Counterfactual Analysis of Bank Mergers*

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Abstract

Bank mergers affect the degree of competition in the supply of financial services. These mergers may impact on the amount of credit granted to firms and households, as well as on the interest rates applied. This paper conducts a structural analysis of the impact of mergers in the Portuguese banking system, using a detailed dataset with unique characteristics. We derive a structural model for the credit market, which allows us to clearly disentangle the merger effects on households and firms. We first estimate the differential impact of mergers on credit granted and on interest rates. However, the structural model used allows us to go further on and build a counterfactual scenario, by considering the pre-merger market equilibrium together with the post-merger environment. We find that mergers increased the total amount of credit granted (especially to the corporate sector) and led to a decrease in interest rates.

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*The analysis, opinions and findings of this paper represent the views of the authors, they are not necessarily those of the Banco de Portugal.

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1 Introduction

The banking sector affects liquidity provision to firms and individuals and has a major role in the functioning of both the financial system and the real economy. As the current crisis has vividly shown, profound changes or disruptions in the banking system may have serious and widespread economic consequences. Mergers are one of the most important changes that can occur in banking markets, given that they affect the availability and pricing of credit through its effect on market structure. In this paper we analyse the effects bank mergers exert on market structure and credit conditions. The conventional approach employed in the literature relies on the comparison of market characteristics before and after the mergers, overlooking changes in market structure in the post-merger industry equilibrium[1]. In this paper, we present a methodology that allows overcoming this gap in the analysis of merger impact. By using a detailed dataset with unique characteristics, we are able to perform a counterfactual analysis of mergers, combining the pre-merger equilibrium setting with characteristics of the post-merger environment.

Our dataset allows us to investigate the merger impact on both firm and household bank loans. Moreover, we are able to analyze the merger effects on both the merged banks and on those banks outside the merging circles, taking into account changes in the post-merger market structure. Furthermore, we analyze the resulting changes in local market structure by modelling the effects of changes in local market structure on aggregate industry configuration.

There is a large literature on the gains banks obtain from merging. For instance, Focarelli et al (2002) find that mergers increase return on equity, but they also lead to a rise in staff costs. In turn, they find that acquisitions generate a long-term reduction in lending, mainly for small firms, and a permanent decrease in bad quality loans, which positively affects long-run profitability. Focusing on European mergers, Altunbas and Marqués (2008) find that improvements in banks' performance subsequent to mergers are more significant if there are strategic similarities between the merging banks. Mergers also generate important changes

[1] In order to evaluate the ex-ante potential impact of mergers, competition authorities usually conduct merger simulation analysis. See, for instance, Epstein and Rubinfeld (2000).

in market structure, as discussed in Berger et al (2004) or in Gowrisankaran and Holmes (2004). Some authors also find that mergers may enhance cost reduction and improve resource allocation[2]. Moreover, mergers may generate informational gains, which may improve banks' screening abilities and customer discrimination (see, for instance, Hauswald and Marquez (2006) or Panetta et al (2005)).

It is also important to assess the impact of bank mergers on customers with varying characteristics. Several authors conclude that bank mergers may negatively affect borrowers, most notably if they are small and medium size firms, dependent on bank funding and with a limited number of bank relationships. For instance, Bonaccorsi di Patti and Gobbi (2007) find that, for a sample of Italian firms, bank mergers have a negative effect on credit, particularly if the lending relationship comes to an end after the merger, even though this effect should persist only during the three years after the merger. However, this negative effect is not sufficient to generate a negative impact on firms' investment or cash-flow sensitivity. Other authors find mixed evidence regarding the impact of bank mergers. Also using a sample of Italian firms, Sapienza (2002) concludes that in-market mergers benefit borrowers if these mergers involve banks with limited market power. However, as the market share of the acquired bank increases, the efficiency gains are offset by an increase in market power, which may imply a decrease in loan supply, especially to small borrowers. In another study, Scott and Dunkelberg (2003) analyze the results of a survey on US firms and find that bank mergers do not affect loan supply or interest rates, even though there is some deterioration in non-price loan terms, such as fees for specific services. Degryse et al (2006) find that the impact of a bank merger is more negative for smaller borrowers and for single relationship borrowers. Moreover, target bank borrowers should be more harmed by the merger than borrowers of the acquiring bank. Finally, Karceski et al (2005) show that mergers may have impacts on borrowers beyond credit availability and interest rates. These authors show that mergers may in fact have important

[2]For instance, Carbó Valverde and Humphrey (2004) argue that mergers should reduce costs faced by banks, raise their return on assets and improve general resource utilization. They also find that a merger is more likely to be successful if it is large (scale effect) and also if it is initiated by a bank that has been previously involved in a merger (learning effect).

consequences on firm value, observing that borrowers of the acquiring banks usually benefit from the mergers, whereas firms that borrow from the target bank suffer an opposite impact[3].

In the present paper, we use a structural model of equilibrium in credit markets to analyze the impact of changes in market factors due to the merger wave. First we estimate the differential impact of the merger wave, by exploring changes in local competition and in coordination moves between banks. Moreover, using this structural model, we are able to go further and estimate a counterfactual scenario for the post-merger period, thus going beyond the simple (and insufficient) comparison of variables before and after mergers occur. Using this methodology, we compare the interest rate and credit flows in the post-merger equilibrium setup with the value of these variables under a counterfactual equilibrium. This counterfactual equilibrium is estimated using the after-merger environment under the pre-merger equilibrium setup.

The estimation of counterfactuals to assess the impacts of a merger can be an important policy tool. For instance, Ivaldi and Verboven (2005) emphasize that the evaluation of a merger from a policy perspective should not be based solely on a static comparative analysis, but should also consider dynamic effects and alternative merger scenarios. Berry and Pakes (1993) also argue that static models of equilibrium do not take into account the long-run reactions of merging and non-merging firms, thus generating misleading results. In an application to the airline industry, Peters (2006) demonstrates the importance of designing a counterfactual analysis to evaluate the impact of bank mergers, but is silent regarding the possibility of collusion or strategic interactions between firms. Berger et al (1998) find empirical evidence which supports the view that dynamic effects of mergers may generate results different from those obtained with static analysis. The authors identify a decrease in lending to small business after a merger, even though this static effect is largely offset by dynamic effects associated with changes in the focus of the merging banks or with the reaction of other banks. Nevertheless, these authors do not consider local changes induced by mergers, neither do they compare the

[3]There is less work done on the impact of bank mergers on depositors. There is some empirical evidence for Italian firms which suggests that bank mergers may have positive consequences for deposits in the long-run, even though there may be some negative effects in the short run (Focarelli and Panetta, 2003).

impact on different institutional sectors.

Our paper contributes to the literature on merger impact in banking markets by presenting a counterfactual analysis, based on a structural model of equilibrium that clearly disentangles the effects of bank mergers on loan flows and interest rates.

The data used allows us to discriminate effects among corporate and household borrowers, and to simulate the counterfactual equilibrium to the mergers that occurred. This approach lends itself to the reporting of intuitive measures of merger impact upon the degree of competition in the market. The use of a counterfactual scenario becomes necessary, as mergers change the market structure underlying bank competition. In particular, as borrowers' choices among alternative banks often take place in small local markets (even though banks' policies can be national), the softening of competition in local markets resulting from a merger may be larger than an estimate based on aggregate, country-wide, figures.

We are able to make use of a significant change in market structure in the Portuguese banking market. Portugal is a small economy participating in the European Union, and joined the single currency program, the Euro, since its inception. Like in the other European Union countries, it experienced a wave of mergers in the banking sector. The most significant changes occurred in 2000, with the merger of several financial institutions. The almost simultaneous nature of these mergers provides a natural break point in time, allowing us to define a pre- and a post-merger period. Hence, we divide the 1995-2002 period in two: the pre-merger 1995-1999 period and the post-merger 2000-2002 period. Four out of the seven major financial groups were directly involved in those changes, either by selling or by acquiring at least one financial institution. In this paper, we analyse two different products (credit to households and to firms), two different groups of institutions (those that are directly involved in the mergers and those that are not) and consider two different periods (pre- and post-mergers).

Several interesting findings emerge from our analysis. We find that the 2000 merger wave globally increased total credit granted and decreased interest rates. However, the analysis of aggregate credit flows hides important differences between institutional sectors. In fact, we find that the amount of credit flow granted to the household sector decreased, while the

amount of credit granted to the corporate sector increased during the same period. The changes in credit flows affected both the banking groups involved in the mergers and the groups not involved. In fact, all financial institutions experienced an increase in the corporate credit sold following the merger and a decrease in the interest rate charged. However, the banks directly involved in the merger recorded a larger increase in corporate credit than the banks that were not directly involved in the merger. The decline in credit granted to the household sector after the merger period, which was concentrated in banks not involved in the merger wave, suggests that households may be more sensitive to changes in local market competition. These results show the existence of clear strategic interactions between banks, suggesting that mergers may actually affect the degree of competition in the market, through the changes in the local market structure, to a larger extent than predicted by aggregate market analysis.

The paper proceeds as follows. Section 2 develops the model of the equilibrium in the credit market. Section 3 describes the data and the major corporate changes in the banking system in 2000. Section 4 estimates the structural model of the equilibrium in the credit market and section 5 analyzes the impact of the merger wave. Section 6 presents some concluding remarks.

2 The Analytical Framework

2.1 Demand Equation

Given our purpose of assessing the market equilibrium effects of bank mergers, our approach to estimation has to rely on a minimum structure, such that alternative market equilibria can be computed. At the same time, the model needs to be parsimonious and flexible. Moreover, changes in competition should be analysed at the most disaggregated level possible. Even though there is no information on the local market operations of each bank, we do have information on the location of branches and on characteristics of local markets (such as population), thus allowing us to consider differences in local bank competition. In fact, as local

market competition certainly depends on the number and location of branches, the relative position of the branch network of each bank does affect the demand faced by the bank, and thus own and rival banks branch densities are considered in our model. The branch density is commonly used in the empirical literature on local banking competition (see, for instance, Degryse and Ongena, 2005). We consider that rivalry between banks is relevant on the choice of interest rates. Finally, economy-wide variables should influence demand and must be included as demand-side controls.

Since our unit of observation is the bank, we consider the total market demand function L_{it} directed at each bank (i), during a quarter (t), as a function of both economy-wide variables (V_t) and bank-level determinants (S_{it})[4]:

$$L_{it} = V_t \; S_{it}$$

The set of variables V_t includes the aggregate average interest rate on new loans granted in the country in quarter t, r_t, and a vector Z_t including other economy-wide variables, namely the GDP level. The vector V_t is given by:

$$V_t = A_1 r_t^{\alpha_1} Z_t^{\alpha_2}$$

where A_1 is a constant, and α_i are parameters to be estimated.

The bank specific variables considered, S_{it}, include the number of branches of a bank and of its rivals, B_{it} and $B_{-it} = (B_t - B_{it})$, respectively. It is important to note that in each period, the decision variable r_{it} is the average interest rate that bank i charges on new loans granted during quarter t, not the average interest rate on existing loans.

The overall demand directed at bank i is also determined by the level of competition the bank faces in the local markets in which it is active, as well as by the relative size of such markets. In fact, for a given number of branches, different locations can imply significant differences in demand generated. Therefore, we include a set of local market competition variables X_{it}.

[4]See Kim and Vale (2001) for further details.

The vector of bank-level determinants is given by:

$$S_{it} = A_2 B_{it}^{\phi_1} B_{-it}^{\phi_2} r_{it}^{\phi_3} X_{it}^{\phi_4}$$

where A_2 is a constant and ϕ_i are parameters to be estimated.

Pooling all variables together, the demand equation we estimate is:

$$\ln L_{it} = \alpha_0 + \alpha_1 \ln r_t + \alpha_2 \ln Z_t + \phi_1 \ln B_{it} + \phi_2 \ln B_{-it} + \phi_3 \ln r_{it} + \phi_4 \ln X_{it} + \varepsilon_{it} \qquad (1)$$

In the expression (1), L_{it} stands for the total volume of (new) loans granted by bank i during a particular quarter t. We have district data and therefore $L_{it} = \sum_{k=1...K} L_{ikt}$, where k stands for the district identification[5].

In equation (1), the vector of local market characteristics X_{it} consists of:

$$POP_{it} = \sum_{k=1...K} POP_{ikt} \frac{B_{ikt}}{B_{it}}$$

$$LC_{it} = \sum_{k=1...K} \left(\frac{B_{kt} - B_{ikt}}{B_{kt}} \frac{B_{ikt}}{B_{it}} \right)^2$$

where the sum is performed for all the districts in the country. The variable LC_{it} is the sum of the squares of the district local market competition values.

The variables capturing local market characteristics deserve some further justification. The first one, $POP_{it,}$ is a measure of the importance of each market to bank i in period t: the proportion of branches each bank has in market k is weighted by the population in that market. Thus, banks which have a higher proportion of branches in more heavily populated areas will have, ceteris paribus, a higher demand for their loans.

The second measure, LC_{it}, attempts to capture not a rough indicator of the level of potential demand in each market, but the intensity of competition. The basic element is the share of (branch) competition faced by bank i in market k. This is given by the share of rival banks in total number of branches in market k, weighted by the importance of market k,

[5] There are 18 districts in Portugal.

branch-wise, to bank i. This index is able to accommodate the differences involved in having branches in markets where other banks have no branches relative to crowded markets.[6]

2.2 The Bank's Problem

After setting the demand function faced by each bank, we turn now to the supply side of the market. The profit function of a bank relevant for our analysis, which focuses on the loans market, can be simply stated as interest rate income less marginal costs multiplied by total (new) loan demand in each period. Marginal costs include the opportunity cost of financial funds.

The relevant (short-run) decision variable of bank i is its interest rate. To account for possible strategic interaction among banks belonging to different economic groups, we take a simple approach, assuming that they take into consideration, in their decisions, a fraction of the impact they have on the profits of other banks. Under perfect collusion (or joint management) banks would maximize joint profits, while under perfectly independent behaviour each would maximize own profits. Thus, this approach accommodates intermediate situations by the introduction of a single parameter, which measures to what extent a bank considers the impact of its decisions on the profits of other banks.

The bank's problem is to maximize profits using the interest rate as the control variable:

$$\max_{r_{it}} \Pi_{it} = L_{it}(r_{it} - c_{it}) + \sum_{j \neq i} \lambda_{ij} L_{jt} \left(r_{jt} - c_{jt}\right)$$

where j represents all remaining banks and c_{it} are marginal costs. Parameters λ_{ij} are the competition factor that accounts for the effect of bank j on bank i's objective function. The number of parameters implied by λ_{ij} is potentially quite large, and restrictions on possible values will be imposed during estimation.

Using the demand equation defined in the previous section, it becomes straightforward to characterize the optimal interest rate choice taken by bank i. The first order condition is:

[6] A similar index can be found in Barros (1999).

$$0 = \frac{\partial \Pi_{it}}{\partial r_{it}} = L_{it} + \frac{\partial L_{it}}{\partial r_{it}}(r_{it} - c_{it}) + \sum_{j \neq i} \lambda_{ij} \frac{\partial L_{jt}}{\partial r_{it}} (r_{jt} - c_{jt})$$

and from the specification (1), we have:

$$\frac{\partial L_{it}}{\partial r_{it}} = \frac{\phi_3}{r_{it}} L_{it}$$
$$\frac{\partial L_{jt}}{\partial r_{it}} = \left[\frac{\partial L_{jt}}{\partial r_t}\right]\left[\frac{\partial r_t}{\partial r_{it}}\right] = \left[\alpha_1 \frac{1}{r_t} L_{jt}\right]\left[\frac{1}{n_t}\frac{1}{r_{it}} r_t\right] = \alpha_1 \frac{1}{n_t}\frac{1}{r_{it}} L_{jt}$$

where we have used the fact that $(1 + r_t) = \left[\Pi_{m=1}^{n} (1 + r_{mt})\right]^{1/n_t}$ and n_t is the total number of banks in quarter t.

Simplification allows us to write the first-order-condition as:

$$0 = L_{it} + \phi_3 L_{it} \frac{r_{it} - c_{it}}{r_{it}} + \sum_{j \neq i} \lambda_{ij} \alpha_1 \frac{1}{n_t} L_{jt} \frac{r_{jt} - c_{jt}}{r_{it}}$$

For estimation purposes, it becomes useful to solve the equation with respect to the interest rate r_{it}:

$$r_{it} = \frac{\phi_3}{1 + \phi_3} c_{it} + \sum_{j \neq i} \lambda_{ij} \frac{\alpha_1}{\phi_3 - 1} \frac{1}{n_t} \frac{L_{jt}}{L_{it}} (r_{jt} - c_{jt}) + \upsilon_{it} \tag{2}$$

Together, the system of equations (1) and (2) characterize the equilibrium in the credit market. The strategic effects of the j rivals of bank i are captured by the group of parameters λ_{ij}. The impact of the branch network is obtained from the coefficients ϕ_1, ϕ_2. The parameter ϕ_4 evaluates the extent of the impact of the local market characteristics on granting new credit.

3 The Data

The dataset is the result of merging four different sources of data. The first dataset includes information on the branches' location. The second dataset includes unique interest rate and credit data, which allows to distinguish between the household and the corporate sectors. The third database gathers the regional characterization and the fourth information on banks' balance sheet data. The dataset consists of quarterly data from the first quarter of 1995 to the

third quarter of 2002 and each observation corresponds to a bank at each quarter. Quarterly data of credit flows exactly matches similar periodicity for banks' balance sheet and income statement data.

Regarding branch location, the data are collected by the Banking Supervision Department at *Banco de Portugal* (BP). We have quarterly data on the location of branches from the beginning of 1995 to the end of the third quarter of 2002. Whenever a bank establishes a branch, it is required to report this event to the BP within a period of three months. The same time period is set for a branch change of address, closing or other major change.

The data on credit and interest rate is collected from the *Estatísticas Monetárias e Financeiras* (EMF), Statistics Department, at the BP. The EMF is a monthly mandatory survey sent to all financial institutions operating in the country and includes information on end-of-period stocks and flows of credit. Regarding the stock of credit data, the EMF survey suffered two major revisions: at the end 1997 and another at end-2002 implying that we are only able to construct country aggregate data on the stock of credit for the 1995-2002 period.[7] As for flows of credit, we have data on the households and corporate sectors for the 1995-2002 period. Data on the interest rates are based on the flows of new credit granted. There was a major revision in interest rate statistics at the end of 2002, with the purpose of harmonizing methodologies within the Eurosystem, which prevents the use of more recent data. In fact, from 2003 onwards, interest rate statistics began to be estimated using a sample of representative banks, instead of using the whole universe of banking institutions, as before. Hence, there are several banks (including small banks belonging to the seven largest banking groups) for which there is no interest rate data after end-2002. Nevertheless, a longer estimation period would probably not be adequate, given that the effects of mergers should be more strongly and clearly captured in the years immediately after these mergers[8]. Moreover, it would be

[7] From 1995 to the end of 1997 the credit data is divided in credit granted to: (1) state-owned non-financial companies and (2) privately-owned non-financial firms and households. From 1998 to 2002, credit is divided into: (1) credit granted to households, (2) non-financial institutions, (3) emigrants and (4) non-monetary financial institutions (not allowed to hold deposits). Between 1995 and the end of 1997, the data on local debt and credit is yearly-based (data accounts for the end-of-year stock). From 1998 to end 2002 the data is biannual (end-of-semester stocks).

[8] For instance, Berger et al (1998) consider that the dynamic effects of bank mergers should be analyzed in

a very strong assumption to require that the pre-merger equilibrium holds for many years after the merger wave, as changes in economic and financial variables should also shape this equilibrium.

We further collected data on the demographic characteristics of the districts from the National Statistical Agency (INE), including total population by municipality.

Finally, banks' income statement and balance sheet data are obtained from the Banking Supervision Department on a quarterly basis. The variables include total assets, capital (tier 1 and tier 2 capital), liquidity ratios, total credit, net income and loan-to-assets ratio.

3.1 Description of the 2000 Merger Wave

During the 1995 to 2002 sample period, the financial system in Portugal experienced several restructuring processes. Among the main corporate changes, we highlight the five most significant ones: (i) in January 1996, *Banco Português de Investimento* (BPI) buys *Banco Borges & Irmão* (BBI) and *Banco Fonsecas e Burnay* (BFB); (ii) in December 1997, *Banco Comercial de Macau* (BCM) changes to *Expresso Atlantico*; (iii) in September 1998, there was a merger between BBI, *Banco Fomento e Exterior* (BFE) and BFB and the new institution is named as BBPI; (iv) in March 2000, the group *Banco Pinto e Sotto Mayor* (BPSM), which included the banks BPSM, *Banco Totta e Sotto Mayor Inv* (BTSM Inv), *Banco Totta e Açores* (BTA) and *Credito Predial Português* (CPP) is extinguished. The bank BPSM is bought by *Banco Comercial Português* (BCP). At the same time, BTSM Inv is acquired by *Caixa Geral de Depósitos* (CGD); BTA is created and CPP is acquired by BTA and finally (v) in September 2000, Santander buys BTA.

Among the main events, the ones occurred in 2000 are by far the most important, as they involved major banks as well as major financial groups. Among the seven major financial groups, four were directly involved either by selling a financial institution or by acquiring one. Due to the significant changes occurring in 2000, we may distinguish between specific characteristics of the pre-2000 period, which we designate as the pre-merger period, comprehending

the three years following the merger.

the 1995-1999 period, and specific characteristics of a after-2000 period, which we denominate the post-merger period, including the 2000-2002 period.

To better understand the changes occurring in the credit market during 2000 we analyze the evolution of the stock of credit and total number of branches in the country during the 1995-2002 period. The pattern is presented in Figure 1. The figure reveals that credit flows seem to peak at mid-1999, while the total number of branches more significantly increased between 1995 and 1998. Figure 1 also reveals a decelerating trend in the number of branches following the important consolidation move in 2000.

The increasing trend in the total number of branches in Portugal is comparable to what has happened in other countries such as Italy or Greece between 1997 and 2001. Table 1 presents an international comparison for the density of the number of branches across a selected group of countries at the end of the sample period. The total number of branches in Portugal per 1000 inhabitants was similar to what is observed in Germany, Italy or Austria but lower than in Belgium or Spain.

An inspection of the aggregated numbers in Figure 1 suggests that the merger and acquisition activity in 1998 and 2000 did not significantly affect the total credit figures but that is not necessarily so for the within group composition. In Figure 2 we present a closer look at the corporate changes and compute the market shares of total stock of credit for the main financial groups during the 1995-2002 period. We observe that the 2000 merger wave significantly changed the market share of some groups. Moreover, as illustrated in Figure 3, the banking groups involved in the 2000 merger wave experienced a larger gain in market shares than the remaining banks.

We also observe that after the merger wave there was some increase in the dispersion of interest rates of the larger banking groups (Figure 4). This heightened dispersion was mostly due to a relative increase in interest rates offered by the groups directly involved in the 2000 merger wave (Figure 5).

All this evidence suggests that the significant changes occurring in 2000 may have had important consequences in the credit market, namely on the credit flow granted, interest rate

charged and strategic effects among the financial players. This paper analyzes those changes.

3.2 Summary Statistics

Overall, there are 71 banks in the dataset that are in operation for at least one quarter during the sample period. Banks are grouped in 8 major financial groups: we consider the seven most important financial groups that include 26 banks and one additional group including the remaining banks in the sample. Four of these banking groups were directly involved in the 2000 merger wave.

Table 2 presents the summary statistics of our sample for the stock of credit, flows and other variables for three different groups of banks: i) the four large banking groups involved in the merger wave, ii) the three large banking groups not involved in the mergers, and iii) the remaining banks which were not involved in the merger wave. The average credit market share of a bank belonging to the group of banks engaged in mergers is 3.4 percent, while the large banks that do not belong to this group have on average 6.7 percent of the total stock of credit. In turn, the other banks not involved in mergers have only, on average, 0.6 percent of the credit market. This last evidence highlights the importance of treating these banks separately and, hence, they will be excluded from regression analysis.

The average interest rate on the total credit flow charged by the banks involved in mergers is 11.1 percent (9.2 percent for the other large banks and 8.5 for the smaller banks). The household market experiences higher interest rates (13.2, 10.4 and 10.2 percent for the groups of banks under analysis) than the corporate sector (9.9, 9.3 and 7.9 percent, respectively)[9].

These statistics refer to the entire sample period. We will analyse how the merger wave affected credit flows and interest rates, both for households and for firms.

[9]Most of the banks in the sample operate in both the household and the corporate credit markets, even though some small banks display null credit flows in one of these segments in some quarters. All banks considered grant credit to households and only two small banks never grant credit to firms during the entire sample period.

4 Analysis of Equilibrium in the Credit Market

The system of equations that characterizes the equilibrium in the credit market consists of equations (1) and (2). As we have previously discussed, (2) includes the interaction of bank i with each rival bank j. In order to simplify the empirical estimation, we have reduced the number of strategic effects and considered the interaction of bank i with its main rival, which is defined to be the financial institution with the lowest interest rate during the quarter, $R\min_{it}$.[10] As a consequence, the system to estimate is given by:

$$\begin{cases} \ln L_{it} = \alpha_0 + \alpha_1 \ln r_t + \alpha_2 \ln GDP_t + \phi_1 \ln B_{it} + \phi_2 \ln B_{-it} + \phi_3 \ln r_{it} + \\ +\phi_{41} POP_{it} + \phi_{42} LC_{it} + \varepsilon_{it} \\ \\ r_{it} = \beta_0 + \beta_1 c_{it} + \beta_2 R\min_{it} + \upsilon_{it} \\ \\ \beta_1 = \frac{\phi_3}{1+\phi_3} \\ \\ R\min_{it} = Min_{r_{jt}} \left[\frac{1}{n_t} \frac{L_{jt}}{L_{it}} (r_{jt} - c_{jt}) \right] \end{cases} \tag{3}$$

The system (3) also highlights the nonlinear constraint involving the parameters β_1 and ϕ_3, representing a link between equations (1) and (2).

The results are presented in Table 3. The model is estimated for quarterly data and covers the 1995-2002 period. Columns (1) to (4) characterize the equilibrium for the total credit granted, aggregating household and corporate credit, and columns (5) to (8) and (9) to (12) correspond to the estimations for the household and corporate sectors estimated separately. It should be noticed that, in this setting, we are able to differentiate banking output into household and firm loans without making any assumptions regarding their complementarity or substitutability, given that these are two different and independent markets. This implies null cross-elasticities of demand between these markets, given that, by definition, customers cannot switch between these two markets. Thus, specifying linear demand functions should

[10] We have tried different strategic effects and the results do not change significantly. For instance, we have considered (i) defining the main rival as the bank that has granted more credit during the quarter ($Xmax_{it}$), (ii) the interaction of the five main rivals, (iii) the average of the interaction of the five main rivals $\text{Xmax}_{it} = 1/5 \sum_{j=1,\ldots,5} X\max_{jt}$ or (iv) the interactions given by: $Xmax_{it} = (1/n_t) \sum_{i=1,..5} L\max_i / Lit * (r\max_i - c_{jt})$.

not inflict problems which would exist in markets where these cross-elasticities vary in response to different strategies[11].

In Table 3, columns (1)-(2), (5)-(6) and (9)-(10) are the results when we estimate equations (1) and (2) independently, while the remaining columns consider the constraint presented in the system described by (3). The system of equations is estimated using a seemingly unrelated (SUR) model, which allows for cross-equations correlation of the residuals. All regressions are executed using banks' fixed effects and robust standard errors.

Looking at the results for the aggregated credit flows, in columns (1) to (4), we observe that the total number of branches is positively and significantly related to the logarithm of total credit granted, indicating that local branching arrangements are an important factor in liquidity provision. In the SUR estimation, we obtain an estimate for $\phi_1$equal to 1.23, with a t-statistic of 3.96.

In addition, the interest rate charged by the bank is negatively related to the total credit granted[12]. As expected, the interest rate charged by the bank i, r_{it}, is strongly and positively related to the interbank market rate, c_t, which we use to proxy for the bank's costs. The estimate for the coefficient β_1 is, in the SUR model, 1.31, with a t-statistic of 31.1.

Although columns (1) to (4) reveal consistent estimates of the determinants of the credit and interest rates charged by the bank, the analysis for the aggregate credit flows smoothes important idiosyncratic characteristics of the determinants of the household and corporate sectors credit markets. Columns (5) to (8) present the results for equations (1) and (2) and system (3) for the household sector and columns (9) to (12) present a similar analysis for the corporate sector. The distinction across these institutional sectors highlights important differences in these markets, thus justifying a disaggregate specification rather than treating the credit market as a homogeneous market.

We observe that the banks' own number of branches positively influences credit granted,

[11] Berg and Kim (1998) empirically document such separability in the Norwegian market and present a discussion on cross-market interactions when banks produce multiple outputs.

[12] In the table, we omit the t-stats for this coefficient in columns (3), (7) and (11), as this coefficient is determined by the constraint in (3).

both to households and to firms (the estimated coefficients are 0.87 and 1.65, respectively). In turn, the number of branches of the remaining banks is not significantly correlated with credit granted to households, as illustrated in columns (5) and (7), while it has a negative and significant impact on credit supplied to the corporate sector.

Looking at the macro determinants, Table 3 reveals that the impact of the GDP level on credit granted is positive for both credit markets. Given that GDP reflects changes in global macroeconomic conditions and also changing industry risk, this result confirms the usually observed pro-cyclicality of liquidity provision[13]. However, this impact is statistically significant only for credit to households. On the other hand, local branch competition has a positive impact on the credit flow. This impact is fourfold larger in the corporate than in the household sector[14].

The results obtained from the regression estimates suggest that the influence of the rivals' strategic behaviour, measured by the coordination parameter λ, is not significantly different from zero, both for the corporate and household sectors.

Having analyzed the determinants of credit flow and interest rates for the household and corporate markets, we can now determine how these parameters change following bank mergers.

5 The Impact of the Merger Wave

This section analyzes the impact of the 2000 merger wave on the determinants of credit flows and interest rates. On the one hand, we are interested in the impact of the merger wave on the credit flow and interest rates charged and, on the other hand, we aim at determining how has the merger affected local branch competition and coordination moves in the banking industry.

In order to pursue this objective we consider two scenarios. The first scenario determines the differential impact of the merger. That is, we determine how has the impact of critical variables such as local branch competition and coordination moves among financial institutions

[13] Controlling for GDP should capture the most relevant time fixed effects.

[14] The estimated coefficient ϕ_{42} is 5.31 for households (with a t-statistic of 1.92) and 19.81 for firms (with a t-statistic of 6.06).

changed from the pre- to the post-merger period. In the second scenario, a new setup has been created in the post-merger period. Under this scenario, a comparison between the pre- and post-merger periods should be performed using the estimation for the post-merger period and the one that calculates the variables' impacts during the pre-merger period using post-merger data. This last estimation is commonly known as the *counterfactual*.

5.1 The Differential Impact of the Merger Wave

We first compute the differential impact of the merger on the equilibrium in the credit market. In particular, we are interested in determining how variables such as the strategic behaviour and local competition change after the merger. In order to pursue this objective, we consider a dummy variable $AFTER$ that has value one if the quarter is in year 2000 or after, and zero otherwise, and run a modified empirical model of (3):

$$\begin{cases} \ln L_{it} = \alpha_0 + \alpha_{01} AFTER + \alpha_1 \ln r_t + \alpha_2 \ln GDP_t + \phi_1 \ln B_{it} + \phi_2 \ln B_{-it} + \phi_3 \ln r_{it} + \\ +\phi_{41} POP_{it} + \phi_{42} LC_{it} + \phi_{43} LC_{it} * AFTER + \varepsilon_{it} \\ \\ r_{it} = \beta_0 + \beta_1 c_{it} + \beta_2 R\min_{it} + \beta_3 R\min_{it} * AFTER + \upsilon_{it} \\ \\ \beta_1 = \frac{\phi_3}{1+\phi_3} \\ \\ R\min_{it} = Min_{r_{jt}} \left[\frac{1}{n_t} \frac{L_{jt}}{L_{it}} (r_{jt} - c_{jt}) \right] \end{cases} \tag{4}$$

In this model, the coefficient α_{01} captures eventual changes in the level of credit flow after the merger wave and ϕ_{43} the difference in the impact of the local branch competition on the quarterly credit flow following the 2000 merger with respect to the impact during the pre-merger period. Using the coefficient β_3 and equation (2) we can compute a similar differential effect for the strategic interaction, λ, which we name λ_{after}.

The results for the differential impact are presented in Table 4. Columns (1) to (4) present the analysis for the total credit flow (household plus corporate credit) and columns (5) to (8) and (9) to (12) present the results for the household and corporate sectors, respectively. As

before, columns (1)-(2), (5)-(6) and (9)-(10) represent the first two equations of the model (4) without considering the non-linear constraint.

The first row of the estimated coefficients in Table 4 shows the results for the variable $AFTER$. The negative coefficients in columns (5) and (7) reveal that the quarterly credit flow decreased after the merger for the household sector, despite the decrease in interest rates (columns (6) and (8)). For the corporate sector, the sale of credit increased after the merger, as observed in columns (9) and (11), and the interest rate charged decreased, as shown in columns (10) and (12). Post-merger equilibrium loan rates decrease when the merger induces large cost advantages relative to the increase in banks' market power, as shown by Carletti et al (2007). Our results are consistent with Fonseca and Normann (2008), who argue that even though a merger involving the largest firm in a market creates a more asymmetric market structure, asymmetric markets exhibit lower prices than symmetric markets with the same number of firms.

For robustness purposes, we considered the possibility that the effect of bank mergers takes some time to be reflected in credit flows and interest rates. To test this possibility, we estimated the same regressions, but considering that the dummy variable $AFTER$ would take the value of unity only from 2001 onwards. The results for households remain broadly unchanged. For firms, we continue to observe the negative impact on interest rates, but the positive impact on credit ceases to be significant. Nevertheless, the impact of the mergers should have been felt almost immediately, as suggested by the rapid change in banks' names and identities.

Looking at the effect of local branch competition, we find that the positive impact was most significant for the corporate sector. In this credit market, we find that the merger leads to a decrease in the impact of local competition on the credit flow, but only for firms. Hence, the positive impact of local bank competition on credit granted to firms becomes slightly smaller (though still positive) after the merger wave.

The strategic effect of the main rival following the merger is presented in the last two group of rows in Table 4. We observe that there are no significant coordination moves between banks,

neither before nor after the mergers.

5.2 Counterfactual Analysis of the Merger Wave

The previous analysis computes a differential effect of specific variables and assumes that all remaining interactions remain constant. We now assume that a new scenario is created that influences all variables in the credit market. Under this scenario, the evaluation of the difference in strategic effect requires the comparison between the results for the post-merger period and the ones obtained from the estimation of the pre-merger impact using the post-merger data (counterfactual). The main disadvantage of this empirical estimation is that we need to restrict the analysis to the post-merger sub-sample. The main advantage is that we can analyze the pre-merger impact using the post-merger setup which is obviously a much more realistic assumption.

The way we construct the counterfactual for the empirical estimation is the following. We first estimate the model (3) for the 1995-1999 period and obtain estimations for the pre-merger impact. We then use the pre-merger coefficient estimates of this model for the 2000-2002 data to obtain the value of the estimated post-merger credit flows and interest rates charged by the bank. This means that these two estimated variables are the credit and interest rates practiced in the post-merger period assuming the impact of the market environment, strategic effects and local market competition in the pre-merger period.

We also consider the possibility of ignoring changes in the branch network after the mergers, given that the mergers should have had effects on the structure of the branch network and, most notably, on local bank competition. Hence, we also estimate counterfactual values for credit and interest rates by assuming that the branch network remains unchanged at pre-merger levels.

Table 5 presents the main counterfactual estimations. In the table, we distinguish two groups of financial institutions: (i) the ones that are directly involved in the merger wave and (ii) the ones that are not directly involved in the merger wave. By "directly involved" we mean that the financial group acquired or sold a financial institution to a different financial

group.[15]

We begin by comparing observed credit flows and interest rates in the pre- and post-merger periods. After the merger wave, loan flows were higher than in the pre-merger period, both for households and firms. It is worth noticing that this trend was stronger for the banks directly involved in the merger, given that the remaining banks actually recorded some decrease in loan flows, specially in what concerns loans to households. Comparing interest rate in the pre- and post- merger periods, we observe that there was a widespread decrease in interest rates after the mergers occurred, partly reflecting lower banks' funding costs arising from lower money market interest rates during this period, as well as from access to more varied funding sources after the integration in the European Monetary Union. However, the data clearly show that banks directly involved in the mergers decreased interest rates more aggressively than the other banks, narrowing their interest rate margins in order to attract more costumers and, possibly, also reflecting efficiency gains arising from the merger process.

In columns (3), (7) and (11), we present the counterfactual estimates of loan flows and interest rates. As described above, these estimates result from predicting these two variables for the post-merger period, by taking into account the pre-merger equilibrium and the post-merger environment. Hence, variables such as money market interest rates, GDP growth or number of branches are considered in the post-merger period to obtain these estimates.

Our estimates show that loan flows would have increased even more if mergers would not have occurred, though only for household loans. Still, this increase would be larger for the banks directly involved in the merger wave. Nevertheless, these banks would also be the ones with a larger increase in loan flows to the corporate sector. By comparing credit flows observed after the merger with the estimated post-merger flows, we continue to observe a difference in the estimated evolution of loans to households and to firms. On the one hand, the model predicts that household credit could be larger than what was actually observed (specially for the banks not involved in the merger wave). On the other hand, the model predicted

[15] As previously documented, out of the seven major financial groups, four were directly involved in the merger wave and three were not directly involved.

a slowdown in credit granted to firms, in striking contrast with the acceleration actually observed during this period. The difference between estimated and observed corporate loans was larger for the banks directly involved in the merger wave.

The counterfactual estimates also suggest that interest rates would still decrease if no merger had occurred. However, comparing these estimates to the post-merger observed values, we conclude that the observed decrease in interest rates was, by any means, larger than that predicted by the pre-merger equilibrium, even taking into account the developments in money market interest rates in the post-merger period. The most impressive difference comes from the interest rate on loans to firms applied by the banks involved in the merger wave, what may suggest efficiency gains arising from these mergers.

Finally, in columns (4), (8) and (12) we present the results for the counterfactual estimates when the branch network is assumed to remain unchanged at the pre-merger levels. This may be a strong assumption, given that it is unlikely that the branching structure and the intensity of local bank competition would not change between 1999 and 2002. However, without the mergers this branching network would probably be considerably different from the one actually observed, thus making relevant the results for this counterfactual estimation. In this version of the counterfactual, interest rates would be the same as in the previous counterfactual estimation, given that the model establishes that the number of branches does not directly affect interest rates charged by banks. However, in what concerns loan flows, the estimates show that if there were no changes in the branch network, the estimated loan flow would not be as high as predicted by the counterfactual which assumes changes in branches. This result is specially strong for corporate loans.

In sum, we observe that mergers have increased the amount of credit granted to firms and decreased the availability of loans to households. Moreover, the merger wave induced a stronger decrease in interest rates than what could be expected, thus benefiting consumers. These results are broadly consistent with those resulting from the differential analysis of the merger wave impacts, even though the counterfactual analysis provides a much more rigorous framework to disentangle the merger impacts, by relying on a structural model of equilibrium.

6 Concluding remarks

Bank mergers usually have important consequences in terms of bank competition, access to credit or loan pricing. However, the effects of bank mergers on these variables are hard to disentangle from other market and macroeconomic dynamic effects that occur simultaneously, affecting loan demand and supply, as well as its pricing. In this paper, we present a structural analysis of the impact of mergers in the Portuguese banking market. In the late 90s, several large banks were involved in a strong and fast consolidation process, thus providing an empirical setup to assess changes in market structure after the mergers.

Using a structural model, we derive the equilibrium in the pre-merger setting. Combining this estimated equilibrium with the post-merger environment, we are able to construct a counterfactual estimate of loans and interest rates. This allows us to compare the observed loan flows and interest rates with those resulting from the pre-merger equilibrium, thus assessing the impacts of the bank merger wave.

We obtain several interesting results. The interest rates observed after the mergers were lower than those predicted by the model, in the pre-merger equilibrium. This may reflect efficiency gains resulting from the mergers and translated into more competitive pricing. In turn, loan flows were smaller than those predicted by the counterfactual estimates. However, if we control for changes in the branching network occurring after the merger period, we observe that loan flows were stronger than what could have been observed without mergers.

There are, nonetheless, important differences between loans granted to households and to firms: whereas loans granted to households were in fact lower than what would be suggested using the pre-merger equilibrium, loans granted to firms actually recorded a stronger growth than what could have occurred if no mergers had taken place. All in all, households may have faced some constraints in access to credit after the merger, even though loans to households recorded robust growth rates during this period. On the contrary, loans granted to firms seem to have surpassed by a large extent the counterfactual estimates.

The counterfactual estimates also highlight important differences between the banks di-

rectly involved in the merger wave and the remaining large banking groups. The banks directly involved in this process decreased their interest rates on corporate loans much more aggressively than other banks. Simultaneously, credit granted to firms by these banks was also much larger than what could have been expected if no mergers had occurred. In turn, the estimated decrease of loans granted to households assumed a larger magnitude for the banks who did not directly participate in the merger wave.

The structural model used to perform these counterfactual estimates allows to clearly identify the effects of bank mergers on credit and interest rates. Changes in market equilibrium resulting from mergers affect banks' decisions, as well as their strategic interactions. Potential efficiency gains seem to haven been transmitted to customers through lower lending rates and firms have faced less bank financing constraints than they otherwise would.

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Figures and tables

Figure 1
Credit and total number of branches

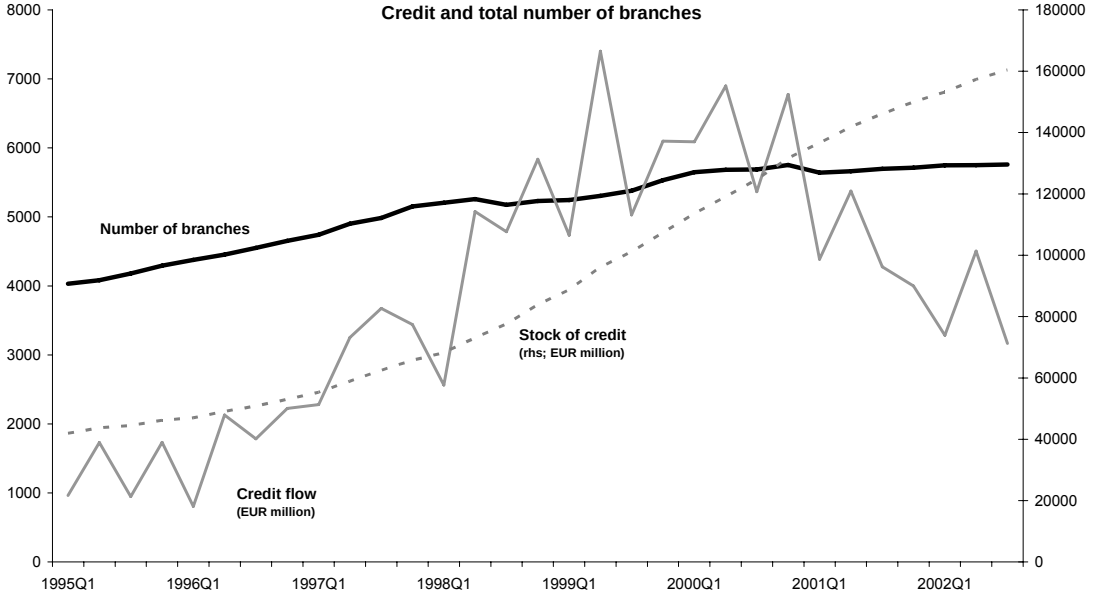

Figure 2
Market shares of the major financial groups (by stock of credit)

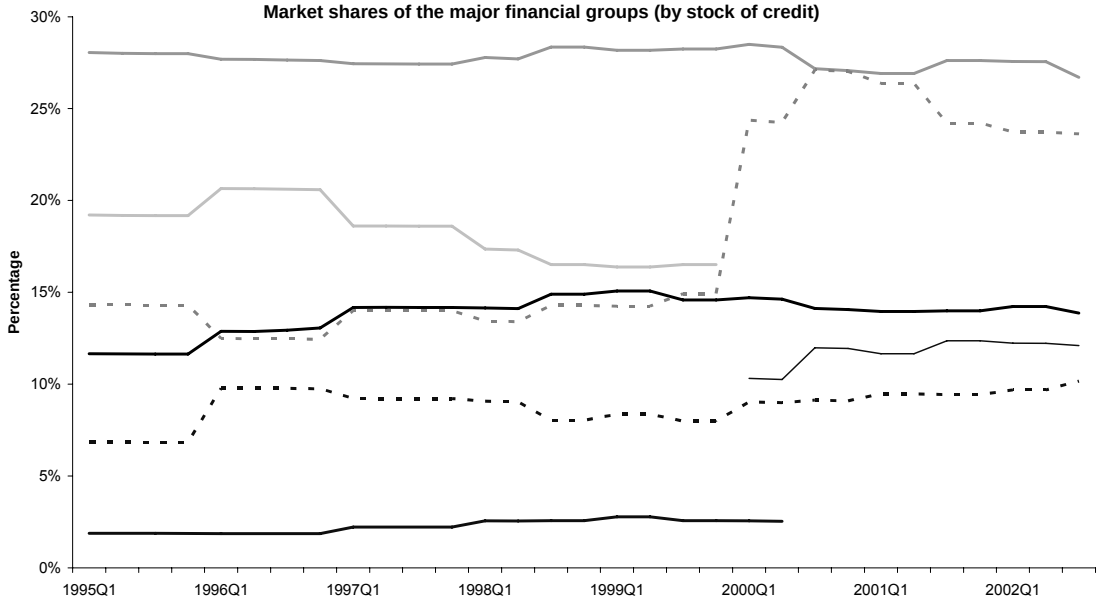

Figure 3

Market shares of the groups involved in mergers and of the remaining banks

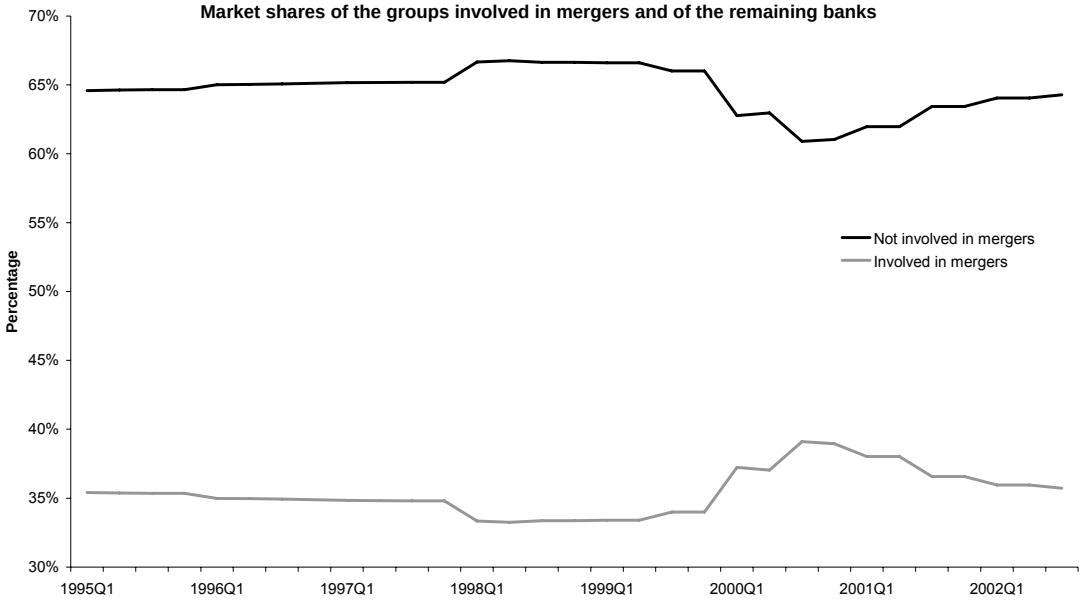

Figure 4

Relative interest rates of the major financial groups

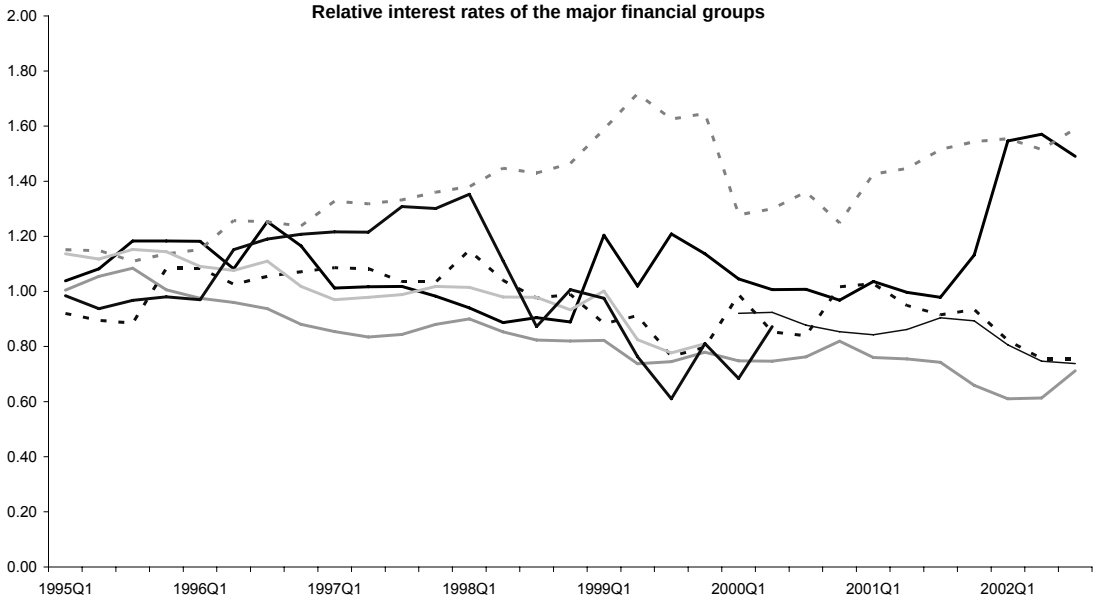

Figure 5

Relative interest rates of the groups involved in mergers and of the remaining banks

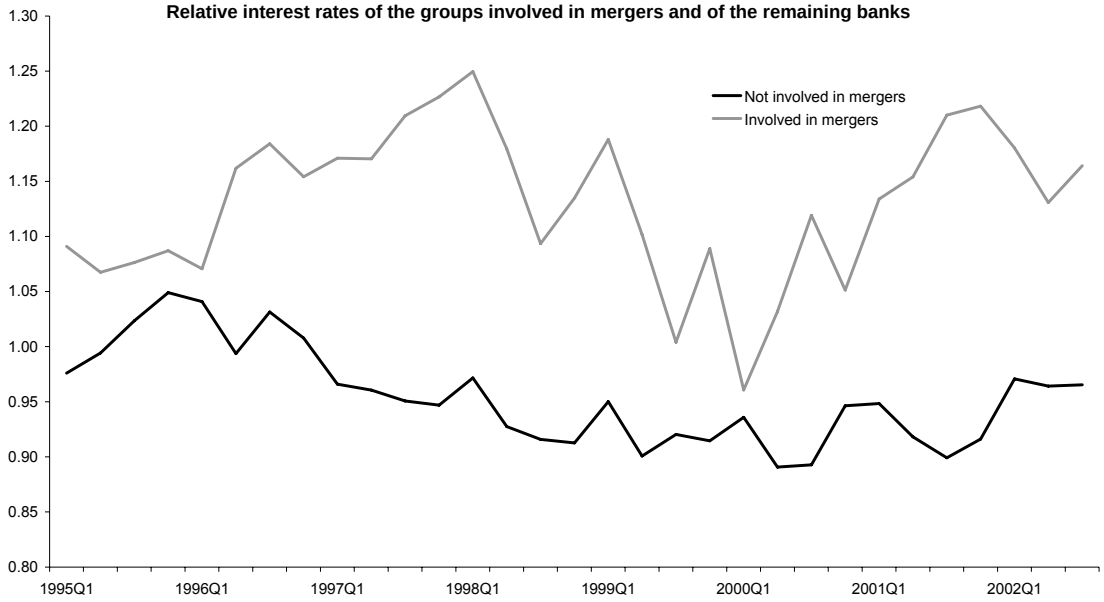

Table 1: International Comparison

Sources: EU countries - Structural Analysis of the EU banking sector (ECB, November 2002)
USA - Federal Reserve Statistical Release; CIA World factbook; Bureau of economic analysis;U.S. Census Bureau, Population Division
Germany- Deutsche Bundesbank Banking Statistics
Report on financial structures (ECB,2002)

	Assets per GDP			Number of Branches per 1000 inhabitants			Number of Branches per km2		
	1997	2000	2001	1997	2000	2001	1997	2000	2001
Belgium	3.06	2.82	3.03	0.72	0.64	0.60	0.237	0.213	0.199
Denmark	2.11	2.45	2.6	0.43	0.44	0.44	0.033	0.034	0.034
Germany	2.56	2.99	3.04	0.57	0.53	0.50	0.132	0.121	0.115
Greece	1.07	1.56	1.55	0.24	0.27	0.28	0.019	0.022	0.022
Spain	1.7	1.85	1.93	0.97	0.98	0.97	0.075	0.078	0.077
France	2.44	2.47	2.57	0.44	0.43	0.44	0.047	0.047	0.048
Italy	1.56	1.52	1.52	0.44	0.49	0.51	0.084	0.094	0.097
Netherlands	2.31	2.86	2.98	0.43	0.37	0.33	0.200	0.176	0.154
Austria	2.27	2.58	2.72	0.58	0.56	0.56	0.056	0.054	0.054
Portugal	2.37	2.74	2.87	0.48	0.55	0.54	0.052	0.062	0.060
Finland	0.97	0.99	1.23	0.25	0.23	0.23	0.004	0.004	0.004
United States	0.58	0.63	0.64	0.23	0.23	0.23	0.006	0.007	0.007

Table 2 - Summary statistics

In the table all credit values are in Eur million
Interest rates are annualized.
Market shares displayed as percentages.

	Banks involved in mergers					Large banks not involved in mergers					Other banks not involved in mergers				
	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max	Obs	Mean	Std. Dev.	Min	Max
Stock of credit															
Total stock of credit	323	2751	5134	1.5	31866	232	5422	7270	0.04	37014	791	419	580	0.24	3268
Stock of household credit	195	1509	2596	0	12245	148	3924	5544	0	23904	543	140	250	0	1511
Stock of corporate sector credit	195	2002	4002	0	20290	148	2610	3092	0	12898	543	308	434	0	2321
Number of branches	323	175	249	1	1312	232	242	229	1	786	791	26	44	1	217
Market share of the bank (total credit)	323	3.4	4	0.0	26.1	232	6.7	8	0.0	27.4	791	0.6	1	0.0	3.9
Market share (household credit)	195	2.9	4	0.0	21.2	148	7.9	11	0.0	35.3	543	0.3	1	0.0	3.0
Market share (corporate sector credit)	195	4.0	7	0.0	31.8	148	5.2	5	0.0	20.3	543	0.6	1	0.0	4.4
Flow of credit															
Total credit flow	323	2268	6064	0.2	39776	232	1903	2866	0	16420	791	314	555	0	3514
Credit flow (households)	323	318	761	0	5769	232	401	567	0	2750	791	41	78	0	437
Credit flow (corporate sector)	323	1950	5335	0	35655	232	1502	2341	0	13812	791	273	496	0	3116
Interest rates															
Interest rate	323	11.1	5	3.2	25.7	232	9.2	4	3.8	20.0	791	8.5	4	2.6	23.6
Interest rate (household credit)	287	13.2	5	3.2	25.7	213	10.4	4	3.2	20.0	622	10.2	5	1.5	28.0
Interest rate (corporate sector credit)	264	9.9	4	3.1	23.5	226	9.3	4	3.8	18.8	736	7.9	3	2.6	22.3
Interbank market rate	323	5.2	2	2.4	9.1	232	5.0	2	2.4	9.1	791	4.9	2	2.4	9.1
Bank specific and demographic variables															
ROA	323	0.003	0.0	-0.1	0.03	232	0.003	0.0	-0.1	0.02	791	0.001	0.0	-0.3	0.04
LC	323	0.3	0.3	0.1	1.0	232	0.3	0.3	0.1	1.0	791	0.5	0.3	0.1	1.0
POP	323	14.0	3.8	9.4	21.4	232	13.0	3.7	2.4	21.4	791	15.0	5.1	2.5	21.4

Table 3 - Characterization of the determinants of credit flows and interest rates

In the table we define: $X_{max} = (1/n_{banks}) * L_{maxi} / L_{it} * (r_{meanmax} - tdBP)$. We include banks' fixed effects and robust standard errors.
Robust t statistics are presented in parentheses. * significant at 10%; ** significant at 5%; *** signficant at 1%.
The t statistics for the coefficient associated with ln(rit) in columns (3), (7) and (11) are omitted, as this coefficient is determined by a constraint in the model.
The estimations are performed for quarterly data during the 1995-2002 period.

	Total credit flows				Households				Firms			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	OLS	OLS	System of equations		OLS	OLS	System of equations		OLS	OLS	System of equations	
	ln(Credit)	r_{it}	ln(Credit)	r_{it}	ln(Credit)	r_{it}	ln(Credit)	r_{it}	ln(Credit)	r_{it}	ln(Credit)	r_{it}
ln(number of branches)	1.224 **		1.233 ***		0.849 **		0.870 **		1.644 *		1.652 ***	
	(2.08)		(3.96)		(2.48)		(2.45)		(1.83)		(3.53)	
ln(number of branches other banks)	-0.897		-0.956		0.377		0.428		-3.237 ***		-3.065 ***	
	-(1.13)		-(1.37)		(0.60)		(0.62)		-(2.84)		-(3.21)	
$ln(r_t)$	-0.063		-0.509 *		-0.224		-0.138		-0.416		-0.316	
	-(0.17)		-(1.73)		-(0.55)		-(0.35)		-(0.61)		-(0.65)	
$ln(r_{it})$	-0.612 ***		-0.178 ***		-1.078 ***		-1.154 ***		-1.099 **		-1.196 ***	
	-(2.80)		-		-(4.32)		-		-(2.52)		-	
GDP	0.032		0.029		0.078 ***		0.076 ***		0.013		0.002	
	(1.43)		(1.39)		(3.26)		(3.14)		(0.39)		(0.06)	
POP	0.085		0.075		0.012		0.014		-0.207		-0.191	
	(0.50)		(0.96)		(0.12)		(0.13)		-(0.70)		-(1.63)	
LC	8.119 *		7.986 ***		5.276 *		5.314 *		20.389 ***		19.809 ***	
	(1.66)		(3.51)		(1.76)		(1.92)		(2.88)		(6.16)	
c_t		1.308 ***		1.305 ***		1.316 ***		1.316 ***		1.319 ***		1.320 ***
		(27.91)		(31.11)		(21.90)		(25.45)		(26.72)		(26.56)
Rmin		1.487		-1.534		0.100		0.065		0.167 ***		0.163 ***
		(0.84)		-(0.30)		(0.08)		(0.06)		(3.08)		(3.82)
constant	5.597	3.651 ***	6.280	3.672 ***	-2.423	4.692 ***	-2.957	4.692 ***	26.635 **	3.807 ***	25.313 ***	3.797 ***
	(0.75)	(5.46)	(0.98)	(5.58)	-(0.40)	(7.49)	-(0.45)	(6.03)	(2.51)	(5.24)	(2.76)	(5.15)
Lambda (λ)				-3.549				1.021				1.133
$H_0 = \lambda = 0$ [$\chi^2(1)$]				0.09				0.00				0.41
Observations	562	562	562	562	507	507	507	507	496	496	496	496
R-squared	0.90	0.82			0.92	0.78			0.85	0.72		

Table 4 - Analysis of the differential imapct of the merger wave

In the table we define: $X_{max} = (1/n_{banks}) * L_{maxi} / L_{it} * (r_{meanmax} - tdBP)$. We include banks' fixed effects and robust standard errors.
Robust t statistics are presented in parentheses. * significant at 10%; ** significant at 5%; *** signficant at 1%
The t statistics for the coefficient associated with ln(rit) in columns (3), (7) and (11) are omitted, as this coefficient is determined by a constraint in the model.
The estimations are performed for quarterly data during the 1995-2002 period.

	Total credit flows				Households				Firms			
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
	OLS	OLS	System of equations		OLS	OLS	System of equations		OLS	OLS	System of equations	
	ln(Credit)	r_{it}	ln(Credit)	r_{it}	ln(Credit)	r_{it}	ln(Credit)	r_{it}	ln(Credit)	r_{it}	ln(Credit)	r_{it}
AFTER	0.350 **	-1.400	0.311 *	-1.419 ***	-0.473 ***	-1.866 ***	-0.480 ***	-1.869 ***	0.957 ***	-1.721 ***	0.964 ***	-1.722 ***
	(2.25)	-(7.85)	(1.90)	-(7.52)	-(3.12)	-(8.62)	-(3.07)	-(8.05)	(4.38)	-(8.42)	(4.45)	-(7.85)
ln(number of branches)	0.948		0.955 ***		0.987 ***		1.025 ***		1.166		1.163 **	
	(1.60)		(3.03)		(3.01)		(2.81)		(1.31)		(2.49)	
ln(number of branches other banks)	-0.925		-0.783		0.525		0.707		-3.421 ***		-3.273 ***	
	-(1.13)		-(1.11)		(0.82)		(1.03)		-(3.03)		-(3.50)	
$ln(r_t)$	-0.036		-0.145		0.137		0.296		-0.716		-0.491	
	-(0.10)		-(0.42)		(0.33)		(0.70)		-(1.10)		-(0.94)	
$ln(r_{it})$	-0.658 ***		-0.296 ***		-1.032 ***		-1.064 ***		-1.135 ***		-1.266 ***	
	-(3.03)		-		-(4.13)		-		-(2.67)		-	
GDP	0.030		0.048		0.130 ***		0.131 ***		-0.043		-0.042	
	(0.95)		(1.59)		(3.77)		(4.05)		-(0.94)		-(0.85)	
POP	0.133		0.138 *		-0.022		-0.019		-0.220		-0.206 *	
	(0.81)		(1.77)		-(0.20)		-(0.17)		-(0.79)		-(1.81)	
LC	6.131		5.762 **		6.442 **		6.389 **		17.591 **		17.158 ***	
	(1.27)		(2.51)		(2.19)		(2.25)		(2.54)		(5.39)	
LC*AFTER	-0.990 ***		-1.033 ***		0.474		0.461		-2.295 ***		-2.278 ***	
	-(3.10)		-(4.09)		(0.99)		(1.46)		-(5.04)		-(5.19)	
c_t		1.171 ***		1.166 ***		1.143 ***		1.145 ***		1.177 ***		1.177 ***
		(24.61)		(26.26)		(18.75)		(21.53)		(23.25)		(23.32)
Rmin		-5.468		-12.305		-0.400		-1.013		0.659 **		0.646 ***
		-(0.69)		-(1.12)		-(0.31)		-(0.93)		(2.16)		(4.52)
Rmin*AFTER		5.525		10.182		-5.349		-7.604		-0.501 *		-0.490 ***
		(0.70)		(0.83)		-(0.47)		-(0.51)		-(1.68)		-(3.36)
constant	7.019	4.501 ***	4.793	4.534 ***	-6.336	5.763 ***	-8.402	5.751 ***	33.217 ***	4.685 ***	31.669 ***	4.688 ***
	(0.89)	(7.07)	(0.71)	(7.09)	-(0.98)	(9.45)	-(1.25)	(7.73)	(2.96)	(6.73)	(3.46)	(6.72)
Lambda (λ)				-110.0				7.1				3.0
$H_0 = \lambda = 0$ [$\chi^2(1)$]				0.15				0.32				0.85
Lambda*AFTER (λ_{after})				91.1				52.9				-2.3
$H_0 = \lambda = 0$ [$\chi^2(1)$]				0.14				0.17				0.82
Observations	562	562	562	562	507	507	507	507	496	496	496	496
R-squared	0.90	0.84			0.92	0.80			0.86	0.76		

Table 5 - Analysis credit flows and interest rate levels in different scenarios

In the table we present average values for the 7 largest banking groups.
The group of financial institutions directly involved in the merger represent financial institutions belonging to financial groups that during 2000 have acquired or sold a financial institution to a different financial group.
The sample consists of quarterly data. The pre-merger period comprehends the 1995-1999 period.
The after-merger period consists of the 2000-2002 period.

	All banks				Banks directly involved in mergers				Banks not directly involved in mergers			
	Observed in the pre-merger period	Observed in the post-merger period	Estimated for the after-merger period (without merger effect)	Estimated for the after-merger period (keeping branch network at pre-merger levels)	Observed in the pre-merger period	Observed in the post-merger period	Estimated for the after-merger period (without merger effect)	Estimated for the after-merger period (keeping branch network at pre-merger levels)	Observed in the pre-merger period	Observed in the post-merger period	Estimated for the after-merger period (without merger effect)	Estimated for the after-merger period (keeping branch network at pre-merger levels)
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)	(10)	(11)	(12)
Credit flows (ln)												
Total	5.76	5.81	6.01	4.96	5.50	5.76	5.42	4.28	6.16	5.88	6.74	5.81
Households	4.10	4.77	5.29	5.07	3.74	5.07	5.17	5.06	4.60	4.37	5.45	5.08
Firms	5.59	6.01	4.49	3.86	5.39	6.14	4.10	3.20	5.84	5.89	4.86	4.48
Interest rates												
Total	11.46	8.20	9.21	9.21	12.18	8.92	10.33	10.33	10.39	7.30	7.81	7.81
Households	13.31	9.37	10.83	10.83	14.49	10.46	12.04	12.04	11.68	7.96	9.29	9.29
Firms	11.03	6.83	8.59	8.59	11.30	6.58	9.16	9.16	10.68	7.07	8.04	8.04