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### On competition and banking

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# Chapter 1

## Introduction and overview

The justification of the existence of banks is traditionally based on the presence of transaction costs and asymmetric information. These imperfections have been central to the financial intermediation literature for several decades (see the reviews by Baltensperger, 1980; Santomero, 1984; and Freixas and Rochet, 1997). Recently, these imperfections have become less important, in the sense that both transaction costs and the asymmetry of information have been reduced (Allen and Santomero, 2001, p. 272). In many countries, in particular in the US, there has also been a significant reduction in the relative importance of banks' traditional activities of granting loans and managing deposits. Although this trend is visible in Europe as well, it is not as strong (in particular for Germany; see Allen and Santomero, 2001). Also, other types of intermediaries such as pension funds and mutual funds have shown significant growth. Thus, financial intermediation remains an important issue.

Next to (decreasing) transaction costs and informational asymmetries, financial intermediation is characterized by another type of imperfection. Empirical evidence indicates that banking sectors in many countries are characterized by imperfect competition (see chapter 2). For European countries in particular, the evidence generally points to monopolistic behavior or even collusive conduct (see Molyneux et al., 1994; Neven and Röller, 1999; De Bandt and Davis, 2000; and Bikker and Groeneveld, 2000). Evidently, banking market structure and bank behavior have important consequences, not only for banks' clients but for the functioning of financial markets and financial stability as well. For that reason, it is interesting to study imperfect competition in banking.

The issue of competition in banking raises several important ques-

tions. For example, is competition in banking a good thing? How does it affect financial stability and social welfare? And of course, how do banks compete (or interact strategically) in practice? How can this be measured? Since the empirical evidence indicates that there is indeed imperfect competition in banking, how can it be modeled theoretically? What are the implications of these theoretical models for bank behavior in general, or for interest rate setting by banks in particular? How do banks set interest rates in practice? And what do clients think about that? Do they prefer a competitive banking sector, or not? This thesis addresses these questions, focusing on the traditional intermediation activities of banks. In the next section we discuss the aim of this study in more detail. Section 1.2 gives a brief introduction to the theoretical background of our approach to competition in banking, and section 1.3 presents the outline of the thesis.

## **1.1 Aim of the study**

As we argued above, banking sectors are generally characterized by imperfections, which result in loss of production and growth and a suboptimal social welfare level. In part, this is explained by transaction costs (Benston and Smith, 1976) and asymmetric information (Stiglitz and Weiss, 1981). This, however, is not the entire story. Since banks provide costly services to firms and households, namely the management of loans and deposits, they compete with each other for these firms' and households' patronage. The functioning of loan and deposit markets is generally characterized by imperfect competition (see chapter 2). The empirical evidence of imperfect competition as well as the high concentration ratios observed in many banking markets suggest that further insights can be derived from a study of the functioning of banking markets, and of the strategic behavior of the individual actors in these markets. In this thesis, we do exactly that. By applying models and ideas from the field of Industrial Organization (IO), which deals with the functioning of (imperfectly competitive) markets, to the banking sector we aim to deal with several important aspects of imperfect competition in banking. We distinguish four subthemes, discussed below. The IO approach to banking is discussed in somewhat more detail in the next section.

The first part of this thesis addresses the issue of competition in banking directly. We consider questions like: What is competition? Is

competition in banking good or bad? How has imperfect competition in banking been modelled theoretically, and what are the implications of these models? How to measure the competitiveness of a market? How competitive are banking sectors in practice? We do so by presenting a survey of the literature on banking, focusing in particular on the IO approach (chapter 2), and an empirical illustration, measuring the competitiveness of the Dutch consumer credit market (chapter 3).

Second, we consider in more detail how to model imperfect competition in the banking sector. We present three different theoretical oligopoly models from the standard IO literature and apply them to banking (chapters 4-6). In particular, we consider Stackelberg quantity leadership, double Bertrand competition, and spatial competition. Within the context of the particular model, in each of these chapters we study the effects of certain decisions by the regulator or central bank, using a comparative statics approach. For example, we analyze the effects of changes in the money market or policy rate and of the introduction of a reserve requirement on bank behavior and interest rates.

Third, we turn to delayed and, in particular, asymmetric interest rate or price adjustments. We analyze the response of a particular interest rate, the Dutch mortgage rate, to changes in the capital market or swap rate (chapter 7). The latter interest rate performs the role of the underlying marginal cost for banks in providing mortgages. We study the response of the mortgage rate to changes in this marginal cost, and analyze lagged and asymmetric mortgage rate adjustments. More precisely, we investigate whether the mortgage rate responds faster to increases than it does to decreases. Asymmetric price adjustments are not limited to the mortgage market but are widespread and occur in many markets (see Peltzman, 2000). Several explanations for the phenomenon have been advanced in the literature. We consider an additional possible explanation based on the most-favored-customer clause (chapter 8).

The final question addressed in this thesis returns to bank market structure and concerns the issue of how imperfect competition among banks affects banks' clients (chapter 9). Do clients actually prefer more competition in the banking sector? In the context of an oligopolistic output market model, we analyze the effects of bank market structure on borrowers' (firms') profits and ask whether borrowers may prefer a banking monopoly over a less concentrated market structure, in the sense that competing firms may prefer to borrow from the same bank. Intuitively, this allows them to credibly commit not to over- or under-

invest, thus limiting competition in the production stage and thereby increasing profits.

Most of the chapters are theoretical in nature. Our purpose in this thesis is not to test these different theoretical models against one another, but to show how various specific models are able to explain different (real-world) phenomena.

## **1.2 The IO approach to banking**

Banks can be studied from various perspectives. As mentioned above, in this thesis we focus on the IO approach to banking. In chapter 2 we will present a survey of the literature and briefly go over some alternative approaches. Here, we give a short introduction on the IO approach to banking and discuss how this study fits into the literature.

The field of IO deals with the functioning of markets in general and with imperfect competition in particular (see e.g. Tirole, 1988; Martin, 1993). In the IO approach to banking, models and insights from IO are applied to the banking sector (see Freixas and Rochet, 1997, chapter 3). Thus, we concentrate on how banks compete, and on the results of specific modes of competition or bank behavior on bank output and interest rates, as well as the consequences for banking market performance and for banks' clients. We also analyze the effects of certain decisions by the regulator or central bank, such as a change of the policy rate or the introduction of a reserve requirement.

In the IO approach, banks are considered as independent actors that strategically react to their environment in a way that is optimal to them in a certain respect (e.g. maximizes profits). This allows one to model the competition between banks explicitly. The model of Klein (1971) and Monti (1972) has been the basis for many IO-bank models. This static model describes the strategic behavior of a single representative profit-maximizing bank. The bank acts as a price taker for securities but as a price setter for both deposits and loans and can be interpreted as a monopolist on these markets. By maximizing the bank's profit function, the optimal structure of assets and liabilities as well as the size of the bank is determined. The model thus takes into account the special feature of a bank that it must take strategic decisions both on the 'input' (deposit) and on the 'output' (loan) market. The original model has been criticized, generalized, and extended by many authors. For example, the result of independence of loan and deposit side decisions

has been shown not to hold in general (see Pringle, 1973; and Dermine, 1986).

A model that describes a single, monopolistic bank does not seem very realistic. Based on extensive empirical evidence (see also chapter 2) banking sectors are generally characterized by high concentration and imperfect competition. Therefore, we should consider banks as oligopolists. Freixas and Rochet (1997, pp. 59-61) present a straightforward extension of the Klein-Monti model which concerns a finite number of identical banks competing in quantities, i.e. Cournot competition. VanHoose (1988) also presents a model of Cournot behavior among a finite number of banks.

But these models share another feature that is not very realistic. Banks are assumed to compete in quantities, whereas in the real world we often observe banks competing in prices (interest rates). Stahl (1988) describes an interesting general model of imperfect competition among intermediaries. In this model, there is double Bertrand competition, that is, there is price competition for both inputs and outputs. As Stahl shows, this may result in market equilibria that depart from the Walrasian (perfect competition or 'standard' Bertrand) equilibrium. Evidently, this model can be applied to the banking sector by reinterpreting inputs as deposits and outputs as loans (see Yanelle, 1987, 1989; and Freixas and Rochet, 1997, pp. 64-66).

In the context of the theoretical models of bank competition as discussed above, a wide range of issues can be addressed. This has been done in particular in the more recent IO-banking literature. Above, we already mentioned the effects of policy rate changes and reserve requirements, and the 'double' competition (for deposits as well as for loans) that we also consider in this thesis. In the literature, several other topics have been analyzed as well. It is not surprising that the focus has been on characteristics that make banks special, i.e. different from ordinary firms. Apart from double competition such features are, for example, asymmetric information leading to adverse selection and moral hazard; financial stability versus competition; regulation; product differentiation and specialization; bank-firm relationships; switching costs; networks (e.g. of branches or Automatic Teller Machines, ATMs); and monetary transmission (for details, see chapter 2). Several of these aspects, such as product differentiation and bank-firm relationships, will be touched upon in this thesis as well. Despite the fact that certain characteristics or functions of banks, such as asset transformation, are not dealt with by

the IO approach, it thus allows one to study the nature of competition among banks as well as a wide range of other topics.

Finally, next to studying theoretical models of imperfect competition in banking many authors have analyzed empirically the level of competition in specific banking markets. From the high concentration ratios observed in many banking markets (see Molyneux et al., 1994,; ECB, 1999, pp. 55-57; and chapter 2 of this thesis) it cannot directly be concluded that banks exert market power. The Structure-Conduct-Performance (SCP) hypothesis states that a high concentration facilitates collusion and increases market power, and therefore increases prices and profitability of firms (see Gilbert, 1984). But according to the Relative-Efficiency (RE) paradigm, there may be an alternative explanation for the positive relationship between concentration and profitability observed in many (banking) markets. Efficient firms, which are able to earn high profits because of low costs, increase in market share, implying a high concentration of efficient, profitable firms. Furthermore, a high concentration does not imply high profits if the market is contestable, that is, if there is a threat of entry that induces the incumbents to behave competitively. Therefore, it is important not to infer the level of market power from concentration indices only, but to analyze it independently. Fortunately, it is possible to estimate indices that directly refer to the degree of competitiveness in a market using econometric methods (see e.g. Martin, 1993). These methods have been widely applied to banking markets all over the world.

### **1.3 Outline**

This thesis consists of a literature survey on competition in banking in chapter 2, and seven separate papers, in chapters 3 to 9. All chapters are self-contained. Therefore, they can be read separately. This also implies that now and then there is some overlap between various chapters. Below, we discuss the various chapters in more detail.

We start with an introduction on the issue of competition in banking in chapter 2. There we give a very brief overview of the banking literature and the various approaches that can be distinguished. We consider the social welfare implications of a competitive banking sector. This issue is related to the balance between financial stability and the benefits of competition. Then we provide a survey of the literature that comprises the (theoretical) IO approach to modelling competition

in banking. Finally, we ask how banks compete in practice. Empirical evidence with respect to the competitiveness of the banking sector in various countries suggests that competition in banking is imperfect (in Europe in particular) but different from monopoly or full collusion. This suggests that indeed oligopoly models are relevant for banks.

In chapter 3 we continue to focus on competition in banking and illustrate this empirical approach by measuring the competitiveness of the Dutch consumer credit market. We discuss different methods that can be used to assess the level of competition in a market. We choose to apply the well-known Bresnahan-Lau method (Bresnahan, 1982; Lau, 1982), which derives the competitiveness of the market from the estimated conjectural variation elasticity.

Chapter 4 is the first of a series of three chapters that applies a standard competition model from the IO literature to banks and analyzes within the context of this model the comparative static effects of certain decisions by the central bank or regulator. In chapter 4 we focus on the Stackelberg leader-follower duopoly with quantity competition on a market for a homogeneous good. We consider the effects of changes in the money market or policy rate, set by the central bank, on output in a Stackelberg version of the Klein-Monti model. The intuition here is to study the effects of asymmetry in the conduct of banks in the Klein-Monti model. However, the model can be interpreted more generally and applies not only to banks but to ordinary firms as well. To stress this broader interpretation we present it as a general IO model, focusing on the effects of an industry-wide marginal cost change. We analyze the effects of a cost increase on total market output, as well as on the individual output of the two firms. We then reinterpret these results in terms of banking and the effects of a money market or policy rate change.

Chapter 5 turns to banks competing in prices. This chapter is based on Stahl's (1988) double Bertrand model, which describes the special case of price competition between intermediaries as a two-stage game. In the first stage the intermediaries or merchants buy stock from producers, which they sell to consumers in the second stage. The model has double Bertrand competition in the sense that there is price competition in both stages. The capacity that firms have in the second stage is endogenously determined by the outcome of the first stage of the game. We apply this model to financial intermediaries or banks in chapter 5. In particular, we investigate the effects on equilibrium interest rates of the introduction



by the central bank of a reserve requirement, i.e. a requirement for banks to hold a fraction of deposits as a (non-interest bearing) reserve at the central bank.

Chapter 6 applies a third IO model of competition, the spatial competition model with price competition for horizontally differentiated goods. We consider the Salop circular city model (Salop, 1979) in which several banks are assumed to be located symmetrically along a circle. In this model, we analyze the effects of the choice of a monetary policy rule by the central bank on interest rate setting by banks. We focus in particular on the relative markup or Lerner index, which is the difference between the lending rate charged by the banks and the policy or money market rate (which performs the role of marginal cost in this model), as a fraction of the lending rate. We analyze in what way a procyclical monetary policy may affect the Lerner index. Interpreting the Lerner index as a measure of market power, this implies a study of the effects of monetary policy on the market power of banks.

In chapter 7 we focus on the response of a specific bank lending rate, the Dutch mortgage rate, to an underlying interest rate (either the capital market rate or the so-called swap rate). This chapter contributes to the empirical literature that shows that prices respond asymmetrically to cost changes in many markets. So the focus here, as well as in the next chapter, is on asymmetries in lending rate (or price) adjustments. That is, the degree of price rigidity may differ between increases and decreases. In general, the empirical literature suggests that prices rise faster than they fall (Peltzman, 2000). The market for mortgages in The Netherlands is an example. We investigate Dutch mortgage rates and analyze their responses to increases and decreases in the underlying capital market rates. In this chapter we also discuss various theoretical explanations for asymmetric price adjustments in general, and discuss their validity for the mortgage rate in particular.

In chapter 8 we study an additional possible explanation for asymmetric price adjustments. We do not focus on banks here but instead present a more general model that applies to a duopoly with price competition and heterogeneous goods, in which firms may choose to offer a most-favored-customer clause (see Cooper, 1986; Tirole, 1988, pp. 330-332). With this clause, a firm announces to its customers that if it will reduce its price within a certain period of time, it will rebate the difference to current customers. We expect firms that offer the most-favored-customer clause to be reluctant to decrease prices because of the

costs of rebates incurred. Therefore we study asymmetric cost-change induced price adjustments in this duopoly model. The chapter thus aims to give an alternative explanation for asymmetry in price adjustments.

In chapter 9 we ask what banks' clients think about competition in banking. In general, one would expect client firms to prefer a more competitive banking market, since that implies lower interest rates. However, this may not always be true. In chapter 9 we ask whether firms that need to obtain financing from a bank may prefer to borrow from the same (monopolist) bank rather than from different (say, duopolist) banks and, in that way, may induce a banking monopoly. We use a three-stage model where firms choose a bank in the first stage that they are assumed to be locked in with during the rest of the game. In the second stage, they invest the loans obtained from the banks chosen in the first stage, and in the final stage the firms compete on the output market. This model is very general in the sense that the precise type of competition between the two firms is not specified. In that respect it differs from the models presented in chapters 4-6. Here, we only require that the investments of the firms are either strategic substitutes or strategic complements. We consider the issue of borrowing from the same bank as a competitor, which can provide firms with a commitment device not to over- or underinvest. In this context, we ask whether banks' clients may actually prefer a less competitive (more concentrated) banking industry.

Chapter 10 concludes by summarizing the main results and presenting some general conclusions. In this chapter we also give some possible directions for future research. We end with a Dutch summary.

