branch networks has not been the only change in the market. Although the number of the bank offices has been more or less stable for seven years, they have seen an an ever increasing degree of automation especially in the payment system. Currently, some 96 % of all payments are sent to a bank in electronic form. Bank branches still have their role in retail banking as the asset structure of households has changed such that there is more demand for insurance and investment services, i.e. more personal services. Such changes have created a challenge for the banks as to how to utilize information technology in order to cope with these environmental changes.

This starting point leads to another subject of this study, which is a discussion of the function of the banks' financial intermediation. Section 3 presents the main ideas of the so-called relationship banking approach. After that the section discusses the potential effects of remote access services on bank-customer relationships and presents the main goals of the management of technology in banking.

Some banks, however, are more profitable and/or have a better ability to cope with change than the others. This phenomenon is interesting both for managers and antitrust authorities, since the *revealed* possible sustainable competitive advantage is not only a market imperfection but the ultimate goal a firm's competitive strategies are aimed at. Hence section 4 provides an overview of the sources of competitive advantage in resource based theory (and its subsequent variants). Section 4 also discusses the origins of competitive threats and how the competitive action of different kinds of rivals reshapes the industry.

Section 5 points out the main research questions this thesis aims to answer. The connections between the different topics are also discussed. The section also presents short summaries of the essays included in the thesis. Section 6 summarizes the thesis as whole and discusses possible streams for future research.

2 DEVELOPMENT OF FINNISH BANKING SECTOR 1995-2006

Finland faced a deep recession and a banking crisis in the early 1990s. The crisis resulted in the failure of several major banks and one bank group. The net value of public financial subsidies allocated to the banks in order to avoid the collapse of the financial system was approximately six billion EUR. This thesis does not cover the crisis time but the period of analysis begins from 1995, when the recovery had just started.

For this study the important legacy of that crisis was the merger of two major bank groups. This merger began a somewhat voluntary reorganization of the markets with the rationalization of local branch networks. In order to secure efficiency and competitiveness, it is natural that in mergers the overlaps of branch locations are eliminated.

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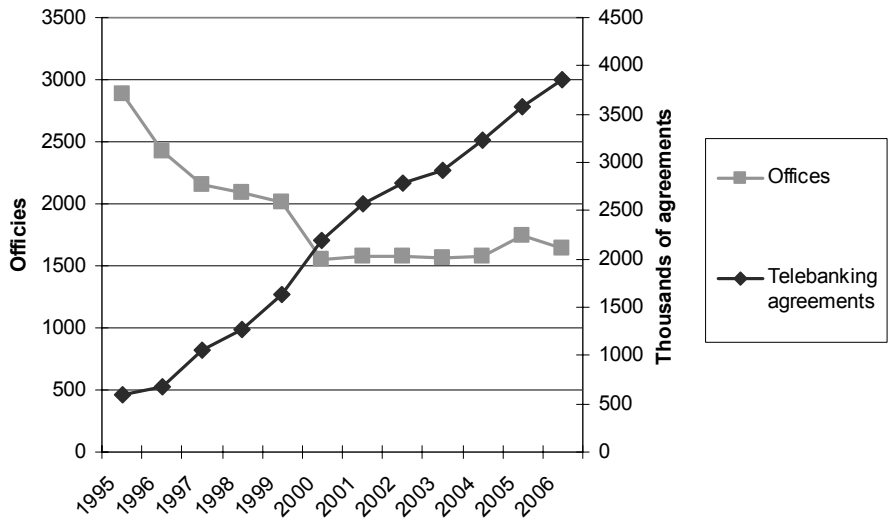

Figure 1. Development of the number of bank branches and telebanking agreements (Source: Finnish bankers association and own calculations)[1]

[1] Data for year 2000-2006 is provided by The Federation of Finnish Financial Services (www.fkl.fi). Data for 1995-1999 is provided by their predecessor; The Finnish Bankers Association. These figures also include a number of offices of The Finnish Post providing bank services for one major bank group during 1995-1999.

During the late 1990s information technology advanced rapidly and remote access technologies become more and more important in bank service provision. Along with the development of the remote access services and adaptive customer behavior the local presence of the banks often became purposeless which led to an increased number of branch closures. Figure 1 illustrates the development of bank branches.

As Figure 1 shows, mass closures were over in year 2000. This, however, does not mean that reform after that was any less dynamic. In fact, the development of the industry continued apace.

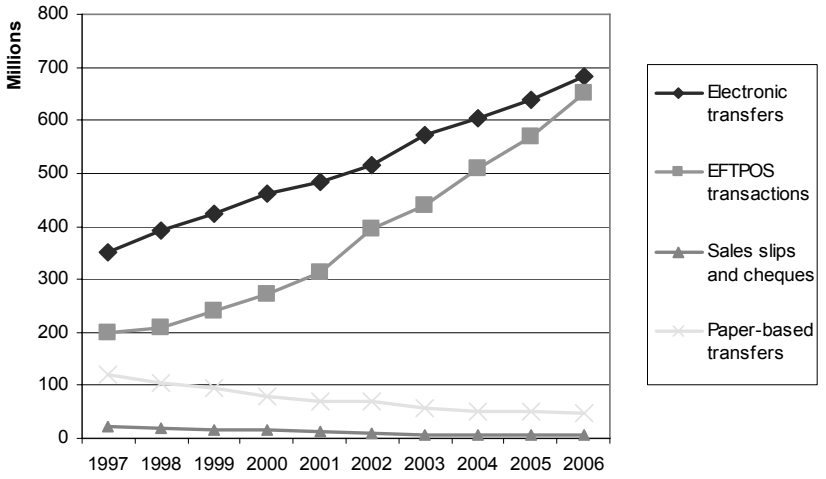

Figure 2. Change in payment system 1997-2006 (source: Finnish Bankers Association)

Figure 1 also shows that the number of customers using remote access services has expanded dramatically. Additionally the total number of processed payments has increased remarkably since 1997 as can be seen from Figure 2. Simultaneously the number of paper-based money transfers has declined. The degree of automation, i.e. the share of payments sent to banks in electronic form, naturally increased during this period. The current level stands at 96 per cent. The automation of the payment system has had a remarkably positive effect on productivity. According to The Finnish Bankers Association (or current Federation of Finnish Financial Services) the number of employees of deposit banks operating in Finland has decreased some 10 percent since 1997. During the same period the growth of processed payments has increased by more than 100 percent!

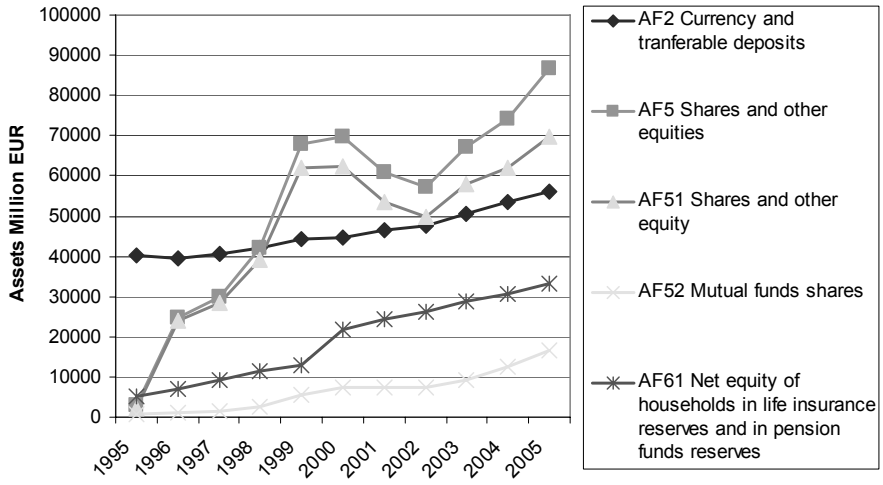

Figure 3. Development of assets of households and non-profit organizations serving households 1995-2005 (source: Statistics Finland)

Changes in the payment system are not the only strategically important changes in the banks operating environment. Figure 3 presents the development of different assets held by households and non-profit organizations serving households. Over time the value of deposits has increased, but the "new" asset types' weight in households' portfolios has increased. Shares and mutual fund shares are now more important asset groups than traditional deposits. Also life insurance and pension funds have become very important asset types and their current value exceeds 30 billion EUR.

This development can be also observed in the income structure of Finnish deposit banks as the traditional financial intermediation i.e. borrowing and lending has lost its relative importance somewhat as a source of bank income. Figure 4 presents the development of the income share of financial intermediation for different Finnish bank groups.[2] Traditionally the income share of financial intermediation has been relatively low for commercial banks. The share has risen slightly over the last few years possibly because of the rise of interest rates and a strong expansion of the housing loan market. It is also possible that competition has pushed the prices of other services down.

[2] Every presented group except for commercial banks are cooperative groups that have their own "central bank". Commercial banks are presented as a group in order to reflect the average differences between the local banks and commercial banks.

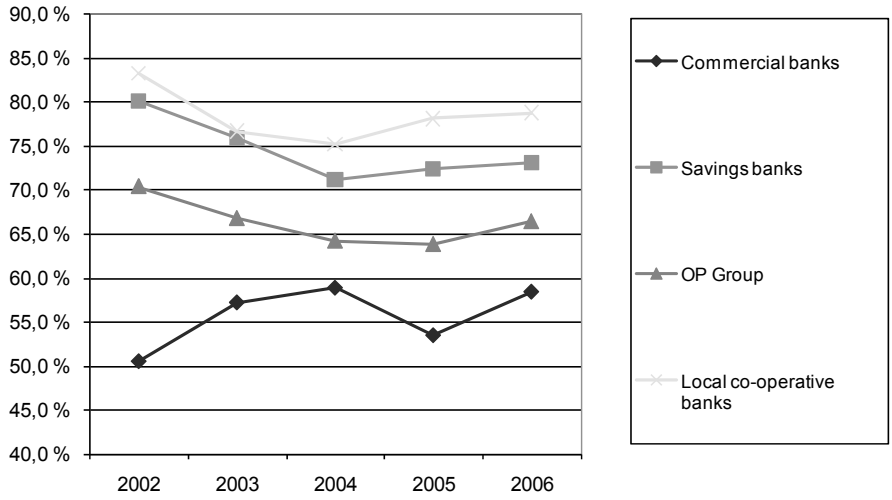

Figure 4. Net income of financial intermediation/total income ratio (source:Finnish Financial Supervision Authority and own calculations)

The use of new technology has improved the efficiency of the banking industry. One typical measure of cost efficiency used in banking industry is the cost/income ratio. As Figure 5 shows, efficiency has improved remarkably over the last five years. There are also significant differences in the level of efficiency between the bank groups as Figures 5 and 6 reveal. That is not surprising since it is reasonable to assume that the differences in the services provided have had an impact on both the cost and income levels of the banks. However, it is also useful to remember that the cost/income ratio does not only represent the development of the efficiency of banking firms but can also show the development of collusive behavior, especially when the development is the same for all of the players.

The figures in this section show that the period between 1995 and 2006 has been interesting for Finnish banking (or more generally the financial) industry. Even though Finland is still a bank-dominated economy, the use of new financial instruments and the entry of new institutions for corporate finance has also occurred. Also household saving behavior has changed as stocks and mutual funds have become very popular and customers do not anymore save using only the banks' (time) deposits. This change has naturally created a need for serious strategic rethinking and seen new service developments by banks. The dynamics of the industry did not end in 2001 when the number of bank branches reached their current level. The role of the branch offices has actually become more important for the business than it used to be due to new

services. In particular, the automation of routine services has altered the tasks of bank personnel so that they provide more financial consulting services than before.

The next section discusses the effect of technological development on banking. The changes are analyzed with particular reference to studies on relationship banking.

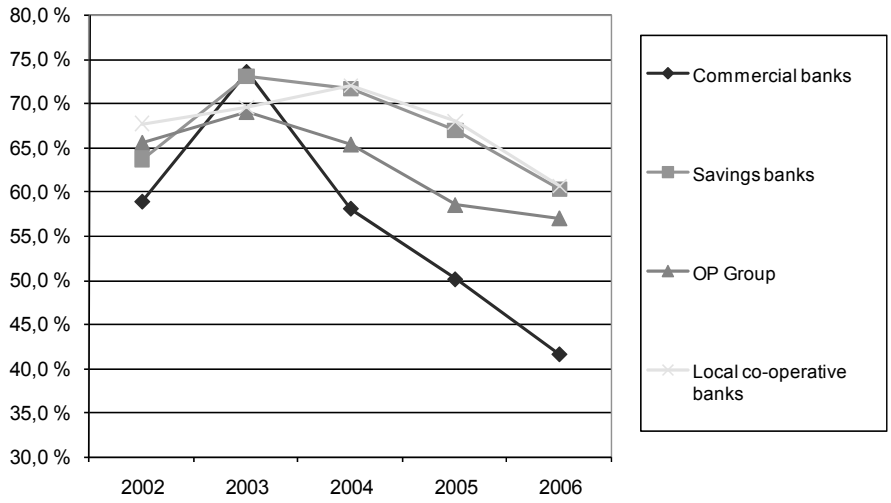

Figure 5. Development of cost/income ratio, 2002-2006. (source: Finnish Financial Supervision Authority)

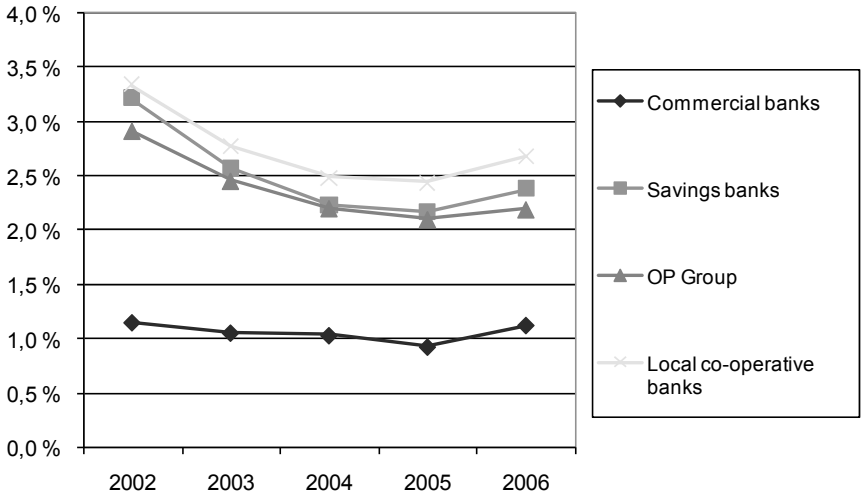

Figure 6. Net income of financial intermediation/total assets ratio, 2002-2006 (source:Finnish Financial Supervision Authority and own calculations)

3 TECHNOLOGICAL DEVELOPMENT, BANK RELATIONSHIPS AND COMPETITION[3]

3.1 Relationship banking

The literature of banking can be crudely divided into two subgroups: the industrial organization (IO) view and the asymmetric information view (Freixas & Rochet 1997)[4]. Another way to categorize literature is presented by Boot & Thakor (2000). In the literature of the oligopolistic rent generation they found three relevant strands for analyzing banking competition. Those are: spatial models, monopolistic competition models and ex post rent generation in banking relationships.

In the theory of banking the main concept is asymmetric information. The problem of information asymmetry causing fundamental problems for the whole market mechanism was originally presented in Akerlof (1970). In his analysis sellers know exactly the quality of the purchase (in Akerlof's analysis, cars) but buyers know just the distribution of quality (good or bad) of the items for sale. In this context risk-neutral buyers are willing to pay a sum equal to the expected value of the item. If a seller concludes that the utility of owning a good quality item is higher than the market price then he is not willing to sell his products. This decreases the average value and market price of the items for sale. Eventually all the products for sale in a market are bad quality ones, i.e. lemons. Since buyers know that and the reservation value of the buyers is higher than the utility of having a bad quality item there will be no sales in the market and the market collapses. This is the so-called *lemons problem*.

This problem is also present in financial intermediation markets: borrowers have an information advantage over lenders about their own trustworthiness (creditworthiness). Furthermore, some of the borrowers are opportunistically trying to get some money with no intention of paying it back. If these borrowers cannot be distinguished from good ones the market will collapse.

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[3] This section utilizes the earlier papers of Koponen & Okko (2003, 2004).

[4] Crudely, since many of the IO-approach papers also have features from an asymmetric information view.

The good borrowers then have the incentive to signal their quality even if it creates costs for them.[5] However, the signaling creates problems since bad borrowers can have the incentive to give false signals about their creditworthiness. Therefore, the banks cannot, at least with financially significant loans trust only in the signals a loan applicant gives. Consequently, banks have to somehow implement screening systems to distinguish between the good and bad quality borrowers. The screening activity is a solution for the adverse selection problem. In the financial contract lies the seed for moral hazard, since agents (borrowers) have an informational advantage over the principals (banks) regarding their actions, i.e. how the money is spent or how much effort they put into a financed project. A solution for this kind problem is monitoring, i.e. controlling what an agent is doing.

Relationship banking is one way of mitigating the problem.[6] Boot (2000) defines *relationship banking* as a service provision of financial intermediation that

a. invests in obtaining customer-specific information often proprietary in nature; and
b. evaluates the profitability of investments through multiple interactions with the same customer over time and/or across products.[7]

Respectively, according to Berger (1999) relationship-based finance occurs when the three following conditions hold

1. Information is gathered by the fund provider beyond the relatively public and transparent data
2. Information is gathered through continuous interaction between the firm (customer) and provider and often through multiple interactions
3. Information remains confidential.

[5] The seminal work on signaling is Spence (1973). Campbell & Kracaw (1980) study the role of signaling in financial intermediation. Bank loans can be used as signals of credit-worthiness, which lowers the information costs of other contracts.

[6] For customer relationship generated information asymmetries and their effects on bank competition, see e.g. Sharpe (1990), Dell'Ariccia (2001), Dell'Ariccia et al. (1999) and Bouckaer & Degryse (2001).

[7] The idea that banks have a monitoring cost advantage in lending to depositors is presented in Black (1975) and in Fama (1985). The advantage is present especially in repeating short-term loans typically offered by banks (Fama 1985).

Based on these views the raison d'être of the banks is often seen in the ability to mitigate the problems of asymmetric information between the borrowers and investors due to long and diverse relationships. The opposite of this approach is *transaction banking*, which focuses on a single transaction by a customer or multiple transactions by many customers, instead of relationships (Boot & Thakor 2000).[8] Such kinds of activities exist in banking, too. Information requirements differ to some extent in these activities and information technology has created more space for this sector but we will not concentrate on those questions now.

3.2 Development of ICT and bank customer relationship

Before the era of remote services banks had a close relationship with their customers since naturally customers were forced to visit bank offices relatively often. Technological development has decreased the importance of offices since currently most financial operations can be handled without visiting a bank. Therefore many branch offices have lost their purpose and have been closed down.

This development naturally makes the payment system more efficient since the electronic payment systems are more cost effective than a system based on tellers.[9] However, the flipside of the coin is that customer and bank relationships become weaker since customers' contact with their bank becomes less personal. One advantage of a bank's physical presence over virtual banks is certainly the possibility for face-to-face contacts, which creates confidence and trust between a bank and a customer.

The development of remote access services widens the geographic markets of the banks. This further increases competition between banks by introducing new banks operating in the same market. Typically, the increase in the competitiveness of the markets is seen as beneficial for customers and the economy as whole. However, the banking markets are not typical markets but markets where asymmetric information and risk play the main roles. An increase in competition can have adverse effects on average customer quality and lead to higher default rates for the banks (see e.g Broecker 1990, Riordan 1993).

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[8] The same kind of classification can be found in marketing literature. Relationship-marketing refers to customer relationship management based on long term relationships between customers and suppliers, while in the transaction marketing context one deal says little about the chance of a repeat purchase. Tuominen (1997) provides an extensive overview on relationship marketing literature.

[9] According to Booz-Allen & Hamilton survey in 1996 payment via the Internet cost a bank 1 cent while the same payment by ATM cost 27 cents and in a branch $1,07 (The Emerging Digital Economy, available at < http://www.ecommercecommission.org/document/EmergingDig.pdf>).

Basically the development of ICT has two opposite effects on banking.

1. Sparsely located branch networks and a decreasing level of face-to-face contact make local knowledge and relationships (as well as trust and loyalty) weaker
2. The development of information technology makes it easier to find information.

A priori it is hard to say which one dominates. The Internet has changed the way banking services are produced and shifted the service domain of banking.

Information transparency, or opacity, is a basic problem within banking. The new economy has increased transparency and decreased opacity (se e.g. White 2003). The result has been that indirect financial intermediation (banking) has been forced to give space to market-based direct intermediation (securitization). However, it has been able to expand its service domain in other directions (see e.g. Yakhlef 2001). Transaction banking has benefited from this development because it is easier to handle large amounts of information on standardized transactions. Relationship banking has become weaker but in this way it has been possible to draw some new customers into new service relations.

This all means that ICT has had both intersectoral and intrasectoral impacts on banking. Banking itself has experienced new competition from other sectors and it has had opportunities and challenges with regard to reorganizing its own activities. In the intersectoral (or intermarket) competition banks have to compete with other financial institutions and in intrasectoral competition they have to compete with each other (interbank competition). The structural change of the financial sector has also been enhanced by deregulation, which has resulted from the so-called new economy, too.

From the point of view of a firm there are two alternatives for debt financing: going to the capital market or to a bank. Even in the case of capital market financing a bank normally organizes transactions. Relationship lending (relationship banking) can benefit a borrower more than transaction lending because banks specialize in specific sectors and can help customers in their project choice and improve the project payoff. Therefore customers, who depend on their beliefs about their own quality, may prefer relationship lending despite the potentially higher interest rate. (See e.g. Boot & Thakor 2000). Firm size is certainly a factor that affects customer selection when choosing between bank and capital market financing

Boot & Thakor (2000) make some interesting observations about competition from this point of view. The intrasectoral or interbank competition increases the importance of relationship banking. When banks compete with each other there is the danger that the customers moving from one bank to another are not the highest quality customers. Hence, it is

important to keep in good touch with customers in order to avoid the problem of adverse selection. In contrast to this, intersectoral competition (competition from capital markets) reduces relationship lending. however, each remaining relationship loan may have greater value added for the borrower.

The literature of finance points out that the banks have an information advantage (see Fama 1985) compared to their rivals since banks have access to customers' payment information (e.g. a firm's checking account). If virtual banks can also collect similar information, this does not necessarily provide any advantage for the hybrid banks (banks with branch offices and remote access services) though that is not normally the case. Usually, a new virtual bank cannot offer a full payment service and an entrant has that disadvantage anyway.

There is also another unique feature that banks have. They can lend claims on their debt which are accepted and used by the public as money (Bossone 2001). As money creators, they are irreplaceable by nonbank institutions. This special feature will also survive in the e-age. Irrespective of its technological support structure, bank money has always been "virtual" because it has always rested on promises issued by entities, which rely on and attract public trust.

Banks with branch networks have better non-customer specific local knowledge since they are physically present in their geographically located core markets. Also we have to remember, that payment data gives a rather rough picture of a customer's (or project's) creditworthiness. Hence, it can be argued that the information "heard in the market place" provides highly important knowledge about the customer. This kind of information is hard to access remotely.

3.3 The challenges of the management of technology in banking

This thesis concerns the effects of remote access technologies (phone banking, Internet banking, mobile applications etc.) on bank relationships, information management and the management of technology related to those and especially the market level outcomes of those aspects. In the IO-approach to banking banks are modeled as active entities that respond optimally to changes in their competitive environment (Freixas & Rochet 1997). Most of the specific properties of banking are normally omitted in these models (See e.g. Bouchaert & Degryse 1995, Degryse 1996, Byers & Lederer 2000, 2001 and Byers et al. 2002). Therefore the existing IO-literature on banking, which essentially concentrates on the efficiency of the payment system, is inadequate for the purpose of describing the development process as a whole.

Thus, to gain a complete picture about the management of technology (MOT) problem of a bank, the main goals of the management of technology are presented in figure 7. Those are: improving customer satisfaction, reducing costs and improving and developing new methods for collecting and analyzing customer information. In relation to customer satisfaction, this increases when, for instance, customers are given new secure and convenient ways to contact banks and manage financial transactions. A reduction in the costs of running a bank occurs if the need for branch office services is lower or processes become more efficient. And lastly, if banks can implement new and efficient ways to collect and analyze customer information they improve the basis of their lending decisions.

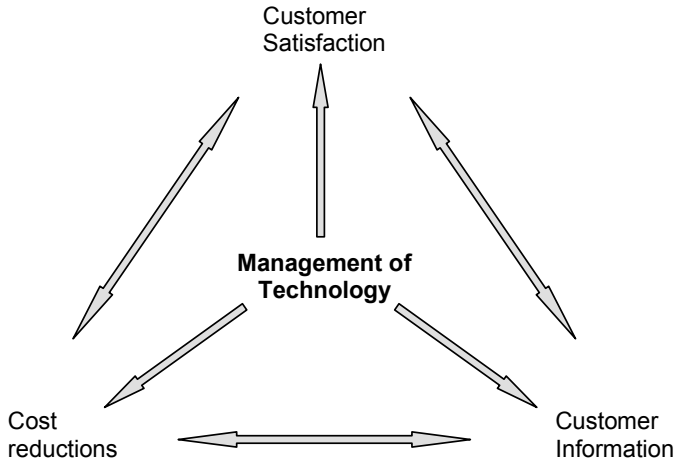

Figure 7. Main goals of MOT in banking.

These goals, however, are interrelated and even stand in contradiction to each other, at least to some extent. That is because direct action on one or more of the parts has an indirect effect on the other(s). These interrelations create a system where everything affects everything else. For instance cost reductions in branch networks decrease customer satisfaction. Similarly, sparse branch networks decrease the level of customer relationships and make access to local and customer specific information poorer. Therefore banks either face a poorer quality of information or have to produce also new methods to manage information.

The challenge of the MOT in banking is to deal with this system by directly affecting the different parts and simultaneously take into account the indirect effects of the choices. One of the most important tasks of banking, i.e. the collecting and processing of customer information and the allocating of

deposits to the right projects makes the management of the technology of banking much more complicated than just using technology to generate cost savings in a payment system and producing better ways of satisfying customer needs in relation to service accessibility. Measures for the fulfilment of these goals can include:

- Customer satisfaction: the number of accounts, balance sheet value, profits, etc.
- Cost reductions: cost efficiency measures (e.g. the average cost of a transaction, the relative efficiency of a bank compared to similar rivals)
- Customer information: defaults

In summary, this section argues that remote access technologies have had a major effect on banking. New information technologies are resources on which banks can base their competencies. There have even been expectations about the strong expansion of internet banking substituting the largely traditional face-to-face service of branch banking. Banks cannot, however, count on customer satisfaction and cost reduction created by the use of new technologies. The central problem of the MOT in banking is the management of information, specifically, how is it possible to create systems for gathering and analyzing appropriate data concerning borrower quality? The new ICT has increased the effectiveness of producing and transmitting codified information, which has created better access for customers and better possibilities for decision making. However, the assessment of customer quality also ultimately requires tacit knowledge. Consequently, banks cannot take care of their traditional role by only using codified information.

The role of information has also expanded the number of possible sources of competitive advantage as well as the means of competition. That is, the success of a bank can depend on many different resources, but in this rapidly developing technological environment the sustainability of competitive advantage requires different capabilities.

4 COMPETITION AND COMPETITIVE ADVANTAGE IN BANKING

The previous section presented the ideas of relationship banking and illustrated the possible implications the Internet has for customer to bank relationships. In this section we go deeper into the differences between the different organizational forms banks have and analyze competition, especially in retail banking markets. The resource-based view of the firm and the market competition theories created from that are used as tools for this analysis.

4.1 Resource-based view

The resource-based view of the firm is based on the seminal work of Edith Penrose. In her book[10] Penrose presented a firm as a collection of different resources. This explication has fostered an enormous amount literature and new different strands of research in strategic management. Rugman & Verbeke (2002) have collected the main ideas of the recent RBV-literature. These are

1. The ultimate goal of a firm is to achieve sustained, above normal returns, which are better than its business rivals
2. Resources are not equally available for all firms and the right combination of resources, competencies and capabilities is a precondition for sustained superior returns
3. Competencies and capabilities lead to sustained superior returns if they are firm-specific (immobile), valuable to customers (trivial), non-substitutable and difficult to imitate. Heterogeneity is created by the Schumpeterian competitive process or by isolating mechanisms and uncertain imitability and therefore it can be sustainable.
4. From a dynamic perspective innovations can make a crucial contribution to sustainable superior returns.

Hall (1992) concentrates on the intangible nature of the root causes of competitive advantage of the firm. He argues that capability differentials can be based on either competencies, or assets. The former refers to the

[10] Edith T. Penrose: The Theory of the Growth of the Firm.

knowledge, skill and experience of employees and to the culture of the corporation as a whole and the latter to positional differential as a consequence of past actions (reputation, the advantageous location of facilities) or from the possession of legal entities. The more intangible the resources (or capabilities), the harder they are either imitated by rivals or transferred to new firms. That is, intangibility decreases the mobility of resources. This is in line with Peteraf (1993), who concludes that the cornerstones of sustained competitive advantage are superior resources, ex post and ex ante limits to competition, and imperfect resource mobility (the efficient firms can sustain their competitive advantage only if their resources cannot be expanded freely or imitated by other firms).

RBV is typically used to explain the inter-firm differences (see e.g. Wernerfelt 1984, Dierickx & Cool 1989, Barney 1991). In banking heterogeneity between the banks is obvious. At first, incumbents have an information advantage over newcomers since they already have customer relationships with local entrepreneurs and households. Secondly, the most important resources of the banks are highly intangible (cf. Hall 1992). It is easy to see the differences in financial assets but the most important feature is managerial ability and informational advantage achieved by learning-by-doing.[11] Local knowledge is especially important. Also the local presence and history of a long relationship creates trust between the bank and customer. This trust-bond is difficult and expensive to achieve.[12]

4.2 Interfirm rivalry and competitor identification

The literature presented previously concentrates on the factors firms can have and exploit in free market competition. These papers do not, however, explicitly analyze competition, but take it, more or less, as given. Chen (1996) takes this one step further and bridges competitor analysis and interfirm rivalry. He introduces two firm-specific and theory-based constructs: market commonality and resource similarity. Firms have a unique market profile and strategic resource endowment. Pair-wise comparisons in these two dimensions

[11] According to survey results in Hall (1992) employee know-how and reputation are perceived as the resources, which make the most important contribution to business success.

[12] The source of sustainable competitive advantage has to meet the VRIO attributes (Barney 1997). To put it in the normative form: managers should decide what resources are not *valuable*, *rare*, *inimitable* (or very costly to imitate) or the resources for which a firm is not *organized* to leverage a certain factor or competency. In Rouse & Daellenbach (1999) was reported a consultant experience in linen supply company. The only resource meeting the VRIO criterion in this specific case was the relationship between the company and customers! And as presented, what is different about banking compared to most industries is the role of information and relationships.

can illuminate the pre-battle competitive tensions between firms and affect how the focal firm interacts with each of its competitors (figure 8).

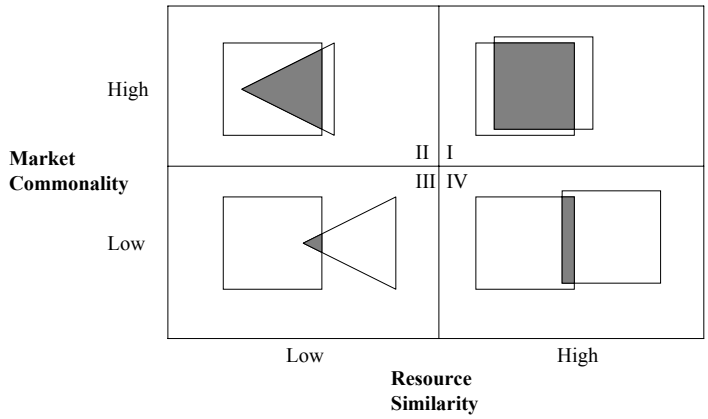

Figure 8. A Framework of competitor analysis (Chen 1996)

Bergen & Peteraf (2002,) continue the development of Chen's (1996) theory. They argue that Chen's analysis of the identification of competitive threats is problematic since threats can arise on both the supply and the demand side. By concentrating on product markets in a competitive environment scanning can lead to the failure to identify threats from indirect or potential rivals developing relevant resources and latent capabilities. A solution to this problem is to provide a two-stage method for the analysis of competitor awareness.

The first stage of analysis is about recognizing and classifying the competition. In this stage they use a similar two-dimension similarity-commonality framework to that used by Chen. The dimensions are market commonality and resource similarity. Market commonality is defined as the degree to which a given competitor overlaps with the focal firm in terms of customer needs served. Resource similarity is defined as the extent to which a given competitor possesses strategic endowments comparable, in terms of type, to those of the focal firm. By using this they classify direct competitors as ones with a high market commonality and a high resource similarity compared to the focal firm. Indirect competitors (substitutes) have a high market commonality and a low resource similarity and potential competitors have a low market commonality and a high resource similarity with the focal firm (see figure 9).

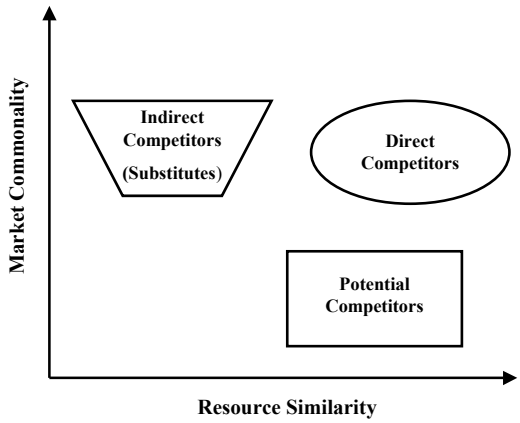

Figure 9. Mapping the competitive terrain (Bergen & Peteraf 2002)

At this point the method is same as in Chen (1996). The point of departure from Chen is that at the first stage they do not take into account the amount of resources. This is moved to stage two. Bergen & Peteraf then introduce a new concept, resource equivalency. Resource equivalency means the extent to which a given competitor possesses strategic endowments capable of satisfying the same customer needs as a focal firm. Resource equivalency has a fundamental effect on the competition due to competitive balance; that is, a low resource equivalency reveals that firms are different in the capability to initiate and respond to competitive actions.

Even though the competitor analyses of Chen and BP have slight differences the main results are practically the same.[13] The models nicely present competitive asymmetry and demonstrate that any given pair of firms may not pose an equal degree of threat to each other.

The main hypotheses arising from the analysis are the following:

[13] This is presented by Bergen & Peteraf as slightly different through the use of the concept of resource equivalency. Both Chen and Bergen & Peteraf have also developed their analyses of competitor identification and competitive interaction, see Peteraf & Bergen (2003) and Chen et al. (2007). The former introduces different substitutors into the framework. The latter explicates and re-conceptualizes the competitor analysis and interfirm rivalry model developed by Chen by using the concept of competitive tension. Both of these extensions have made a clear contribution to both the academic and practical competitive analysis. Their studies provide a theoretical background solid enough to understand the competition and industry dynamics.

1. A high market commonality and/or resource similarity between competitors reduces the incentive to attack and also the probability of response is higher[14]
2. Market commonality has a stronger predictive ability than resource similarity as there is a higher visibility of any potential attack
3. Competitive asymmetry in market commonality and resource similarity also creates asymmetry in the aggressiveness of the firms, i.e. the likelihood of attack and response differs between firms.

In addition to these the concept of resource equivalency is an excellent tool for analyzing the competitive threat faced by the focal firm.

4.3 Dynamics of the financial intermediation and banking

A motivation for this rather lengthy theoretical discussion is related to the dynamics of the banking industry. By using the previously described model one can classify competitive threats and furthermore the driving forces of industry dynamics. For instance, at an early stage of development a bank could have been gained a competitive advantage by investing in remote access technologies and placed its rivals in the role of inferior substitutors.[15] Similarly, bank groups and insurance companies have a rather similar resource base of extensive branch networks and the capability to invest assets, but in the 1990s they served different customer needs. From the banks' point of view insurance companies were potential competitors able to expand their business onto the traditional turf of banks, which has actually happened.

Theoretically industry dynamics can be seen as an outcome of the process whereby general purpose technology has been applied in certain interrelated industries and new technologically and economically feasible combinations have changed the competitive environment of the firms (see Carlsson 2004, Consoli 2005 applies the approach with respect to retail banking services). These kinds of new combinations in retail banking are classified and analyzed in World Retail Banking Report by Capgemini (Capgemini 2008). According to the report, behind the success and profitable organic growth of leading banks are four "pillars". Those are

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[14] This clearly has an Antitrust-implication: collusive behavior is more likely in industries with high market commonalities and resource similarity.

[15] Brokerage companies have also used new banking technology in order to provide payment and saving services and hence pose some threat to traditional banks. That is, the new technology can in many cases make traditional (narrow) market definitions inappropriate.

- the combination of a fast time to market, innovation and local client intimacy
- full multi-channel integration and optimization
- increasing sales productivity through dynamic branch management
- leveraging a multi-brand portfolio to create attractive value propositions for each market segment

Depending on the weight of these pillars, the report provides three distribution strategies for growing beyond the traditional retail banking business mode. The first strategy is called; "better sell", that is a bank tries to achieve a better fit for its diverse clients' needs based on segmentation. The second strategy is; "larger offer" and is based on the aim of extending and offering non-financial products and services and the third called "indirect business" is based on the idea of selling services through other distributors (e.g. retailer). The last model is the inverse of the typical "larger offer" strategy, which has expanded retailers' service repertoire to financial services.

In the Finnish context banks have basically followed the last two strategies. For instance, cooperation between the banks and insurance companies is clear as together they can provide their customers with a wider and more competitive portfolio of services and do it more efficiently than by providing these alone. Also some mergers and acquisitions between banks and insurance companies have occurred.

By taking a look at financial services from the retailing point of view, two main retailing groups have chosen different strategies. The market leader S-group has quite recently established its own bank called S-bank. The second biggest group, K-group as well as basically all other retailers relies on cooperation with banks or credit card companies. Similarly, many car dealers have given up their own finance companies and currently arrange car loans jointly with a bank's subsidiaries specialized in car finance. Generally the trend seems to be towards indirect business. S-bank can be seen as a part of sophisticated customer loyalty program, though only the future will show its competitive effect on traditional banking markets.

S-bank is not the only player challenging incumbent banks. While the automation of service production has led to poorer customer relationships and weaker customer loyalty, it has opened up space for international players such as GE money, which provides financial services (especially consumer loans). Due to the entry of international players these markets have become more competitive.

According to Capgemini (2008), the distribution optimization is still the most important means of achieving competitive advantage. This is not a surprise, since all the mentioned main growth strategies require that. This is also the case in Finland as along with the development of new remote access

solutions, banks have established new branches with a certain goal (e.g. being specialized in house loans) and developed the level of personal service at branch offices in strategically and economically relevant services. Therefore the local banking markets are still valid objects of research.

Since this kind of industry is facing a rapidly altering business environment, the methods used to analyze the evolution of the industry and its competition have to be rather flexible in comparison to the traditional methods used in empirical industrial economics. Market dynamism also requires a more detailed analysis of the sources of competitive advantage. This asks the question is a superior financial performance based simply on an abuse of market power or is there some resource or a set of capabilities which explains a firm's sustained success when compared to its rivals? That question is relevant, not only in antitrust cases, but also in corporate governance as it questions the incentive system and asks: should management be rewarded only for firm-specific success and not for "windfall" profits, which are ubiquitous in the banking industry?

5 RESEARCH QUESTIONS AND RESULTS

5.1 The themes of the essays

As presented above the development of the Finnish banking industry has been rapid in more ways than one. There are a number of interesting and economically important research puzzles within the theoretical framework presented in the previous two sections. In this thesis the issues selected for deeper research are all *related* to competition in the Finnish banking markets: each of the five essays interprets competition and its outcomes as technology-affected phenomena that have consequences within a region. The results are useful for developing knowledge both in the management of technology and strategic management in banking. By using the method of backward induction researchers in those fields can analyze the implications of certain strategies, corporate structure, or held resources for a company's success. Similarly economists can apply this method in analyses of a bank's technology policy.

In this thesis the main background variable of the banking industry's dynamics is the trend of decreasing distance costs (or access costs) based on the use of new information and communications technology. The de-linkage of service production and consumption is presumed to lead to the geographical concentration of the service production provided that there are unexploited economies of scale. At the economy level this development should have two interrelated outcomes: competition intensifies due to the limited geographical differentiation and the efficiency of the industry improves. This leads also to a traditional economic question: does increased market competition improve the efficiency of firms?

Along with technological development the demand for different service types has also evolved as indicated by the development of the different asset item values held by households. This, jointly with the entry of new types of rivals to the markets traditionally dominated by the banks, has expanded the repertoire of competitive actions used by firms. Hence measuring the intensity of competition has become even more difficult than it used to be. Fortunately new methods for the analysis of a competition have been developed.

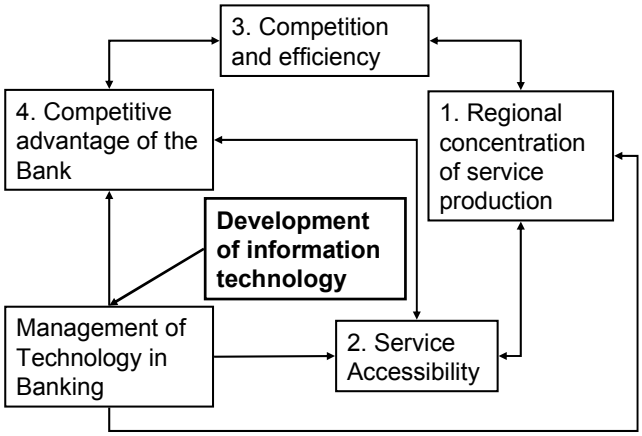

Figure 10. Themes as a system

Figure 10 presents these research questions as a system. The connectors between the boxes illustrate both the methodological and well as the thematic proximity between the themes. The main themes analyzed in the thesis are the regional development of the banking industry, the relation between competition and efficiency both at bank and market level, and competitive advantage in banking. The first two essays of the thesis are related to the regional development of banking. The third essay provides a theoretical analysis of the changes in competition and market structure based on decreasing distance costs. Whilst the relationship between competition and efficiency is analyzed in the third essay at the market level to discover how efficient the market is. The fourth essay analyzes the competition-efficiency relationship empirically at bank level. The fifth essay provides a methodology for the empirical identification of dynamic capabilities. The following subsection provides a summary of each essay.

5.2 Summary of the essays

Essay 1. REGIONAL CONCENTRATION OF FINANCIAL SERVICES IN FINLAND DURING 1995-2000 (joint with Mika Widgrén)[16]

The first essay of this thesis analyzes the specialization and absolute concentration of regional financial service output in Finland. The theoretical

[16] Published in Finnish Journal of Business Economics, 2/2003.

base of the study lies in new economic geography. The hallmark of the theoretical models is that the concentration of economic activity is encouraged via circular causality. The spatial concentration of activities, thus, itself creates an environment for further regional concentration. In financial services and banking the recent development in information technology decreases the costs of exporting these services from one region to another, which makes financial services markets more integrated. At the same time it may well lead to the concentration of output in these services being located in certain regions.

If production is assumed to be prone to concentration in certain areas there must be unexploited opportunities of economics of scale. Even though studies on economies of scale in banking have found rather modest economies of scale at the corporate level, there is a strong possibility that the same firms can exploit economies of scale at branch level. This is also supported by the results of last two essays of this thesis.

Derived from the theory, we tested whether the intra-region trade effect measured by the surface area of a region and the share of the potentially immobile labor force in the region had an effect on the concentration of the banking business. Also concentration towards existing population and business centers was tested. The analysis showed that a region's surface area has a negative effect both on specialization and production. An increase in the share of immobile labor positively affected specialization and negatively affected per capita production.

Essay 2. *REGIONAL DIFFERENCES IN BANK OFFICE SERVICE ACCESSIBILITY: AN ENTRY APPROACH*

Structural changes in retail banking markets and the development of remote access technologies have reduced the number of bank branches in many developed countries. That has made the closure of bank branches and service accessibility in rural/peripheral regions an interesting issue .

A typical way of analyzing the differences in accessibility is to compare distances between branches or branch densities. This kind of approach is not naturally reasonable in terms of economics as the most definitive characteristic of a lucrative market is not its geograhic area but service demand and competition in the market. A more sound way of studying accessibility is the use of firm perspective. That is, the accessibility of the services should be conditional on the profitability of entry into a market for a bank.

This paper uses an empirical entry approach in order to analyze whether peripheral regions have suffered from the development of branch networks in general and determine if some specific regions have faced more closures that one should expect? The analysis is conducted for Finnish NUTS2 regions by

using municipality level panel data for the years 1995, 1997, 1999, and 2001, i.e. for the era when Finnish banks were adjusting their branch networks to meet both structural changes and adapt to the possibilities of new technology. Accessibility is measured by the presence of both different bank groups and individual offices in the municipality. The different characteristics of the municipalities are controlled for in order to capture the same rationale banks do when deciding whether to have a branch in a certain municipality.

The analysis shows that there are some differences between the regions in the accessibility of the services measured both by the number of bank groups and the number of branches located in a municipality. Workers commuting to a municipality increased accessibility as well as the average taxable income. These characteristics are typically related to local centers but administrative city-status also had an additional positive effect. With regard to the development of accessibility, the analysis shows no differences between regions. Instead it shows that banking activity has become increasingly concentrated in local centers over the period of analysis, which is the reasonable outcome of decreasing transportation costs according to the spatial models of competition.

Essay 3. *THE COMPETITIVE IMPACT OF RELATIVE CHANGES IN SELLERS' AND BUYERS' TRANSPORTATION COSTS - AN APPLICATION TO BANKING*

New technology has enabled banks to provide new, customer utility and efficiency enhancing remote access services. One of the banks' main functions is information management. The remote access technologies have increased the physical distance between the bank and the customer. This can cause deterioration in the quality of the customer information banks base their lending decisions on. Also the decrease in distance costs leads to intensified competition.

This paper analyzes changes in market competitiveness within a spatial context. It shows that with equal transportation costs a market where the customer pays for transportation is less competitive than a market where customers do not incur transportation costs. In a free-entry context intensified competition also leads to a more concentrated market structure. The model is also applied to loan markets. In bank markets lenders "transportation costs" are based on localized customer information leading to inaccurate screening. The model shows that a decrease in distance costs faced by a borrower leads to intensified competition, market concentration and a lower average quality in the borrowers financed by a bank.

Essay 4. *THE COMPETITION AND EFFICIENCY OF FINNISH LOCAL BANKS: DOES MARKET STRUCTURE EXPLAIN DIFFERENCES IN EFFICIENCY?*

A traditional puzzle in economics is the interplay between the efficiency and competitiveness of a market. According to the theory intensified competition forces companies to improve their efficiency. However, the intensity of competition is rather difficult to measure. A typical proxy used for competition is market concentration. This proxy has, typically for economics, two opposite interpretations. First, according to the SCP-approach increased concentration is more likely to lead to a collusive outcome. Contrary to this, the Chicago or efficiency approach sees market concentration as an outcome of the competitive process whereby more efficient companies increase their market shares at the expense of those less efficient.

This paper analyzes the interplay between the efficiency of a bank and the structure of a bank's main markets in Finland from 2003 to 2006. The analysis utilizes data envelopment analysis (DEA) during its first stage. The second stage estimates the effects of the environmental variable on the relative efficiency of local banks as generated by DEA. The environmental variables describe both the market structure and rivalry. In addition to more traditional views, group variables are also included in the models to control for the possible sustainable competitive advantage of a bank group. The analysis shows that technical efficiency has improved during the period and that there are significant sustainable efficiency differences between the bank groups. That is, one can argue that a network of banks can have a sustainable competitive advantage. An increase in market concentration seems to have an adverse effect on efficiency. In contrast, the presence of rival banks in the bank's main market improves its efficiency.

Essay 5. *A METHODOLOGY FOR THE EMPIRICAL IDENTIFICATION OF DYNAMIC CAPABILITIES – THE CASE OF LOCAL BANKING (joint with Mikko Pohjola)*

The last essay of the thesis considers the identification of the dynamic capabilities, or more generally, any source of sustainable competitive advantage. Even though the dynamic capabilities literature (or lately the more general dynamic resource based view) has been one of the focal points of the strategic management literature, the number of empirical studies in the field is low. The reason for this is that dynamic capabilities are by definition hard to identify and measure.

The essay proposes a two-stage methodology for the empirical identification of dynamic capabilities. The first stage of the methodology aims to identify the competitive advantage of a firm and to control the effect of market power on firm success. The purpose of the first stage is to identify the existence of competitive advantage that is sustained over a period of time in a changing competitive environment. The second stage concentrates on the in-depth identification of the capability.

The first stage of the methodology is applied in an analysis of Finnish banking markets. In order to find out the competitive advantage of a firm we estimate differences both in production costs and in the pressure of competition faced by different bank groups. As an indicator of the differences of the competitive pressure faced by the banks a novel method, the so-called Boone-indicator, was used. The results showed some support for sustainable competitive advantage. The analysis is based on a panel analysis of local banking markets in Finland from 2002 to 2005.

6 CONCLUSION AND THE WAY AHEAD

The thesis at hand analyzes the development of the Finnish banking sector since 1995. The development of the market can be divided roughly into two periods. The first takes place between 1995 and 2001 when banks were introducing new remote access services and scaling down their branch networks. The second period of the development is related to the need for new financial services. In the thesis the first two essays analyze the regional aspects of the relevant financial services. The third essay provides a theoretical analysis of the spatial aspects of bank competition. The fourth essay analyzes the traditional question of the interplay between competition and efficiency. The last essay proposes a two-stage methodology for the identification of the sources of competitive advantage.

The efficiency of banking has improved a lot and simultaneously with that new technology has enabled banks to concentrate their operations regionally. The flip-side of the coin of efficiency is the decay of the proximity between bank offices and customers. The empirical analysis shows that there are interregional differences in accessibility but no differences in the development of accessibility. Also the differences in the accessibility of personal services between different municipality types were clear and significantly favored urbanized municipalities.

The regional concentration of service production has, however, had a positive effect on market efficiency beyond improving economies of scale. The analysis of the relation between competition and efficiency showed that in concentrated markets banks were less efficient than ones in bigger markets with more rivals. This analysis also showed sustained differences in efficiency between banks at the bank group level. That is, there seems to be significant sustainable competitive advantages in the banking sector.

The identification of sources of competitive advantage is a challenge for strategic management. For owners and regulatory authorities the source of competitive advantage manifested as a superior financial performance is an interesting question. That is, is a firm's financial success based on the use of monopoly power or on an organization's pure superiority in comparison to its competitors? A proposed two-stage methodology for the empirical identification of dynamic capabilities is based on the idea that in order to correctly identify dynamic capabilities a researcher has to control for market imperfections in order to separate capability based superior financial

performance from market power based monopoly profit. Also, if the source of competitive advantage is claimed to be based on dynamic capability, it should survive the test of a turbulent business environment. In practice such a methodology should include a quantitative empirical analysis during the first stage and more in-depth, qualitative methods during the second stage.

The results showed that there seemed to be some competitive advantage, which was manifested as a cost advantage, which lasted over the period of analysis. Cost advantage did not seem to create relaxed competitive pressure. From a competitive intelligence point this phenomenon has an explanation that is almost a cliché: doing things right is not the same as doing the right things. By combining the results of the market side competition analysis of essay 5 and the efficiency results from essay 4 the savings banks group is revealed to be the Finnish bank group with a competitive advantage. Naturally there is need for more detailed quantitative data on the service portfolios of these banks, but it is also evident that qualitative methods are needed in any extensive empirical analysis of dynamic capabilities as a source of competitive advantage.

This thesis also proposes a further avenue of research; the qualitative analysis of the sources of competitive advantage in banking. That is, after identifying a bank with competitive advantage one should start to analyze the sources of that advantage (by conducting the second stage of the proposed methodology). Also the use of DEA or stochastic frontier analysis in the first stage has to be planned, since the DEA in essay 4 identified a different bank group to that of essay 5 as the most efficient. This difference is most likely caused by a difference in the research focus as essay 4 was focused purely on the technical efficiency of multi-output production whilst essay 5 used proxies for the average costs of the service production as a whole. In any case, the empirical identification of sources of competitive advantage deserves more attention in the future.

Another interesting topic is the interplay of the competitive actions used and a bank's success. In the empirical studies of market competition it was found that the market leaders were more likely to lose their market share, relative to industry challengers, when they are less competitively aggressive, carry out simpler repertoires of actions and also carry out competitive actions more slowly (see Chen & Miller 1994, Ferrier et al. 1999, Smith et al. 2001). Typically, strategic attacks work better than tactical ones (Chen et al. 1992). Previous studies on this subject have identified successful players but this study seeks an answer to the question: how do the competitive strategies of "champion banks" differ from those of less successful banks. This kind of research should also shed light, not only on the dynamics of financial intermediation but, also on researchers' ability to illustrate the development of

associated industries like retailing, the software-industries, accounting and management consulting services, etc, since most strategically significant competitive actions are based on innovative behavior that utilizes old practices in a new environment.

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ESSAY I

REGIONAL CONCENTRATION OF FINANCIAL SERVICES IN FINLAND DURING 1995–2000

(Joint with Mika Widgrén)

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LTA 2/03 • p. 242–263

AKI T. KOPONEN and MIKA WIDGRÉN

Regional Concentration of Financial Services in Finland during 1995–2000[1]

ABSTRACT

In this paper we analyzed the process of regional concentration of financial service production. For indicators of concentration we used specialization index and financial service production per capita in the region. Theoretical base of the study lies on new economic geography. Derived from the theory, we tested whether the intra-region trade effect measured by geographic area and the share of the potentially immobile labor force in the region affect on the concentration. Also the concentration towards existing centers was tested. We found that the region's area has negative effect both on the specialization and production. Increase in share of immobile labor affected positively on specialization and negatively on per capita production.

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1. INTRODUCTION

During the latter half of the 1990s Finnish banking experienced a substantial reduction in terms of the branch network. The number of branches decreased from more than 3000 in 1995 to approximately 1500 in 2001. This development is likely to have regional consequences that may vary significantly from one region to another.

In this paper, we analyze specialization and absolute concentration of regional financial service output in Finland.[2] Financial services include here banking, insurance and other financial services. We attempt to quantify regional effects by using the ideas developed recently in the new economic geography literature. For that purpose we estimate two simple sets of models where different agglomeration forces are used and their impact is analyzed. The hallmark of the theoretical models is that concentration of economic activity is encouraged via circular causality. Spatial concentration of activities, thus, itself creates an environment for further regional concentration (see Krugman 1991, Fujita, Krugman & Venables 1999).

Economic geography models are usually used to explain concentration and agglomeration of industrial production (e.g. Amiti 1998, Br¸lhart 1998, Forslid et al. 1999, Braunerhjelm et al. 2000). An often-heard argument is that deeper integration will cause industrial delocation to big centers leaving other regions empty. The driving forces behind this development are lower trade costs and scale economies. In financial services and banking, the recent development in information technology decreases costs of exporting these services from one region to another, which makes financial services markets more integrated. At the same time it may well lead to concentration of output in these services to certain regions.

If we assume that the production is apt to concentration there must be unexploited opportunities of economics of scale. There exists extensive literature on scale economies in banking and few studies in insurance markets. Typically in bank market studies the maximum size of the banks facing scale economies has been moderate or even surprisingly low, and after this size banks have been found to face either constant or increasing marginal costs. The possible U-shape of average cost curve has been flat, i.e. both economies and diseconomies of scale have not been modest (see e.g. Berger & Humphrey 1994, Altunbaş et al. 2001, Cavallo & Rossi 2001, Hughes et al. 2001). Also the insurance market studies have revealed economies of scale either for smaller firms (see e.g. Suret 1991) or universally (Segal 2002).

Since the economies of scale are according to most of the empirical studies present only for rather small firms, does this make the expectation of concentration of service production irrelevant? The answer is no. Even though the financial service providers can face diseconomies of scale at the corporate level, there is a strong possibility that same firms face econo-

2 For recent development in banking in Europe, see Danthine et al. (1999).

mies of scale at the branch level (see e.g. Benston 1965, Berger et al. 1987, Zardkoohi & Kolari 1994, Toivanen 1995, Berger et al. 1997). As previously noted, the U-shape of the cost curve is rather flat. Therefore costs of the diseconomies of scale are not so high that these cannot be covered with better service prices customers are willing to pay for better accessibility of the service. Therefore, as long as the location matters and customers are willing to pay for convenience of physical proximity, firms can sustain diseconomies of scale at the corporate level. Since the new methods to serve customers from distance reduce the importance of location, i.e. the convenience of branch proximity felt by customers, it could be assumed that financial institutions will shut down small branches and concentrate the activity on bigger ones. The scale economies at branch level can be then exploited more effectively and theoretically this drives regional concentration of production.

An important aspect in location of financial services output is the importance of distance. In recent studies the usual empirical finding is that the importance of distance has declined in banking but that it still a significant determinant behind location decisions in banking (see Vesala 2000, Hyytinen & Toivanen 2002). In this paper, we take this development as given and concentrate on other determinants behind concentration.

The paper is organized as follows. In section 2 we present recent development of Finnish financial services markets. In section 3 we describe theoretical background of our study and the dataset that is used. Section 4 gives the results of the empirical analysis and, finally, section 5 concludes.

2. RECENT DEVELOPMENTS IN FINANCIAL SERVICES

Remote access services (Internet-services, WAP-services, Phone-banking) have reduced the importance of location. However, the development has not been able to exclude the fact that financial services are basically regional. That is, even if moving, a customer does not necessarily e.g. switch to a new bank. It is highly unlikely that a customer in Helsinki with no customer relationship history moves his/her financial business to a bank in Turku. Among financial services banking is perhaps most connected to region.

The development of bank service accessibility in Finland looks adverse. However, the overall picture is not so dismal, since part of the trend in number of the branch availability trend can be explained with technological progress. Drastic development of remote access technology has decreased the need for physically visit the bank and therefore some of the branches has become redundant. In table 1, we present the development of ”total financial service network”. By total financial service network we mean the customers possibilities to execute financial transactions.

TABLE 1. Total financial service network

Year	Online Connections	Giro ATMs	Cash dispensing ATMs	Branches
1995	732000	2153	2421	2880
1996	855000	2363	2298	2427
1997	1249000	2482	2285	2159
1998	1493000	2458	2208	2096
1999	1872000	2434	2181	2015
2000	2431000	2418	2134	1550

Source: Finnish Bankers' Association.

In the development of branch office and ATM networks the impact of online connection development can be seen. The number of branches has decreased throughout the period of analysis. First, the ATM network expanded until 1993 (cash dispensing ATMs) and 1997 (giro ATMs). Especially in the case of giro ATMs the most important factor of the development is the increase of online connections, since for the private consumers online connection at home is a strong substitute for the giro ATMs. Decrease in number of the cash dispensing ATMs is most likely to be compensated by the payment and credit cards. Number of payment and credit cards increased during the period 32% being approximately 2,8 millions in 2000.

Table 2 shows substantial change in payment behavior during the last decade. In 1995, some 48% of the payments were made in branch office. This ratio was as low as 11,8% in 2000. The number of payments made via online connections increased 184% (12,3% p.a.) from 1991 to 2000. The number of payments made with giro ATMs increased 119% respectively with average yearly growth rate of 9%. It is important to remember that the number of online connections increased strongly during the period whilst the number of giro ATMs has moderately decreased from 1997. Hence, the bank charges have been an effective method in the payment behavior change – the bank charges have given the incentive for self-service in banking.

Table 2. Payment transmission (millions of payments)

Year	Online Payments	Giro ATM Payments	Payments in Branch Office	Total	Share of payments via data connection (%)
1995	304	144	163	611	73
1996	316	151	161	628	74
1997	350	158	143	651	78
1998	391	174	124	689	82
1999	423	202	113	738	85
2000	462	241	94	797	88

Source: Finnish Bankers' Association.

3. FINANCIAL SERVICE PRODUCTION CONCENTRATION

3.1 Theoretical background

The key result in theoretical literature of economic geography is that self-enforcing backward and forward linkages drive concentration. Trade costs and scale economies and the fact that firms and economic activities in general are linked via input-output matrices are the main ingredients of circular causality (see Krugman & Venables 1995). In our application, downstream (industrial) firms use the supply of upstream (financial) services like an intermediate output but more importantly the linkage works from downstream to upstream as well since the downstream firms form the base for the supply of financial services. This emphasizes the role of financial services as producer services (producer services and integration, see Ethier & Horn 1991).

Another element is labor mobility, which is partially linked with general concentration. When the regional distribution of output changes it boosts migration and this migration leads to expenditure shifting, which in turn may further increase relocation of firms (and financial services) towards centers. When labor mobility contributes to location of financial services it partially gives financial services a consumer services emphasis (for consumer services and integration, see Haaparanta & Heikkinen 1995).

When trade costs or costs of exporting financial services from one region to another are sufficiently low the agglomeration forces become weaker and at the same time there exist dispersion forces. In particular, the dispersion forces that are independent of integration may become dominant. Comparative advantage is an often-mentioned example. In this paper, we evaluate two such variables. We check whether there is concentration towards existing centers at regional level and whether these regional centers are able to appeal financial services or is concentration mainly taking place inter-regionally. Another factor that may work against concentration is a high percentage of agriculture and public services in a region, which may work as a brake for circular causality tendency as there exists an upper limit for labor mobility.

In the empirical model below, we proxy trade costs with the area of a region. In big regions it is, other things being given, more costly to serve all parts of the region whereas is small and compact regions it is less costly. Our region units are NUTS4[3] regions. As mentioned above, we assume a general decline in costs of exporting financial services from one

3 In Finland NUTS4 regions consist of some 5,3 municipalities. The NUTS4 regions are used in the geographical unit since this is the most accurate level in which the regional production data was available for us. NUTS4 is also the best regional unit available to reflect the area where labor force travels daily, i.e. reflecting in most accurately the economic region. For this use municipality would be far too small unit and respectively NUTS3 region (county) too big.

region to another. The area variable attempts to capture the intra-region trade cost. Low intra-region trade cost supports, ceteris paribus, concentration.

Our measure for linkages between upstream and downstream firms is region's share of production in other market industries. The higher the share the more potential demand there is for financial services. The intensity of labor mobility, on the other hand, is proxied by potential share of immobile labor. We count the percentage of workforce in agriculture and public services for this.

3.2 Data description

The data used in our analysis is a panel consisting of both economic and geographic variables and covering years 1995–2000. The observations units are NUTS4 regions (85 regions) and data is supplied by Statistics Finland. The variables used here are an index for specialization in financial services (FINSPE, region's share of financial service production divided by regions share of total market production), financial service production per capita (FINGRPPC, in thousands euros), region's geographic area (AREA, in square-km's), share of immobile labor (IMMOBLS, share of labor working in agrarian industry and for non-market industries), and region's share of production in other market industries (MGFIN). A dummy-variable indicating the existing center of the NUTS3 area is also included (CENTER). Descriptive statistics for the pooled sample are presented in table 4 and yearly descriptive statistics can be found in appendix 1.

During the period of analysis there has been no clear trend in either specialization of financial service production or in per capita production.[4] Instead, the share of labor in immobile industries has decreased due to job creation in market industries.

Appendix 2 presents scatter plots of specialization and per capita production. It gives regional observations on the main explaining variables in theoretical model presented above.

TABLE 3. Descriptive statistics of pooled sample, N=510.

	Mean	Std.Dev.	Minimum	Maximum
FINSPE	**0.856036**	**0.333528**	**0.25851**	**2.28592**
FINGRPPC	**628.697**	**309.266**	**271.481**	**3158.61**
MGFIN	**0.0117647**	**0.0337323**	**0.000232853**	**0.323587**
AREA	**3978.17**	**5136.58**	**517.87**	**35108.6**
IMMOBLS	**0.462756**	**0.105873**	**0.262934**	**0.696533**
CENTER	**0.235294**	**0.424599**	**0**	**1**

4 However, in year 2000 per capita production of financial services is significantly higher than the average.

The figures in appendix 2 show that specialization is increasing with immobile labour. Area and MGFIN do not show as clear effects. There are two distinct regions in the data, namely Helsinki and Maarianhamina. Generally, it seems that there is weak decrease of per capita output in financial services as area or share of immobile labor increases. Regions share of other market production has positive effect on per capita production of financial services even when the distinct regions are excluded.

4. EMPIRICAL ANALYSIS AND RESULTS

In this section, we analyze econometrically agglomeration and regional specialization of financial service production. The basis of analysis lies on theory presented above. According to this the financial service production should locate where 1) the demand is, i.e. the regions with either high percentage of private market industry excluding financial services 2) where transportation costs are lower, i.e. the area of the region is small and 3) where the population is immobile, i.e. regions with high percentage of public services and agriculture.

4.1 On estimations

First, we estimate for both the financial specialization and per capita financial services output three model specifications. These models contain only the mobility and transportation cost indicators. In the second set of models, we add our demand indicator, MGFIN, into the first set of models and, finally, the fourth specification contains also a dummy variable CENTER (for the definition see above). Functions are linear and independent variables in the models are

(1) CONSTANT, AREA, IMMOBLS
(2) CONSTANT, AREA, IMMOBLS, MGFIN
(3) CONSTANT, AREA, IMMOBLS, MGFIN, CENTER

Functions are estimated with one way random effects model (RE) and random coefficients model (RCM). Also OLS-estimations are reported. We use random effects model instead of fixed effects model since we have two time-invariant variables, AREA and CENTER, in our models. However, a well-known problem with random effects model is the possible correlation of independent variables with observation unit specific error term. One solution for this problem is the model presented by Hausman and Taylor (1981)[5] where variables that are correlated with error term can be defined. However, it is difficult to define *a priori* which varia-

5 For text-book presentation of this model, see e.g. Baltagi (2001).

bles are possibly correlated with the error term. Also, the estimation of Hausman-Taylor model has identification constraints, i.e. number of possibly correlated time-invariant variables cannot exceed the number of uncorrelated time-variant variables.

The possible correlation between the independent variables and the observation unit specific error terms can easily create a situation where the error terms contain the concentration effects that we are trying to find. This unpleasant feature is difficult to avoid. In addition to the causes of concentration we are interested whether the dynamics of concentration changes over the time. For this purpose, we estimate a random coefficient model (RCM) (see e.g. Hsiao 1986 or Greene 2001) where we use time periods as a grouping variable. The models can be written in RCM context as

$$y_t = X_t\beta_t + \varepsilon_t,$$

where $\beta_t = \beta + v_t$. Then β_t is a random coefficient applied to the certain yearly cross-section and n_t is the outcome of the random process and b the mean coefficient vector. For specialization a random process can be generated using the decline in importance of the location and, for per capita production, simply using economic growth. Basically we estimate group of functions and test whether the parameter estimates are same for all of them. In general RCM-estimates are closer to OLS-estimates than RE-estimates since average estimates presented in following tables are variance weighted OLS-coefficients.

4.2. Results and discussion

The results here are presented such that at first we report the estimation results of RE-model. After that we shortly compare RE estimation results to OLS and RCM ones and shortly discuss possible econometric problems.

The estimates in tables I and II demonstrate that the variable indicating intra-region transportation costs (AREA) is insignificant both for specialization and for production per capita. Immobility is significant factor and increases specialization, but decreases per capita production (market production is lower in those areas). Economic importance of the region, measured by regions share of market production, increases concentration but has no affect of specialization. The "center" status of region is insignificant factor for both dependent variables.

The coefficients in tables I and II have all expected signs. The insignificance of distance variable suggests that both relative specialization in financial services and output per head in financial services are not negatively affected in regions with long distances. Relatively high share of immobile labor and region's high share in market production are opposite forces in the sense that they are partially exclusive. The former works like a brake and a dispersion force and the latter as an agglomeration force. Together these imply that it is likely that finan-

TABLE I. Specialization estimations with whole sample (Nobs. = 510).

	Model 1			Model 2			Model 3		
	OLS	RE	RCM	OLS	RE	RCM	OLS	RE	RCM
CONSTANT	0.180959**	0.628473**	0.166162**	–0.05345	0.555122**	–0.0803**	–0.12507	0.55799**	–0.15696**
	(0.059564)	(0.089595)	(0.041813)	(0.060632)	(0.091585)	(0.018242)	(0.065466)	(0.095317)	(0.036754)
AREA	–8.94E-06**	–2.12E-06	–9.02E-06**	–1.04E-05**	–2.69E-06	–1.06E-05**	–1.07E-05**	–2.47E-06	–1.09E-05**
	(2.70E-06)	(6.13E-06)	(2.68E-06)	(2.51E-06)	(5.63E-06)	(2.68E-06)	(2.49E-06)	(5.61E-06)	(2.64E-06)
IMMOBLS	1.53571**	0.510008**	1.5697**	1.96337**	0.649827**	2.02118**	2.08206**	0.633284**	2.14955**
	(0.131107)	(0.184859)	(0.177942)	(0.129781)	(0.186678)	(0.140311)	(0.135747)	(0.186306)	(0.159421)
MGFIN				3.58385**	0.925506	3.67855**	3.29874**	0.73474	3.38452**
				(0.386254)	(0.806076)	(0.451158)	(0.397045)	(0.839033)	(0.456692)
CENTER							0.090039**	0.026253	0.094152**
							(0.032252)	(0.072219)	(0.030663)
Model test F-value (prob.)	68.73 (.000)			82.20 (.000)			64.43 (.000)		
LM-statistics (prob value)	967.48 (.000)			893.20 (.000)			883.22 (.000)		
Homogeneity test (prob. value)		10.92 (.758)			18.32 (.563)			20.34 (.729)	

Notes. Standard errors are in parenthesis. Significance levels of 1% and 5% are indicated respectively by ** and *. Model test F-value is the joint significance test of the regressors. Lagrange Multiplier test (LM-statistics) tests random effects model against OLS (High values favors RE over OLS). Homogeneity test tests whether there are random coefficients or is same model applicable for all groups (low values favors homogeneity assumption).

TABLE II. Per capita production estimations with whole sample (Nobs. = 510).

	Model 1			Model 2			Model 3		
	OLS	RE	RCM	OLS	RE	RCM	OLS	RE	RCM
CONSTANT	1075.36**	1197.65**	1051.08**	716.557**	947.68**	689.247**	651.694**	935.445**	620.907**
	(58.3283)	(92.591)	(141.639)	(51.5717)	(86.5238)	(98.7421)	(55.6257)	(91.2758)	(70.7516)
AREA	–0.00477486	–0.00291072	–0.00484**	–0.00695227**	–0.003636	–0.00708**	–0.0072089**	–0.0035722	–0.00737**
	(0.00264626)	(0.00595744)	(0.001195)	(0.00213094)	(0.0046449)	(0.001272)	(0.00211635)	(0.00461703)	(0.001325)
IMMOBLS	–924.166**	–1204.47**	–878.986**	–269.558*	–788.758**	–215.78**	–162.08	–774.839**	–101.13*
	(128.387)	(193.764)	(180.411)	(110.388)	(180.253)	(82.7342)	(115.343)	(183.364)	(40.4814)
MGFIN				5485.69**	5141.19**	5506.65**	5227.5**	5037.27**	5244.84**
				(328.535)	(685.32)	(669.263)	(337.366)	(712.718)	(576.221)
CENTER							81.5381**	28.7405	84.8693*
							(27.4038)	(59.6447)	(37.7625)
Model test F-value (prob.)	35.41 (.000)			121.48 (.000)			100.83 (.000)		
LM-statistics (prob. value)		913.81 (.000)			734.14 (.000)			722.22 (.000)	
Homogeneity test (prob. value)			16.08 (.377)			32.61 (.037)			35.45 (.080)

Notes. Standard errors are in parenthesis. Significance levels of 1% and 5% are indicated respectively by ** and *. Model test F-value is the joint significance test of the regressors. Lagrange Multiplier test (LM-statistics) tests random effects model against OLS (High values favors RE over OLS). Homogeneity test tests whether there are random coefficients or is same model applicable for all groups (low values favors homogeneity assumption).

cial services concentrate less than market production. This is confirmed by the fact that the coefficient of IMMOBLS gets negative sign when output per head is the dependent variable and positive sign when specialization in financial services is dependent variable.

As mentioned above, Helsinki and Maarianhamina are distinct observations in our data. In tables III and IV, we present the estimation results when these observations are excluded.

Tables III and IV show that when Helsinki and Maarianhamina are omitted, MGFIN is negative and significant and CENTER is positive and significant in explaining specialization in financial services. The coefficient of CENTER is insignificant in the model explaining output per head in financial services. Like previously, high share of potentially immobile labor has positive effect on specialization and negative of per head financial service production. Negative sign of MGFIN in financial service specialization estimations and insignificance in production per capita estimations suggest that the market size effect is highly dominated by Helsinki region's importance in providing financial services. It is also interesting that NUT3 center status has positive impact on the specialization but no impact on the per capita production.

If we exclude Helsinki and Maarianhamina the high percentage of private market industries have a negative and significant impact on relative concentration of financial services, i.e. specialization, while it does not have on absolute concentration, per capita output. If we exclude the dominant role of the national center and an island center we can draw the conclusion that financial services concentrate on a slower pace than private industries' output in general. This seems to be due to potential immobility in rural regions with high shares of public services.

In the third set of estimations, we use all observations, but for Helsinki and Maarianhamina we include a dummy variable, CENTERHM. Then we have the following explanatory variables

(4) CONSTANT, AREA, IMMOBLS, CENTERHM

(5) CONSTANT, AREA, IMMOBLS, MGFIN, CENTERHM

Estimation results are for these models are presented in tables V and VI.

The tables show that CENTERHM is highly significant. It seems that there are two centers in financial service production. In Helsinki, the levels of specialization and production per capita have been rather stable, but in year 1996 the specialization index decreased strongly from previous year and in 2000 when production increased by 30% from previous year. Specialization and production in Maarianhamina have especially increased over time; due to decrease in transportation costs many financial services for the clients of ≈landsbanken in continental Finland are actually operated in Maarianhamina.

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Like in table IV above the inclusion of CENTERHM dummy variable makes MGFIN to lose its significance in per capita production estimations. Similarly the specialization is de-

TABLE III. Specialization estimations without assumed main centers (Nobs. = 498).

	Model 1			Model 2			Model 3		
	OLS	RE	RCM	OLS	RE	RCM	OLS	RE	RCM
CONSTANT	–0.03098	0.413471**	–0.05462	–0.09469	0.683411**	–0.14576**	–0.08753	0.683603**	–0.13842**
	(0.04882)	(0.081905)	(0.044792)	(0.070126)	(0.096321)	(0.032131)	(0.070046)	(0.094522)	(0.032193)
AREA	–9.48E-06**	–2.99E-06	–9.57E-06**	–9.68E-06**	–4.09E-06	–9.88E-06**	–9.74E-06**	–4.19E-06	–9.94E-06**
	(2.14E-06)	(4.74E-06)	(2.50E-06)	(2.15E-06)	(4.75E-06)	(2.48E-06)	(2.14E-06)	(4.76E-06)	(2.45E-06)
IMMOBLS	1.93596**	0.92711**	1.9907**	2.04384**	0.56617**	2.1447**	2.03046**	0.555321**	2.13096**
	(0.106605)	(0.172781)	(0.17854)	(0.136487)	(0.184353)	(0.112895)	(0.136316)	(0.1801299	(0.118282)
MGFIN				1.70709	–11.7101**	2.37207	–0.00227	–15.5991**	0.703403
				(1.34984)	(2.296789)	(1.22372)	(1.62174)	(2.65552)	(1.61784)
CENTER							0.06241	0.173103*	0.06095
							(0.03301)	(0.070613)	(0.036567)
Model test F-value (prob.)	165.73 (.000)			111.31 (.000)			84.81 (.000)		
LM-statistics (prob. value)		793.57 (.000)			781.91 (.000)			783.78 (.000)	
Homogeneity test (prob. value)			21.26 (.129)			23.94 (.245)			24.49 (.491)

Notes. Standard errors are in parenthesis. Significance levels of 1% and 5% are indicated respectively by ** and *. Model test F-value is the joint significance test of the regressors. Lagrange Multiplier test (LM-statistics) tests random effects model against OLS (High values favors RE over OLS). Homogeneity test tests whether there are random coefficients or is same model applicable for all groups (low values favors homogeneity assumption).

TABLE IV. Per capita production estimations without assumed main centers (Nobs. = 498).

	Model 1 OLS	Model 2 RE	Model 3 RCM	OLS	RE	RCM	OLS	RE	RCM
CONSTANT	790.007**	915.329**	770.491**	636.595**	913.21**	592.732**	639.395**	917.934**	595.011**
	(31.3524)	(56.0577)	(92.9985)	(44.0727)	(70.698)	(99.094)	(44.1202)	(70.5565)	(98.9961)
AREA	–0.00573472**	–0.00390409	–0.00587**	–0.00620542**	–0.00405612	–0.00643**	–0.00623093**	–0.00409934	–0.00646**
	(0.00137685)	(0.00280431)	(0.000898)	(0.0013501)	(0.00270175)	(0.000844)	(0.00134976)	(0.00271538)	(0.000864)
IMMOBLS	–381.793**	–666.255**	–340.345**	–121.967	–655.4**	–37.4704	–127.207	–665.654**	–42.0561
	(68.4629)	(120.751)	(79.9533)	(85.7793)	(136.913)	(101.528)	(85.8621)	(136.594)	(101.829)
MGFIN				4111.23**	–281.199	4658.88**	3442.03**	–1744.1	4016.67**
				(848.352)	(1499.15)	(1057.87)	(1021.49)	(1792.16)	(1122.44)
CENTER							24.4327	57.0453	24.0616
							(20.792)	(41.3274)	(28.5819)
Model test F-value (prob.)	35.27(.000)			32.41 (.000)			24.67 (.000)		
LM-statistics (prob. value)		490.21 (.000)			437.25 (.000)			437.59 (.000)	
Homogeneity test (prob. value)			74.67 (.000)			89.63 (.000)			91.88 (.000)

Notes. Standard errors are in parenthesis. Significance levels of 1% and 5% are indicated respectively by ** and *. Model test F-value is the joint significance test of the regressors. Lagrange Multiplier test (LM-statistics) tests random effects model against OLS (High values favors RE over OLS). Homogeneity test tests whether there are random coefficients or is same model applicable for all groups (low values favors homogeneity assumption).

TABLE V. Specialization estimations with dummies for assumed main centers (Nobs. = 510).

	Model 4			Model 5		
	OLS	**RE**	**RCM**	**OLS**	**RE**	**RCM**
CONSTANT	**–0.03319** **(0.048653)**	**0.392723**** **(0.081983)**	**–0.05734** **(0.0479241)**	**–0.02554** **(0.051876)**	**0.469497**** **(0.083939)**	**–0.05486*** **(0.024915)**
AREA	**–9.57E-06**** **(2.14E-06)**	**–3.38E-06** **(4.71E-06)**	**–9.68E-06**** **(2.54E-06)**	**–9.51E-06**** **(2.14E-06)**	**–2.94E-06** **(4.74E-06)**	**–9.65E-06**** **(2.48E-06)**
IMMOBLS	**1.94147**** **(0.106207)**	**0.97496**** **(0.173077)**	**1.99775**** **(0.187887)**	**1.92783**** **(0.110985)**	**0.849521**** **(0.173605)**	**1.99147**** **(0.117081)**
MGFIN				**–0.18372** **(0.429926)**	**–2.41647**** **(0.883117)**	**–0.07248** **(1.01965)**
CENTERHM	**1.22781**** **(0.07026)**	**1.08803**** **(0.157109)**	**1.23675**** **(0.131489)**	**1.25286**** **(0.091548)**	**1.42534**** **(0.201733)**	**1.25291**** **(0.262132)**
Model test F-value (prob.)	**175.12 (.000)**			**131.17 (.000)**		
LM-statistics (prob. value)		**781.89 (.000)**			**782.99 (.000)**	
Homogeneity test (prob. value)			**25.12(.197)**			**30.29(.214)**

Notes. Standard errors are in parenthesis. Significance levels of 1% and 5% are indicated respectively by ** and *. Model test F-value is the joint significance test of the regressors. Lagrange Multiplier test (LM-statistics) tests random effects model against OLS (High values favors RE over OLS). Homogeneity test tests whether there are random coefficients or is same model applicable for all groups (low values favors homogeneity assumption).

creasing in MGFIN. As an overall result we can see that both for specialization and per capita production region's area has no effect. The share of labor in immobile industries positive effect has positive effect on specialization and negative on per capita production. This indicates that financial services do not concentrate on regions with high shares of agriculture and public services absolutely but rather relatively.

In general the pooled sample estimation works fine with specialization, i.e. homogeneity over groups is not rejected based on chi-squared test in models 1–3 for FINGRPPC with whole sample and without CENTERHM dummy cross-sectional homogeneity is rejected in model 2 with FINGRPPC as a dependent. With sample excluding Helsinki and Maarianhamina all models reject the hypothesis of yearly estimation homogeneity. However, in these models rejection is due to year 2000: by leaving it out homogeneity in coefficients levels of the yearly predictions is high. Even though the homogeneity is rejected with inclusion of all years, in all models the yearly predictions have qualitatively (sign of the coefficient) same coefficients. For models 4 and 5 for FINGRPPC this does not apply. For IMMOBLS and MGFIN there are change both in levels and significance of coefficients. In the case of IMMOBLS, coefficient levels increase in

TABLE VI. Per capita production estimations with dummies for assumed main centers (Nobs. = 510).

	Model 4			Model 5		
	OLS	RE	RCM	OLS	RE	RCM
CONSTANT	792.467**	874.934**	769.409**	749.55**	836.213**	725.5**
	(33.8663)	58.9777	91.5285	35.6899	61.3903	113.846
AREA	–0.00560722**	–0.00440824	–0.00577**	–0.00594432**	–0.00467768	–0.0061**
	(0.00148713)	(0.00281542)	(0.001001)	(0.00147418)	(0.00277892)	(0.000848)
IMMOBLS	–388.165**	–575.306**	–339.854**	–311.59**	–508.735**	–263.34*
	(73.9284)	(127.681)	(76.0652)	(76.3552)	(130.347)	(117.844)
MGFIN				1031.06**	1055.04	1062.07
				(295.78)	(548.046)	(867.741)
CENTERHM	1621.93**	1594.86**	1632.87**	1481.34**	1449.3**	1492.16**
	(48.9069)	(93.0525)	(380.227)	(62.9833)	(119.028)	(466.687)
Model test F-value (prob.)	441.38 (.000)			341.37 (.000)		
LM-statistics (prob. value)		320.72 (.000)			305.57 (.000)	
Homogeneity test (prob. value)			165.15 (.000)			178.63(.000)

Notes. Standard errors are in parenthesis. Significance levels of 1% and 5% are indicated respectively by ** and *. Model test F-value is the joint significance test of the regressors. Lagrange Multiplier test (LM-statistics) tests random effects model against OLS (High values favors RE over OLS). Homogeneity test tests whether there are random coefficients or is same model applicable for all groups (low values favors homogeneity assumption).

time and it is significant in last three years and, in the case of MGFIN, coefficient levels decrease in time and are insignificant in last four year. Altogether it seems that the factors driving concentration and specialization has been stable over the period of analysis.

The RE estimation results deviated from the OLS and RCM estimations. Many of the variables that were significant in OLS and RCM estimations lost their significance in RE estimation. That was the case especially with the regions area: in all OLS and RCM estimations the area was negative and highly significant, but in significant in all RE estimations. Also the constant was typically substantially higher in RE estimations. However there were no cases where the significant coefficient had an opposite sign in RE compared to OLS or RCM. In the analysis, we used reduced form models on purpose since we wanted to concentrate on the impact of the main determinants of location analyzed in the theoretical new economic geography literature. The cost of this choice was limited possibility to test different assumptions of correlation between independent variables and observation unit specific error term (i.e. estimation previously mentioned Hausman-Taylor model).

TABLE VII. ABB-estimations with the whole sample.

	FINSPE			FINGRPPC		
	Model 1	Model 2	Model 3	Model 1	Model 2	Model 3
ONE	0.08122**	–0.05313**	–0.10753**	975.59**	510.153**	346.275**
	(0.015448)	(0.007637)	(0.008441)	(52.9559)	(23.6779)	(18.1783)
AREA	–5.72E-06**	–6.66E-06**	–7.59E-06**	–0.00431**	–0.00543**	–0.00543**
	(8.19E-07)	(5.60E-07)	(4.74E-07)	(0.000422)	(0.000382)	(0.000339)
MYY	0.967105**	1.2224**	1.43145**	–830.994**	–112.678**	19.5691
	(0.124424)	(0.092761)	(0.07831)	(48.9751)	(28.5818)	(28.7845)
MGFIN		2.01159**	2.04382**		5144.33**	4075.85**
		(0.166796)	(0.123353)		(136.003)	(92.4347)
CENTER			0.063069**			99.0771**
			(0.004531)			(7.11847)
Lagged value of dependent variable	0.423518**	0.420374**	0.358351**	0.098215	0.226186**	0.386912**
	(0.079025)	(0.044932)	(0.036003)	(0.051472)	(0.029506)	(0.020805)
Bhargava-Sargan	0.006	0.000	0.001	0.000	0.000	0.000

Notes. The estimates are second step GMM-estimates. Standard errors are in parenthesis. Significance levels of 1% and 5% are indicated respectively by ** and *. Bhargava-Sargan is test statistic for the model specification. Reported figures are p-values.

Another problem relates to dynamics of concentration. In the data, time-series variation was strongly dominated by cross-sectional variation.[6] This implicates that possibly we should include the lagged dependent variable into estimation equations. Therefore we made tentatively Arellano/Bond/Bover IV (Arellano et al. 1991, 1995) estimation for dynamic panel data models for models 1–3 with whole sample. The results are presented in table VII. The results were pretty well in line (signs and significances of coefficients were same) with RCM and OLS estimations presented above and as assumed the lagged values of the dependent variable were significant. Compared to RE estimation results, the changes in significances were remarkable. However the Bhargava-Sargan specification test showed problem of over-identification in the dynamic models, i.e. it is likely that there are too many instrumental variables in the model.

5. CONCLUSIONS

In this paper, we analyzed specialization and absolute concentration of regional financial service output in Finland. For this purpose we estimated three sets of simple models where we

6 This can be seen also in RCM estimations: in most of cases the homogeneity hypothesis was not rejected.

included variables describing potential agglomeration forces in determination of the location of output.

Our models take it as given that general costs of ″exporting″ financial services from region to region are decreasing due to development in information technology. We add the intra-regional aspect of trade costs and proxy it with region's area. The significance of area was dependent on the estimation method. In all random effects estimations with no lagged values of dependent variable are was statistically insignificant. In OLS and random coefficients estimations effect of area was negative and highly significant. Also the inclusion of lagged values of dependent variables made effect of the area negative and highly. This led us to conclude that distance matters in the sense that there is a tendency of concentration to areas where demand is relatively close.

We argued that potential sources of (labor) immobility might slow down the agglomeration process and even turn it when trade costs are sufficiently low. In all estimations we found that, indeed, this seems to be the case in financial services as well. High percentage of public services and agriculture has a positive highly significant impact on specialization but not on absolute concentration. Immobility combined with gains from local banks' local knowledge implies that in these regions there is a comparative advantage in banking services. This does not, however, work in output per head where the effect is negative and significant.

The forward linkages obtain only weak and partial support. In terms of specialization the share of private market industries in output has significant positive effect only in our first model specification. When we exclude Helsinki and Maarianhamina or when we control their impact with dummies there is no evidence on significant forward linkages. In absolute concentration there seems to be significant forward linkages but also they seem to vanish if we control for the Helsinki effect.

In sum, the results of this paper suggest that the forward linkages do not obtain unambiguous support from location financial services in Finland. The results on intra-regional trade costs suggest that there are significant home market effects but concentration in financial services output seems to proceed more slowly than in industrial output. A phenomenon reminiscent to comparative advantage supports relative concentration of financial services into rural regions with high percentage of public services. ■

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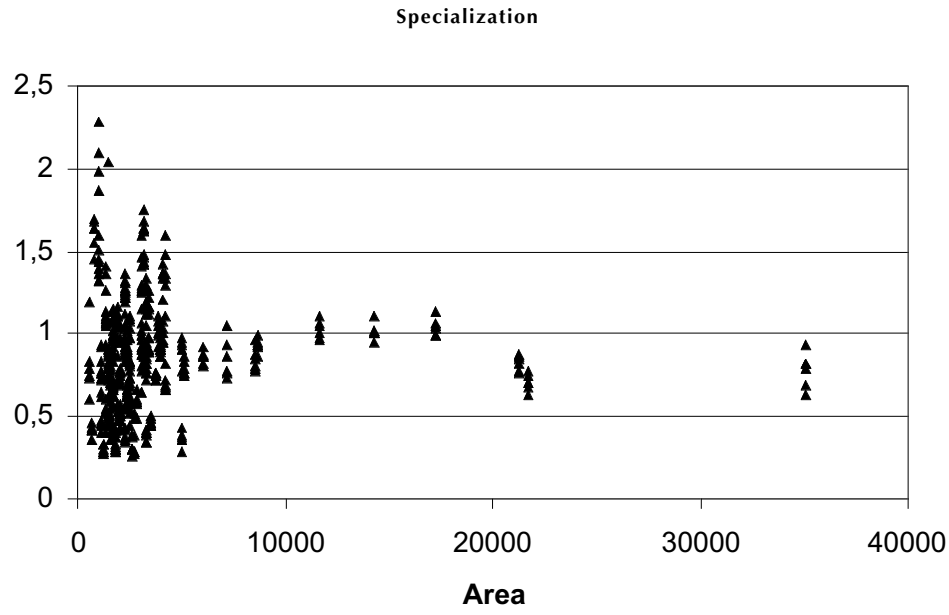
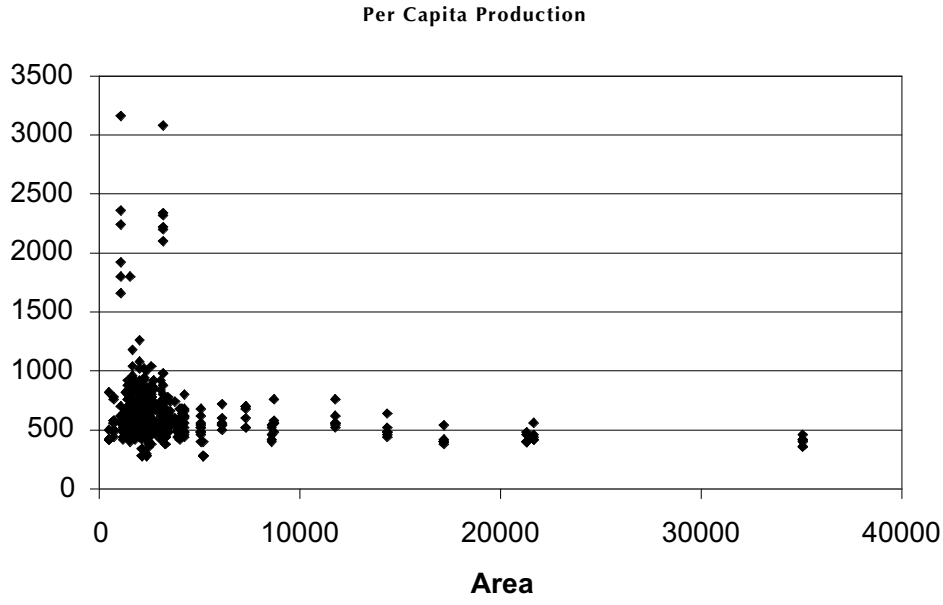
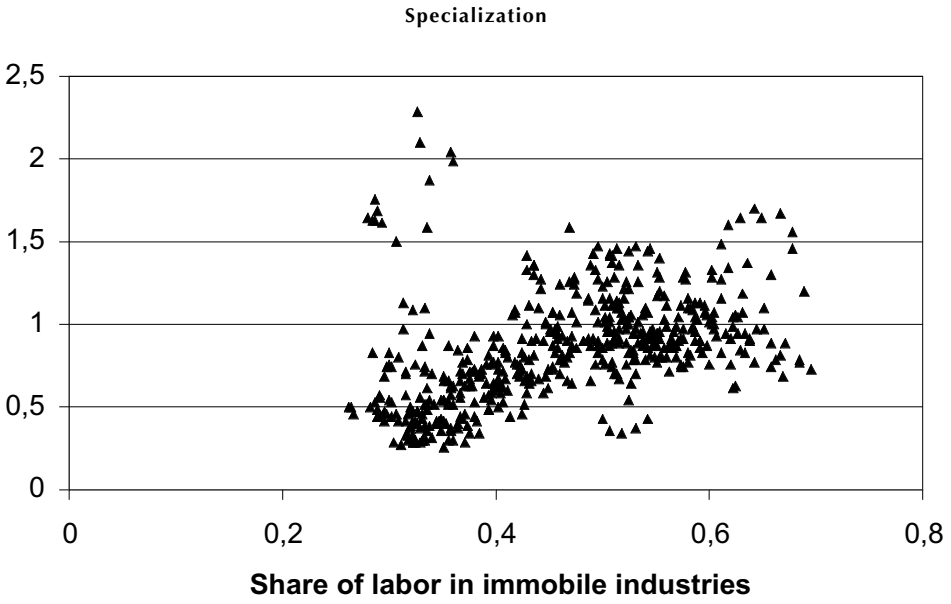
APPENDIX 1. Yearly descriptive statistics.

Variable	Mean	Std.Dev.	Minimum	Maximum
YEAR 1995, 85 Obs.				
FINSPE	.813853667	.305564081	.258510145	1.75952627
FINGDPPC	562.315575	253.654224	272.937224	2198.80272
MGFIN	.0117647059E	.0317889070	.343622000E-03	.287184613
AREA	3978.17094	5162.00011	517.870000	35108.6300
IMMOBLS	.484671226	.110334721	.285711197	.696533265
CENTER	.235294118	.426699929	.000000000	1.00000000
YEAR 1996, 85 Obs.				
FINSPE	.873887608	.325154284	.288562297	1.62040046
FINGDPPC	627.885028	264.955064	271.480928	2217.53591
MGFIN	.0117647058	.0331014157	.326342000E-03	.299656661
AREA	3978.17094	5162.00011	517.870000	35108.6300
IMMOBLS	.476549424	.110065441	.282107064	.689227298
CENTER	.235294118	.426699929	.000000000	1.00000000
YEAR 1997, 85 Obs.				
FINSPE	.871353674	.335402660	.284262560	1.87291759
FINGDPPC	602.305280	260.725494	277.373275	2098.90106
MGFIN	.0117647059	.0321813871	.259408000E-03	.290364221
AREA	3978.17094	5162.00011	517.870000	35108.6300
IMMOBLS	.468263580	.105900513	.286862493	.684782609
CENTER	.235294118	.426699929	.000000000	1.00000000
YEAR 1998, 85 Obs.				
FINSPE	.848782320	.353712136	.294191387	2.03787762
FINGDPPC	617.255387	321.311799	281.254395	2348.33558
MGFIN	.0117647059	.0346480469	.250801000E-03	.314224968
AREA	3978.17094	5162.00011	517.870000	35108.6300
IMMOBLS	.454025854	.102199143	.265748273	.648711944
CENTER	.235294118	.426699929	.000000000	1.00000000
YEAR 1999, 85 Obs.				
FINSPE	.864772795	.335353356	.275850249	2.09478889
FINGDPPC	597.210780	296.114005	283.607487	2358.28831
MGFIN	.0117647058	.0356553815	.232853000E-03	.323313442
AREA	3978.17094	5162.00011	517.870000	35108.6300
IMMOBLS	.447308592	.101774756	.262933805	.644666575
CENTER	.235294118	.426699929	.000000000	1.00000000
YEAR 2000, 85 Obs.				
FINSPE	.863563447	.349795680	.280060701	2.28591771
FINGDPPC	765.211253	401.204442	401.307115	3158.61362
MGFIN	.0117647059E	.0357947636	.240139000E-03	.323586904
AREA	3978.17094	5162.00011	517.870000	35108.6300
IMMOBLS	.445719295	.101460930	.265119864	.636960087
CENTER	.235294118	.426699929	.000000000	1.00000000
All observations in current sample				
FINSPE	.856035585	.333528503	.258510145	2.28591771
FINGDPPC	628.697217	309.266365	271.480928	3158.61362
MGFIN	.0117647059	.0337322997	.232853000E-03	.323586904
AREA	3978.17094	5136.58390	517.870000	35108.6300
IMMOBLS	.462756329	.105872922	.262933805	.696533265
CENTER	.235294118	.426699929	.000000000	1.00000000

APPENDIX 2. Scatter plots of specialization and per capita production of financial services.






Specialization
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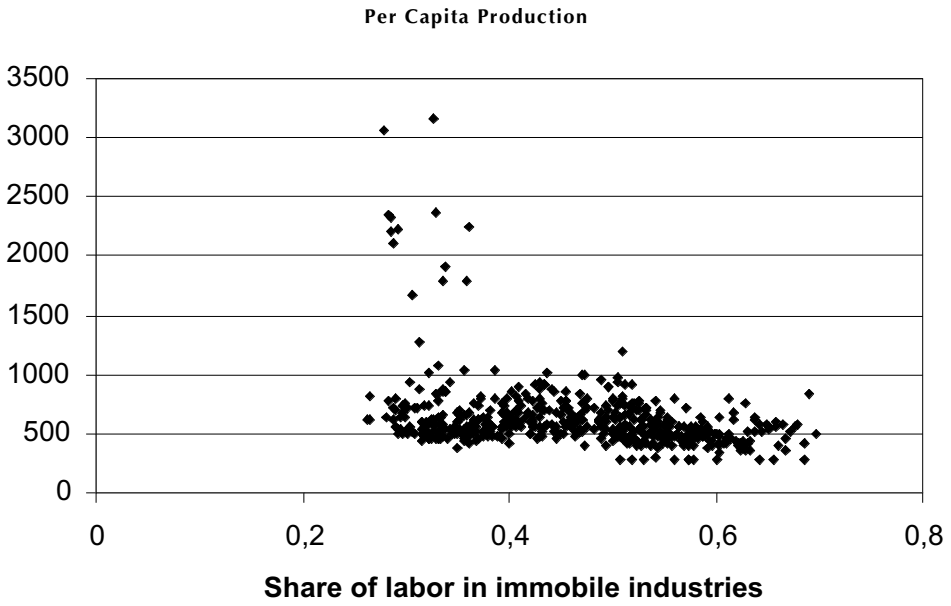
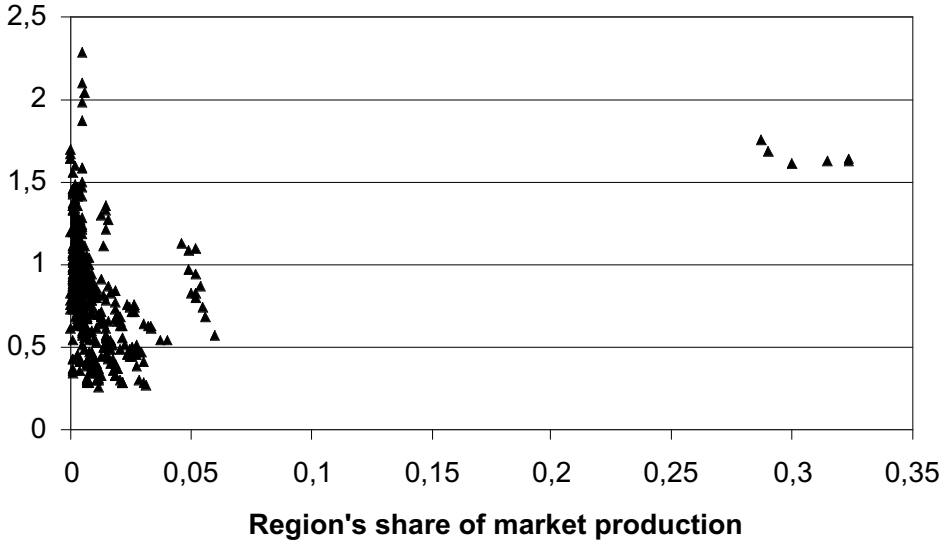
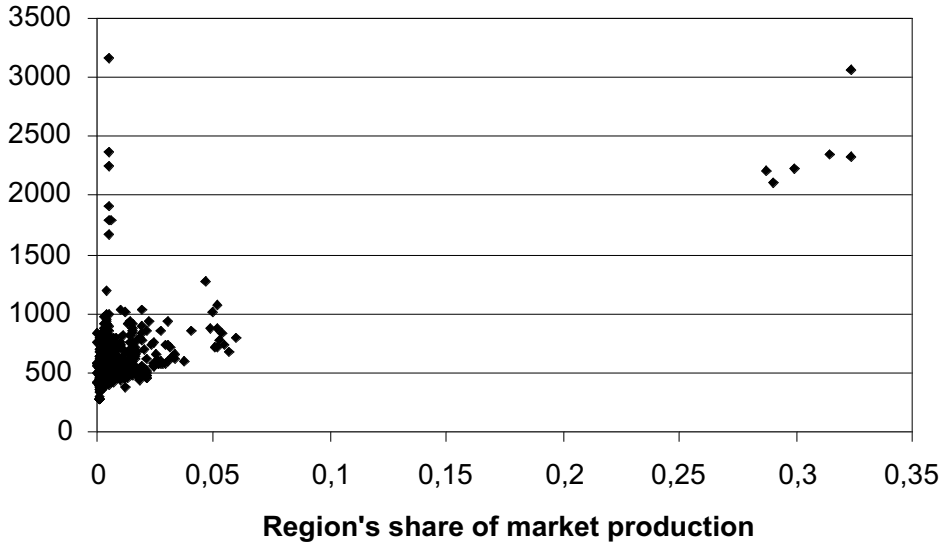
2
1,5
1
0,5
0
0
0,2
0,4
0,6
0,8
Share of labor in immobile industries


Per Capita Production
3500
3000
2500
2000
1500
1000
500
0
0
0,2
0,4
0,6
0,8
Share of labor in immobile industries

Specialization



Per Capita Production



ESSAY II

REGIONAL DIFFERENCES IN BANK OFFICE SERVICE ACCESSIBILITY: AN ENTRY APPROACH

REGIONAL DIFFERENCES IN BANK OFFICE SERVICE ACCESSIBILITY: AN ENTRY APPROACH

Abstract

Structural changes in retail banking markets and the development of remote access technologies have reduced the number of bank branches in many developed countries. Thus the closure of bank branches and reduced service accessibility in rural and peripheral regions has become an issue for public discussion.

The most typical ways of analyzing differences in accessibility are to compare distances between branches or branch densities. Such approaches are not naturally reasonable in terms of economics, since the most definitive characteristic of a lucrative market is not its geographical surface area but the service demand and competition in the market area. Hence a sounder way to study accessibility is to use firm perspective. Firm perspective is based on the idea that the accessibility of services should be conditional on whether market entry would be profitable for a bank or not.

This paper uses an empirical entry approach in order to analyze whether peripheral regions in Finland have suffered from the closure of branch networks in general and to determine if specific regions have received more closures than could be expected? The analysis was conducted for the Finnish NUTS2 regions by using municipality level panel data for the years 1995, 1997, 1999, and 2001, i.e. for the era when Finnish banks were adjusting their branch networks to meet structural changes occurring in the industry and adapting to the possibilities provided by new technologies. Accessibility is measured by the presence of both different bank groups and individual offices in a municipality. The different characteristics of the municipalities are controlled for in order to capture the same rationale as banks do when deciding about the existence or absence of a branch in a certain municipality.

The analysis shows that there are some differences between the regions in terms of the accessibility of the services as measured by both the number of bank groups and the number of branches located in a municipality. Workers commuting to a municipality increased accessibility as well as the average

taxable income. These characteristics are typically related to local centers but an administrative city-status also had an additional positive effect. With regard to the development of accessibility, the analysis shows no differences between the regions. Instead, it shows that banking activity has become increasingly concentrated in local centers over the period of analysis which is the reasonable outcome of decreasing transportations costs according to the spatial models of competition.

1 INTRODUCTION

During the late 1990's and early 2000's banks in Finland substantially scaled down their office networks. This development was driven by both the development of remote access technologies, which made some of branch offices redundant and created changes in the market structure within Finnish retail banking markets. This paper analyzes the regional development of branch office accessibility in Finland from 1995 to 2001, i.e. during the period of the most intense branch network reorganization.

The acccessibility of branch services is typically studied in terms of branch density measured by numbers of banks per square kilometer (or mile) (see e.g. Evanoff 1988, Gunther 1997). This paper approaches the problem according to the idea that it is more appropriate to analyze accessibility on the same basis as firms do. Such an approach enriches our picture of the accessibility of services whilst taking into account the economic constraints faced by banks.

In this age of the digitalization of services and the development of ever more remote services it is naturally questionably as to whether it appropriate to use geographical distance as a good proxy for service accessibility. For example, daily bank business for most people in Finland, is conducted via their access to the internet, which is now more important than their geographical proximity to a bank office. Therefore in addition to traditional geographical distance from a bank, the accessibility of a bank is defined by the proportion of a population that has a computer, access to the Internet and an internet banking account. In this study I do not have data on this variable. However, it is likely that some control variables are correlated with this variable and therefore the results presented in this paper are actually even stronger if the wider definition of accessibility is used. Since this is naturally only speculation the accessibility of a service refers to its geographical proximity for the remainder of the paper.

A bank's entry into a certain market is driven by expected profitability in that market. A simple entry and competition analysis methodology is provided by Bresnahan & Reiss (1987, 1990, and 1991). The methodology is based on the observed number of firms in certain markets and the assumed demand conditions within the market as indicated by certain market characteristics. Through ordered probit models an econometrician can estimate the entry thresholds for different numbers of firms operating in a market in terms of

population. The methodology has been applied in the analysis of retail bank competition by e.g. Cetorelli (2002).

This paper concentrates on the parameter coefficient estimates of the index function to see which parameters are the ones driving market entry and consequently affect the accessibility of the banking service provided. The entry threshold ratios are, however, presented in order to characterize the growth in market size required to support an extra bank or branch and shed some light on the branching strategies of the banks.

The second question in this paper is how banking service accessibility developed regionally in Finland from 1995 to 2001. Similarly, Gunther (1997) analyzed the development of banking service accessibility in rural areas of the U.S. In his analysis he assumed that changes in branching restrictions could have an effect on the accessibility of banking services. In our study we have no a priori assumption concerning regional differences or the development of accessibility. However, it is possible that both the effects of mergers and changes in inter-organizational co-operation as well as the adjustment of office networks with respect to new technology have been regionally unequal for peripheral locations.

In addition to the regional differences, an interesting aspect is the potential difference in accessibility between different municipality types. Koponen & Widgrén (2003) found that the production of financial services was being concentrated in Finland towards existing regional centers. This study seeks an answer to the question of whether the accessibility of the banking services is better in regional market centers. The concentration towards centers can be analyzed by the development of the accessibility of banks.

The paper is organized as follows. Section 2 provides an overview of the Finnish retail banking markets from 1995 to 2001. Section 3 describes the method and data used in the analyses. Section 4 presents the estimated models and results. Section 5 discusses the results and concludes the paper.

2 BANKS AND BANK GROUPS IN FINLAND

According to the Finnish Bankers' Association, at the end of 2001 there were a total of 334 domestic banks operating in Finland, which included 8 commercial banks, 244 co-operative banks belonging to the OP Group, 42 local co-operatives and 40 savings banks. Additionally, there were 18 branch offices of foreign credit institutions active in Finland, of which seven receive deposits. Those banks are grouped in this paper as follows:

Nordea: The Finnish retail banking activities of Nordea. The local branches of the Finnish predecessors of Nordea are seen as branches of Nordea.

Savings banks: Savings banks are treated as one group. Savings banks include both local savings banks and a bigger savings bank, Aktia, which was the "central bank" of the group during the period of analysis. The current savings banks are the few that survived the Finnish banking crises of the early 90's.

The OP Group: local cooperative banks, which are members of the OP Group and the commercial bank OKO Bank that operates in the Helsinki-area.

Local Cooperative Banks: local cooperative banks which did not join the OP Group and which established The Association of Local Co-operative Banks in 1997

Ålandsbanken: the main bank on Ahvenanmaa, which also has some other mainland branches.

Sampo: formerly known as Postipankki, Leonia-bank, current name from year 2001.

Other banks: mainly the branch offices of international large bank corporations and a few small Finnish banks with the legal right to conduct retail banking.[1]

During the period of analysis there were a few events that affected the market structure with respect to the retail banking markets and also the number of branch offices. The first was the merger of Kansallis-Osake-Pankki

[1] For more detailed information on other banks operating in Finland, visit the homepage of The Federation of Finnish Financial Services <http://www.fkl.fi >.

and Union Bank of Finland in 1995, which formed the predecessor for the Nordea's current operations in Finland. This decreased the number of branches in the group due to the elimination of overlaps in the branch network. In 1997 the current OP Group was officially established. Due to conflicts of opinions about the group structure some 40 something local cooperative banks left the OP Group and established a group of local cooperative banks. At the same time the group structure of the OP Group became more solid.

The third major structural change in the market structure and subsequently on the number of bank branches operating started in 1997 when the state-owned bank, Postipankki, merged with Suomen vientiluotto Oy (Finnish Export Credit ltd.). As a result of this merger the activities of these firms were pooled under a new holding company, which was renamed Leonia-bank in 1998. This event did not affect the branch network of the bank but the end of cooperation in office service provision, between The Finnish Post and Leonia (the predecessor of Sampo Bank), at the beginning of the year 2000 drastically decreased the number of outlets where Leonia's services were supplied. Finally Leonia merged with the insurance company Sampo. The subsequent merger with the Mandatum investment bank created the current Sampo-bank.[2] Also, over that time many banks with small-scale activities in Finland entered the market.

Table 1. Development of bank office networks by bank groups

	1995	1997	1999	2001
Nordea and its predecessors	806	484	347	301
Savings banks	256	252	262	267
OP Group	974	898	736	711
Local Cooperative Banks Group	0	0	108	129
Sampo and its predecessors	1034	778	543	150
Other	31	42	54	62
Total	3101	2454	2050	1620

Source: Finnish Bankers' Association. Note that Saving banks include Aktia and local savings banks. Respectively Sampo and its predecessors includes the number of post offices, which provided bank services.

The effects of those events on the accessibility of branches was as follows. The elimination of the branch network overlaps of the Union Bank of Finland and KOP and the end of the old and traditional Finnish Post-Leonia

[2] For an overall view of developments of market structure, see e.g. Anderson et al. (2000).

cooperation as both decreased the number of branch offices.[3] In contrast to these changes the Local Cooperative Bank Group improved its office's accessibility and the number of major bank groups operating in some municipalities increased. In general though, the development of remote access technologies has decreased the importance of branch offices and made some branch offices redundant.[4] Therefore the trend has been a decrease in number of branch offices. The development of the number of branch offices is presented in Table 1.

[3] Naturally, in the previous case the decrease in number of branch offices was merely due to the elimination of overlaps in the branch office networks and it did not significantly actually affect the accessibility of branch office service. In latter case the accessibility of current Sampo Group's office services was weakened remarkably.

[4] According to The Finnish Bankers' Association in 1995 some 48 % of the payments were made in branch office. This share was as low as 11,8 % in 2000. The number of payments made via online connections increased 184 % (12,3 % p.a.) from 1991 to 2000. The number of payments made with giro ATMs increased 119 % with an average yearly growth rate of 9 %. For a study on consumer choices with regard to e-banking in Finland, see Karjaluoto (2002). Vesala (2000) provides a study on the competitive effects of technological transformation in retail banking.

3 RESEARCH METHOD AND DATA

3.1 The method

Following the entry model presented in Cleeren et al. (2006), the estimated (latent) profit functions take form $\Pi_{it}^{N} = \pi_{it}^{N} - u_i - \varepsilon_{it}$, where π_{it}^{N} refers to the deterministic part of the profitability of the banks in municipality *i* at year *t*, u_i is the market specific random effect and ε_{it} is the normally distributed error term. Banks are assumed enter to the market as long as $\Pi_{it}^{N} \rangle 0$. The deterministic part depends on the number of banks or bank branches in the municipality as well as the other economic characteristics of the municipality, i.e.

$$\pi_{it}^{N} = \alpha \ln(POPUL_{it}) + \beta POTENTIAL_{it} + \gamma DIFFERENTIATION_i + \delta^K REGION_i^K - \lambda^N BANKS_i^N,$$

where $POPUL_{it}$ is population in the municipality *i* at year *t*, $POTENTIAL_{it}$ is a vector of variables affecting on demand for bank services, $DIFFERENTIATION_i$ a vector of variables describing the possibilities of geographic differentiation in the municipality, $REGION_i^K$ is a vector of dummies that indicates whether the municipality *i*'s location is in the NUTS2 region *K* and $BANKS_i^N$ is the respective vector of dummies indicating whether the number of banks (or bank offices) equals the *N* in municipality *i*.

The most interesting estimated parameters for the purpose of this study are $\delta^{K'}$s since the significances of these parameters reveals possible regional differences in service accessibility. Variables included in the vector $POTENTIAL_{it}$ basically control for the economic differences between the municipalities. These variables are average taxable income in the municipality, jobs per employed labor force ratio and city-status as an indicator of municipality's role as a local center. $DIFFERENTIATION_i$ includes types of municipality (rural, densely populated, town-like), share of agricultural jobs to the total number of jobs and surface area of the municipality. λ^N's are used later in the computations of entry threshold ratios.

The following subsection provides the motivation for and the descriptive statistics for the main variables in analyses.

3.2 Data

Both the accessibility of certain bank groups' branches and branches in a municipality in general can be seen as measures of the accessibility of a bank's office services. The first one is more appropriate if an analyst sees the variety of different bank groups as being more important than the unconditional proximity of a branch. In the first case an analyst places a higher value on the differentiation between the bank groups in comparison to distance based differentiation. To achieve more alternatives for the analyses we estimated the same model specifications for both measures.

The dependent variables of ordered probit estimations are the number of banks and offices in a municipality (for ordered probit, see e.g. Maddala 1983 or Greene 2000). In ordered probit estimations the dependent variable has to take all values between the 0 and maximum in the data. In the case of the bank groups the dependent variable takes all the values from zero to seven and therefore there are no problems with the estimations. Unfortunately, this is not the case with the branches. The maximum number of branches in a municipality in 2001 was as high as 100. Therefore it is clear that the required presence of all values in the sequence of ordered responses does not satisfy. Therefore the data is censored so that all municipalities with at least 10 branches belong to the last group.[5]

The development of frequencies of different market structures as measured by the number of bank groups and bank offices is presented in Tables 2 and 3. The respective regional figures for the NUTS2 regions (see map in appendix A) are presented in appendices B and C.

[5] To be precise, the values given for the bank groups are also somewhat censored, since in some of the biggest cities more than seven groups operate.

Table 2. The distribution of the municipalities according to the presence of bank groups

Bank groups in municipality	1995	1997	1999	2001
0 Groups	0 (0.0000)	1 (0.0023)	1 (0.0023)	4 (0.0090)
1 Groups	7 (0.0158)	26 (0.0588)	59 (0.1335)	142 (0.3213)
2 Groups	141 (0.3190)	135 (0.3054)	128 (0.2896)	157 (0.3552)
3 Groups	213 (0.4819)	187 (0.4231)	145 (0.3281)	71 (0.1606)
4 Groups	75 (0.1697)	85 (0.1923)	92 (0.2081)	44 (0.0995)
5 Groups	4 (0.0090)	4 (0.0090)	11 (0.0249)	13 (0.0294)
6 Groups	2 (0.0045)	4 (0.0090)	2 (0.0045)	7 (0.0158)
7+ Groups	0 (0.0000)	0 (0.0000)	4 (0.0090)	4 (0.0090)

Table 3. The distribution of the municipalities according to the number of bank offices

Offices in municipality	1995	1997	1999	2001
0 Offices	0 (0.0000)	1 (0.0023)	1 (0.0023)	4 (0.0090)
1 Offices	4 (0.0090)	16 (0.0362)	43 (0.0973)	100 (0.2262)
2 Offices	83 (0.1878)	93 (0.2104)	90 (0.2036)	116 (0.2624)
3 Offices	73 (0.1652)	94 (0.2127)	104 (0.2353)	81 (0.1833)
4 Offices	69 (0.1561)	68 (0.1538)	72 (0.1629)	48 (0.1086)
5 Offices	36 (0.0814)	46 (0.1041)	40 (0.0905)	31 (0.0701)
6 Offices	50 (0.1131)	36 (0.0814)	26 (0.0588)	16 (0.0362)
7 Offices	22 (0.0498)	25 (0.0566)	24 (0.0543)	12 (0.0271)
8 Offices	27 (0.0611)	14 (0.0317)	8 (0.0181)	12 (0.0271)
9 Offices	19 (0.0430)	10 (0.0226)	10 (0.0226)	3 (0.0068)
10+ Offices	59 (0.1335)	39 (0.0882)	24 (0.0543)	19 (0.0430)

As described above, the trend has been for the number of branches to decrease. From 1995 to 2001 there were only a few municipalities where the number of branches increased. Therefore only the change in the number of bank groups operating in the municipalities is analyzed. During the period analyzed some municipalities merged. Since the mergers were driven by the fact that the municipalities form economic entities it is justified to treat the mergered municipalities as one market for the whole period. In addition, a few artificial mergers were made due to difficulties in distinguishing the locations of branches in some municipalities. The artificial mergers are justified since in these cases the municipalities have since consolidated or are very likely to merge officially within a few years.

Evanoff (1988) and Gunther (1997) used population and per capita income in municipalities in their analyses as variables to control for the differences between the municipalities.

The point of departure from their chosen independent variables is that their studies did not take into account the surface area of the municipality. Taking this into account reveals results on absolute differences in service accessibility. That is, if one tries to achieve absolute equality in accessibility without taking into account the surface area of the municipality then the average distance to all the bank offices must be the same. This approach is rather hard to justify from a bank's point of view because if a bank branch in a municipality that is twice the area size of another municipal bank branch wishes to have equal profits to the bank branch in the smaller area then the variable profits of its services would have be doubled in order to cover the fixed costs of the second branch. Thus, we include the surface area of a municipality in the analysis. It is also likely that area has a positive effect on the number of banks or offices in a municipality due to the higher returns generated by the increased possibility for horizontal differentiation.

Today many people work outside their hometown and as people typically work when bank offices are open it is possible that those who work outside their hometown also do business with a bank located in the municipality where their work place is. The municipalities with a high jobs to employed labor force ratios therefore have a higher customer potential and it is possible that the accessibility of their service is better, too.

Table 4. Descriptive statistics of the independent variables

	Mean	Std.Dev.
Population	11635.7	32748.7
Average taxable income (thousand euros)	13.5314	2.75445
Ratio of jobs to employed labor force in a municipality	0.862517	0.180635
Share of agricultural jobs in a municipality	0.1986	0.125231
Geographical surface area of municipality (km^2)	765.033	1436.75
Municipality has City-status (dummy)	0.246606	0.431157
Municipality is classified as a town-like municipality (dummy)	0.151584	0.358718
Municipality is classified as densely populated (dummy)	0.162896	0.369375
Municipality is classified as a rural municipality (dummy)	0.68552	0.46444
REGIOND1 – Municipality is located in South Finland (dummy)	0.076923	0.266545
REGIOND2 – Municipality is located in South Finland (dummy)	0.384615	0.486642
REGIOND3 – Municipality is located in East Finland (dummy)	0.169683	0.375461
REGIOND4 – Municipality is located in Central Finland (dummy)	0.19457	0.395981
REGIOND5 – Municipality is located in Northern Finland (dummy)	0.138009	0.345007
REGIOND6 – Municipality is located in Ahvenanmaa (dummy)	0.036199	0.186838

Source: Statistics Finland, Number of observation units=442, N=1768.

The differences between municipalities are also captured by dummy-variables describing the municipality's type. The municipality classification is the one used by Statistics Finland. In the classification the municipalities belong either to the group of rural municipalities, densely populated municipalities or town-like municipalities. In theoretical models the concentration of economic activity is encouraged via circular causality. The spatial concentration of activities itself creates an environment for further regional concentration (see Krugman 1991, Fujita, Krugman & Venables 1999). The share of immobile labor creates friction in this system. Therefore, in areas with a high share of agricultural jobs it can be assumed that people are not willing to move to other areas and therefore provide a more stable demand for bank services. Thus the accessibility of bank services should be higher than otherwise. Also, the distribution of the population within these municipalities tends to be more equal and that provides space for horizontal differentiation, pricing freedom and better service accessibility. The dummy for town status is included as it is likely that towns are centers where the accessibility of bank services is higher than otherwise.

Finally, the potential differences in service accessibility between the regions are reflected by dummy-variables. The reference group is the town-like municipalities of the Uusimaa-region (For the NUTS2 regions of Finland, see the map in appendix A). The independent variables used in the estimations are described in table 4.

4 ESTIMATION RESULTS

In the following estimations four different specifications are used for π_{it}^{N}. The first specification includes only population and dummies for regions and the number of bank groups (or offices). In the second specification the natural logarithm of geographical area, average taxable income and the ratio of jobs to employed labor force in a municipality are included. The third specification also includes the ratio of agricultura jobs. In addition to all previously mentioned variables statistical or administrative variables describing the municipality type are included in the fourth specification. Also a full set of year dummies and constant terms is included in the models.

These specifications are used in both of the accessibility estimations as well as in the accessibility chance estimations. The results are reported in the two following subsections.

4.1 Differences in accessibility

The first set of estimations used the number of bank groups present in a municipality as a dependent variable. The parameter estimates are presented in Table 5.

The population of a municipality has positive sign and was statistically significant in every model specification. According to the first specification the number of banks was below the level of Uusimaa in Northern Finland and above that in Ahvenanmaa. The accessibility differences between Uusimaa and other regions were statistically insignificant. Additional control variables made the difference between Uusimaa and Northern Finland more significant and also accessibility in Eastern Finland was statistically significantly lower when compared to Uusimaa.

The job-sufficiency of the municipality, i.e. the amount of jobs per employed labor force increased the number of bank groups operating in a municipality. If a municipality had an administrative city-status then it also had more banks. An interesting finding here is that the total area of a municipality in the full model is statistically insignificant. According to the theory this should have had positive effect, i.e. market size should have encouraged entry due to the increased possibility of differentiation and pricing freedom. Consequently, it seems that excess revenues due to differentiation

are negligible and a more equal population distribution, as indicated by an increased proportion of agricultural jobs, generates more village level monopolies.

In conclusion it can be said that there are still some differences between the regions in terms of the accessibility of bank services as measured by the number of bank groups located in a municipality. Increased commuter transport to a municipality increased the number of bank groups. Increased average taxable income had the same effect. These characteristics are typically related to local centers but city-status also had an additional positive effect.

Another way of analyzing accessibility is to use the number of offices as a basic unit. The parameter estimates are presented in table 6.

Again the coefficient of population is positive and significant for all specifications. The regional differences in accessibility were the same as the ones presented in the previous subsection except for the first model specification, which showed that in addition to Ahvenanmaa the number of offices was also statistically higher in Central Finland when compared to Uusimaa. In specifications 2 to 4 the number of offices were lower in Eastern Finland and Northern Finland and higher in Ahvenanmaa when compared to Uusimaa.

Average taxable income did not have any statistical significance in any of the models. Geographical surface area had a positive and highly significant effect on the number of offices. Also, with all other things being equal it was found that rural municipalities had more offices than either town-like municipalities or municipalities with city-status. Therefore it seems that some bank groups located in rural areas follow the strategy of extensive branch networks. This can lead to entry deterrence and fewer bank groups in a municipality. The previously presented results give some support for that.

In general, bank accessibility, either measured by bank groups or offices, is better in towns even when taking into account a municipality's characteristics. There are also statistically significant differences between the regions. The question of whether those differences are the legacy of the financial crisis of the 1990's or were created during the late 1990's will be analyzed in next subsection.

Table 5. Differences in accessibility – bank groups

	Spec. 1a	Spec. 2a	Spec. 3a	Spec. 4a.
Population (natural log)	2.07644**	1.79256**	2.22835**	2.06234**
	(0.098025)	(0.103543)	(0.133532)	(0.171193)
Constant	-10.3202**	-12.3838**	-16.9992**	-15.7886**
	(0.940763)	(0.948885)	(1.29773)	(1.60342)
Year 1997	-0.10134	-0.08896	0.023535	0.020669
	(0.17827)	(0.180312)	(0.179902)	(0.180666)
Year 1999	-0.29044**	-0.30605*	-0.07447	-0.07752
	(0.110662)	(0.135836)	(0.13793)	(0.14036)
Year 2001	-1.77677**	-1.85885**	-1.5861**	-1.5949**
	(0.100741)	(0.15778)	(0.158383)	(0.159518)
Surface area (natural log)		0.304748**	0.221925*	0.254321
		(0.101319)	(0.109332)	(0.130437)
Average taxable income		0.033345	0.053209*	0.056611*
		(0.028311)	(0.025375)	(0.025339)
The ratio of jobs to employed labor force in a municipality		3.43953**	3.89455**	3.54841**
		(0.443268)	(0.47069)	(0.50615)
Share of agricultural jobs in a municipality			4.90461**	5.2118**
			(0.895125)	(0.924266)
Municipality type – densely populated				0.309739
				(0.393956)
Municipality type - rural				-0.01236
				(0.487276)
City-status				0.663295*
				(0.28753)
Southern Finland	0.213434	-0.20706	-0.26502	-0.26802
	(0.316069)	(0.309274)	(0.312348)	(0.32905)
Eastern Finland	-0.70635	-1.7171**	-1.94712**	-1.91582**
	(0.378968)	(0.39066)	(0.425229)	(0.444276))
Central Finland	0.372872	-0.43726	-0.6146	-0.64856
	(0.343995)	(0.344343)	(0.362011)	(0.374296)
Northern Finland	-0.76995*	-1.77574**	-1.75071**	-1.75049**
	(0.38772)	(0.435767)	(0.456178)	(0.4909)
Ahvenanmaa	1.6681**	1.52775**	1.85922**	1.69647**
	(0.572523)	(0.502641)	(0.516267)	(0.529042)
2 Groups	3.62485**	3.70801**	3.92256**	3.89811**
	(0.25606)	(0.260946)	(0.27007)	(0.272111)
3 Groups	6.31982**	6.41572**	6.72323**	6.70027**
	(0.28071)	(0.283624)	(0.291758)	(0.293515)
4 Groups	9.47536**	9.58906**	9.98848**	10.0045**
	(0.323374)	(0.328677)	(0.336256)	(0.339627)
5 Groups	12.5375**	12.7004**	13.222**	13.237**
	(0.347597)	(0.358798)	(0.369815)	(0.37215)
6 Groups	13.5482**	13.7347**	14.3487**	14.3381**
	(0.374952)	(0.383545)	(0.396888)	(0.398739)
7+ Groups	14.7904**	15.0636**	15.8571**	15.7965**
	(0.510385)	(0.524025)	(0.545938)	(0.549447)
Sigma	1.42838**	1.33649**	1.45654**	1.44766**
	(0.074461)	(0.070373)	(0.076736)	(0.078749)
Pseudo-R^2	0.178909	0.161582	0.170664	0.169482

Notes. Standard errors are in parentheses. Significance levels of 5% and 1% are denoted respectively by * and **. R^2 in ordered probit estimations is pseudo-R^2 calculated as R^2=1-(Lf/Lr), where Lf is the value of the log likelihood function maximized with respect to both the intercepts and explanatory variables and Lr is the value of the log likelihood function maximized with respect to intercepts alone. N=1768 (442 per yearly cross-section)

Table 6. Differences in accessibility - Offices

	Spec. 1b	Spec. 2b	Spec. 3b	Spec. 4b.
Population (natural log)	3.18548**	3.00279**	2.95923**	3.11397**
	(0.122885)	(0.136293)	(0.157698)	(0.197501)
Constant	-16.1154**	-18.782**	-18.3424**	-19.8022**
	(1.0698)	(1.23963)	(1.46607)	(1.87147)
Year 1997	-1.08879**	-1.02948**	-1.04227**	-1.06809**
	(0.114801)	(0.116244)	(0.121257)	(0.121292)
Year 1999	-1.97229**	-1.85872**	-1.88446**	-1.93993**
	(0.106468)	(0.143893)	(0.155123)	(0.154998)
Year 2001	-3.52285**	-3.35695**	-3.39247**	0.166599
	(0.127823)	(0.207116)	(0.224596)	(0.299832)
Surface area (natural log)		0.674878**	0.681886**	0.536716**
		(0.125014)	(0.128362)	(0.141798)
Average taxable income		-0.03833	-0.03857	-0.03816
		(0.047749)	(0.047836)	(0.047723)
Ratio of jobs to employed labor force in a municipality		1.5703**	1.55787**	1.9939**
		(0.512335	(0.51728)	(0.579855)
Share of agricultural jobs in a municipality			-0.43162	-1.3985
			(0.889107)	(0.903853)
Municipality type – densely populated				0.581165
				(0.452911)
Municipality type - rural				1.50737**
				(0.551109)
City-status				-3.47456**
				(0.222538)
Southern Finland	0.117141	-0.07442	-0.0828	-0.45185
	(0.31364)	(0.382151)	(0.381814)	(0.41184)
Eastern Finland	-0.58595	-1.97636**	-1.95212**	-2.54173**
	(0.380195)	(0.476185)	(0.475611)	(0.507372)
Central Finland	0.891207**	0.132496	0.121291	-0.06679
	(0.334921)	(0.415546)	(0.416793)	(0.44592)
Northern Finland	-0.58007	-1.90692**	-1.93811**	-2.38096**
	(0.393355)	(0.502869)	(0.503618)	(0.557537)
Ahvenanmaa	2.63578**	2.89427**	2.84434**	2.29861**
	(0.590743)	(0.622073)	(0.634945)	(0.611412)
2 Offices	4.07812**	4.14464**	4.13827**	4.13125**
	(0.22164)	(0.218332)	(0.220109)	(0.217817)
3 Offices	7.1915**	7.27009**	7.2602**	7.2598**
	(0.250584)	(0.248138)	(0.250306)	(0.247229)
4 Offices	9.50863**	9.58239**	9.57303**	9.58456**
	(0.277091)	(0.276391)	(0.279)	(0.277305)
5 Offices	11.2057**	11.2645**	11.2566**	11.2757**
	(0.29957)	(0.299314)	(0.302038)	(0.299144)
6 Offices	12.3597**	12.4116**	12.4046**	12.4393**
	(0.309546)	(0.30886)	(0.312044)	(0.311841)
7 Offices	13.5051**	13.5528**	13.5465**	13.588**
	(0.334569)	(0.337444)	(0.340901)	(0.338618)
8 Offices	14.3901**	14.4319**	14.4256**	14.4746**
	(0.347018)	(0.351442)	(0.355326)	(0.353314)
9 Offices	15.1937**	15.2351**	15.2312**	15.284**
	(0.362231)	(0.365779)	(0.370391)	(0.367219)
10+ Offices	15.9185**	15.9682**	15.966**	16.0165**
	(0.382299)	(0.386593)	(0.391312)	(0.388953)
Sigma	2.14718**	2.09062**	2.09025**	2.09821**
	(0.085814)	(0.085747)	(0.085726)	(0.089555)
Pseudo-R^2	0.240575	0.226189	0.22567	0.225144

Notes. See table 5.

4.2 Changes in accessibility

As in the previous subsection an ordered probit is used in order to analyze the changes in bank accessibility. The changes in accessibility are measured by changes in the number of bank groups operating in the municipality. Parameter estimates are presented in table 7.

Table 7. Changes in accessibility

	Spec. 1c	Spec. 2c	Spec. 3c	Spec. 4c
Population (natural log)	0.469282**	0.489136**	0.471235**	0.328217**
	(0.037013)	(0.053562)	(0.060094)	(0.075021)
Constant	-2.83142**	-2.36662**	-2.06706**	-1.04295
	(0.353639)	(0.45834)	(0.646028)	(0.745353)
Year 1999	-0.01852	0.000529	-0.00448	-0.00558
	(0.089383)	(0.094165)	(0.094529)	(0.094812)
Year 2001	-1.25272**	-1.22129**	-1.22924**	-1.24922**
	(0.092086)	(0.11141)	(0.112318)	(0.112703)
Surface area (natural log))		-0.13349*	-0.13151*	-0.03568
		(0.05187)	(0.051999)	(0.061436)
Average taxable income		-0.01302	-0.01762	-0.01017
		(0.023072)	(0.024237)	(0.023958)
Ratio of jobs to employed labor force in a municipality		0.375187	0.347089*	0.011167
		(0.223162)	(0.227372)	(0.247449)
Share of agricultural jobs in a municipality			-0.3365	-0.0925
			(0.510936)	(0.532216)
Municipality type – densely populated				-0.34923*
				(0.171103)
Municipality type - rural				-0.34181
				(0.218216)
City-status				0.355721**
				(0.136512)
Southern Finland	0.124914	0.103401	0.100913	0.097578
	(0.141388)	(0.148371)	(0.148446)	(0.149112)
Eastern Finland	-0.04623	0.029558	0.03256	0.000973
	(0.156087)	(0.182727)	(0.182859)	(0.184696)
Central Finland	0.153886	0.153979	0.157085	0.162609
	(0.151871)	(0.170087)	(0.170221)	(0.171001)
Northern Finland	-0.07051	0.052275	0.042128	-0.03555
	(0.162422)	(0.185741)	(0.186445)	(0.191964)
Ahvenanmaa	0.719612**	0.620003**	0.601635*	0.503302*
	(0.233201)	(0.235174)	(0.236886)	(0.239804)
Increase in banks	2.81645**	2.84077**	2.84405**	2.88226**
	(0.086907)	(0.088352)	(0.0887)	(0.09138)
Pseudo-R^2	0.204585	0.210166	0.210378	0.217418

Notes. Standard errors are in parentheses. Significance levels of 5% and 1% are denoted respectively by * and **. R^2 in ordered probit estimations is pseudo-R^2 calculated as $R^2=1-(L_f/Lr)$, where L_f is the value of the log likelihood function maximized with respect to both the intercepts and explanatory variables and Lr is the value of the log likelihood function maximized with respect to intercepts alone. N=1326 (442 per yearly cross-section)

Population has a positive effect on development and the bigger the municipality the less likely the number of bank groups will decrease.

Furthermore no model specification showed regional differences except the positive one for Ahvenanmaa. In densely populated municipalities the number of banks has decreased, but municipalities with city-status also faced less bank exits. In addition, when population growth was added to the model it did not qualitatively change any of the above presented results.

A general result regarding changes in accessibility is that we can conclude that if we measure accessibility by the number of bank groups then banking activity is concentrated in towns. The absence of interregional differences in the development of accessibility when examined with respect to regional differences on the level of accessibility leads to the conclusion that differences in accessibility are one legacy of the banking crisis of the early 1990's.

4.3 Entry threshold ratios and competition

An entry-threshold ratio reveals how much the market should grow per active bank (or office) in order to support a new entrant. This ratio can be used as an indicator of changes in intensity of competition as the higher the ratio the higher the impact of a new entrant on competition is. If a ratio has high values this indicates a lack of competition at the initial level.

Basically the ratio is population per banks in markets with N banks divided by population per bank in markets with N-1 banks. By using the profit equation in subsection 4.1 the entry thresholds for N banks can be computed according to the function

$$S^N = e^{\frac{\beta\,\overline{POTENTIAL} + \gamma\,\overline{DIFFERENTIATION} + \delta^K\,\overline{REGION}^K - \lambda^N}{\hat{\alpha}}},$$

where $\overline{POTENTIAL}$, $\overline{DIFFERENTIATION}$ and $\overline{REGION}$ are the sample means of the respective variables (cf. Cleeren et al. 2006) and Greek letters with are the estimates for the coefficients of the respective variables. Parameter $\hat{\alpha}$ is the estimated coefficient for population. Furthermore, the entry threshold ratio can be written as

$$R^N = \frac{S^N}{N} \Big/ \frac{S^{N-1}}{N-1} = e^{\left(\frac{\lambda^N - \lambda^{N-1}}{\hat{\alpha}}\right)}$$

Table 8 presents the entry thresholds ratios both for bank groups and bank offices for each model specification.

Table 8. Entry thresholds ratios

Bank groups

	Spec. 1	Spec. 2	Spec. 3	Spec. 4
R^3	2.441017	2.998028	2.234319	2.462774
R^4	3.428098	4.360871	3.090726	3.463901
R^5	3.495803	4.415434	3.161448	3.531228
R^6	1.355845	1.464493	1.311593	1.360365
R^7	1.559063	1.713991	1.496759	1.565452

Offices

	Spec. 1	Spec. 2	Spec. 3	Spec. 4
R^3	1.771632	1.880173	1.909089	1.811845
R^4	1.552275	1.622514	1.641049	1.578423
R^5	1.362891	1.40779	1.41955	1.379667
R^6	1.197154	1.223833	1.230776	1.207155
R^7	1.228039	1.2552	1.262267	1.238221
R^8	1.155221	1.174913	1.180022	1.162615
R^9	1.143949	1.161642	1.166227	1.150596
R^{10}	1.129948	1.145699	1.149777	1.135868

Table 8 shows that differences between the models are rather marginal. The required growth in markets supporting three bank groups instead of two is strikingly high and if a market has five bank groups the entry of an additional bank has a strong impact on competition. Another explanation is that bank groups have different branching strategies e.g. in some groups the fixed cost of a branch office is higher than for others. Therefore the market should grow at the rate presented above.

Evanoff (1988) showed that office density was higher in rural areas where branching was limited compared to the regions that allowed statewide branching. The explanation for this phenomenon was that the pre-emptive behavior of incumbent banks, which saturated markets with branches, deters the entry of new rivals. This kind of behavior could also be a possible reason for the high entry threshold ratios related to the entry of bank groups.

Since the focus of the paper was not to actually analyze the competition in local bank markets, these results were presented as an illustration that the market was also interesting from the point of competition. However, the use of entry threshold ratios is rather dubious as an indication of competition since the market definitions can be inappropriate. Also these entry models leave out much strategic behavior as well as the role of barriers to entry.

5 CONCLUSIONS

This paper presented an analysis of interregional differences in bank service accessibility in the Finnish retail banking markets. The analysis tried to find out whether there are differences in the level of accessibilities, firstly between regions within Finland, and secondly, between the different types of municipalities. Also, differences in the development of bank accessibility were analyzed. Bank service accessibility was measured from the point of view of accessibility to certain bank groups and more generally as an accessibility to bank offices in general. A previous approach was based on the idea that customers have preferences concerning different bank groups and on the idea that the proximity of a branch office benefits the customer in general. Variables controlling for the differences between local markets were population, taxable income, geographic area, the share of agricultural jobs and the ratio of jobs to employed labor force in a municipality.

The results show that there are indeed differences in bank accessibility when measured both by the number of bank groups and the offices in the municipality. The accessibility of the bank groups was significantly higher in municipalities with city-status. This shows that banking activity is concentrated in large population centers. In the development of accessibility we did not find differences between the regions.

The main possible problems of this study are related to the market definition i.e. is a municipality a natural base-unit for analysis? If the aim is to compare interregional differences in bank service accessibility as measured by offices it can be so. For the banks this is not likely, since banks can have a branch network strategy based on the use of remote access technologies. However, if this behavior is the same in every region of the country then there should not be any differences in branch accessibility.

A more difficult question is the appropriateness of the NUTS2 regions as defined by Eurostat. These regions are purely statistical units and definitions for Finnish regions have undergone several changes. It is obvious that the use of NUTS2-classification is not necessarily the best grouping method for the study of regional differences. Hence, in the future it is necessary to try other regional classifications for the regions. Also, as was discovered in the analyses of Eastern and Northern Finland a more rigorous method of analysis is required in order to gain a deeper time-dimension for the data.

Even though this paper did not concentrate on market entry and competition issues, market entry threshold ratios were presented. As shown by market entry studies, intensified competition leads to higher market thresholds. An interesting question is whether the competition is actually more intense in those areas with fewer banks. Unfortunately the data at hand does not allow this kind of analysis, but more recent data used in Koponen (2008) and Koponen & Pohjola (2007) does.

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APPENDIX A: NUTS2 REGIONS IN FINLAND

Region-codes

1. Uusimaa
2. Southern Finland
3. Eastern Finland
4. Central Finland
5. Northern Finland
6. Ahvenanmaa

APPENDIX B: REGIONAL DEVELOPMENT OF ACCESSIBILITY BY BANK GROUPS

Region 1 – Uusimaa

	1995	1997	1999	2001
0 Groups	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
1 Groups	0 (0.0000)	3 (0.0882)	4 (0.1176)	4 (0.1176)
2 Groups	3 (0.0882)	5 (0.1471)	8 (0.2353)	11 (0.3235)
3 Groups	17 (0.5000)	11 (0.3235)	3 (0.0882)	4 (0.1176)
4 Groups	12 (0.3529)	13 (0.3824)	16 (0.4706)	11 (0.3235)
5 Groups	1 (0.0294)	1 (0.0294)	1 (0.0294)	2 (0.0588)
6 Groups	1 (0.0294)	1 (0.0294)	1 (0.0294)	1 (0.0294)
7 Groups	0 (0.0000)	0 (0.0000)	1 (0.0294)	1 (0.0294)

Region 2 – Southern Finland

	1995	1997	1999	2001
0 Groups	0 (0.0000)	1 (0.0059)	1 (0.0059)	3 (0.0176)
1 Groups	3 (0.0176)	18 (0.1059)	35 (0.2059)	51 (0.3000)
2 Groups	52 (0.3059)	44 (0.2588)	34 (0.2000)	52 (0.3059)
3 Groups	74 (0.4353)	61 (0.3588)	45 (0.2647)	31 (0.1824)
4 Groups	39 (0.2294)	43 (0.2529)	49 (0.2882)	24 (0.1412)
5 Groups	1 (0.0059)	1 (0.0059)	4 (0.0235)	6 (0.0353)
6 Groups	1 (0.0059)	2 (0.0118)	0 (0.0000)	1 (0.0059)
7 Groups	0 (0.0000)	0 (0.0000)	2 (0.0118)	2 (0.0118)

Region 3 – Central Finland

	1995	1997	1999	2001
0 Groups	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
1 Groups	0 (0.0000)	0 (0.0000)	2 (0.0267)	32 (0.4267)
2 Groups	31 (0.4133)	31 (0.4133)	28 (0.3733)	28 (0.3733)
3 Groups	39 (0.5200)	36 (0.4800)	37 (0.4933)	10 (0.1333)
4 Groups	5 (0.0667)	8 (0.1067)	6 (0.0800)	2 (0.0267)
5 Groups	0 (0.0000)	0 (0.0000)	1 (0.0133)	2 (0.0267)
6 Groups	0 (0.0000)	0 (0.0000)	1 (0.0133)	1 (0.0133)
7 Groups	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)

Region 4 - Eastern Finland

	1995	1997	1999	2001
0 Groups	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
1 Groups	0 (0.0000)	1 (0.0116)	8 (0.0930)	20 (0.2326)
2 Groups	25 (0.2907)	25 (0.2907)	26 (0.3023)	37 (0.4302)
3 Groups	44 (0.5116)	40 (0.4651)	30 (0.3488)	17 (0.1977)
4 Groups	16 (0.1860)	18 (0.2093)	17 (0.1977)	6 (0.0698)
5 Groups	1 (0.0116)	1 (0.0116)	4 (0.0465)	2 (0.0233)
6 Groups	0 (0.0000)	1 (0.0116)	0 (0.0000)	3 (0.0349)
7 Groups	0 (0.0000)	0 (0.0000)	1 (0.0116)	1 (0.0116)

Region 5 – Northern Finland

	1995	1997	1999	2001
0 Groups	0 (0.0000)	0 (0.0000)	0 (0.0000)	1 (0.0164)
1 Groups	0 (0.0000)	0 (0.0000)	1 (0.0164)	26 (0.4262)
2 Groups	27 (0.4426)	27 (0.4426)	26 (0.4262)	23 (0.3770)
3 Groups	32 (0.5246)	31 (0.5082)	30 (0.4918)	8 (0.1311)
4 Groups	1 (0.0164)	2 (0.0328)	3 (0.0492)	1 (0.0164)
5 Groups	1 (0.0164)	1 (0.0164)	1 (0.0164)	1 (0.0164)
6 Groups	0 (0.0000)	0 (0.0000)	0 (0.0000)	1 (0.0164)
7 Groups	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)

Region 6 - Ahvenanmaa

	1995	1997	1999	2001
0 Groups	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
1 Groups	4 (0.2500)	4 (0.2500)	9 (0.5625)	9 (0.5625)
2 Groups	3 (0.1875)	3 (0.1875)	6 (0.3750)	6 (0.3750)
3 Groups	7 (0.4375)	8 (0.5000)	0 (0.0000)	1 (0.0625)
4 Groups	2 (0.1250)	1 (0.0625)	1 (0.0625)	0 (0.0000)
5 Groups	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
6 Groups	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
7 Groups	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)

APPENDIX C: REGIONAL DEVELOPMENT OF ACCESSIBILITY BY BANK OFFICES

Region 1 – Uusimaa

	1995	1997	1999	2001
0 Offices	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
1 Offices	0 (0.0000)	1 (0.0294)	3 (0.0882)	2 (0.0588)
2 Offices	1 (0.0294)	3 (0.0882)	5 (0.1471)	8 (0.2353)
3 Offices	5 (0.1471)	6 (0.1765)	4 (0.1176)	5 (0.1471)
4 Offices	5 (0.1471)	4 (0.1176)	7 (0.2059)	4 (0.1176)
5 Offices	1 (0.0294)	5 (0.1471)	3 (0.0882)	4 (0.1176)
6 Offices	5 (0.1471)	4 (0.1176)	1 (0.0294)	1 (0.0294)
7 Offices	2 (0.0588)	0 (0.0000)	1 (0.0294)	3 (0.0882)
8 Offices	2 (0.0588)	1 (0.0294)	2 (0.0588)	3 (0.0882)
9 Offices	2 (0.0588)	3 (0.0882)	3 (0.0882)	1 (0.0294)
10+ Offices	11 (0.3235)	7 (0.2059)	5 (0.1471)	3 (0.0882)

Region 2 – Southern Finland

	1995	1997	1999	2001
0 Offices	0 (0.0000)	1 (0.0059)	1 (0.0059)	3 (0.0176)
1 Offices	1 (0.0059)	11 (0.0647)	23 (0.1353)	33 (0.1941)
2 Offices	30 (0.1765)	31 (0.1824)	29 (0.1706)	41 (0.2412)
3 Offices	31 (0.1824)	35 (0.2059)	34 (0.2000)	35 (0.2059)
4 Offices	23 (0.1353)	26 (0.1529)	31 (0.1824)	22 (0.1294)
5 Offices	18 (0.1059)	15 (0.0882)	19 (0.1118)	15 (0.0882)
6 Offices	20 (0.1176)	17 (0.1000)	10 (0.0588)	5 (0.0294)
7 Offices	6 (0.0353)	10 (0.0588)	7 (0.0412)	5 (0.0294)
8 Offices	9 (0.0529)	7 (0.0412)	4 (0.0235)	5 (0.0294)
9 Offices	8 (0.0471)	2 (0.0118)	4 (0.0235)	0 (0.0000)
10+ Offices	24 (0.1412)	15 (0.0882)	8 (0.0471)	6 (0.0353)

Region 3 – Central Finland

	1995	1997	1999	2001
0 Offices	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
1 Offices	0 (0.0000)	0 (0.0000)	2 (0.0267)	23 (0.3067)
2 Offices	15 (0.2000)	20 (0.2667)	18 (0.2400)	24 (0.3200)
3 Offices	12 (0.1600)	21 (0.2800)	24 (0.3200)	13 (0.1733)
4 Offices	17 (0.2267)	13 (0.1733)	15 (0.2000)	8 (0.1067)
5 Offices	7 (0.0933)	10 (0.1333)	9 (0.1200)	3 (0.0400)
6 Offices	9 (0.1200)	2 (0.0267)	1 (0.0133)	2 (0.0267)
7 Offices	3 (0.0400)	2 (0.0267)	3 (0.0400)	0 (0.0000)
8 Offices	4 (0.0533)	1 (0.0133)	0 (0.0000)	0 (0.0000)
9 Offices	2 (0.0267)	1 (0.0133)	1 (0.0133)	0 (0.0000)
10+ Offices	6 (0.0800)	5 (0.0667)	2 (0.0267)	2 (0.0267)

Region 4 - Eastern Finland

	1995	1997	1999	2001
0 Offices	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
1 Offices	0 (0.0000)	1 (0.0116)	6 (0.0698)	15 (0.1744)
2 Offices	17 (0.1977)	17 (0.1977)	16 (0.1860)	17 (0.1977)
3 Offices	10 (0.1163)	13 (0.1512)	14 (0.1628)	14 (0.1628)
4 Offices	12 (0.1395)	12 (0.1395)	13 (0.1512)	11 (0.1279)
5 Offices	5 (0.0581)	8 (0.0930)	3 (0.0349)	8 (0.0930)
6 Offices	11 (0.1279)	11 (0.1279)	13 (0.1512)	8 (0.0930)
7 Offices	7 (0.0814)	8 (0.0930)	13 (0.1512)	2 (0.0233)
8 Offices	7 (0.0814)	4 (0.0465)	0 (0.0000)	3 (0.0349)
9 Offices	5 (0.0581)	4 (0.0465)	2 (0.0233)	2 (0.0233)
10+ Offices	12 (0.1395)	8 (0.0930)	6 (0.0698)	6 (0.0698)

Region 5 – Northern Finland

	1995	1997	1999	2001
0 Offices	0 (0.0000)	0 (0.0000)	0 (0.0000)	1 (0.0164)
1 Offices	0 (0.0000)	0 (0.0000)	1 (0.0164)	19 (0.3115)
2 Offices	16 (0.2623)	18 (0.2951)	18 (0.2951)	22 (0.3607)
3 Offices	10 (0.1639)	14 (0.2295)	25 (0.4098)	11 (0.1803)
4 Offices	9 (0.1475)	10 (0.1639)	6 (0.0984)	3 (0.0492)
5 Offices	5 (0.0820)	8 (0.1311)	6 (0.0984)	1 (0.0164)
6 Offices	5 (0.0820)	2 (0.0328)	1 (0.0164)	0 (0.0000)
7 Offices	4 (0.0656)	5 (0.0820)	0 (0.0000)	1 (0.0164)
8 Offices	4 (0.0656)	0 (0.0000)	1 (0.0164)	1 (0.0164)
9 Offices	2 (0.0328)	0 (0.0000)	0 (0.0000)	0 (0.0000)
10+ Offices	6 (0.0984)	4 (0.0656)	3 (0.0492)	2 (0.0328)

Region 6 - Ahvenanmaa

	1995	1997	1999	2001
0 Offices	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
1 Offices	3 (0.1875)	3 (0.1875)	8 (0.5000)	8 (0.5000)
2 Offices	4 (0.2500)	4 (0.2500)	4 (0.2500)	4 (0.2500)
3 Offices	5 (0.3125)	5 (0.3125)	3 (0.1875)	3 (0.1875)
4 Offices	3 (0.1875)	3 (0.1875)	0 (0.0000)	0 (0.0000)
5 Offices	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
6 Offices	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
7 Offices	0 (0.0000)	0 (0.0000)	0 (0.0000)	1 (0.0625)
8 Offices	1 (0.0625)	1 (0.0625)	1 (0.0625)	0 (0.0000)
9 Offices	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)
10+ Offices	0 (0.0000)	0 (0.0000)	0 (0.0000)	0 (0.0000)

APPENDIX D: REGIONAL DESCRIPTIVE STATISTICS OF INDEPENDENT VARIABLES

Region 1 – Uusimaa

	Mean	Std. dev.	N.
Population	39541.54	96911.62	136
Average taxable income (thousand euros)	17.01	4.56	136
Jobs/employed labor force in municipality	0.77	0.19	136
Share of agricultural jobs in municipality	0.11	0.11	136
Geographic area of municipality	282.06	179.42	136
Municipality has a City-status (dummy)	0.41	0.49	136
Municipality is classified to be a town-like municipality (dummy)	0.35	0.48	136
Municipality is classified to be a dense populated (dummy)	0.24	0.43	136
Municipality is classified to be a rural municipality (dummy)	0.41	0.49	136

Region 2 – Southern Finland

	Mean	Std. dev.	N.
Population	10664.08	22196.58	680
Average taxable income (thousand euros)	14.08	2.25	680
Jobs/employed labor force in municipality	0.83	0.18	680
Share of agricultural jobs in municipality	0.19	0.13	680
Geographic area of municipality	345.18	247.62	680
Municipality has a City-status (dummy)	0.24	0.43	680
Municipality is classified to be a town-like municipality (dummy)	0.18	0.38	680
Municipality is classified to be a dense populated (dummy)	0.16	0.37	680
Municipality is classified to be a rural municipality (dummy)	0.66	0.47	680

Region 3 – Central Finland

	Mean	Std. dev.	N.
Population	9270.26	12869.22	300
Average taxable income (thousand euros)	12.21	1.59	300
Jobs/employed labor force in municipality	0.92	0.12	300
Share of agricultural jobs in municipality	0.23	0.11	300
Geographic area of municipality	1135.62	1004.17	300
Municipality has a City-status (dummy)	0.23	0.42	300
Municipality is classified to be a town-like municipality (dummy)	0.11	0.31	300
Municipality is classified to be a dense populated (dummy)	0.09	0.29	300
Municipality is classified to be a rural municipality (dummy)	0.80	0.40	300

Region 4 - Eastern Finland

	Mean	Std. dev.	N.
Population	8226.43	13336.54	344
Average taxable income (thousand euros)	12.72	1.99	344
Jobs/employed labor force in municipality	0.91	0.15	344
Share of agricultural jobs in municipality	0.22	0.12	344
Geographic area of municipality	547.48	309.56	344
Municipality has a City-status (dummy)	0.27	0.44	344
Municipality is classified to be a town-like municipality (dummy)	0.08	0.27	344
Municipality is classified to be a dense populated (dummy)	0.21	0.41	344
Municipality is classified to be a rural municipality (dummy)	0.71	0.45	344

Region 5 – Northern Finland

	Mean	Std. dev.	N.
Population	9138.62	15911.38	244
Average taxable income (thousand euros)	12.83	2.60	244
Jobs/employed labor force in municipality	0.89	0.16	244
Share of agricultural jobs in municipality	0.18	0.12	244
Geographic area of municipality	2230.61	3210.92	244
Municipality has a City-status (dummy)	0.21	0.41	244
Municipality is classified to be a town-like municipality (dummy)	0.15	0.36	244
Municipality is classified to be a dense populated (dummy)	0.18	0.39	244
Municipality is classified to be a rural municipality (dummy)	0.67	0.47	244

Region 6 - Ahvenanmaa

	Mean	Std. dev.	N.
Population	1590.88	2447.41	64
Average taxable income (thousand euros)	13.50	3.24	64
Jobs/employed labor force in municipality	0.71	0.34	64
Share of agricultural jobs in municipality	0.25	0.13	64
Geographic area of municipality	97.00	41.83	64
Municipality has a City-status (dummy)	0.06	0.24	64
Municipality is classified to be a town-like municipality (dummy)	0.06	0.24	64
Municipality is classified to be a dense populated (dummy)	0.00	0.00	64
Municipality is classified to be a rural municipality (dummy)	0.94	0.24	64

ESSAY III

COMPETITIVE IMPACT OF RELATIVE CHANGES IN SELLERS' AND BUYERS' TRANSPORTATION COSTS – AN APPLICATION TO BANKING

THE COMPETITIVE IMPACT OF RELATIVE CHANGES IN SELLERS' AND BUYERS' TRANSPORTATION COSTS - AN APPLICATION TO BANKING

Abstract

This paper analyzes the changes in market competitiveness in a spatial context. It shows that with equal transportation costs the market where a customer pays transportation costs is less competitive than markets where customers do not face the costs of transportation. In a free-entry context intensified competition also leads to a more concentrated market structure. The model is also applied to loan markets. In bank markets lenders "transportation costs" are based on localized customer information which can lead to inaccurate screening. The model shows that a decrease in the distance costs faced by a borrower leads to intensified competition and market concentration. Increased average distance between the bank and the customers leads also to lower average quality of financed borrowers.

1 INTRODUCTION

The development of information technology has brought new efficiency to improving remote access services in banking. This development has lead to the conclusion that spatial models are not useful in analyses of bank markets (see e.g. Vesala 2000). In this paper we partly agree with that approach. The development of information technology has lowered transportation costs, or more generally costs based on distance, faced by customers and the location of a bank has lost most of its meaning for customers due to remote access technologies. This holds true, especially for access to payment systems.

However, it is not the whole picture. As Freixas & Rochet (1997) demonstrate, in addition to access to payment systems, banks have three other main functions. Those are: transforming assets, managing risks, and processing information and monitoring borrowers. Distance still plays an important role in the last two categories since it is likely that a banker better knows local economic conditions and has access to a wider spectrum of information concerning customers. In essence, local knowledge can be used as a complement to traditional "hard" credit scoring methods. In that sense the distance costs a bank faces are based on the management of information, not on the transportation of traded good, per se.

In this short paper I first present a simple extension of the spatial competition model introduced by Salop (1979). The extension to the model is the introduction of seller transportation costs. With this model the competitive effects of the relative changes in distance costs faced by either buyer or seller can be presented. The analysis does not include the choice of different pricing strategies in the context of spatial competition. Instead of this firms are assumed to follow a uniform pricing strategy and to have rejected the option for location based price discrimination.[1] The analysis shows that markets where a seller includes transportation costs in the product price are more competitive than markets where a buyer has to transport the product by him/herself. In addition, intensified price competition also leads to market concentration in the long run due to market exit.

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[1] For pricing strategies, see e.g Furlong & Slotsve (1983) or Thisse & Vives (1988) and the references mentioned in their papers. Thisse & Vives (1988) also show that when firms have the possibility to discriminate on price, price discrimination is the dominant action. This paper also shows, along with several other studies (see e.g. Hobbs 1986), that discriminatory pricing is beneficial for customers as it creates intensified competition

The second part of the paper applies the same approach to loan markets. A customer’s tranportation costs are mainly generated by mandatory visits to the bank. The banks' transportation costs are, as previously mentioned, based on inaccurate customer screening, which can lead to incorrect lending decisions.

The paper is organized as follows. Section 2 presents the basic model and discusses the main results. Section 3 presents the model as applied to loan markets. Section 4 concludes the findings.

2 BASIC MODEL

2.1 Preliminaries

Let there be N customers located uniformly along a circle with a circumference of 1. Respectively there are n firms located symmetrically on the circle such that firm i's location is denoted by $x_i = \frac{i}{n}, i \in \{1, \cdots, n\}$. All customers have a demand for one unit of the commodity. The unit price of the commodity at firm i is p_i. Customers face a transportation cost (the disutility of distance) α per distance unit.

Customers choose the seller in order to minimize the total cost of the purchase, that is the sum of the price and transportation cost. Customer x is indifferent between firms i and $i + 1$ when

$$p_i + (x - x_i)\alpha = p_{i+1} + (x_{i+1} - x)\alpha \ .$$

The location of marginal customer is then $\breve{x} = \frac{2i+1}{2n} + \frac{p_{i+1} - p_i}{2\alpha}$. Since firms operate on the circle, firm i has two direct rivals, firm i+1 and firm i-1. Therefore there are two marginal borrowers for each bank. Respectively the location of the second marginal customer is $\hat{x} = \frac{2i-1}{2n} + \frac{p_i - p_{i-1}}{2\alpha}$

Obviously firms can face transportation costs, for instance due to free-on-board pricing. The transportation cost for firm i selling to costomer x is $|x - x_i|\beta$, where β is the transportation cost per distance unit.

If the marginal cost of the purchased commodity is c for firm i and the firm faces fixed cost F, we can present the profit function of firm i as

$$\Pi_i = \int_{\frac{i}{n}}^{\breve{x}} (p_i - c - \beta(x - \frac{i}{n}))dx + \int_{\hat{x}}^{\frac{i}{n}} (p_i - c - \beta(\frac{i}{n} - x))dx - F \qquad (1)$$

where $\breve{x} = \frac{2i+1}{2n} + \frac{p_{i+1} - p_i}{2\alpha}$ and $\hat{x} = \frac{2i-1}{2n} + \frac{p_i - p_{i-1}}{2\alpha}$ are the locations of the marginal borrowers.

2.2 Equilibrium

Differentiating (1) with respect to p_i yields the first order condition of profit maximization of firm *i*. That is,

$$\frac{\partial \prod_i}{\partial p_i} = \frac{2\alpha(\beta + 2cn + 2a) - 2n(4\alpha - \beta)p_i + (2\alpha + \beta)n(p_{i+1} + p_{i-1})}{4n\alpha^2} = 0 .$$

Simple algeraic manipulations provides us with a linear system

$$p_i - c = \frac{a}{n} + \frac{p_{i+1} + p_{i-1} - 2p_i}{2} + \frac{\beta}{2}\left[\frac{1}{n} + \frac{(p_{i+1} + p_{i-1} - 2p_i)}{2\alpha}\right] \qquad (2)$$

Linear systems have at most one solution. Since the price $p_i = c + \frac{\beta + 2\alpha}{2n}$ $\forall i \in \{1, \cdots, n\}$ solves the system (2), price $p_i := p^* = c + \frac{\beta + 2\alpha}{2n}$ is the unique solution, that is, the equilibrium price.[2] By substituting this into (1) we are given each firm's profit in the market $\prod_i = \frac{4\alpha + \beta}{4n^2} - F$. Following the typical assumption of free entry profits must be equal to zero in the long run. The respective number of banks operating in the market is $n^* = \sqrt{\frac{4\alpha + \beta}{4F}}$.

A well-known feature of the Salop-model is that spatial markets with free entry provide too much product variation (Salop 1979). An optimal number of firms is one that minimizes the fixed costs of firms and both types of transportation costs. That is, the cost of the market to society is $nF + 2n\int_0^{\frac{1}{2n}} (\alpha + \beta)x dx = nF + \frac{\alpha + \beta}{4n}$. An optimal number of firms $\bar{n} = \sqrt{\frac{\alpha + \beta}{4F}}$ minimizes the social costs. Since the number of banks in a market with free entry is $n^* = \sqrt{\frac{4\alpha + \beta}{4F}}$, it is straightforward to verify that social optimum is achieved if and only if $\alpha = 0$. Therefore only in markets where customers do not bear any of the transportation costs can the social optimum be achieved.

The effects of the relative change in transportation costs can be illustrated by the following cases.

Case 1 *Only customers face transportation costs (β=0 and α=κ>0). The equilibrium price is then* $p^* = c + \frac{\kappa}{n}$ *and the profit of the firm i is*

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[2] Note that if *β=0*, this model degenerates to the traditional Salop model.

$$\Pi_i = \int_{\frac{i}{n}}^{\frac{2i+1}{2n}} (c + \frac{2\kappa}{2n} - c)dx + \int_{\frac{2i-1}{2n}}^{\frac{i}{n}} (c + \frac{2\kappa}{2n} - c)dx - F = \frac{\kappa - Fn^2}{n^2}.$$

Since free entry is assumed, the number of firms in the market is $n = \sqrt{\frac{\kappa}{F}}$ *and the equilibrium price of the commodity is* $p^* = c + 2\sqrt{\kappa F}$.

Case 2 *Firms carry the transportation costs* ($\alpha = 0$ and $\beta = \kappa > 0$).

The equilibrium price is now $p^* = p + \frac{\kappa}{2n}$ *and the profit of firm i is*

$$\Pi_i = \int_{\frac{i}{n}}^{\frac{2i+1}{2n}} (c + \frac{\kappa}{2n} - c - \kappa(x - \frac{i}{n}))dx + \int_{\frac{2i-1}{2n}}^{\frac{i}{n}} (c + \frac{\kappa}{2n} - c - \kappa(\frac{i}{n} - x))dx - F = \frac{1}{4}\frac{\kappa - 4Fn^2}{n^2}$$

The free entry number of banks is $n = \sqrt{\frac{\kappa}{4F}}$ and the equilibrium price of the commodity is $p^* = c + \sqrt{\kappa F}$.

Case 1 follows the traditional Salop setup and the outcome of case 2 is equivalent to that of Bertrand competition with free entry and linearly increasing marginal costs. A market is more competitive in the latter case since the price is lower. Also the market is more concentrated in case 2. That is, in markets with free entry the resulting market concentration has a negative correlation with the intensity of price competition, which contradicts the traditional SCP-view.

The above can be summarized by the following proposition.

Proposition 1 *When a seller's share of transportation costs increases, there is an increase in the intensity of price competition and the concentration of the market increases and consumer welfare increases. If customer transportation costs are absent then the competitive free entry equilibrium is the social optimum.*

3 APPLICATION TO BANKING

The previous section presented a basic model with two-sided transportation costs. In banking the transportation costs facing the customer are easy to comprehend. However, it is not that clear as to how transportation costs affect banks. This is a type of by-product of one of the one main functions of the banking system i.e. the allocation of loanable funds to good entrepreneurs and for good projects.

Following the previous model, it is assumed that there are *N* customers located uniformly around a circle with a circumference of 1 seeking a loan of magnitude *L* and n banks located symmetrically on the circle. Bank *i*'s location is denoted by $x_i = \frac{i}{n},\ i \in \{1,\cdots,n\}$. The loan interest rate at bank *i* is r_i. Customers face transportation cost (the disutility of distance) α per distance unit.

Borrowers denoted by the share λ are good (and respectively 1-λ are "bad"). Good (Bad) borrowers have a success probability equal to π_g (π_b) and furthermore $\pi_g > \pi_b$. Success probability is defined as successful borrowers paying back the loan and interest. Unsuccessful borrowers pay back *(1-Ω)L* (and create credit loss equal to *-ΩL*). Furthermore, the distribution of the types is assumed to be uniform at the circle.

A bank's probability for identifying the type of loan applicant correctly depends on the distance between the bank and the customer. The probability of the correct identification of a customer's quality is assumed to follow function $P_i = 1 - \gamma d_{ix}$,

where $d_{ix} = |x_i - x|$ denotes customer *x*'s distance to bank *i*.[3] That is, the bank closer to the borrower has an information advantage and has more ability to identify a customer type correctly. The conditional probability for receiving finance is $P_i = 1 - \gamma d_{ix}$ for a good quality borrower and γd_{ix} for a bad quality borrower. The share of financed customers as a function of distance is $\int(d_{ix}) = \lambda - \gamma d_{ix}(2\lambda - 1)$ and the good customers' share of a financed population as a function of distance is $g(d_{ix}) = \frac{(1-\gamma d_{ix})\lambda}{\lambda - \gamma d_{ix}(2\lambda - 1)}$.The share of financed

[3] Maximum of the success is normalized to 1 since any constant replacing 1 does not affect on the result.

borrowers decreases in distance if λ >1/2. Also the average quality of the borrowers decreases due to an increased share of misidentifications.

When taking into account the imperfect screening, the demand[4] faced by the bank *i* is

$$D(r_i) = N \int_{\frac{i}{n}}^{\frac{2i+1}{2n}+\frac{r_{i+1}L-r_iL}{2\alpha}} \left(\lambda - \gamma\left(x - \frac{i}{n} \right)(2\lambda - 1) \right) dx \qquad (3)$$

$$+ N \int_{\frac{2i-1}{2n}+\frac{r_iL-r_{i-1}L}{2\alpha}}^{\frac{i}{n}} \left(\lambda - \gamma\left(\frac{i}{n} - x \right) 2\lambda - 1 \right) dx .$$

At first, for the sake of simplicity assume that N=L=1. This assumption does not affect the main results since both of those are constants. Furthermore assume that "good" borrowers generate the loan return r_i with certainty and respectively "bad" borrowers generate credit loss –1 with certainty. Those assumptions created by the terms presented in the previous subsection imply that $\pi_g = 1$, $\pi_b = 0$ and Ω=1. The marginal cost for each bank is constant *r* (interbank loan rate) and the set-up cost (fixed cost) is *F* for each bank.

Since, due to imperfectly successful screening, there are $(1-\gamma d_{ix})\lambda$ good borrowers and $\gamma d_{ix}(1-\lambda)$ bad borrowers then the total share of financed borrowers as a function of distance is $(1-\gamma d_{ix})\lambda - \gamma d_{ix}(-1+\lambda) = \lambda - (2\lambda+1)\gamma d_{ix}$ and the bank has to pay the interest rate *r* for each loan.

The profit function for bank *i* can be written as

$$\Pi_i(r_{i-1}, r_i, r_{i+1}) = \int_{\frac{i}{n}}^{\breve{x}} \left(\left(1 - \gamma(x - \frac{i}{n}) \right) \lambda r_i - \gamma(x - \frac{i}{n})(1-\lambda) - (\lambda - (2\lambda+1)\gamma(x - \frac{i}{n}))r \right) dx +$$

$$\int_{\hat{x}}^{\frac{i}{n}} \left(\left(1 - \gamma(\frac{i}{n} - x) \right) \lambda r_i - \gamma(\frac{i}{n} - x)(1-\lambda) - (\lambda - (2\lambda+1)\gamma(\frac{i}{n} - x))r \right) dx - F \quad (4)$$

where $\breve{x} = \frac{2i+1}{2n} + \frac{r_{i+1} - r_i}{2\alpha}$ and $\hat{x} = \frac{2i-1}{2n} + \frac{r_i - r_{i-1}}{2\alpha}$.

Proposition 2 *The equilibrium loan rate is*

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[4] Note that if identification is perfect then the demand function degenerates to the traditional form and can be written as

$$D(r_i) = (\breve{x} - \hat{x})\lambda N = \left[\frac{2i+1}{2n} + \frac{r_{i+1}L - r_iL}{2\alpha} - \left(\frac{2i-1}{2n} + \frac{r_iL - r_{i-1}L}{2\alpha} \right) \right] \lambda N = \left(\frac{1}{n} + \frac{r_{i+1} + r_{i-1} - 2r_i}{2\alpha} L \right) \lambda N.$$

$$r_i := r_L^* = \left(1 + \frac{1+\lambda}{\lambda(\gamma-2n)}\gamma\right)r + \frac{\alpha(\gamma-4n)}{2n(\gamma-2n)} + \frac{\gamma(\lambda-1)}{\lambda(\gamma-2n)}$$ for all i, if $\lambda>1/2$ and $\gamma<2n$.

Proof. In equilibrium no bank has an incentive to deviate, if no rival deviates. Assume that neighboring banks, i.e. banks i-1 and i+1, price their loans at the supposed equilibrium loan rate. Then, if bank i's profit function's first derivative is zero at this loan rate and the second derivative is negative, maximizes this interest rate also bank i's profit and it has no incentive to deviate. Define an auxiliary mapping $\hat{\Pi}_i$ as $\hat{\Pi}_i(r_i) = \Pi_i(r_L^*, r_i, r_L^*)$. Subsequent simple computations show that $\frac{d\hat{\Pi}_i}{dr_i}(r_L^*) = 0$. Moreover, assuming that $\lambda>1/2$ and

$$\gamma < 2n, \frac{d^2\hat{\Pi}_i}{dr_i^2}(r_L^*) = \frac{2\gamma n r(14n\lambda - 2n - 3\gamma\lambda) + \alpha\lambda(16n^2 + 3\gamma^2 - 12\gamma n) + 4\gamma n^2(1-\lambda)}{n\alpha^2(\gamma-2n)} < 0.$$

Hence $r_i = \left(1 + \frac{1+\lambda}{\lambda(\gamma-2n)}\gamma\right)r + \frac{\alpha(\gamma-4n)}{2n(\gamma-2n)} + \frac{\gamma(\lambda-1)}{\lambda(\gamma-2n)}$ is the equilibrium price for each bank. ■

The number of banks in free entry equilibrium satisfies the zero profit condition

$$\Pi_i = \frac{\lambda(\gamma^2 - 8\gamma n + 16n^2)}{8n^3(2n-\gamma)}\alpha + \frac{(1-\lambda) - r(1+\lambda)}{2n(2n-\gamma)}\gamma - F = 0 \qquad (5)$$

for each bank i. The solution(s) of the zero-profit condition (5) is (are) one of a fourth degree polynome and thus this has an explicit solution. Explicit solutions are, however, rather cumbersome.

Related price and profit functions are very complex and without more assumptions concerning the variables, one can show that $\frac{\partial r_L^*}{\partial\alpha} > 0$. That is, decreasing customer distance costs leads to a lower loan interest rate. This makes markets less attractive and recalls the assumption of free entry and the number of banks decreases. Along with a decreasing number of active banks the average distance between banks increases, which leads to less accurate screening and a lower quality of borrowers. When it is assumed that less than half of the loan applicants are of a low quality type the number of applicants receiving loans decreases.

4 CONCLUDING REMARKS

It is argued that spatial models are not appropriate in an analysis of bank competition. Furthermore, since the service access costs faced by customers (disutility from traveling or distance to service provider) has declined due to information technology it is natural that the spatial nature of bank competition has declined. However, a counter argument comes to light if we take into account the spatial nature of the information.

This paper first presented a general spatial model with two-sided transportation costs. The analysis showed that if sellers bear the transportation costs then price competition in the market intensifies and market becomes more concentrated. Also, in cases where customers face no transportation costs the typical inefficiency of spatial markets, i.e. too much product variation, disappears and the market equilibrium is the social optimum.

A similar approach was applied to lending markets. In this case the lender's transportation costs were based on the spatial nature of the information. That is, the banker is assumed to better know customers that are located close to the bank. When distance between bank and customer increases customer screening becomes less accurate. The main results of this are as follows. Firstly, a decrease in a customer’s distance costs leads to the exit of some banks. Due to an increasing average distance between the bank and its customers the number of customers receiving loans decreases and credit losses increase. The results are, however, rather hard to interpret due to the complexity of price and profit functions. The model needs, as usual with spatial competition models, lots of assumptions concerning the relevant variables. Therefore there is need for further research.

One possible extension to the model is to allow for price discrimination. As seen in the analysis, price and profit equations for uniform pricing models tend to turn rather complicated. Koponen (2002) analyzes bank competition within Hotelling's linear city context (cf. Hotelling 1929) with non-uniform customer density. The analysis shows that price and profit equations related to price discrimination were less complex than ones of uniform pricing. Therefore it could be useful to introduce the possibility of price discrimination into an analysis.

Another stream of development would be to introduce rivals inside the circle. This approach has been applied in the analysis of the mail order business (see e.g. Bouckaert 2000). The results are quite similar to the results

of the first model in this paper - a market with a mail order company has fewer firms than the traditional Salop-market. This approach has also been used in the analysis of loan markets (see Koponen et. al 2002), but without the information aspect.

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ESSAY IV

THE COMPETITION AND EFFICIENCY OF LOCAL FINNISH BANKS: DOES MARKET STRUCTURE EXPLAIN DIFFERENCES IN EFFICIENCY?

THE COMPETITION AND EFFICIENCY OF LOCAL FINNISH BANKS: DOES MARKET STRUCTURE EXPLAIN DIFFERENCES IN EFFICIENCY?

Abstract

In the literature of competition analysis it has been argued for a long time that a lack of competition leads to inefficiency. Furthermore, market concentration is often seen as a competitive problem leading to collusion. In the banking sector markets are often local and concentrated and this means single banks can have a strong market position. This paper analyzes the interplay between the efficiency of a bank and the structure of that bank's main markets in Finland from 2003 to 2006. The analysis utilizes data envelopment analysis (DEA) during its first stage. During the second stage we estimate the effects of environmental variables on the relative efficiency of local banks generated by DEA. Environmental variables describe both the market structure and competition in it. In addition to more traditional views we also include group variables that describe the sustainable competitive advantage of a bank group. Analysis shows that technical efficiency has improved during the period. Analysis also shows that there are sustainable efficiency differences between the bank groups. That is, a network of savings banks seems to have a sustainable competitive advantage. Furthermore, increased market concentration seems to have an adverse effect on efficiency. Also the presence of rival banks in the main market improves efficiency.

1 INTRODUCTION

The efficiency of markets is a central theme in economics. According to conventional wisdom the efficiency of the markets contains three elements: the allocative efficiency of the markets, the productive efficiency of the markets and the dynamic efficiency of the markets measured by the creation of welfare enhancing innovations (see e.g. Motta 2004). The first topic, which is, the interplay between the market (or monopoly) power and welfare has been one of the most important research topics within empirical industrial economics since the seminal paper written by Harberger (1954). The renaissance of the second topic, the efficiency of the firm and the competitiveness of markets was a kind of reaction to the previous topic and originated from Leibenstein (1966), who introduced the term X-efficiency referring to the inefficiency of companies (slack) who were enabled by a lack of the competition in the markets. Method development in efficiency analysis dates back to the seminal work by Farrell (1957). Kumbhakar & Lovell (2000) provide a useful presentation of the history of economic thought on the productive inefficiency.

In this paper we analyze the efficiency of local banks in Finland and more specifically, we analyze whether the competitive environment of a bank has an impact on its efficiency. The case market studied here is the Finnish retail banking market. The reason for the choice of this market is two-fold. First, the banking sector is crucial for the development of the economy as a whole as The Bank of Finland states on its web page when discussing the function of the financial markets: *"Financial markets perform the function of channeling excess funds from private individuals and corporations to those individuals and corporations who are in need of financing. Funds are intermediated by banks and other credit institutions, and directly via financial markets through the issuance of securities. An efficient and reliable functioning of the financial system is vital for the economy as a whole. An efficient allocation of funds and financial stability contribute to economic growth and prosperity."* Secondly, banking markets provide rather good data and markets are, at least to some degree, local and differences in local rivalry are possible to control for.

Within the banking industry there are some often used proxies regarding efficiency. These are cost/income ratio, return on equity, return on assets, and net interest margin. In particular, the first proxy, the cost/income ratio, can have an efficiency interpretation in some cases. In competitive markets (or

with a given degree of competition) the lower cost/income ratio implies better efficiency. If a bank, however, has market power, the higher incomes can imply a lower value of the cost/income ratio even for a technically inefficient bank. Therefore the use of a cost/income ratio in efficiency analysis is rather limited without relevant price information. Market power bias is even more severe for the rest of the mentioned proxies (see e.g. Bikker & Bos 2006).

In order to avoid at least most of this problem academic (and also more thorough professional efficiency) studies typically use methods like stochastic frontier analysis (SFA) or data envelopment analysis (DEA). Stochastic frontier analysis belongs to the group of parametric (or econometric) methods, while DEA is a non-parametric method, which uses mathematical programming instead of the statistical estimation of efficiency frontiers. In bank efficiency studies both methods have been used extensively during the last two decades. Berger & Humprey (1997) provides an extensive review on the topic as well as some guidelines for future research.

This paper aims to answer the fundamental question of whether intensified competition improves a bank's efficiency. In order to find the answer, we follow the two-stage approach often used in this kind of analysis. During the first stage we seek relative efficiency estimates for all decision making units with DEA. During the second stage of the study we statistically test whether the different environmental or strategic variables explain the differences in efficiency.[1] Environmental variables include market concentration and the level of urbanization of the market as well as the type of rivals present in the market. Strategic variables include variables describing bank group membership and the intensity of a bank's presence within local markets.

The paper is organized as follows. Section 2 presents a set of theory driven hypotheses concerning the interplay between competition and bank efficiency. Hypotheses stem not only from traditional industrial economics but also from the resource-based view. Section 3 provides a description of the research methodology and discusses the inputs and outputs of a banking firm. Section 4 describes the data and section 5 presents the results. Section 6 concludes the paper.

[1] One of the first to apply this kind of approach was Carlsson (1972). In stage I of his analysis he composed an efficiency index for each industry and in stage II several variables describing market structure and competition were used to explain efficiency differences. Since then the approach has been used both with SFA and DEA.

2 COMPETITION AND EFFICIENCY: SOME HYPOTHESES

Even before Liebenstein, it has been known that a lack of competition not only leads to a higher price level but also has a detrimental effect on efficiency. As Hicks (1935) phrases it, "*It seems not at all unlikely that people in monopolistic positions will very often be people with sharply rising subjective costs; if this is so, they are likely to exploit their advantage much more by not bothering to get very near the position of maximum profit, than by straining themselves to get very close to it. The best of all monopoly profits is a quiet life*."

This phenomenon can be illustrated graphically as higher marginal costs. In Figure 1 the marginal costs of an inefficient firm is MC' and MC refers to the marginal costs of an efficient firm in a competitive market. In a competitive market; welfare, consumer surplus, is given by the area OSp(c). Welfare loss due to an efficient monopolist is given by the area RST. If the monopolist is inefficient marginal cost is MC', the welfare loss is given by the area R'ST'>RST. Additional welfare loss due to inefficiency is given by the shaded area. (Motta 2004).[2]

Square p'(c)VT'p(c) is however somewhat difficult to interpret as a sole welfare loss, since it is actually the gain of "quiet life", extra welfare for the insiders of the company. For instance, a "responsible employer" with market power can pay higher wages to its employees, which raises the marginal costs. An entrepreneur can also be loyal to its home markets and employ more than necessary. Hence the square p'(c)VT'p(c) can also be seen as part of a monopoly profit shared with the stakeholders. In the case of local banking this can be case as local banks can be highly embedded in a community.

A more typical reason for inefficiency is related to the self-interest of the management. That is, if the incentive system is improper, in the case of separated ownership and management, the management will not have the right incentives to put an effort into efficiency improvements. The absence of competitive pressure and market selection can allow such behavior to possibly continue for lengthy periods.

[2] For a thorough graphical treatise of efficiency losses, see Carlsson (1972).

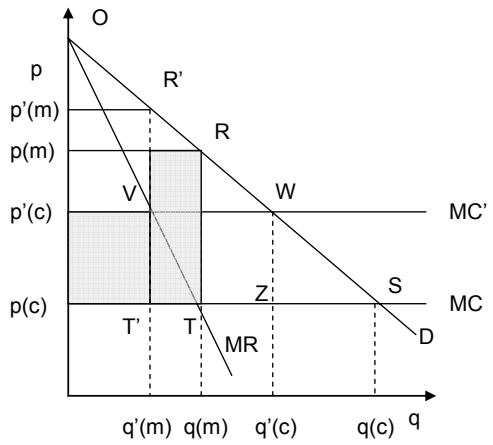

Figure 1. Welfare loss of productive inefficiency (Motta 2004, see also Williamson 1968).

Homogeneity between the firms in certain markets is not, however, given. Even if the text-book economics often assumes that there are no differences in efficiency between the firms, in strategic management literature efficiency differences between firms is a major topic. One explanation for this presented by the resource-based view of a firm is based on the seminal work of Edith Penrose. Penrose (1959) illustrated the firm by presenting it as a collection of different resources. This explication has fostered an enormous amount of literature and new different strands of research in the field of strategic management (see especially Barney 1991, Wernerfelt 1984). Rugman & Verbeke (2002) have collected the main ideas of the recent RBV-literature. These are:

1. The ultimate goal of a firm is to achieve sustained, above average returns compared to its rivals
2. Resources are not equally available for all firms and a combination of resources, competencies and capabilities are a precondition for sustained superior returns
3. Competencies and capabilities lead to sustained superior returns if they are firm-specific (immobile), valuable to customers (trivial), non-substitutable and difficult to imitate. Heterogeneity is created by the Schumpeterian competitive process or by isolating mechanisms and uncertain imitability and therefore can be sustainable.
4. From a dynamic perspective innovations can make a crucial contribution to sustainable superior returns.

Hall (1992) concentrates on the intangible nature of the root causes of the competitive advantage of a firm. He argues that capability differentials can be based on either competencies, or assets. The former refers to the knowledge, skill and experience of employees and to the culture of a corporation as a whole and the latter to the positional differential resulting from the consequences of past actions (reputation, advantageous location of facilities) or from the possession of legal entities. The more intangible the resources (or capabilities), the harder they are either imitated by rivals or transferred to new firms. That is, intangibility decreases the mobility of resources.

This is in line with Peteraf (1993), who concludes that the cornerstones of sustained competitive advantage are superior resources, ex post and ex ante limits to competition, and imperfect resource mobility (the efficient firms can sustain their competitive advantage only if their resources cannot be expanded freely or imitated by other firms).

To test this approach, we set the first hypothesis according to the traditional view in economics which assumes easy imitation and the acquisition of valuable productive resources.

Hypothesis 1: there are no group-wise differences between the banks in technical efficiency, i.e. in the efficiency of production process

What are the factors defining competition? According to the traditional SCP-model concentrated markets are prone to collusive behavior and furthermore relaxed competitive pressure leads to organizational slack and lower technical efficiency. Investments in production capacity in a certain market can also create a barrier to entry. Market concentration can be, however, also a result of the strategic concentration of a firm to find a certain market (niche). For instance, in banking a strong presence in a certain market can improve process efficiency due to superior customer information. That is, local knowledge makes decision making faster, more efficient and reduces administrative costs. Along with this theme we set two hypotheses concerning the efficiency effects of structural factors.

Hypothesis 2: Concentration of a market implies less competition and lower technical efficiency

Hypothesis 3: Strategic geographical concentration improves efficiency

Similarly, as differentiation gives a firm more freedom when pricing that differentiation can also result in technical inefficiency due to relaxed

competitive pressure. If the market is, *ceteris paribus*, geographically smaller, the proximity of a firm's rivals increases.

Hypothesis 4: The more densely populated an area is, the more competitive the environment is and the higher the technical efficiency is.

Resource based theory concentrates on factors that create a sustainable competitive advantage for firms. These papers do not, however, explicitly analyze competition, but take it more or less as given. Chen (1996) takes this one step further and bridges competitor analysis and inter-firm rivalry. He introduces two firm-specific and theory-based constructs: market commonality and resource similarity. Firms have a unique market profile and a strategic resource endowment. Pair-wise comparisons in these two dimensions can illuminate the pre-battle competitive tensions between firms and how the focal firm may interact with its competitors.

Bergen & Peteraf (2002, Henceforth BP) further develop Chen's theory (1996). They argue that Chen's analysis of the identification of competitive threats is problematic since threats can arise both on the supply and demand side. A concentration on product markets in competitive environment scanning can lead to the failure to identify threats from indirect or potential rivals developing relevant resources and latent capabilities. For a solution to this problem they provide a two-stage method for the analysis of competitor awareness.

The first stage of analysis is about recognizing and classifying the competition. In this stage they use a two-dimension similarity-commonality framework similar to Chen's. The dimensions are market commonality and resource similarity. Market commonality is defined as the degree to which a given competitor overlaps with the focal firm in terms of customer needs served. Resource similarity is defined as the extent to which a given competitor possesses strategic endowments comparable, in terms of type, to those of the focal firm. By using this they classify direct competitors as ones with a high market commonality and a high resource similarity in relation to the focal firm. Accordingly, indirect competitors (substitutes) have a high market commonality and a low resource similarity and potential competitors a low market commonality and a high resource similarity with the focal firm (see figure 2).

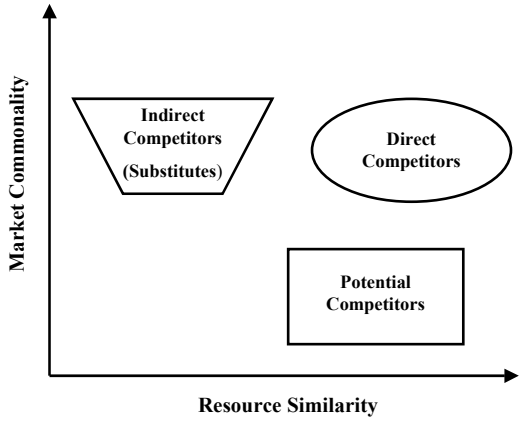

Figure 2. Mapping the competitive terrain (Bergen & Peteraf 2002

Basically, the method is same as Chen's (1996) up to this point. Their point of departure from Chen is that during the first stage the amount of resources is not included in the analysis, but is moved to the second. Bergen and Peteraf introduce a new concept here called resource equivalency. This refers to the extent to which a given competitor possesses strategic endowments capable of satisfying the same customer needs as a focal firm. Resource equivalency has a fundamental effect on competition due to the competitive balance; in brief a low resource equivalency reveals that firms are different in their ability to initiate and respond to competitive actions.

Even though the competitor analyses of Chen and Bergen and Peteraf differ slightly, the main results are practically the same. The models nicely present the competitive asymmetry and show that a given pair of firms may not pose an equal degree of threat to each other.

General hypotheses rising from the analysis are the following:

1. A high market commonality and/or resource similarity between competitors reduces the incentives to attack as the probability of response is higher[3]
2. Market commonality has a stronger predictive ability than resource similarity as there is a higher visibility of any potential attack

[3] This clearly has an antitrust-implication: collusive behavior is more likely in industries with high market commonalities and resource similarities.

3. Competitive asymmetry in market commonality and resource similarity also creates asymmetry in the aggressiveness of the firms, i.e. the likelihood of attack and response differs between the firms.[4]

Based on the model of strategic behavior in competitive interaction we set the last hypothesis as:

Hypothesis 5: Dissimilarity of rivals increases competition and improves technical efficiency.

[4] The same is presented by BP in slightly different form by using the concept of resource equivalency.

3 EFFICIENCY ANALYSIS

3.1 Analytical methodology

Data Envelopment Analysis (DEA) has basically two main variations: an input oriented approach and an output oriented approach. The former emphasizes how much input quantities can be decreased without changing the quantity of the outputs. The latter aims to evaluate how much the output quantities can be increased without decreasing the input quantities. Both approaches will yield the same efficient and inefficient decision making units (DMUs). Furthermore, in constant returns to a scale model efficiency scores are also the same in both input and output oriented versions.

In this paper we use input-oriented variable returns to create a scale variation of DEA (the so-called BCC model according to its creators Banker, Charnes and Cooper (1984)). The choice of input orientation is clear as we are interested in the technical efficiency of banks and thus need to ask: what is the relation between excess usage of the resources and the competitive environment of the bank? Also, it is reasonable to assume variable economies of scale in banking.[5]

Figure 1 presents the basic idea of the BCC model. In the figure the dashed line is the efficiency frontier for the constant returns to scale (CRS) model and only decision making unit B is an efficient one. The solid line connecting points A, B and C is the efficiency frontier for variable returns to scale (VRS). Therefore it is obvious that relative efficiency scores by VRS are always at least as high as the scores generated by the CRS model. The input efficiency of the decision making unit D is PR/PD. That is, the efficient reference DMUs for DMU D are A and B.

[5] For estimates of scale economies, see e.g. Altunbaş et al. (2001).

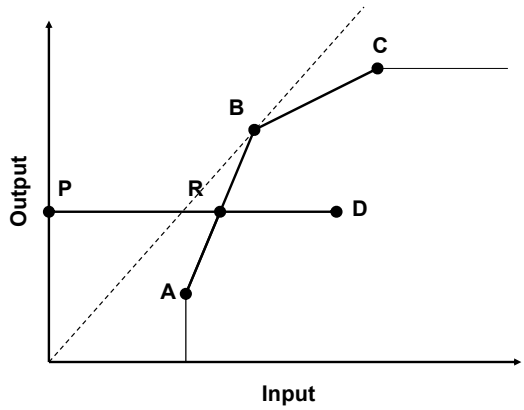

Figure 3. The BCC Model (Cooper et al., 2006)

In our analysis the DEA is used as a first stage for creating estimates for the relative efficiency of the banks. During the second stage we estimate the effect of a set of environmental variables on the efficiency of the DMU. The environmental variables are variables that can influence the efficiency of the DMU but are not under the (direct) control of the decision making unit. In this case environmental variables can relax the competitive pressure facing the bank and provide room for organizational slack. The chosen approach follows the standard procedure of the two-stage efficiency analyses.[6] According to this approach in the second stage Tobit estimation is used, since efficiency scores are typically assumed to be somewhat censored with a maximum value equal to one.[7]

3.2 The inputs and outputs of a bank

One rather fundamental question in efficiency analysis is what are the inputs and outputs of a bank (or a financial institution)? Generally all agree that loans and other major assets are the outputs of a bank. The role of deposits is not unanimous, but they have characteristics related to both inputs and outputs. That is, since the interest is paid for by deposits and funds are used as the raw material for loans then deposits are like all other inputs. Simultaneously deposits include the characteristics of outputs since there is a strong service dimension in the forms of safekeeping, liquidity and payment services. (Berger & Humprey 1997).

[6] An extensive list of studies using this approach is presented by Simar & Wilson (2007).
[7] For Tobit analysis, see e.g. Greene (2000).

The main approaches constituting the inputs and outputs are the production and intermediation approach (Sealey & Lindley 1977). The production approach sees financial institutions as producers of services for account holders. In other words, financial institutions mainly perform financial transactions and process documents for their customers. According to this approach the main outputs of the financial institutions are measured by the number and types of transactions and documents processed. An intermediation approach sees financial institutions as mediators between the supply and demand of funds. (Berger & Humprey 1997).

In efficiency analyses of banking the number of inputs and outputs, that is the level of aggregation or the omission of activities, have varied. Furthermore, in some cases income and costs have been included in an analysis whereas some other studies have relied only on balance sheet stock items and labor (or administrative costs). The available income and cost data allows the decomposition of inefficiency into allocative and technical inefficiency. That is, indirect price information brings the efficiency concept closer to economic efficiency by taking into account not only technical efficiency but also the allocation of the resources (Cooper et al., 2006). Without price information this kind of analysis is not possible and the inefficiency is a general "waste" of resources, or rather, too little is made from too much.

In the X-efficiency context the lack of price information is not that severe, since the inefficiency of the production process in general is the point of interest. Also a straightforward analysis of the previously described economic efficiency is challenging within the context of geographically differentiated markets, since the demand and supply of different financial assets can be very different between the markets. Therefore also the pricing power of the DMU affects the efficiency results.

Next we briefly describe the inputs and outputs used in efficiency analyses in banking. For instance Brockett et al. (1997) used four inputs and four outputs that combined both stock and flow variables. The inputs used were; interest expense, non-interest expense, provision for loan losses and total deposits, while the outputs were; interest income, total non-interest income, allowances for loan losses and total loans.

Casu & Molyneux (2003) specified two inputs: total costs (interest expenses, non- interest expenses, personnel expenses) and total customers and short term funding (total deposits) and two outputs: total loans and other earning assets. Berger & Mester (2003) use purchased funds, core deposits and labor as inputs and consumer loans, business loans, real estate loans and securities held as outputs. Also Wheelock and Wilson (2003) and Simar & Wilson (2007) adopted the same view. Cinca et al. (2002) define the number

of employees, fixed assets and deposits as inputs and operating income, deposits and loans as outputs.

Miller & Noulas (1996) used four inputs and six outputs. The inputs are total transactions deposits, total non-transactions deposits, total interest expense and total non-interest expense, The outputs are commercial and industrial loans, consumer loans, real estate loans, investments, total interest income and total non-interest income. In Weill (2004) outputs were loans and investment assets and inputs included labor, physical capital and borrowed funds. Input prices were used in cost frontier estimation.

In Sathye (2001) input variables were labor, capital, and loanable funds. The outputs used in the study were loans and demand deposits. Also Aly et al. (1990) and Hancock (1986) used this definition. Sathye (2002) relied on flow variables as inputs and outputs. The only variables used were net interest income and non-interest income as outputs and interest expenses and non-interest expenses as inputs. Those variables are assumed to; “measure as directly as possible management’s success in controlling costs and generating revenues”.

Fiorentino et al. (2006) defined three input and output categories. These were fixed assets (such as branches and administrative buildings), labor measured as full-time equivalents (FTE) and borrowed funds measured as the volume of deposits and bonds. Outputs were the volume of interbank and customer loans and investments in stocks and bonds. Input prices are derived as depreciation relative to fixed assets, personnel expenses relative to FTEs and interest expenses relative to total borrowed funds. Liu & Tone (2006) used three inputs: interest expenses, credit costs and general and administrative expenses and two outputs: interest accruing loans and lending revenues.

Lastly, Bos & Kolari (2005) define bank outputs as loans, investments and off-balance sheet items. Input prices include the price of labor, financial capital and physical capital.

4 DATA

In this paper we analyze the efficiency of local Finnish banks. Bank groups included in the analysis are local savings banks, local co-operative banks and OP Group (amalgamations of the cooperative banks). The data covers the years 2003 to 2006.

The data used shows incomes from different financial activities in net terms (cost minus expense). Administrative and other costs are a fortunate exception. Also the aggregation of different incomes is at higher level of aggregation compared to some previously mentioned studies. Therefore, we cannot use flow terms but only stock values as outputs. This is, however, not a problem, since in this paper we are interested in the interplay between technical efficiency and competition.

Hence, in the DEA section we analyze technical efficiency by using the administrative costs of the bank (ADMCOST) as inputs. Also considered inputs are the borrowed funds of the bank (DEPOSITS) and the equity capital of the bank (EQUITY). The outputs of the bank are loans to the public, public entities and credit institutions (LOANS), other investment assets of the bank (OTHASSET) and off-balance sheet commitment (OFFBALAN), which reflects the items not included in the basic monetary transformation activity of the bank. The definitions and statistics of the variables are presented in Table 1.

The descriptive statistics of these variables are also presented in the Appendix and are grouped according to bank groups (Table A1) and by year (Table B1). Group statistics show that the banks are on average quite similar, although the local co-operative banks are slightly smaller in all respects and the member banks of the OP Group have on average more off-balance sheet commitments and the savings banks have more assets that can be termed other. Yearly descriptive statistics show their general expansion of activities.

In the second stage of the analysis we estimate the effect of the organization and the competitive environment of the bank on efficiency. The first subgroup of variables controls the possible bank group efficiency differences (SBD, CBD and LCBD). Bank group dummies are used here both to reflect possible group-wise differences in efficiency but also for controlling for the possibility systematic behavior differences not captured by DEA.

Table 1. Variables used in DEA, definitions and descriptive statistics, Year 2003-2006.

	Mean	Std.Dev.	Minimum	Maximum
ADMCOST - administrative cost of the bank, thousand EUR	1855.114	2970.261	95	24376
DEPOSITS - Bank's liabilities to the public and public sector entities, and to credit institutions, thousand EUR	98478.66	166443.7	3558	1505668
EQUITY - Equity capital, thousand EUR	10676.94	13634.33	-724	158878
LOANS - claims of the public and public sector entities and credit institutions, thousand EUR	102881.3	176546.1	3841	1560904
OTHASSET - Debt securities and the sum of other balance sheet assets, thousand EUR	12031.47	17175.11	56	176487
OFFBALAN - Off-balance sheet commitments, thousand EUR	7230.328	16659.74	44	199980

Source: The Finnish Financial Supervision Authority. Number of observations 1274, observation units 322.

In line with conventional wisdom in economics, we analyze whether the market concentration has an effect on efficiency. Since the market definition is not helpful, we simply use, as a proxy for market concentration, the Herfindal-index, which is taken from the number of each bank's branches in the bank's main market as defined by the location of the bank's headquarters (MMKTCONC). The strategic concentration of a bank in a certain geographic market is controlled by OWNCONC, the Herfindal-index based on the bank's own branches in different municipalities. Local rivalry as represented by different types of rivals is presented by the variable LBRIV and COMMRIV, which refer respectively to local bank and commercial bank rivals present in the bank's main market. In addition or as an alternative to these variables, the municipality type of the bank's main market is also used in the analysis. These variables are TOWNLIKE, DENSELY and RURAL.

The development of information technology together with the penetration of the Internet and mobile connections has dramatically increased remote access technologies in banking. This development has decreased the importance of the physical proximity needed in banking activities since most transactions can now be completed without visiting bank offices. Thus, online banking services has meant the behavior of customers has developed to assume a higher degree of self-service. Hence a set of year-dummies has been used in the analysis to capture the overall efficiency of development due to technological development and the implementation of new innovations.

Table 2. Environment variables used in analysis, definitions and descriptive statistics, years 2003-2006.

	Mean	Std.Dev.	Minimum	Maximum
SBD - A dummy variable referring to the Savings Bank	0.122449	0.327932	0	1
CBD - A dummy variable referring to membership of the amalgamation of the co-operative banks (OP Group)	0.745683	0.435648	0	1
LCBD - A dummy variable referring to the local co-operative bank	0.131868	0.33848	0	1
MMKTCONC - Main market concentration, Herfindal-index calculated by using the number of each bank groups' branch offices located in the same municipality as the bank's headquarters	0.541442	0.264844	0.152778	1
OWNCONC - Bank concentration in a certain market, Herfindal-index calculated by using the number of a bank's branch offices located in different municipalities	0.780536	0.309401	0	1
LBRIV - Local bank rival present in the main market, dummy-variable	0.77237	0.419467	0	1
COMMRIV - Commercial bank rival present in the main market, dummy-variable	0.635793	0.481396	0	1
TOWNLIKE - The municipality where a bank's headquarters is located in a town like, dummy-variable	0.175039	0.38015	0	1
RURAL - The municipality where a bank's headquarters is located in a rural, dummy-variable	0.61617	0.486508	0	1
DENSELY - The municipality where a bank's headquarters is located in a densely populated but not town-like, dummy-variable	0.208791	0.406604	0	1

Source: Finnish Bankers' Association, Statistics Finland, Own calculations, nobs. 1274, observation units 322

More detailed definitions and the descriptive statistics of the environmental variables are presented in Table 3. In addition, the group-wise and year-wise descriptive statistics for the environmental variables are presented in the Appendix (Tables A2 and B2). Those tables show that the most drastic changes in the Finnish banking markets occurred during the 1990's and hence the yearly changes in the environmental variables are very moderate. In

contrast to this the differences of the competitive environment between the analyzed local bank groups are remarkable. The headquarters of the local co-operative banks are not located in urban areas. It is also more likely that they will have more local bank rivals than the member banks of the other groups. The member banks of the OP Group are typically more concentrated in the main market than the saving banks are. Also their main market concentration is respectively higher.

5 RESULTS

In the analysis the first stage provides the efficiency scores of each observation. The DEA applies an input-oriented approach with variable returns to scale. At this stage we link different observations to the decision making unit (DMU), but treat each observation as its own. The development of the efficiency scores are presented in Figure 4. The figure demonstrates that efficiency seems to increase over time. This will be further validated in the statistical part of the results. Figure 4 also shows that the relative inefficiency of the median bank compared to its most efficient rivals during the period of analysis is a little less than 10 %.[8]

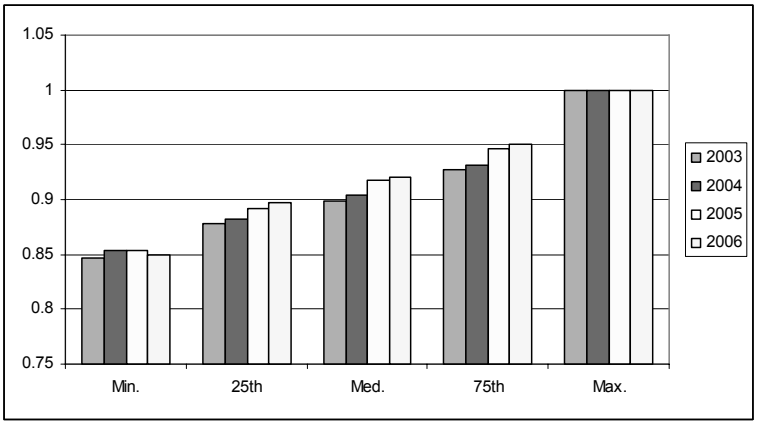

Figure 4. The development of the relative efficiency of local banks 2002-2006.

Next, the efficiency observations are explained by the following models meeting the previously proposed hypotheses on the factors behind efficiency. The independent variables of the models are as follows

1. constant, D04, D05, D06

[8] In this model setup with more diverse inputs and outputs the relative efficiency levels are generally higher than in the alternative setup. According to the simpler model the relative inefficiency of the median bank was some 20 %. The correlation between the efficiency scores was, however, above 0.9 and the problem is not likely very severe. One possible way to control the differences between the different model specifications is presented by Cinca et al. (2002) and Cinca & Molinero (2004).

2. constant, D04, D05, D06, SPD, LCBD
3. constant, D04, D05, D06, OWNCONC
4. constant, D04, D05, D06, MMKTCONC
5. constant, D04, D05, D06, LBRIV, COMMRIV
6. constant, D04, D05, D06, RURAL, DENSELY

In addition to these models, we also estimated a model with all the independent variables from Models 1-6. The results are presented in Table 3 as Model 7. Along with the standard procedure the (random effects) Tobit-estimations (for panel data) are applied here. Only the efficiency observations are censored (the upper limit is 1).

Table 3. Competitive environment and efficiency – Tobit estimates of models 1-7.

	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6	Model 7
ONE	0.906918***	0.907537***	0.920365***	0.921593***	0.897573***	0.929842***	0.932486***
	(0.002137)	(0.002191)	(0.003037)	(0.003416)	(0.003679)	(0.00303)	(0.008087)
D04	0.003908	0.003907	0.00367	0.004001	0.004317	0.003912	0.003928
	(0.003026)	(0.00298)	(0.002981)	(0.002991)	(0.00302)	(0.002888)	(0.002866)
D05	0.015216***	0.015212***	0.01506***	0.015215	0.01685***	0.015183***	0.015239***
	(0.00303)	(0.002984)	(0.002985)	(0.002995)	(0.0032)	(0.002892)	(0.003092)
D06	0.020746***	0.020742***	0.020651***	0.020716	0.022659***	0.020785***	0.020817***
	(0.003048)	(0.003002)	(0.003003)	(0.003013)	(0.003263)	(0.002909)	(0.003168)
SBD		0.010735**					0.01367***
		(0.003265)					(0.003731)
LCBD		-0.01473***					-0.01053**
		(0.00316)					(0.003209)
MMKTCONC			-0.02462***				-0.00153
			(0.004004)				(0.007209)
OWNCONC				-0.01882***			0.001935
				(0.003441)			(0.004269)
LBRIV					0.003945		0.000391
					(0.002853)		(0.003057)
COMMRIV					0.008359***		-0.00442
					(0.002243)		(0.003549)
RURAL						-0.0306***	-0.03259***
						(0.002789)	(0.003663)
DENSELY						-0.01952***	-0.0191***
						(0.003334)	(0.003652)
Sigma	0.038287***	0.037701***	0.037718***	0.037845***	0.038018***	0.036532***	0.035968***
	(0.000786)	(0.000774)	(0.000774)	(0.000777)	(0.00078)	(0.00075)	(0.000738)

Standard errors are in parenthesis. */**/*** indicates significance level of 5 %/1 %/0.1 % respectively.

As all the models show, relative efficiency improved compared to the reference year 2002. However, yearly differences are not statistically significant in every case. Model 2 shows the group-wise efficiency differences: savings banks are on average more efficient than OP group members. The local co-operative banks perform worst. This result is also gained with the full model. Both bank concentration in certain markets (Model 3) and main market concentration (Model 4) seem to have an adverse effect on efficiency. In the full model both of these variables lose their significance. Even though there is no sign of multicollinearity, it is possible that both of these concentration measures correlate with the municipality type of a bank's main market. Sparse population leads to productive inefficiency is an observation based both on less intense competition and on the increased need for a branch office service, which creates higher administrative costs. Finally, Model 5 shows that the strategic dissimilarity of a rival improves efficiency, but in the full model this relationship does not exist.

Since Model 2 shows that there are group-wise differences in efficiency and it is also obvious that the municipality type of main market mainly captures the efficiency effects of market concentration and rivalry, we also estimated a group of models with the aid of different combinations of independent variables. In the models we included bank group dummies for each model to control for the persistent group differences and possible environment effects not captured by the environmental variables at hand. These models are:

I. constant, D04, D05, D06, SPD, LCBD, MMKTCONC
II. constant, D04, D05, D06, SPD, LCBD, OWNCONC
III. constant, D04, D05, D06, SPD, LCBD, MMKTCONC, OWNCONC
IV. constant, D04, D05, D06, SPD, LCBD, LBRIV, COMMRIV
V. constant, D04, D05, D06, SPD, LCBD, RURAL, DENSELY

Parameter estimates of these models are presented in table 4.

In the first model savings banks seem to be the most efficient bank group and local co-operative banks are the least efficient banks on average. Simultaneously market concentration seems to in line with the conventional wisdom which claims there is a negative effect on technical efficiency i.e. concentration leads to x-inefficiency. If we control the banks regional concentration (alternative model II) savings banks seem to be as efficient as the member banks of the OP Group. Geographic diversification also has a positive effect on a bank's efficiency. Including both market concentration and a banks' geographic concentration in the model does not change that. Local Co-operative banks are on average the least efficient banks. Local rivalry improves the bank efficiency and the moreover, the dissimilarity of a rival has a statistically significant efficiency effect. Finally, the type of municipality where a bank's headquarter is located, can be used as a proxy for market

competition, since bigger and more densely populated municipalities are more lucrative markets than rural areas. Model V shows that the more urban the main market is the more efficient the bank is.

Altogether there seems to be a positive correlation between market competition and bank efficiency. Also there are persistent efficiency differences between the bank groups. One possible reason for the inefficiency of the local co-operative banks can be their scale as those banks are on average about 60 percent of the size of the savings banks and the member banks of the OP Group. That suggests economies of scale at bank level, at least to some extent, and that the smaller local co-operative banks have not reached that point.

Table 4. Competitive environment and efficiency – tobit estimates of alternative models

	Model I	Model II	Model III	Model IV	Model V
ONE	0.919752***	0.92325***	0.92759***	0.89629***	0.929067***
	(0.003092)	(0.003848)	(0.003978)	(0.003653)	(0.002995)
D04	0.003695	0.00401	0.003813	0.004551	0.003904
	(0.002944)	(0.002952)	(0.0029349	(0.002972)	(0.002846)
D05	0.015074***	0.015225***	0.015115***	0.01768***	0.015169***
	(0.002948)	(0.002956)	(0.002938)	(0.003152)	(0.00285)
D06	0.020665***	0.020752***	0.020689***	0.023588***	0.020762***
	(0.002966)	(0.002974)	(0.002955)	(0.003216)	(0.002867)
SBD	0.008629**	0.003196	0.004013	0.01126***	0.013224***
	(0.003248)	(0.003576)	(0.003559)	(0.003243)	(0.003136)
LCBD	-0.01389***	-0.0169***	-0.01554***	-0.01508***	-0.01059***
	(0.003125)	(0.003161)	(0.003159)	(0.003178)	(0.003069)
MMKTCONC	-0.02209***		-0.01707**		
	(0.00399)		(0.004289)		
OWNCONC		-0.01862***	-0.01258***		
		(0.003762)	(0.004034)		
LBRIV				0.006145*	
				(0.002841)	
COMMRIV				0.00787***	
				(0.002215)	
RURAL					-0.03001***
					(0.002784)
DENSELY					-0.01862***
					(0.003349)
Sigma	0.037247***	0.037353***	0.037114***	0.037401***	0.036007***
	(0.000765)	(0.000767)	(0.000762)	(0.000768)	(0.000739)

Standard errors are in parenthesis. */**/*** indicates significance level of 5 %/1 %/0.1 % respectively.

6 CONCLUDING REMARKS

This paper analyzed the relation between competition and efficiency in Finnish local banking markets. The paper applied a two-stage methodology. The first stage used a variable returns to scale version of DEA in order to estimate the relative efficiency of the banks. During the second stage a Tobit model was estimated with efficiency scores as the dependent variable and a set of environmental variables as independent variables.

The analysis showed that the relative efficiency of the banks in the sample has increased over time. The inefficiency of a median bank in 2006 was on average some 8 percent during that period. The analysis also showed that there is a positive relation between the different indicators of competition and efficiency. Banks located in densely populated regions were generally more efficient than banks in sparsely populated rural areas. Also the presence of rivals as well as a decreased concentration of local bank markets had a positive effect on bank efficiency. Therefore it seems that a standard assumption in industrial economics, i.e. an increase in competition is having a positive effect on firm efficiency in this case.

The analysis, however, showed that there are persistent efficiency differences between the members of the different bank groups. That is, the ideas of a resource-based view have some support and a bank can have a sustainable competitive advantage. Also dissimilarity between the focal firm and its rivals seemed to have a stronger impact on efficiency than the presence of other local banks.

The results of the paper fit quite well with the theoretical background. The methodology used in the paper has been however been criticized quite recently. It has been pointed out that the conventional two-stage approach with DEA during the first stage and Tobit (or OLS) regression during the second stage used in this paper has some fundamental statistical problems.

Essentially, there are two problems with a two stage approach. Firstly, the studies have not described any data generating process (DGP) related to DEA. As Simar and Wilson (2007) put it, "*since the DGP has not been described, there is some doubt about what is being estimated in the two-stage approach*". Secondly, DEA efficiency estimates are serially correlated and the basic requirement of statistical inference, independence within the sample is violated. Therefore standard approaches are argued to be invalid. As a solution to this problem bootstrapping methods are proposed. Examples of this

literature are Xue & Harker (1999) and Simar & Wilson (2007). To be precise, the latter criticizes previous studies by saying they would be inaccurate. Casu & Molyneux (2003) have applied the method proposed by Xue & Harker (1999) in an analysis of the efficiency of European banking. Simar & Wilson (2007) have also applied their bootstrap approach to banking.

In this paper we did not apply bootstrapping to correct any possible bias in the estimates. In their recent working paper Afonso & St. Aubyn (2006) however applied both the traditional Tobit approach and two different bootstrapping methods. They found that "*The results were strikingly similar with these three different estimation processes"*. Even though, it is not likely that this result can be generalized, it is likely that the results are not as biased as critics of the two stage method have argued. Naturally the use of bootstrapping is the method to continue with in the future.

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APPENDIX A. GROUP-STRATIFIED DESCRIPTIVE STATISTICS

Table A1. Group-wise pooled descriptive statistics of DEA-variables

Savings Banks, n=156				
	Mean	Std.Dev.	Minimum	Maximum
ADMCOST	2125.558	1994.726	262	9000
DEPOSITS	111785.5	107470.1	11696	500395
EQUITY	10130.96	12218.21	1084	62591
LOANS	109845	107814.5	9750	492628
OTHASSET	19766.24	22754.54	1640	139484
OFFBALAN	5857.064	6520.937	102	30823

Members of the of amalgamation of the co-operative banks, n=950				
	Mean	Std.Dev.	Minimum	Maximum
ADMCOST	1913.284	3278.382	95	24376
DEPOSITS	102736.9	184944.1	3558	1505668
EQUITY	11274.32	14724.9	-724	158878
LOANS	108317.4	196684.4	3841	1560904
OTHASSET	11529.38	16941.8	56	176487
OFFBALAN	8216.724	18923.63	44	199980

Local Co-operative banks, n=168				
	Mean	Std.Dev.	Minimum	Maximum
ADMCOST	1275.048	1434.066	219	9691
DEPOSITS	62043.01	66951.2	7578	489005
EQUITY	7805.839	5979.037	743	37968
LOANS	65675.38	73237.87	7475	552683
OTHASSET	7688.345	7789.665	160	43318
OFFBALAN	2927.667	3913.032	67	31889

Table A2. Group-wise pooled descriptive statistics of environment variables

Savings Banks, n=156				
	Mean	Std.Dev.	Minimum	Maximum
MMKTCONC	0.452744	0.17673	0.166667	1
OWNCONC	0.441097	0.273051	8.16E-02	1
LBRIV	0.75641	0.43063	0	1
COMMRIV	0.583333	0.494594	0	1
TOWNLIKE	0.102564	0.304366	0	1
RURAL	0.641026	0.481245	0	1
DENSELY	0.25641	0.438057	0	1

Members of the of amalgamation of the co-operative banks, n=950				
	Mean	Std.Dev.	Minimum	Maximum
MMKTCONC	0.547932	0.274359	0.152778	1
OWNCONC	0.845165	0.279238	0.10718	1
LBRIV	0.750526	0.432936	0	1
COMMRIV	0.655789	0.47536	0	1
TOWNLIKE	0.213684	0.410122	0	1
RURAL	0.604211	0.489277	0	1
DENSELY	0.182105	0.386135	0	1

Local Co-operative banks, n=168				
	Mean	Std.Dev.	Minimum	Maximum
MMKTCONC	0.587104	0.261256	0.25	1
OWNCONC	0.730269	0.28894	0	1
LBRIV	0.910714	0.286008	0	1
COMMRIV	0.571429	0.496351	0	1
TOWNLIKE	2.38E-02	0.152911	0	1
RURAL	0.660714	0.474882	0	1
DENSELY	0.315476	0.466095	0	1

APPENDIX B. YEAR-STRATIFIED DESCRIPTIVE STATISTICS

Table B1. Year-wise descriptive statistics of DEA-variables

Year 2003, n=322				
	Mean	Std.Dev.	Minimum	Maximum
ADMCOST	1804.91	2861.854	97	21803
DEPOSITS	86363.52	140759.9	3602	1140656
EQUITY	9556.429	12148.19	-724	98488
LOANS	89644.4	149022.5	3841	1205398
OTHASSET	10850.4	16148.62	61	139484
OFFBALAN	5852.351	12688.58	53	124929

Year 2004, n=320				
	Mean	Std.Dev.	Minimum	Maximum
ADMCOST	1810.716	2856.345	98	22090
DEPOSITS	94596.21	156808.7	3558	1239816
EQUITY	10247.69	13081.03	384	100624
LOANS	99564.78	167653.2	4057	1326359
OTHASSET	10303.12	14561.38	56	132463
OFFBALAN	6466.122	14334.7	44	132556

Year 2005, n=319				
	Mean	Std.Dev.	Minimum	Maximum
ADMCOST	1857.893	2968.713	95	23111
DEPOSITS	101579.2	170023.4	3743	1392551
EQUITY	10930.53	13340.3	468	108754
LOANS	105316.5	178608.8	4028	1435511
OTHASSET	13364.95	18096.77	93	171937
OFFBALAN	7705.696	17653.19	56	182746

Year 2006, n=313				
	Mean	Std.Dev.	Minimum	Maximum
ADMCOST	1949.319	3198.787	180	24376
DEPOSITS	111751.5	194141.6	4537	1505668
EQUITY	12010.06	15715.21	483	158878
LOANS	117407.8	206544.3	3899	1560904
OTHASSET	13654.46	19383.72	311	176487
OFFBALAN	8944.744	20816.39	117	199980

Table B2. Year-wise descriptive statistics of environment variables

Year 2003, n=322				
	Mean	Std.Dev.	Minimum	Maximum
SBD	0.121118	0.326772	0	1
CBD	0.748447	0.434581	0	1
LCBD	0.130435	0.337305	0	1
MMKTCONC	0.546382	0.25625	0.1875	1
OWNCONC	0.779773	0.309501	8.16E-02	1
LBRIV	1	0	1	1
COMMRIV	0.645963	0.478965	0	1
TOWNLIKE	0.173913	0.379625	0.00E+00	1
RURAL	0.614907	0.487375	0	1
DENSELY	0.21118	0.408781	0	1

Year 2004, n=320				
	Mean	Std.Dev.	Minimum	Maximum
SBD	0.121875	0.327654	0	1
CBD	0.746875	0.435483	0	1
LCBD	0.13125	0.338202	0	1
MMKTCONC	0.536708	0.267511	0.160494	1
OWNCONC	0.784808	0.305949	8.16E-02	1
LBRIV	0.89375	0.30864	0	1
COMMRIV	0.646875	0.47869	0	1
TOWNLIKE	0.175	0.380562	0	1
RURAL	0.615625	0.487209	0	1
DENSELY	0.209375	0.4075	0	1

Year 2005, n=319				
	Mean	Std.Dev.	Minimum	Maximum
SBD	0.122257	0.328097	0	1
CBD	0.746082	0.435935	0.00E+00	1
LCBD	0.131661	0.338654	0	1
MMKTCONC	0.54034	0.267471	0.152778	1
OWNCONC	0.779655	0.312211	0	1
LBRIV	0.617555	0.486748	0	1
COMMRIV	0.630094	0.483537	0	1
TOWNLIKE	0.175549	0.381033	0	1
RURAL	0.61442	0.487497	0	1
DENSELY	0.210031	0.407971	0	1

Year 2006, n=313				
	Mean	Std.Dev.	Minimum	Maximum
SBD	0.124601	0.330794	0	1
CBD	0.741214	0.438669	0	1
LCBD	0.134185	0.341397	0	1
MMKTCONC	0.542324	0.269251	0.152778	1
OWNCONC	0.777851	0.311366	8.16E-02	1
LBRIV	0.571885	0.495598	0	1
COMMRIV	0.619808	0.486211	0	1
TOWNLIKE	0.175719	0.38119	0	1
RURAL	0.619808	0.486211	0	1
DENSELY	0.204473	0.403962	0	1

ESSAY V

A METHODOLOGY FOR THE EMPIRICAL IDENTIFICATION OF DYNAMIC CAPABILITIES – THE CASE OF LOCAL BANKING

(Joint with Mikko Pohjola)

A METHODOLOGY FOR THE EMPIRICAL IDENTIFICATION OF DYNAMIC CAPABILITIES – THE CASE OF LOCAL BANKING[1]

Abstract

In this paper we propose a two-stage methodology for the empirical identification of dynamic capabilities. The first stage of the methodology aims to identify the competitive advantage a firm possesses and to control the effect of market power on firm success. The purpose of the first stage is to identify the existence of a competitive advantage that is sustained over a period of time in a changing competitive environment. The second stage concentrates on the in-depth identification of the capability. The first stage of the methodology is applied in an analysis of Finnish banking markets. In order to find out the competitive advantage of a firm we estimate differences both in production costs and in the pressure of the competition faced by the different bank groups. The analysis is based on a panel analysis of local banking markets from 2002 to 2005.

Keywords: Dynamic capabilities, competitive advantage, competition analysis, panel data, banking

[1] This paper has been presented at the 16th International Conference on Management of Technology, May 15, 2007, Miami, Florida.

1 INTRODUCTION

Strategic management literature is interested in the empirical phenomena of different levels of performance between firms within the same market or industry. More precisely the fundamental question is why some firms sustainably outperform others. The prevailing approach explaining the sources of (sustainable) competitive advantage is the so-called resource-based theory (RBT). The RBT provides diverse suggestions of potential sources of competitive advantage, but since the seminal paper by Teece, Pisano and Shuen (1997) strategic management literature has increasingly focused on dynamic capabilities. The dynamic capabilities view (DCV) or more broadly the dynamic resource based view (Helfat and Peteraf 2003) has emerged to address the dynamics of the factors behind the competitive advantage of a firm. More precisely dynamic capabilities are seen as the means to manage and develop a resource base in order to outperform competitors in a changing environment.

Until recently dynamic capabilities literature has evidenced mostly conceptual progress (Teece *et al.* 1997, Eisenhardt and Martin 2000, Zollo and Winter 2002, Winter 2003). This is also the case in resource-based view type research in general (Hoopes *et al.* 2003).[2] Even though the empirical analysis of dynamic capabilities has become the focal point of dynamic capabilities research after over a decade of, mostly, conceptual analysis and case studies, the empirical evidence on dynamic capabilities is still scarce. The reason for this is that dynamic capabilities are intangible and by definition difficult to observe. Hence literature has been lacking empirical yardsticks with which to measure the performance of dynamic capabilities (Helfat *et al.* 2007, 7).

Empirical strategic management research has often focused on questions relating to organizational performance from an inductive managerial point of view, that is, by choosing successful companies and trying to explain success according to some theory-driven proxy variables. This research strategy linked to both a resource-based and a dynamic capabilities view has been justly criticized for being tautological (e.g. Porter 1991, Williamson 1999). As known, a superior financial performance can be based not only on a firm's

[2] Since the DCV has developed within the resource-based theory, conceptually we regard the dynamic capabilities view as a subset of the more recent dynamic resource based view (see Helfat and Peteraf 2003).

own actions, but also on market imperfections. Then for instance organizational slack related to market power can be disguised as expenditure on human resource development (e.g. courses held in the Caribbean) correlated with performance.

Stemming from the problems above, the aim of this paper is to provide a methodology for the analysis of sustainable competitive advantage. Our point of departure is market outcome and general organizational performance from which we deduce possible cases of dynamic capabilities among firms with evident sustainable competitive advantage. In other words we adapt a falsificationist approach. That is, the existence of dynamic capabilities cannot be assumed before their inexistence is falsified. The methodology divides into two separate stages. The first one makes it possible to identify companies with potential dynamic capabilities. In other words, companies that operate in a changing market environment and that have a sustainable competitive advantage not based on market imperfections. An additional function of the first stage is to give insights into the "location" of the capability within a company. The second stage consists of the in-depth analysis of the firm-specific sources of competitive advantage using both quantitative and qualitative methods.

Appropriate research methods have been under debate also within the RBV researchers' community. For instance Rouse and Dallenbach (1999, 2002) and Levitas and Chi (2002) discussed suitable empirical approaches. To simplify the debate, the former argued for more in-depth analyses conducted by case-study methods, while the latter emphasized the necessity of statistically large sample analyses. The purpose of introducing the two-stage methodology is to improve our understanding of dynamic capabilities through empirical research. Therefore our paper is closely related to the discussion on research methods for the resource-based view.

The paper is organized as follows. The next section provides a short review of dynamic capabilities and resource-based view literature. After that we present a top-down method for the identification of dynamic capabilities. Then we apply the first stage of the method to analyze bank group level competitive advantage and the possibility of dynamic capabilities in Finnish bank markets. The last section concludes the findings.

2 THE DYNAMIC RESOURCE-BASED VIEW AND DYNAMIC CAPABILITIES

The resource-based theory of the firm, dating back to the seminal book by Penrose (1959) and more recently building on the papers of for example Wernerfelt (1984), Rumelt (1984), and Barney (1991), has become one of the most important theories in strategic management. In the recent years literature on resource-based theory has grown exponentially (Acedo *et al.* 2006).

Resource-based theory is based on the idea that there are systematic and stable differences in the resource base and hence in the performance of firms (Foss 1998, 137). Performance differences are based on the resources and capabilities of firms. These resources and capabilities have to meet the VRIO criteria (Barney 1997).[3] From the resource-based view competitive advantage focuses on firm specific resources and their organizing and combination in ways that give firms capabilities to outperform their competitors.

Most recently the focus has moved towards considering the dynamic nature of sustainable competitive advantage. The RBV does not take into account factors related to the development of the resource base and the capabilities of firms. Instead, it emphasizes the selection of resources leaving out the process of resource development and adaptation to the external environment (e.g. Barney 1986). The dynamic capabilities view of competitive advantage emerged to address the criticism of this static nature of the original resource based view. It can be said to be a dynamic version of the resource-based view, which adds the element of change to this approach. In this sense the dynamic capabilities view of competitive advantage is a direct descendant of the resource-based view as it explicitly encompasses the ideas of evolutionary economics into its theory (see e.g. Acedo *et al.* 2006). This strand of the theory has focused on the capabilities that provide firms with the competence to adapt to change in their environment and their competitive position (cf. Teece *et al.* 1997). It has highlighted the *process* of creating and maintaining competitive advantage instead of focusing on the resource and capability *base* of a firm.

Teece et al. (1997) define dynamic capabilities as "the firms' ability to integrate, build, and reconfigure internal and external competences to address

[3] VRIO=Valuable, Rare, Inimitable and Organization focused

rapidly changing environments." Illustratively Winter (2003) has specified the definition of dynamic capabilities as first order and higher order capabilities in contrast to zero-level capabilities, which provide earnings on a day-to-day basis. Dynamic capabilities, on the contrary, alter the resource base and thus focus on enabling the sustainable outperforming of rival firms even in a changing competitive environment. The concept of dynamic capabilities builds on four central ideas:

I. The ability to alter the resource base in relation to the changing environment is fundamental to dynamic capabilities (Teece *et al.* 1997). Hence, they are more valuable in unstable environments.
II. Dynamic capabilities may create market change not only respond to it (Eisenhardt and Martin 2000). Dynamic capabilities and the evolution of the market environment are not separate phenomena. The co-evolution of a market and its firms complements the ambiguous nature of dynamic capabilities.
III. The resource base of a firm is path dependent and dynamic capabilities can alter these paths (Helfat 1997). Dynamic capabilities do not exist separately of the resource base of firms. On the contrary, they only function together with and through the existing resource base.
IV. Dynamic capabilities require long-term commitment and they are context dependent (Winter 2003). It is not possible to generalize the performance or even existence of dynamic capabilities without taking into account the institutional, environmental and market context.

These aspects are covered in the latest definition that draws on prior literature, which states that dynamic capabilities are *the capacities of organizations to purposefully create, extend, or modify their resource base* (Helfat *et al.* 2007, 4).

Since dynamic capabilities are aimed at changing the resource base of a firm, they are indirectly linked to performance (Zott 2003). The visibility of this link is strengthened with the dynamic resource-based view introduced by Helfat and Peteraf (2003) which explicitly merges the dynamic capabilities and resource-based view. Adopting this concept makes it possible to analytically separate dynamic capabilities from other resources and capabilities.

Empirically the dynamic resource based view and especially dynamic capabilities have seen little progress. There have been some efforts to operationalize the concept for empirical analysis (e.g. Jantunen 2005).

However, dynamic capabilities have been regarded as an ambiguous and elusive concept, since they are not a single entity, but come in different forms and perform different tasks, for example foresight, organizational learning, management and so on. (Helfat *et al.,* 2007). In addition, the effectiveness of dynamic capabilities varies in relation to the environment they are utilized in. Hence, it is clear that dynamic capabilities are by definition intangible and somewhat obscure. In conclusion we can draw together the difficulties in identifying and measuring dynamic capabilities:

I. Dynamic capabilities do not necessarily provide competitive advantage in every instance. For example Barnett and Pontikes (2006) show that maintaining a position of advantage in a highly competitive market might hinder the ability to successfully move to other markets. In other words, context and path dependency constrain the competitive moves possible to individual firms (Foss 1998).
II. The possibility of ad hoc problem solving is limited in situations of increasing competition or change in the operating environment (Winter 2003).
III. The separation of first order and second (or higher) order capabilities can occur as simple instruments or crude proxies leave capabilities often black-boxed (Jantunen 2005)
IV. The focus of analysis must be inter-temporal or longitudinal. Cross-sectional case studies or other data alone cannot suffice (Levitas and Chi 2002).
V. A superior performance may result from market imperfections and thus other context dependent factors may be mistakenly identified as capabilities.

3 EMPIRICAL IDENTIFICATION OF DYNAMIC CAPABILITIES - A METHODOLOGY

Empirical research, on the elements behind competitive advantage or lack of thereof, dates back to the seminal paper by Schmalensee (1985). The fundamental debate, starting from traditional industrial organization research, where an industry's structure was seen as the explanatory factor of firm performance, has been over what the explanatory factors of differences in firm performance are.

In the literature inspired by Schmalensee (1985) the sources of variation in profitability of firms, is decomposed between industry, corporate, and business unit effects.[4] Schmalensee (1985) found that corporate effects were small compared to industry effects. However, subsequent literature has conversely shown that firm effects are more significant in explaining sustainable competitive advantage (e.g. Rumelt 1991). This debate is of course fundamental from the strategic management point of view, since if the firm or business unit doesn't matter managerial and strategic efforts are a waste of time and resources.

Studies on performance variation have been conducted using panel data methods and mainly data from US firms from a large number of industries (Lipczynski *et al.* 2005, 332). However, while some of the literature shows that the industry effect might not be eliminated (e.g. Porter and McGahan 1999), since there are persistent industry characteristics relating to the institutional environment, product characteristics *etc*., industry or market specific analysis would be warranted in order to probe more closely into the determinants of firm performance.[5]

However, research on the variation of performance doesn't address the question of the identification of the sources of these variations (Rouse and Dallenbach 1999). Moreover, it does not allow for taking into account the environmental or contextual aspect of competitive advantage. The resource-based view, on the other hand, has approached these issues. However, the

[4] Lipczynski *et al.* (2005, 333–334) include an extensive review of the sources of variation in firm performance literature.

[5] An early example of focusing on a single industry is the paper by Amel and Froeb (1991) who analyze the Texan banking sector. Their result is that differences between banks are greater than the variation between geographical markets. They justify focusing on geographical markets within a single industry by stating that they give a better approximation of markets than an industrial sector.

resource-based view, which has been around for over two decades, has yet to make methodological progress to form a unified base for the field. For instance Rouse and Dallenbach (1999) and Levitas and Chi (2002) represent opposing methods of tackling the problem. While the former underlines the importance of qualitative case studies, which make it possible to retrieve in-depth knowledge on the sources of competitive advantage, Levitas and Chi (2002) emphasize the necessity of methods that are capable of handling both the cross-sectional and longitudinal dimensions of the issue at hand. This discussion is as least as relevant a matter in the context of dynamic capabilities as it is for the resource-based view in general.

Rouse and Dallenbach (1999, 2002) propose an approach for the empirical analysis of competitive advantage. They suggest that researchers should trace down the path of value generation. However, the selection process of firms should not be made on an *ad hoc* basis. Instead, thorough analysis of the market population should be performed, since it is possible to test for the existence of unobservable factors by examining their observable outcomes (Levitas and Chi 2002, 960). However, in the case of dynamic capabilities there are inevitably problematic, ambiguous and obscure causalities (e.g. Williamson 1999). In fact, situations might arise where the origin of competitive advantage is still unclear. In such instances interpretations of competitive analysis might be left in the shadows and hence lead to the black-boxing of capabilities.

In Rouse's and Dallenbach's (1999) view the selection of firms is ultimately a subjective choice. This may lead to increasing the probability of making tautological reasoning (cf. Porter 1991, Williamson 1999). While Levitas and Chi (2002) call for the *verification* of the sources of sustainable competitive advantage the issue becomes more problematic in the dynamic capabilities framework. However, it is risky to make a choice about capability analyzed separately from the case at hand, if context and environment specific issues are not explicitly controlled for. Since dynamic capabilities are harder to operationalize than zero-level capabilities or resources, we have to first provide the possibility to *falsify* the existence of them before they can be verified. By adapting a contrary approach to that of Rouse and Dallenbach (1999) and Levitas and Chi (2002) we present a two stage top-down analysis of dynamic capabilities (Figure 1).

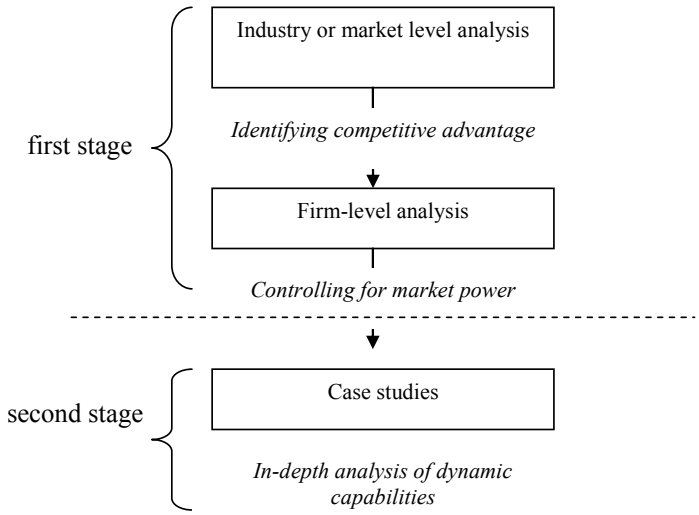

Figure 1. Top-down method for identifying dynamic capabilities[6]

The first stage consists of quantitative empirical methods aimed at picking up interesting dynamic markets, successful companies and making a competition analysis of the market in order to control for the market power of the companies based on market imperfections. Since it is clear that not all dynamic capabilities ensure profitability independently of context, they should be analysed explicitly by taking into account the market and institutional environment. By focusing on capabilities that create competitive advantage it is possible to create the opportunity to analyze market specific dynamic capabilities.

Competition is of course one of the most important aspects of the environmental context in which the firms operate (cf. Dutta *et al.* 2005). Thus, when analysing the competitive environment in the context of dynamic capabilities competitive indicators have to be taken into account. Therefore it is necessary that we have a measure for performance as well as a measure for competitive conduct within the environment. Looking back at variations in performance literature allows a parallel to be drawn between it and the first phase of our methodology. Consequently, after separating industry, corporate, and business unit level explanatory factors we may proceed with a more detailed analysis of them.

[6] Our method is an extension of what was originally developed in Björkroth *et al.* (2006), as a method of competition surveillance for competition authorities.

In-depth analysis is needed in order to draw new conclusions on the functioning of competitive advantage and role dynamic capabilities. The second stage of our methodology is aimed at achieving this purpose. After controlling for context dependent factors and identifying firms that still show sustained competitive advantage, it is necessary to move "inside the organization". After examining the identified firms, we can use the insights gained from the in-depth analysis and test them with a population of firms in other contexts, i.e. create better proxy variables for dynamic capabilities.

The method aims at making the subjective and often implicit choices which typically precede case studies explicit. This approach resembles a multi-method approach, which consists of a combination of qualitative and quantitative analysis. This has become known as the triangulation of methods and recently become more common in other disciplines of the social sciences.

4 LOCAL BANKING

In this section we use the first stage of the methodology presented above for Finnish banking markets. Finnish local banking is a suitable case to analyse from the respect of dynamic capabilities, since the market has been under remarkable endogenous as well as exogenous change during the last decade. A severe crisis in the banking sector in the beginning of the 1990's led to changes in the market structure. It has also included the increasing use of internet banking in which Finland has been one of the leading countries. Additionlly, loan interest rates (and especially loan premiums) have been falling and saving behaviour has changed from using time deposits to investing in stocks and mutual funds. All together this has lead to increasing changes in the market environment of local banks.

4.1 The data

According to the Finnish Bankers' Association, at the end of 2001 there were a total of 334 domestic banks operating in Finland, which included 8 commercial banks, 244 co-operative banks belonging to the OP Group, 42 local co-operative banks and 40 savings banks. These figures vary over time, but the variation is limited during the period of analysis, years 2002 to 2005. In the case at hand we concentrate on groups of local independent banks. The analyzed bank groups are the following:

Savings banks: Savings banks are treated as a one group, which here includes local savings banks. The current savings banks are the few that survived the Finnish banking crisis in the early 90's.

OP Group: local independent cooperative banks, which are members of the OP Group and the commercial bank OKO Bank operating in the Helsinki-area.

Local cooperative banks: local cooperative banks which did not join the OP Group and which established The Association of Local Co-operative Banks in 1997.

The reason for choosing Finnish local banks as an example here is twofold. The first part is practical; with these local banks we have access to detailed profit and loss accounts and balance sheets at a local market level. This data can be combined with local market structure data in order to control for market power due to market imperfections. Currently this information at local

level is unavailable for commercial banks. Secondly, even though local banks are independent banks, they can be considered to be the business units of a joint brand providing the same services. Hence we can analyze whether there are group level competitive advantages or dynamic capabilities. Furthermore, it is also possible to expand the analysis to the business unit level.

Table 1. Definitions and descriptive statistics of the main variables (n=1280)[7]

	Mean	Std.Dev.	Min.	Max.
LNPROFIT - natural logarithm of the net operating profit	6.59752	1.11767	0	9.82363
ASSETS - sum of balance sheet items (thousand euros)	105952	172403	4008	1552230
ASSETS1 - balance sheet items (ASSETS) and off-balance sheet commitments (thousand euros).	112197	185994	4115	1719230
FIMSHARE - income share of net interest revenues	0.740124	0.084134	0.411854	0.992313
CIR - cost/income ratio	0.64381	0.174402	0.34	5.188
CPA - cost/assets1 ratio	0.022145	0.004755	0.011081	0.0550557

The main variables used in the analysis are presented and defined in Table 1. The used variables cover the profitability of the business, its scale, the focus of the business and its efficiency. The logarithmic form of net operating profit has been used as an indicator of profitability. There are two scale measures, one with and one without off-balance sheet items. Off-balance sheet items can be used here as indicators of the business focus and scale. The income share of net interest revenues will be used to control the effect of the differences of business focus on cost levels. Cost efficiency variables are the most typical ones in the banking sector; the cost/income ratio and the alternative measure, cost/scale of total business ratio. In addition, a set of year dummies (D2003, D2004 and D2005) and dummies for the identification of different bank group membership (DSB for Savings Banks and DLCB for Local Cooperative Banks) are used in the analyses. The use of and motivation for the variables are presented in more detail in the next subsections.

Next we will take a closer look at the indicators of competitive advantage. Group-wise differences in cost efficiency will be analyzed first. Then we

[7] Group-wise data is presented in the Appendix A.

analyze whether there are differences in competitive pressure between the members of different bank groups. With these analyses we tackle the two main manifestations of competitive advantage: superior efficiency and relaxed competition. However, the latter is somewhat cumbersome, since the analysis method is not capable of sorting out monopoly power based on market imperfections within local submarkets. Market imperfections are tentatively analyzed according to the average number of rivals in the geographic core markets of the banks.

4.2 Cost efficiency as an indicator of competitive advantage

One evident indicator of the competitive advantage of an organization is its cost efficiency, especially when it is persistent over time. However, there are certain industry and market related factors, which affect cost efficiency. For instance, in the banking sector it is reasonable to assume that at least some economies of scale are immanent. Even though estimations for minimum efficient scale are often rather low, especially in this case where the banks are small local banks, these levels are not typically exceeded and we are likely to find economies of scale.[8] There is also evidence that banks face economies of scale at the business unit level (see e.g. Benston 1965, Berger *et al.* 1987, Zardkoohi and Kolari 1994, Toivanen 1995, Berger *et al.* 1997). Since there are remarkable differences in the scale of the banks (see table 1), it is reasonable to also control for the scale of activity.

Similarly we can ask whether the income (or service) structure has an effect on the cost-revenue ratio. Income structure can be based on local demand for different services. That is, the relative demand for financial services or investment services can vary across the local markets. There are also significant differences in income structures evident in the data (see appendix A). Therefore we will control for differences in income structure when comparing the cost efficiency of different groups.

By controlling for income structure and scale we can have some sort of proxy for group-specific strategic superiority that is manifested by cost efficiency.

In the banking industry it is typical to report the cost/income ratio as an indicator of a bank's efficiency. Therefore we will use it here too. However, there is a problem related to the cost/income ratio; the effect of market competition. That is, competitive intensity straightforwardly affects both

[8] For estimates for minimum efficient scale, see e.g. Berger and Humphrey 1994, Altunbaş *et al.* 2001, Cavallo and Rossi 2001, Hughes *et al.* 2001, Bos and Kolari 2005)

interest and non-interest incomes. Therefore, intensifying competition, *ceteris paribus,* raises the cost/income ratio. In order to mitigate this problem, we also estimate a cost model for the non-interest costs/scale of the business ratio.[9]

We estimate the parameter coefficients in order to conclude whether there are group-wise differences in cost efficiency. In the estimated models, the differences are captured by the bank group dummies DLCB and DSB. Since the bank group membership dummies are time-invariant, estimated models are random effect models. The models are:

(1)

$$CIR_{it} = \alpha_1 + \alpha_2 D2003_{it} + \alpha_3 D2004_{it} + \alpha_4 D2005_{it} + \alpha_2 DLCB_i + \alpha_2 DSB_i + \beta_3 FIMSHARE_{it} + \beta_3 ASSETS_{it} + \varepsilon_i + \nu_{it}$$

and

(2)

$$CPA_{it} = \alpha_1 + \alpha_2 D2003_{it} + \alpha_3 D2004_{it} + \alpha_4 D2005_{it} + \alpha_2 DLCB_i + \alpha_2 DSB_i + \beta_3 FIMSHARE_{it} + \beta_3 ASSETS1_{it} + \varepsilon_i + \nu_{it}$$

Where ε_i is individual specific disturbance and v_{it} is "classical" disturbance.[10] Estimation results are presented in tables 2. Since the Lagrange multiplier test rejects the classical regression (OLS) against random effect model in both cases, we report only the latter.

Model 1 shows that the cost/income ratio increased from 2002 to 2003 by some 4 percent units and henceforth it has decreased. That is, revenues increased form 2003 to 2005 faster than costs. On average the cost/income ratio of the savings banks was statistically significantly higher than the one for the Members of OP Group. Also the ratio was relatively higher for the local cooperative banks, although the statistical significance was lower. It also seemed that concentrating on traditional financial intermediation does not pay and actually raises costs higher than revenues. This model does not reveal economies of scale in Finnish local banking.

The results of Model 2 reveal a trend of lowering costs. Compared to the OP Group both rivals are less efficient. Here the share of net interest incomes from financial operations seems to lower the cost level. That is rather natural since higher asset values resulting from the relatively high values of deposits

[9] The efficiency of banks is often analyzed by using methods like the Stochastic Frontier Analysis (SFA) or Data Envelopment Analysis (DEA).The former is a parametric and the latter a non-parametric method for estimating the relative efficiency of certain firms to the most efficient (hypothetical) firm. From our point of view, these methods are highly applicable also in the empirical research on dynamic capabilities *especially* when analyzing the success of a single firm. However, they are rather heavy to apply. Here our focus is more on the analysis of the group of firms and therefore it is useful to use the present method which easily reveals group level differences. For an extensive survey on the results and methods used in bank efficiency literature, see Berger and Humprey (1997). For the use of SFA in measuring capabilities, see Dutta *et al.* (2005).

[10] For method, see e.g. Greene (2000).

and loans held by a bank have a decreasing effect on the dependent variable CPA. However, the model presents economies of scale within this sample.

Table 2. Cost efficiency differences between the bank groups

	Model 1	Model 2
Constant	0.413343***	0.03662***
	(0.0487382)	(0.001171)
D2003	0.042526***	-0.00235***
	(0.00644733)	(0.000156)
D2004	0.032898***	-0.00436***
	(0.00723581)	(0.000175)
D2005	-0.01724*	-0.00663***
	(0.00755178)	(0.000182)
DSB	0.129654***	0.001485*
	(0.0264828)	(0.000626)
DLCB	0.046605	0.002399***
	(0.0258745)	(0.000612)
FIMSHARE	0.272027***	-0.01483*
	(0.0605656)	(0.001458)
ASSETS	-4.52E-08	
	(4.65E-08)	
ASSETS1		-5.53E-09***
		(1.02E-09)
LM-statistics	403.19***	969.93***
Standard errors are in parenthesis. */**/*** indicates significance level of 5 %/1 %/0.1 % respectively.		

4.3 Competitive pressure in local banking

Generally simple indicators of market competition (e.g. Herfindal-index or price-cost margin) are problematic as various factors of competition create non-monotonicity in typically used indicators. Boone (2000, 2004) and Boone *et al.* (2005) present a method based on the relative profitability of firms. Based on present evidence it seems that this method is less sensitive to different forms of competition (e.g. strategic competition, differentiation, or advertising) than other indicators.[11]

[11] In order to identify competitive advantage the flexibility of the indicator is appreciated. The reason for this is that the dynamic capabilities view has broadened the economic foundation from being a mostly neoclassical framework (price theory) to incorporating ideas of institutional and evolutionary economics. This literature, in which the work of Nelson and Winter (1982) is the most influential, takes an evolutionary approach to competitive advantage. Hence, in our view the empirical analysis should also be in line with this approach by taking into account the dynamic aspect of the markets and competition.

The Boone method or the so-called Boone-indicator (BI) is based on the idea that intensified competition cuts the profits of inefficient firms more than those of efficient firms. The strength of this approach is in its generality; the basic effect is not conditional on the form of competition. Also the estimation of BI does not require extensive data. In fact, only the profits and costs of three companies at different levels of cost efficiency are required.

One operational problem related to the approach is the choice of the reference company. As a solution to this Boone *et al.* (2005) operationalized the model by estimating the function

(3) $$\ln \pi_i = \alpha + \beta AVC_i + \varepsilon_i ,$$

where Π_i is firm i's turnover minus wage and material expenses and AVC_i (variable unit costs) wage and material costs divided by turnover. In this form the estimated parameter β measures how much the percentage of the profit of the company changes when the unit costs change by one percent. An interpretation of this parameter is that the higher the value of β the more intense the competition.

Here we use two alternatives as a proxy for AVC: the cost/income ratio (CIR) and the cost/sum of assets and off-balance sheet commitments (CPA). As mentioned the first one is a typical efficiency indicator in the bank sector and is close to the definition of AVC presented above. Since the basic function of the bank sector is asset formation we apply the latter as a cost indicator of asset management. We also control for possible inter-bank differences with control variables, which are FIMSHARE and ASSETS in the equation (4) and FIMSHARE and ASSETS1 in equation (5).

Typically, this indicator is used in order to analyze the change in the intensity of competition in a certain market over time. In this case we apply the method to analyze whether there are differences in the pressure of competition between the local banks. That is, in the models the OP Group is the focal group and the savings banks and local cooperative banks have their own rotation terms, which show the differences in competitive pressure. These are DSB*CIR and DSB*CPA for the savings banks, and DLCB*CIR and DLCB*CPA for local cooperative banks. If the parameter estimate is statistically significant for the rotation term, the competitive pressure of the group is different vis-à-vis the focal group.

The estimated model for the first cost alternative, cost/income ratio CIR (Model 3) takes the form

(4)

$$\ln \pi_{it} = \alpha_1 + \alpha_2 DLCB_i + \alpha_3 DSB_i + \beta_1 CIR_{it} + \beta_2 DSB_i * CIR_{it} + \beta_3 DLCB_i * CIR_{it} + \gamma_1 FIMSHARE_{it} + \gamma_2 ASSETS_{it} + \varepsilon_i + \nu_{it}$$

and the second cost alternative CPA (model 4) takes form:

(5)

$$\ln \pi_{it} = \alpha_1 + \alpha_2 DLCB_i + \alpha_3 DSB_i + \beta_1 CPA_{it} + \beta_2 DSB_i * CPA_{it} + \beta_3 DLCB_i * CPA_{it} + \gamma_1 FIMSHARE_{it} + \gamma_2 ASSETS1_{it} + \varepsilon_i + \nu_{it}$$

Since the group dummy is a time invariant only the random effect estimations for panel data are feasible for these models. Again the Lagrange multiplier test rejects the classical regression (OLS) against the random effect model and we only report the latter. The results of the estimated models (3) and (4) are presented in Table 3.

The estimation based on cost/income ratios (Model 3) shows statistically significant results that support the idea that the OP Group has a competitive advantage over the savings banks. However, the local cooperative banks are as competitive as the OP Group members. Estimations based on total costs per assets and off-balance sheet commitments (Model 4) show the opposite results though. It seems that the competitive pressure faced by the savings banks is relaxed compared to the OP group. The difference between the local cooperative banks and the OP Group is not statistically significant.

Therefore, at least at market level it is hard to find unambiguous statistical support for the competitive advantage for any group. By combining these results with the efficiency results, it seems that the OP Group has a competitive advantage over its rivals on the production process side but there is no difference between the groups when it comes to competitiveness.

Table 3. Differences in competitive pressure

	Model 3	Model 4
Constant	8.74116***	7.51107***
	(0.151038)	(0.188217)
AVC	-3.81928***	-40.4101***
	(0.162374)	(4.2607)
DSB	1.27849***	-0.77213*
	(0.324037)	(0.345754)
DLCB	0.5115	-0.52956
	(0.306403)	(0.289001)
DSB*AVC	-1.50038***	14.2021
	(0.440289)	(11.4312)
DLCB*AVC	-0.74741	30.4483*
	(0.426293)	(14.7003)
FIMSHARE	-0.13811	-0.44248
	(0.168611)	(0.236651)
ASSETS	3.44E-06***	
	(1.71E-07)	
ASSETS1		3.00E-06***
		(1.95E-07)
LM-statistics	1084.47***	914.38***
In model 3 AVC refers to CIR and respectively in model 4 to CPA. Standard errors are in parenthesis. */**/*** indicates significance level of 5 %/1 %/0.1 % respectively.		

4.4 The role of market imperfections and the second stage of analysis

As stated before, the traditional question in industrial economics and strategy literature is the role of market imperfections as a source of superior financial performance. So far the method used here has not been able to distinguish evidence for that, but the group-wise differences in competitive pressure can be based on local competitive conduct and not just on superior customer value. Here we have not yet included variables for controlling local competitive conduct. However, we can take a brief look at the number of rivals located close to the focal bank. That is, it can be assumed that the local bank has market power, if there are few rivals in the same region. Table 4 presents some descriptive average figures for branch units per member bank, the geographic market areas (municipalities), and number of rival bank groups operating in the core market of the bank for each analyzed bank group.

The operational areas of the savings banks are the widest among the local bank groups. Also the local cooperative banks have wider main markets than members of the OP Group. This has a historical explanation as in 1997 these banks left the OP Group and in many cases they have had reasons to expand into new geographical markets. The OP Group member banks have on average the smallest branch network and they operate at the local level. It also seems that these banks have a very strong market position in their core markets since the average number of rivals for them is far lower than for any other of the rival groups. Unfortunately at this point we have not combined profit and loss accounts that contained branch office and rival data. Thus, we can neither report the average size of the branches nor straightforwardly estimate the effect of local rivalry on competitive pressure. Though it is possible to attempt an estimation as shown below.

Table 4. Group-wise branch networks, market areas and local rivals.

YEAR 2003	Branch units	Municipalities	Rival banks
Cooperative banks (OP Group)	2.8	1.9	1.6
Local Cooperative Banks	3.1	1.9	2.5
Savings banks	5.3	3.9	2.5
YEAR 2004	Branch units	municipalities	Rivals
Cooperative banks (OP Group)	2.6	1.7	1.7
Local Cooperative Banks	3.3	2.0	2.8
Savings banks	5.2	3.8	2.6
YEAR 2005	Branch units	municipalities	Rivals
Cooperative banks (OP Group)	2.7	1.8	1.7
Local Cooperative Banks	3.4	2.0	2.5
Savings banks	5.3	4.0	3.0
Source: Finnish Bankers Association, own calculations. Approximate number of banks in each group: cooperative banks 240, local cooperative banks and savings banks 40 each. Commercial banks are included in the number of rivals, but not reported here.			

Those structural figures give us a hint that the competitive position of the OP Group may be partly based on the superior accessibility of services and monopoly power at the local level.

The group's extensive office network at the local level can also be economically suboptimal and the low number of the rivals can also be a result of the organizational inertia of the OP Group. That is, some of the member

banks are very small compared to the banks of the rival groups (see appendix, table A1). Also many of those small banks have only one office. As the estimations showed, economies of scale seem to be present and important. It is possible that local monopoly power does not outplay these inefficiency costs. Since member banks are independent units, the only option is to merge with some bigger banks and after that the new bank possibly closes down that unprofitable branch office. In many cases this option is unfeasible due to local democratic decisions made by the representatives of the bank's customer members. That demonstrates the significant role of path-dependency due to organizational form.

The first stage also showed that, by looking explicitly at the different components of competitive advantage, the results were ambiguous. In other words, it is impossible to carry out a sound analysis of competitive advantage by looking at simple indicators of financial performance. Instead, market level competitiveness and competition analyses are needed in order to pinpoint the "location" of the competitive advantage within a bank.

In this paper the differences between the banks in the services they offer were simply controlled for by using the income share of traditional financial intermediation. Within the analyzed local banks the differences in that income share between the bank groups were not very significant. Actually, there were no statistically significant differences between the bank groups in their income structure. Since income distribution was the significant factor for cost efficiency, but not a significant factor of competitive pressure, it seems that competitive advantage at the customer level was based on selling the right products in the right markets. In this respect the savings banks seemed to have a competitive advantage over the other banks.

Altogether, since the cost efficiency estimations showed cost advantage for the OP Group during a rather turbulent business reorganization period, it seems that a group can have dynamic capability manifested as cost advantage. In addition, the saving banks seemed to have a competitive advantage in the customer markets because for one indicator the competitive pressure faced by the savings banks was relaxed. Therefore the need for a second stage analysis was warranted.

5 CONCLUDING REMARKS

In this paper we proposed a two-stage methodology for the empirical identification of dynamic capabilities. The idea behind the methodology is that in order to correctly identify dynamic capabilities a researcher has to control for market imperfections so that it is possible to separate capability based superior financial performance from market power based monopoly profit. Also, if the source of competitive advantage is claimed to be based on dynamic capability, it should be able to survive the test of a turbulent business environment. In practice the methodology should use quantitative empirical analysis for the first stage and more in-depth, qualitative methods in the second stage.

One possible way of conducting the first stage of the methodology was presented with reference to local banking in Finland. The results showed that there seemed to be some competitive advantage, which was manifested as cost advantage and lasted over the period of analysis. Cost advantage did not seem to create relaxed competitive pressure. Instead the analysis showed some competitive advantage for the less efficient bank group. This discrepancy, however, provides a strong argument for a variety of methods to be used in the first stage; otherwise researchers would be more inclined to erroneously jump to the quick conclusion of an absence of competitive advantage. One possible tool set for the identification of competitive advantage is the method of efficiency analysis (see e.g. Koponen 2008). This kind of approach better enables control for the different types of product sets which banks provide. Furthermore it provides a better analysis of the differences between the different types of banks.

The research implies that the second stage of an analysis should focus on the possible dynamic capabilities in a group's management of its operational processes. It is also evident that qualitative methods are needed in an extensive empirical analysis of dynamic capabilities as a source of competitive advantage.

This was the first attempt to use our methodology for the empirical identification of dynamic capabilities. The central limitation of this research is the missing second stage of the research. In order to proof the usefulness of the approach that second research stage must be conducted. We also hope that this paper opens discussion on applying empirical research because there is an

obvious need for using a diverse (eclectic) set of methods to unravel the complex phenomenon of dynamic capabilities.

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APPENDIX A GROUP-WISE POOLED DESCRIPTIVE STATISTICS

Savings Banks, n=154.				
	Mean	Std.Dev.	Minimum	Maximum
LNPROFIT	6.55	1.29	0.00	9.13
ASSETS	121141	118976	12957	584283
ASSETS1	126315	124511	13046	613443
FIMSHARE	0.7795	0.0731	0.6012	0.9459
CIR	0.75153247	0.39115567	0.505	5.188
CPA	0.0224	0.0042	0.0133	0.0551
Members of the OP Group, n=958.				
	Mean	Std.Dev.	Minimum	Maximum
LNPROFIT	6.67	1.10	1.39	9.82
ASSETS	110156	190411	4008	1552229
ASSETS1	117219	205945	4115	1719226
FIMSHARE	0.7227	0.0800	0.4119	0.9406
CIR	0.61840292	0.10492299	0.34	1
CPA	0.0219	0.0049	0.0111	0.0499
Local Cooperative Banks, n=168.				
	Mean	Std.Dev.	Minimum	Maximum
LNPROFIT	6.22	0.97	2.08	8.47
ASSETS	68056	71704	8397	535769
ASSETS1	70616	74970	8521	563583
FIMSHARE	0.8033	0.0740	0.5579	0.9923
CIR	0.68994643	0.11462008	0.417	0.939
CPA	0.0234	0.0043	0.0130	0.0344

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