Banking Productivity: An Extension of Traditional Theory

Master Thesis in Economics
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Abstract

This thesis aims at contributing to the growing number of studies on banking productivity, by attempting to introduce the interest rate spread as one of the driving forces behind productivity changes and alterations of the intermediary role of banks. The analysis is based on observations from the banking sectors of Germany and Sweden. As there is no clear consensus on the proper way of measuring banking output, and the choice of method varies considerably from study to study, this paper adopts the intermediation approach which is one of the three most often recurring methods applied in research papers. The results include some interesting revelations such as the low significance of a change in labour and capital to the growth in banking output (challenging traditional theory), and that Swedish banks on average were moving away from the traditional intermediary role between 1979 and 1996 while German banks kept lending business at their centre of attention.
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1 Introduction

The optimal allocation of financial resources is of great importance for economic growth. Banks have traditionally played a pivotal role in this allocation process as intermediaries between agents with surplus of funds and agents with deficit of funds. Today however, banks face an intense competition from financial markets and other types of financial firms, due to deregulation and development of new financial instruments. These changes have induced banks to expand the range of services provided, in order to facilitate their presence in the allocation process of financial resources. Thus, the productivity of the banking sector is of great interest, and has been at the focal point in numerous studies. The multi-product nature of contemporary banking has at the same time served as a basis for investigations of the changing intermediary role of banks. Just to mention a few of these previous studies on banking productivity and the changing role of banks; Wang (2003) conducted a research on economies of scale in banking using a new measure of bank service output; Fixler and Zieschang (1999) described different approaches to measuring output; Saidenberg and Strahan (1999) examined the importance of bank finance for large corporations; Brewer, Jackson and Moser (2001) studied the major differences in financial characteristics of banking organizations that use derivatives relative to those that do not; Bauer, Berger, and Humphrey (1991) developed a measurement for the growth of total factor productivity in banking.

This thesis aims at contributing to the growing number of studies on banking productivity, by attempting to introduce the interest rate spread as one of the factors influencing productivity changes, while playing a part in the alteration of the intermediary role of banks. The interest rate spread, which is influenced by many factors, is the source of profits when banks perform their traditional intermediary role. This paper assumes that a shrinking interest rate spread might contribute to an increase in productivity and to the changing role of credit institutions. Several working papers have studied the interest rate spread and its determinants. However, it is quite difficult to find any previous research on the relationship between the interest rate spread and banking productivity. Hence, the purpose of this thesis is to provide an insight into this relationship, and test whether banking productivity and the changing intermediary role of banks are affected by the development of the interest rate spread. The analysis is based on observations form the banking sectors of Germany and Sweden. It should be noted here that studies on banking productivity usually bump into obstacles due to the lack of data, especially when it comes to time-series analysis, and there is a need for more statistics in order to improve the quality of research.

In the following section, the trend in banking productivity over the last couple of decades is in focus, complemented by a short description of technological changes and other events occurring in the banking sector. Subsequently, the theoretical framework provides a production function and explains the difficulties with measuring output in banking, while the last three subsections describe the interest rate spread, money demand, and the intermediary role of banks.

In section four, various econometric models have been constructed to test for the connection between interest rate spread and banking productivity, and the changing intermediary role of banks. The results are subsequently linked up with the theoretical framework and analyzed in section five. Finally, the last section presents the conclusions from the analysis, and shows how well the purpose of this thesis has been accomplished.
2 Background

During the last couple of decades, German and Swedish labour productivity figures in banking have followed similar patterns, with somewhat more fluctuations in the case of Sweden. Figure 2.1 depicts how labour productivity in banking developed in the two countries from 1979 until 2002. During this period, German productivity has increased from approximately 2.85 million Euro to 7.27 million Euro in real terms (using 1995 as the base year), while Swedish productivity figures increased from approximately 3.18 million to 7.6 million Euro. It is worth noting that the greater part of the increase occurred in the last seven years of the period in the case of Sweden, with an average growth rate of 10 percent per year, while Germany saw its highest productivity growth between 1994 and 2002, with an average growth rate of 8 percent per year. Prior to these seven years of extraordinary growth, both countries experienced on average a more modest development in banking productivity, with a mean growth rate of 2.7 percent per year in Germany and 1.6 percent in Sweden.

![Figure 2.1](image)

**Labour productivity in banking**

- **Sweden**
- **Germany**

€ mil.

Source: Author’s calculation based on data from OECD, World Bank, SCB, and DESTATIS.

As one can clearly see in the graph, the average growth rate of 1.6 percent in the case of Sweden conceals a great deal of fluctuations. For instance, in the period of 1988-1990 labour productivity in banking rose by 46 percent, which was followed by a 24 percent decrease during 1991-1994. Consequently, labour productivity was only 10 percent higher in 1994 than in 1987. The sharp rise in productivity was driven in part by an over-lending to the real estate industry, which in combination with the following economic recession lead to increasing loan losses and a fall in productivity. As the government came to the rescue with capital injections and loan guarantees, at the same time as a new Bank Support Authority (BSA) was set up to lead the restructuring of the banking sector, the crisis was contained. The BSA determined which banks could be saved, and approved the requests for
loan guarantees accordingly. By 1994-96 no further applications for financial support was received by the BSA, and hence the guarantee program could be phased out (Dziobek & Pazarbasioglu, 1998). The rise in productivity during the second half of the 1990’s seems to have followed a more sustainable path. Furthermore, this astonishing growth was interestingly matched by other countries, which is displayed by figure 2.2. The productivity levels may have been pushed up to higher grounds permanently, although it remains to be seen.

Figure 2.2

Labour productivity in banking

![Graph showing labor productivity in banking](image)

Source: Author’s calculation based on data from OECD, World Bank, SCB, DESTATIS, BFS, CBS, and UK National Statistics. (Figures for UK contain only commercial banks)

Some important episodes in contemporary history of European banking, that most likely affected banking sector output throughout the continent, have been the extensive deregulation, cross-border integration, and harmonization processes conducted by the European Union. The aim was to open domestic banking sectors and to create a Single European Banking Market, which would promote competition and efficiency. According to Diego Romero de Ávila (2003), there is a clear connection between the harmonization of regulations and the rise in the level and efficiency of financial intermediation. The liberalization of capital controls have paved the way for efficiency improvements, while interest rate deregulation affected the level of banking output. During the 1970’s and 80’s, interest rate regulations on both deposits and loans were widespread across Europe, with floors and ceilings established by monetary authorities. In addition, reserve requirements were kept high, accompanied by quantitative restrictions on assets and liabilities that existed in many countries until the early 1990’s. Hence, competition was hampered. The implementation of the Single European Act in 1986 was an important step towards solving the problem by committing EU member states to deregulation and harmonization of the banking industry. Subsequently, the Second Banking Directive (SBD) adopted in 1989 made it possible for licensed credit institutions to set up branches and provide services in other EU member states, without having to apply for a license in those states. According to the SBD, a member state that issued a banking license is responsible for the supervision of that bank independent of its place of operation.
Furthermore, the SBD enabled credit institutions to diversify their operations by eliminating restrictions on banking activities, and hence endorsed the formation of universal banks, at the same time as it shifted capital requirements from the branch to the bank level in order to facilitate cost minimization. Since the integration and deregulation processes were expected to trigger intense cross-border competition, the SBD provided also a strengthening of prudential standards regarding the information disclosure by credit institutions, to prevent banks from taking excessive risks and jeopardize the stability of the banking industry. Finally, the last remaining legal obstacles to the creation of a Single European Banking Market were removed with the adoption of the Maastricht Treaty in 1993, which guarantees the free movement of capital across borders (De Ávila, 2003).

Another important event occurring in financial intermediation during the last couple of decades is the technological advancement in the production of banking services. Besides the use of ever more sophisticated computers and computer software, the innovations in information technology and financial technologies have lead to new products, quality improvements, enhanced lending capacity, and lower costs. Some examples of new technologies in the banking industry are the ATMs, Internet banking, and electronic payments technologies. The spread of automated teller machines, or ATMs, in the 1980’s have reduced the workload on bank staff simultaneously as the proximity to clients improved. However, the case of ATMs can serve as a good example on how consumers may reap most of the benefits arising from new technologies due to competitive pressure in the industry (Berger, 2002). ATM services in Sweden for instance are free of charge to customers as a result of competition, which implies higher costs for the financial intermediaries (Swedish Competition Authority, 2006). When it comes to Internet banking, the credit institutions have adopted this relatively new technology in three ways. They have either set up transactional websites that allow customers to make transactions online (for instance assessing accounts, transferring funds, or applying for loans), or informational websites that provide information about the banks without the possibility for online transactions. The third way is to establish a so called Internet-only banking unit, which offers banking services through a transactional website and ATM facilities, without physical offices available to the public. Electronic payments technologies are used to transfer funds electronically, for example credit and debit cards instead of cash and checks, which reduces the paperwork for financial intermediaries and lowers the cost and time of processing payments. Banks are also significant users of new financial technologies in order to improve portfolio management. These technologies encompass different type of securities, credit and market risk models, and financial derivatives. The technological progress described in this section has most likely contributed to the rise in banking productivity over the years. However, it should be noted that the effects of a new technology may vary considerably with the way it is implemented. Furthermore, in a competitive environment the benefits from technological advances might be passed on to customers in the form of quality improvements, which is difficult to measure and thus productivity figures might be understated (Berger, 2002).

Due to technological innovations, the size and structure of banking organizations (and the whole industry) may have been affected by the manifestation of more scale economies (or fewer diseconomies) in the production process. For instance, credit scoring may entail larger scale economies (or less diseconomies) than older lending techniques, and the use of information exchanges (intermediaries through which banks share information about the creditworthiness of loan applicants) can lower default rates, leading to a shift in work organization (Berger, 2002). The structure of credit institutions, and the way they organize production, might influence their productivity as well as the quality of the services they provide. Thus, the arrangement of co-operation between relationship managers, credit ana-
lysts, clerical and secretarial employees etc. is relevant. In addition to their knowledge and skills, and learning opportunities provided in the workplace (Mason, Keltner, and Wagner, 1999). An interesting change in the way credit institutions organize production is described by Andersson (1998), where banks delegate some work to the customers (for example by allowing them to make transactions through transactional websites), and hence implement an “Ikea-style” production process. According to the 2004 Annual Report of the European Central Bank, the most important structural developments during recent years in the European banking industry have been the consolidation, internationalization, and outsourcing processes. Nearly 2300 credit institutions disappeared between 1997 and 2004 in the Euro area alone, due to mergers and acquisitions or internal restructuring of banking groups. While the outsourcing of support and back-office activities to external suppliers, and intra-group outsourcing of core activities, gained importance due to a desire to reduce costs, and utilize outside expertise in order to untie and employ own resources in core activities.

As a final point, lending as a share of total assets has decreased in the banking sectors of Sweden and Germany during the last couple of decades, displayed in figure 2.3. This could be a sign of the changing intermediary role of banks in both countries. Funds received from depositors are deployed in other activities than lending to a larger extent than before. In Sweden, the ratio dropped from 58 percent to 40, while in Germany it fell from 59 to 47 percent.

![Figure 2.3](image)

**Figure 2.3**

Lending as a share of total bank assets

Source: Author’s calculation based on data from OECD.
3 Theoretical Framework

Banks today are multi-product firms, providing a large variety of financial services. Besides
the traditional lending activity, they offer a range of demand deposit and term deposit ac-
counts, giro accounts, ATM facilities, securities\(^1\) trading facilities, insurance policies, and
other kinds of services which all fulfill various functional needs experienced by households,
companies, and institutions. Some of these functional needs are, the need for a payment
system, liquidity, consumption smoothing, and the financing of diverse projects. As the
production of banking services entails large fixed costs in the form of an extensive branch
network, customized computer software and network, or perhaps specialized employees
whom produce below capacity, banks try to expand their complete range of products in
order to minimize costs per unit of output, and hence to reap the benefits of economies of
scope (Andersson, 1998). Due to the complex nature of contemporary banking, the institu-
tion itself seems to have departed from its traditional role in the economy as intermediary
between borrowers and lenders. This issue is highlighted in the last part of the theoretical
framework. In the following sections a theoretical model is developed for the production
of banking services, starting with a definition of output.

3.1 The concept of banking productivity

3.1.1 Measuring output

Measuring output and productivity in the banking sector is not as straightforward as in
other industries due to the intangible nature of the products. Indeed, just to define output
can be a predicament. For instance, some working papers classify deposits as input while
others as output. Deposits should be classified as input on the basis of the plain notion that
deposits are used to make loans, and the interest rate paid on deposits is the price of that
input. However, some working papers claim that deposit accounts are intrinsically different
type of services provided by the bank to the households and individuals, such as safe keep-
ing, and a smooth payment system, and hence could also be categorized as output (Fixler &
Zieschang, 1999). When considering the services produced, one has to keep in mind that
some services are free of charge, which banks offer as complements to their deposit and
loan products. Thus, output measurements will be biased as some services are left out due
to their non-price characteristics. Furthermore, when banks provide loan products they
ought to monitor the borrowers, i.e. produce information, in order to circumvent clients
with high default risk. Measuring output by the number of physical services provided is
therefore insufficient as the production of information is not included. A bank that pro-
duces a large number of loan accounts while neglects to carry out a thorough screening pro-
cedure, i.e. to produce information, could be less productive in the long run than a bank
that produces a smaller quantity of loan accounts with a proper monitoring procedure. Due

\(^1\) Stocks, bonds, and different kinds of derivatives such as options, futures, forwards, and swaps.
to the complexity of measuring banking output, there have been numerous research papers written on the topic with plentiful ways of approaching the problem. However, so far there is no clear consensus on how to deal with this quagmire, and the way output is measured varies considerably from study to study (Mörótinen, 2002).

There are three main approaches to measuring output in banking that are recurring in research papers. The production or value-added approach, the intermediation approach, and the user-cost approach (Mörótinen, 2002). The production approach measures output as the number of deposit and loan accounts, or as the number of transactions per account. It assumes that a bank’s total costs are equal to the operating expenses for employing capital and labour in the production of loan and deposit accounts (Heffernan, 1996). Output is treated as a flow, however, the measurement fails to capture the quality of services provided, and omits the production of information as previously mentioned (Mörótinen, 2002). Figures for banking sector output presented in the national accounts are compiled with the value-added approach. It shows the value-added arising from transactions per account. Nonetheless, due to the complexity of establishing what value-added should constitute, differences exist between countries in the way banking output is measured.

The intermediation approach, or as it is sometimes called the “asset approach”, identifies intermediation as the core activity in banking, implying that banks are not producers of deposit and loan services (Heffernan, 1996). Banks are providers of intermediation services, and this is achieved mainly through the production of assets. The provision of deposit accounts is considered to be production of intermediate goods, which are provided to depositors as payments in kind for the funds they lend to the bank (Humphrey, 1991). Output is measured by the value of bank assets, while deposits are treated as financial inputs (Mörótinen, 2002). Total costs are equal to operating costs plus interest costs. The intermediation approach is the most frequently recurring method applied in research papers for measuring banking output (Heffernan, 1996). This paper adopts the intermediation approach as well, with the graphs in figure 2.1 and 2.2 displaying productivity levels according to this method. According to this approach, output is measured as a stock at a given point in time, leading to the high figures depicted by the graphs.

When choosing between a stock and a flow measure of banking output, a flow measure is an ideal choice since output is typically a flow. However, in a case where the stock measure is assumed to be proportional on average to the flow measure, the former can be applied as an estimate of output with reliable results. Stock and flow measures of output in banking will be proportional to each other when the nominal value of deposit and loan accounts change due to economic growth or inflation. Economic growth boosts demand for intermediation services, and there will be an increase in deposit and loan accounts. When a change in the nominal values is triggered by these factors only, the value of real balances will also reflect the underlying flow of transactions. The value of real balances can be obtained by deflating the nominal values with an appropriate price index. In practice, the stock of real deposit and loan balances is assumed to be proportional over time to the transaction flows, and hence similar results are expected from both measurements. A stock measure is usually applied when a flow measure is unavailable (Humphrey, 1991).

The third approach to measuring banking output is the user-cost approach, which classifies an item as output or input on account of its contribution to bank revenue. This method assumes that an optimizing firm receives in return exactly the opportunity cost of an asset, and reimburses exactly the opportunity cost of a liability. If the bank receives more than the opportunity cost of assets, then assets are classified as output. If the bank reimburses less than the opportunity cost of liabilities, then liabilities are classified as output (Mörötti-
Empirical studies have shown that deposits as a whole usually become classified as output under the user-cost approach (Fixler & Zieschang, 1999). However, this approach appears to be somewhat ambiguous, as it is unclear why exactly the liabilities (among them deposits) should be classified as output just because the bank might reimburse less than the opportunity cost of these funds.

3.1.2 The Production function and Productivity

The following production function is applicable in the case of a bank, whenever the intermediation approach is applied in measuring output.

\[ Q = AF(K, L, H, N) \]  

According to this function, output \( Q \) is produced by physical capital \( K \), labour \( L \), human capital \( H \), and the network capacity of the bank \( N \) which allows for the provision of diversified quality services. Deposits are left out from the equation since these inputs are considered to be intermediate goods according to the intermediation approach. This production function takes the form of a Hicks-neutral technological progress, where an increase in technology or efficiency \( A \) over time, will raise output for a given level of inputs.

The optimal choice for measuring productivity in any industrial sector is to compute the TFP (Total Factor Productivity). This measure accounts for the effects of all input factors employed in the production process, including returns to scale. The following equation can be used for measuring TFP in banking, where \( \frac{\dot{Q}}{Q} \) corresponds to the percentage change in banking output over time, i.e. \( \frac{Q_t - Q_{t-1}}{Q_{t-1}} \), while \( \frac{\dot{L}}{L} \) symbolizes the percentage change in labour over time and so on.

\[ \frac{\dot{A}}{A} = \frac{\dot{Q}}{Q} - w_k \frac{\dot{K}}{K} - w_L \frac{\dot{L}}{L} - w_H \frac{\dot{H}}{H} - w_N \frac{\dot{N}}{N} \]  

The growth in TFP \( \frac{\dot{A}}{A} \) is equal to the growth in output minus the growth in input factors each multiplied by its share in total expenditure, i.e. the weight of each input in the production process represented by \( w_i \). It is assumed that input prices equal the marginal product of each input factor, and the sum of \( w_i \) equals one, which imposes constant returns to scale on the production process. This constraint however is acceptable since numerous studies in banking have underpinned the prevalence of constant returns to scale at the mean of all banks (Humphrey, 1991). Nevertheless, it should be noted that a more recent study conducted by Wang (2003) concludes that modest economies of scale might exist in the production of banking services.

Although TFP is the optimal choice for measuring productivity, and should be used whenever possible, it is not unusual that one has to settle with a partial measure of productivity due to the lack of data, which is often the case when it comes to banking. Output per labour is a partial measure that can be used whenever TFP is unfeasible. Equation 3.4 displays how a change in output per labour \( \frac{\dot{q}}{q} \) depends on the change in capital per la-
bour \( \frac{k}{k} \), the output elasticity of capital \( \alpha \), and \( \beta \) which is the intercept representing the change in productivity when the change in capital per labour is equal to zero.

\[
\frac{\dot{q}}{q} = \alpha \left( \frac{\dot{k}}{k} \right) + \beta \quad (3.4)
\]

This simplified formula enables the estimation of productivity changes on the macro level in banking, without leaving a broad space for errors, as in many countries labour is still by far the largest expense category for banks.

### 3.2 Demand for money

Demand for money is a demand for real balances, i.e. the purchasing power of money is the primary concern. According to Keynes, an individual has three motives for holding money. The transactions motive, which is the demand for money in order to manage payments; The precautionary motive, which stems from a desire to have the ability to cope with unanticipated events; And the speculative motive due to fluctuations in the money value of other assets that an individual can hold instead of money. All three motives affect people’s decisions regarding the amount of money they hold, at the same time as the money at hand can serve all three purposes simultaneously. Furthermore, there is a trade-off between the benefits of holding money and the interest rate paid on other assets (Dornbusch, Fischer, and Startz, 2001).

Equation 3.5 presents the Baumol-Tobin formula which summarizes the demand for money. It explains how the choice between holding money and other assets (for instance bonds) is affected by a change in income \( Y \), transaction cost \( tc \), and the interest rate on other assets \( i \). M stands for money and P stands for the price level, and hence \( M/P \) is real money (See Dornbusch et al. how to derive the Baumol-Tobin formula).

\[
\frac{M}{P} = \sqrt{(tc \times Y)/2i} \quad (3.5)
\]

According to this equation, demand for money increases with income and the cost of transacting, while decreases with the interest rate paid on other assets than money. A convenient way of observing money demand is to look at the fluctuations in the velocity of money, which is the number of times the stock of money is turned over per annum in financing the yearly flow of income, i.e. nominal income divided by the stock of money. Equation 3.6 displays the income velocity of money, where \( V \) stands for velocity, \( P \) for the price level, \( Y \) is income, and \( M \) is money. Velocity has a strong tendency to rise and fall with market interest rates, where high velocity means low money demand. The formula is derived from the quantity theory of money, which links the price level to the stock of money and income (Dornbusch, Fischer, and Startz, 2001).

\[
V \equiv (P \times Y)/M \quad (3.6)
\]

Finally, the issue of money demand is relevant for banking productivity since deposits and loans are components of the monetary aggregates used by the central banks to determine
the stock of money in the economy. When money demand changes, deposits and loans in the banking sector will adjust, and hence banking output will be affected. Thus, money demand is an exogenous factor influencing banking productivity.

3.3 Changing intermediary role

According to the traditional theory on banking, banks act as intermediaries in the economy between agents with excess financial resources (depositors) and agents with deficient funds (borrowers). The existence of such intermediaries is made possible by the presence of information costs. In a world without banks, both borrowers and lenders have to face search costs in order to find each other. While lenders have to confront also verification costs (verify the accuracy of information provided by the borrower), monitoring costs (monitoring the activities of the borrower), and enforcement costs (in case of violation of the contract). When these information costs are higher than the costs of intermediation, both borrowers and lenders will find it beneficial to seek out banks (Heffernan, 1996). Cosimano (1996) provides a comprehensive study on how the welfare of borrowers and lenders change in the presence of intermediaries.

While banks function as intermediaries in the process of resource allocation, they carry out four main tasks; Offering access to a payment system, Transforming assets, Managing risk, and Processing information. There are three kinds of asset transformation, convenience of denomination (borrowers and lenders can opt the suitable sizes of their contracts), quality transformation (the intermediaries construct portfolios which dilute the risks associated with each contract), maturity transformation (the parties can enter a contract regardless of their preferences concerning the maturity of the contract, due to the large number of assets and liabilities held by the bank) (Freixas & Rochet, 1997).

Banks are confronted by numerous risks as intermediaries, and these risks increase by number when their operations expand. Some of these risks are, the credit risk (which is default on loan agreements that banks shoulder on behalf of depositors), interest rate risk (loss in net income due to interest rate fluctuations), and liquidity risk (deficient liquidity to meet the obligations towards lenders, which banks shoulder on behalf of borrowers) (Heffernan, 1996).

When it comes to the processing of information, it is a central part of the intermediary role. Banks acquire and interpret information in order to improve risk management and asset transformation (Heffernan, 1996).

According to Ronald H. Coase, firms exist because some economic activities can be performed more efficiently in a command style organization than in markets due to the transaction costs associated with the activity (Economics, 2000). However, if the market becomes more efficient in performing an economic activity than the firm, the later will be compelled to modify its operations. In the case of banking, there was a notion raised in previous years about the future prospect of a substantial decrease in significance of these institutions, and that banks might disappear all together. The idea came to existence from the observed technological progress and the invention of new financial instruments, as they are expected to reduce the traditional intermediary role and payment functions of banks. If agents will have the ability to arrange loans, deposits, and payments facilities with each
other at a lower cost than the cost of intermediation, then banks will become redundant. However, such scenarios are not likely to occur any time soon due to the prevalence of high information costs (Heffernan, 1996).

Although banks will most likely stay here for a while, the intermediary role in the traditional sense might still be altered as they move to a larger extent into securities trading, and provide more non-bank financial services at the same time as the provision of loans declines. Since large corporations find it cheaper nowadays to raise short-term funds in the commercial paper market and long-term funds in the bond market than to borrow from a bank, demand for bank loans have decreased among these borrowers. However, Saidenberg and Strahan (1999) provide a comprehensive study on this subject and conclude that banks are still important sources of liquidity for large corporations at times of economic stress, despite the negative trend in their significance.

When it comes to securities trading, banks can have two objectives. First, to hedge against interest rate risk, this is a complement to the lending activity and hence could be considered as part of the intermediary role. Second, to improve financial performance by speculating in the markets or acting as over-the-counter dealers, which imply a digression from traditional lending activity and the intermediary role. In the first case, one could expect a positive relationship between the management of securities and lending, while in the second case there is most likely a negative relationship (Brewer, Jackson, and Moser, 2001).

### 3.4 The interest rate spread

A bank’s interest rate spread is the difference between its lending rate and deposit rate. This spread affects the so-called banker’s mark-up, which is the difference between interest revenue on assets and interest expense on liabilities as a ratio of average bank assets. Since banks are profit maximizers just like any other firm, they have an objective to increase this ratio, and hence to expand the interest rate spread. Despite that both bankers and regulators are concerned about this subject, relatively few models have been developed for analysis. In a study conducted by Ho & Saunders (1981), there have been four main factors identified as determinants of the interest rate spread. They are (1) the degree of risk aversion in bank management, (2) the market structure, (3) the average size of bank transactions, and (4) the variance of interest rates.

Due to the intermediary role that banks play in the economy, they face uncertainties caused by the mismatch in maturities of loans and deposits. Stochastic increases in either the lending rate or deposit rate incite banks to adopt an asset-transformer mode, which implies a higher propensity to accept mismatches in maturities. Whereas an increase in the volatility of these rates will reduce the propensity to accept mismatches and lead the banks to adopt a so-called broker mode (Deshmukh, Greenbaum, and Kanatas, 1983).

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2 Services that are beyond the scope of traditional banking. For instance, insurance policies, stock broking facilities, pension funds, or real estate.

3 These two aspirations are encouraged by existing regulation, which sets capital requirements higher for loans than for securities with equivalent risk (Heffernan, 1996).
As credit institutions face downward sloping demand functions with respect to their lending rate, they exercise some monopoly power in loan markets. Empirical studies have underpinned the prevalence of such imperfect loan markets, where banks are lending rate setters (Zarruk & Madura, 1992). When facing competition in the loan market, banks are confronted by a trade-off between securing their market share in the short-run and safeguarding their long-run survival. According to Bolt & Tieman (2001), an intensifying competition drives current profits down, leading to more relaxed lending conditions and higher risk exposure. Thus, tough competition can also undermine prudent banking and necessitates regulation.

When it comes to the effect of a change in interest rate spread on banking productivity, it is logical to expect a positive influence of a shrinking spread and a negative effect of a growing spread. As banks reduce their spread in face of growing competition or a changing discount rate, borrowing becomes less expensive while return on deposits rise, and hence lending and output will rise. Moreover, when interest rate spread decreases due to competition, banks shift funds from the central bank (non-interest bearing deposits) to the loan market in order to increase banker’s mark-up (Zarruk & Madura, 1992). A shrinking interest rate spread makes the traditional intermediary role of banks less lucrative, thus one can also expect it to induce credit institutions to engage in other activities besides lending in order to reap the benefits of economies of scope.

### 4 Statistical Method and Empirical results

This chapter is testing empirically for the proposition about a possible link between interest rate spread and banking productivity as previously mentioned in the introduction. In order to test for the influence of the interest rate spread over banking sector output, an econometric model with three regressors plus an error term has been constructed below. The three regressors are, (1) the growth rate of labour \( \dot{L}/L \), (2) the growth rate of physical capital \( \dot{K}/K \), and (3) the change of the interest rate spread \( \dot{I}/I \). The value of total banking output at time \( t \) \((\dot{Q})\) is measured according to the intermediation approach, which is the sum of total assets. However, another item has been added to this figure in order to account for the multi-product nature of modern banking, namely the non-interest income\(^4\) which is generated by the provision of brokerage services. The error term includes network effects, the change in technology, money demand, the change in knowledge and skills of employees, and the fluctuations in service charges on non-bank financial services since \( Q \) stands for the value of output. In order to conduct the regressions, data has been collected from OECD, World Bank, SCB, and DESTATIS. The results are presented in table 4.1 below.

\[
\dot{Q}/Q = \beta_1 + \beta_2 \left( \frac{\dot{L}}{L} \right) + \beta_3 \left( \frac{\dot{K}}{K} \right) + \beta_4 \left( \frac{\dot{I}}{I} \right) + u, \quad (4.1)
\]

\(^4\) Fees and commissions received.
According to the results in Table 4.1, Germany has a highly significant intercept coefficient. At the same time, Sweden has a significant intercept coefficient as well at the 10% level. However, when it comes to the slope coefficient of interest, namely the coefficient for interest rate spread, the value does not appear to be significant for any of the two countries. In addition to one of them being positive while the other one is negative. Interestingly, the slope coefficients for labour and physical capital are insignificant as well.

When it comes to testing the significance of a change in interest rate spread for a change in banking labour productivity \((q)\), the following regression function may be used. Besides the interest rate spread, there are two new regressors in the equation. These are \(k\), representing physical capital per labour, and \(\Phi\) that stands for securities as a share of lending plus securities. The idea behind the last regressor is that labour productivity in banking might have been influenced over time to some extent by the changing intermediary role of banks. According to the theory presented in section 3.3, the intermediary role of banks will be altered when these institutions divert from traditional lending activity, which would be reflected by an increasing share of securities (if securities are negatively correlated to lending; correlation test further below). Table 4.2 displays the results from regression 4.2.

\[
\frac{\dot{q}}{q} = \beta_1 + \beta_2 \left( \frac{\dot{k}}{k} \right) + \beta_3 \left( \frac{\dot{l}}{l} \right) + \beta_4 \left( \frac{\Phi}{\Phi} \right) + \eta \quad (4.2)
\]
The intercept coefficients for both countries appear to be significant again in table 4.2. At the same time, the coefficient for interest rate spread is negative for Germany and positive for Sweden, while the t-values do not attach any significance to these figures. However, the coefficient for $\Phi$ in the case of Germany is significant, which confirms the contribution of $\Phi$ to labour productivity in the German banking sector. It is also worth noting that the coefficient is positive for Germany and negative in the case of Sweden. Although the t-value for Sweden is less than desirable to confirm the influence of $\Phi$ on Swedish banking labour productivity, the value is significant at the 14.6% level. Peculiarly, the change in physical capital per labour is significant for banking productivity growth, even though both the change in labour and physical capital were insignificant in regression 4.1.

In equation 4.3, $\Phi$ is the regressand. The purpose with this regression is to comprehend the influence of a change in interest rate spread on the shifting intermediary role of the banking sector. In case a significant relationship appears, the results can underpin the hypothesis that interest rate spread affects banking productivity in part by contributing to the shifting role of banks. The new regressor ($p$) is the risk premium on lending, which is the difference between the prime rate that banks charge their most trustworthy clients and the

$$
\begin{array}{|c|c|c|}
\hline
\text{} & \text{GERMANY} & \text{SWEDEN} \\
\hline
\beta_1 & 0.027 & 0.040 \\
& (2.201)** & (1.814)* \\
& [0.012] & [0.022] \\
\beta_2 & 0.297 & 0.149 \\
& (1.868)* & (0.712) \\
& [0.159] & [0.210] \\
\beta_3 & -0.122 & 0.077 \\
& (-1.331) & (0.598) \\
& [0.092] & [0.129] \\
\beta_4 & 0.564 & -0.183 \\
& (2.307)** & (-1.530) \\
& [0.245] & [0.120] \\
\hline
R^2 & 0.31 & 0.20 \\
\hline
\end{array}
$$

T-values in parentheses and standard errors in brackets.

** Significant at the 5% level.

* Significant at the 10% level.
interest rate on government bonds i.e. the rate of return on a risk free investment. The reason for including this variable is as follows. In case of a departure from the intermediary role (i.e. banks use securities to speculate; correlation test further below), \( p \) will exert a positive influence on ratio \( \Phi \) since credit institutions on average will increase their risk taking in face of higher yields on safe loans. A higher \( p \) entails lower risk exposure that banks will take advantage of by increasing trade with securities until the level of risk exposure is restored, in order to boost profits even further. In case of an improvement of the intermediary role (if securities are positively correlated to lending), \( p \) will exert a negative influence on ratio \( \Phi \), because a larger difference between the prime rate that banks charge their most trustworthy clients and the interest rate on government bonds implies higher yields on safe loans, and credit institutions will direct funds into these safe loans that are less in need of hedging, i.e. complemented by less securities.

\[
\Phi/\Phi = \beta_1 + \beta_2 \left( \frac{i}{l} \right) + \beta_3 \left( \frac{p}{p} \right) + u_i \tag{4.3}
\]

Table 4.3 Results from regression 4.3

<table>
<thead>
<tr>
<th></th>
<th>GERMANY</th>
<th>SWEDEN</th>
</tr>
</thead>
<tbody>
<tr>
<td>( \beta_1 )</td>
<td>0.028</td>
<td>0.014</td>
</tr>
<tr>
<td></td>
<td>(3.058)***</td>
<td>(0.306)</td>
</tr>
<tr>
<td></td>
<td>[0.009]</td>
<td>[0.045]</td>
</tr>
<tr>
<td>( \beta_2 )</td>
<td>0.119</td>
<td>-0.059</td>
</tr>
<tr>
<td></td>
<td>(0.800)</td>
<td>(-0.221)</td>
</tr>
<tr>
<td></td>
<td>[0.149]</td>
<td>[0.269]</td>
</tr>
<tr>
<td>( \beta_3 )</td>
<td>-0.048</td>
<td>0.110</td>
</tr>
<tr>
<td></td>
<td>(-0.484)</td>
<td>(0.846)</td>
</tr>
<tr>
<td></td>
<td>[0.100]</td>
<td>[0.131]</td>
</tr>
<tr>
<td>( R^2 )</td>
<td>0.03</td>
<td>0.04</td>
</tr>
</tbody>
</table>

T-values in parentheses and standard errors in brackets.

*** Significant at the 1% level.

According to regression 4.3, the coefficient for interest rate spread is negative in the case of Sweden and positive in the case of Germany, whereas the coefficient for risk premium on lending is negative for Germany and positive for Sweden. Unfortunately, the only significant value is the intercept coefficient for Germany.
All regressions above were free from autocorrelation problems of order 1 according to the Durbin-Watson tests, with tolerance statistics above 73 and condition indices (CI) below 5 suggesting low multi-collinearity among the explanatory variables in all regressions. Due to the suggestion that a change in interest rate spread might influence banking productivity in part through its effect on the changing intermediary role of banks, multi-collinearity was expected in regression 4.2. Nonetheless, multi-collinearity was low, and hence the insignificant slope coefficient for interest rate spread in regression 4.3 is not a surprise. As the slope coefficients for interest rate spread in regression 4.3 are insignificant according to the t-values, adjusting the slope coefficient for ratio \( \Phi \) in equation 4.2 in order to reflect the suggested influence and to cope with multi-collinearity is redundant. At this point it is also important to clarify a couple of issues regarding the low significance of coefficients.

To conduct a proper regression analysis one needs at least 30 observations, while the regressions above had only 23 observations to go on in the case of Germany, and 20 observations in the case of Sweden. This will naturally affect the significance of coefficients, nonetheless due to the lack of data this flaw had to be accepted. There is an immense need for more data on the macro level in banking in order to improve the quality of research.

With the aim of complementing the results presented so far, and enable a more straightforward interpretation in the analysis, a correlation test has been conducted between lending and the management of securities. According to the theory in section 3.3, the changing intermediary role of banks can be traced partly by this correlation, and hence the results will help us understand the role of \( \Phi \) in regression 4.2 and 4.3.

<table>
<thead>
<tr>
<th>Table 4.4 Correlation between management of securities and lending</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>GERMANY</strong></td>
</tr>
<tr>
<td>Loans</td>
</tr>
<tr>
<td>Correlation</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
</tr>
<tr>
<td>Correlation</td>
</tr>
<tr>
<td>Sig. (2-tailed)</td>
</tr>
</tbody>
</table>

*** Correlation is significant at the 1% level.

Table 4.4 displays the results from the correlation analysis, and shows that correlation is significant between the management of securities and lending, both in the case of Sweden and Germany. However, it is negative for Sweden and positive for Germany. An interpretation of the results is provided in the following section, and analyzed in relation to the theoretical framework.

---

5 A CI between 10 and 30 implies moderate to strong multi-collinearity, while a CI exceeding 30 signifies severe multi-collinearity.
The empirical results provided in section 4 can be interpreted partly as a success. As the correlation test between lending and management of securities were significant both in the case of Sweden and Germany, one is able to draw some conclusions regarding the changing intermediary role of banks. According to theory, banks have to face multiple risks as financial intermediaries, such as interest rate risk, credit risk, and liquidity risk, that accompany the task of asset transformation. By hedging against these risks with different type of securities, banks are able to improve risk management and refine their function as financial intermediaries. In such scenario, bank lending and management of securities would be positively correlated. On the other hand, credit institutions might hold securities with the intention of improving financial performance, i.e. with speculative purposes instead of complementing loans, in which case bank lending and management of securities would be negatively correlated. Thus, the German banking sector on average seems to use securities to improve risk management, while the Swedish banking sector on average seems to utilize securities to enhance profits.

Due to the positive correlation between lending and management of securities, one cannot really claim that the German banking sector has departed from its traditional intermediary role, unlike in the case of Sweden. Hence figure 2.3 in the background should be adjusted by adding securities to lending in the case of Germany, while leaving the figures for Sweden as they are due to the negative correlation. The new graph will reflect changes in the intermediary role more accurately than the previous one, even if still somewhat biased as probably not all securities held by German banks are used for hedging, and not all securities held by Swedish banks are used for speculation. However, banking data available on aggregate level does not allow for classification of the securities according to their purpose. Figure A.1 in the appendix displays the new graph, where securities have been added to loans in the case of Germany.

Although the Swedish banking sector appears to have been moving away from its traditional intermediary role during the last couple of decades, while the German banking sector did not, banking productivity figures for the two countries have stayed in the proximity of one another. This trend was presented in figure 2.1 in the background. At the same time it is evident that Germany experienced a smooth progress in banking productivity, whereas Sweden went through some fluctuations that could be partially related to the different way of managing securities. As German banks acquired securities to complement loans and improve risk management, it has significantly contributed to the growth in banking productivity, which is certified by the coefficient for ratio $\Phi$ in regression 4.2. In the case of Sweden the slope coefficient is negative and significant at the 14.6% level, which means that a departure from traditional lending business by increasing trade with securities instead of employing them in risk management would have negative effects on banking productivity, and perhaps contribute to fluctuations (with some reservations due to the slightly larger probability of errors than what is desirable, which could be caused by the low number of observations). For instance, if securities would have been acquired to complement loans instead of boosting profits, the Swedish banking sector might have been able to mitigate the fall in productivity between 1991 and 1994. Thus, it is reasonable to assume that this type of alteration of the intermediary role makes banking productivity more volatile and the allocation process of financial resources in the economy less stable. However, non-bank financial
activities\(^6\) as a whole contributed greatly to the rise in banking productivity between 1996 and 2002, as lending remained at 40 percent of total output while productivity grew by 10 percent per year.

The choice between using securities to enhance profits and to improve risk management might be affected by multiple factors, with legislation being one of them. As the European Union conducts the harmonization process of regulations by setting minimum standards as benchmark, member states can apply more stringent rules if they wish (which is usually not in their interest, see De Ávila, 2003), and thereby provide different incentives to their banking sectors than what prevails elsewhere in the EU. According to Heffernan (1996), the regulation in several countries sets capital requirements higher for loans than for securities with equivalent risk, hence differences in regulation could be a reason to the dissimilar motives for holding securities in Sweden and Germany. However, it is beyond the scope of this thesis to compare Swedish and German regulations, and the question of what propels credit institutions to acquire securities for hedging or speculation is left to further research.

Regression 4.3 examined how the interest rate spread would influence the ratio of securities divided by lending plus securities (ratio \(\Phi\)) in order to establish the effect of a change in interest rate spread on the changing intermediary role of banks. As the slope coefficients of the explanatory variables for Sweden turned out to be insignificant, which might be due to the low number of observations, the idea about a possible link between interest rate spread and the changing intermediary role of banks cannot be confirmed. Neither is it possible to confirm the link between a change in interest rate spread and an improvement of the intermediary role, as the explanatory variables for Germany turned out to be insignificant as well. When it comes to the impact of a change in interest rate spread on banking output and productivity, the t-values in regression 4.1 and 4.2 attached no significance to this explanatory variable, i.e. the link between interest rate spread and banking output cannot be confirmed.

Although most explanatory variables appear to have low significance in regression 4.1, including labour and capital, the intercept coefficients are significant in both regression 4.1 and 4.2. This leads us to the influence of exogenous factors on banking productivity, that are either beyond the control of credit institutions or cannot be assessed due to the lack of data. In a situation with a significant intercept coefficient and insignificant slope coefficients, one can talk about an exogenous rate of banking productivity growth, i.e., productivity growth will be determined entirely by exogenous factors, and will be equal to a value that lies somewhere between the intercept coefficient plus and minus the standard deviation of growth. Some of these exogenous factors are money demand, the implementation of new technologies, organization of production, network effects, change in skills and knowledge of employees, fluctuations of service charges, and changes in regulations.

Money demand has already been described in the theoretical framework as an exogenous factor influencing banking productivity, and it seems to gain importance under the present circumstances. Since loans and deposits are part of the stock of money in the economy, a change in demand for money should naturally affect both loans and deposits, and hence banking output. According to the Baumol-Tobin formula presented in equation 3.5, a rise in income or transaction costs will increase demand for money, which in turn should boost banking output, while a rise in the interest rate paid on other assets than money will lower

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\(^6\) Securities trading, stock broking services, insurance policies, pension funds, real estate business, interbank deposits etc. (interbank deposits became quite significant in the Swedish banking industry by 2001)
money demand, which most likely has a negative effect on banking output. By looking at
the change in velocity of money, which is the average number of times a unit of currency is
used to finance the yearly flow of income, one can estimate the change in money demand
(see equation 3.6). A rise in velocity implies decreasing money demand, whereas a fall in ve-
locity means that demand for money is growing. Given the outcome of the regression
analysis in this thesis, a deeper investigation of the relationship between money demand
and banking productivity is justified, and hence it is recommended for further studies as it
is beyond the scope of this thesis.

By looking at figure 2.1 in the background, one can clearly see that banking productivity for
both Sweden and Germany were following the same trend during the period under observ-
ation, with some minor differences in fluctuations. From 1979 until the mid 1990's both
countries experienced moderate average growth rates in banking productivity, followed by
rapid growth in the second half of the 1990's. Apparently there is a structural change,
which is not captured by the conventional econometric approach. Instead of looking at
small continuous changes, it would be more appropriate to conduct a qualitative analysis of
the figures presented in the background, in order to explain the possible reasons to the ex-
traordinary jump in banking productivity during the second half of the 1990's. The exoge-
nous factors mentioned above can provide the explanation to the break of structure dis-
played in figure 2.1. Furthermore, as several countries were following the same trend (see
Figure 2.2), there is most likely a common driving force at work. Hence, exogenous factors
such as money demand, that might vary between countries, are less important than for in-
stance technological progress, the deregulation and harmonization processes conducted by
the EU, and the change in organization of production.

Considering the graphs displayed in figure 2.1, it is remarkable how closely associated the
growth in banking productivity appears to be to the creation of the Single European Bank-
ing Market, which would correspond to the previously mentioned findings of Diego Ro-
mero de Ávila (2003). According to De Ávila, there is a clear connection between the de-
regulation, cross-border integration, and harmonization processes conducted by the Euro-
pean Union and the rise in the level and efficiency of financial intermediation. Following
the time of adoption of major EU directives incorporated in the Single European Act, the
Second Banking Directive, and especially the Maastricht Treaty which amplified the impact
of all previous directives, banking labour productivity grew more rapidly than before. Ger-
man banking productivity figures began to climb at a higher speed following the year of
adoption of the Maastricht Treaty, while Swedish productivity figures started to surge in
1996 the year after Sweden became an EU member. Figure 2.2 seems to reinforce this no-
tion by displaying a comparable development in banking productivity experienced by other
EU member states, which signifies the presence of a common driving force at work such as
EU-wide deregulation (Although Switzerland is not a member of the EU, Article 56 of the
Maastricht treaty introduced full freedom of capital movements between EU member
states and third countries, and through bilateral agreements the Swiss gained access to the
internal market which allowed the country to benefit from changing regulations even as an
outsider). Thus, changes in regulations appear to have considerable impact on develop-
ment, and should be accounted for as an important exogenous factor influencing banking
sector output. However, De Ávila claimed that deregulation of lending and deposit rates
had significantly contributed to a rise in banking output, which cannot be verified in this
study. His regression analysis comprised dummy variables representing the implementation
dates of different EU directives, and hence the true effect of varying interest rates on bank-
ing output was not revealed. Changes in lending and deposit rates will automatically expand
or reduce the interest rate spread, which in this paper could not be established to have sig-
nificantly influenced output and productivity. Nevertheless, one could object to this line of reasoning by saying that quantitative restrictions on assets and liabilities existed in many countries until the early 1990’s, and for this reason banking output was obstructed from fully reacting to changes in the interest rate spread. As a result, the slope coefficient for interest rate spread in regression 4.1 and 4.2 will be insignificant, and the number of useful observations in regression analysis will be reduced even further as only the figures from the early 1990’s and onwards can tell the true effect of a change in interest rate spread on banking productivity. Thus, qualitative analysis of the graphs becomes even more useful relative to the conventional econometric approach. The influence of deregulations is undeniably one of the most important causes to the jump in banking productivity.

When it comes to the implementation of new technologies in the production of banking services, it is reasonable to assume that productivity growth has been drastically enhanced by this factor as well, as major technological innovations occurred at the time of extremely high growth rates, and it is a common driving force just like deregulations. The spread of internet in the second half of the 1990’s, and the IT revolution (implying here the progress in IT technologies, and not the IT bubble), are two examples of technological advancements that took place at the same time as both Sweden and Germany experienced rapid growth in banking productivity. Government efforts during the 1990’s to make broadband internet connection available to as many people as possible provided further stimulus for credit institutions to utilize these new technologies by offering ever more sophisticated internet banking services. Together with electronic payment technologies, these innovations have reduced the paperwork for financial intermediaries and lowered the cost and time of processing payments while improving the quality of services. Although banking productivity rose considerably during the 1990’s in graph 2.1, there is reason to suspect that productivity figures according to the value added approach would make the connection between technological progress and banking output even more evident. This is due to the larger impact of these technologies on the number of transactions per deposit and loan account than on total banking assets which is output according to the intermediation approach. However, the contribution of financial technologies to productivity growth is probably more significant when applying the intermediation approach, since new securities, credit and market risk models, affect total banking assets more than the transactions per deposit and loan accounts. It should be noted here as well that new financial technologies could also have negative effects on banking output due to the increasing alternatives of financial assets available to households, which might lead to a decline in bank deposits and loans. As previously mentioned in the background, the effect of a new technology depends also on the way it is implemented. Thus, it is important to acknowledge that the contribution of technological progress to banking productivity relies on the change in skills and knowledge of employees as well. The provision of learning opportunities for employees, and the qualifications of new recruits is essential for the success of innovations. Although the change in skills and knowledge of employees has not been investigated in this thesis, technological progress has undoubtedly played a key role in the rapid banking productivity growth observed in the graphs.

As a last plausible major exogenous factor influencing banking productivity growth, one should contemplate the change in organization of production described in the background. It can be considered as a common exogenous driving force to the countries investigated, since the banking sectors in all these countries went through changes in the organization of production mainly as a response to the new opportunities and solutions offered by technological progress and deregulation. The use of information exchanges, credit scoring, outsourcing of support and back-office activities to external suppliers, and intra-group out-
sourcing of core activities, the “Ikea-style” inclusion of customers into the production process that has spread throughout the continent with the Internet and development of information technologies, and the creation of advanced networks have all occurred during the second half of the 1990’s, at the time of rapid productivity growth. Thus, structural development in banking is the third most important explanation to the extraordinary growth depicted in figure 2.1 and 2.2.

6 Conclusion

The purpose of this thesis was to test for the influence of interest rate spread on banking productivity and the changing intermediary role of banks in order to extend the traditional theory on banking. As such, the purpose has been fulfilled. Although the effect of a change in interest rate spread could not be confirmed in any of the regressions despite the predictions of theory, and possibly due to the lack of data, the test results have provided some useful insights. German banks on average did not depart from the traditional intermediary role during the last two decades, while the Swedish banking sector drifted away between 1979 and 1996, and kept lending business approximately at 40 percent of total assets after 1996 (the figures for Germany were above 70 percent throughout the period under observation). Non-bank financial activities as a whole made an important contribution to Swedish banking productivity, although the shifting of funds from lending to securities in order to boost profits appear to have negative effects on productivity growth (with some reservations due to the low t-values). Thus, a departure from the traditional intermediary role of banks in this manner could contribute to fluctuations in productivity and make the allocation process of financial resources in the economy less stable. An interesting revelation was that neither the change in capital or labour has significantly influenced growth in banking output when applying the intermediation approach, which challenges traditional theory. The driving forces were exogenous, and if status quo remains with more data available in the future, one has to start seriously contemplating whether a modification of traditional theory is due. Some of the mentioned exogenous factors were deregulation, money demand, the implementation of new technologies, and changes in organization of production.
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<http://www.scb.se/default____30.asp>.


World Bank (2004), World Development Indicator. (CD-ROM)

Appendix

A.1

Lending business as a share of total bank assets

Source: Author's calculation based on data from OECD.

(Lending business for Germany includes securities)