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ABSTRACT

This paper forms part of the research on the transmission of monetary policy via the interest rates of Spanish banks and savings banks, analysed from a disaggregated perspective. In this respect, it considers structural factors that cannot be taken into account in more aggregated studies, as for example the different characteristics of the markets where credit institutions operate.

The study's objective is to analyse the differences in the velocity and degree of responsiveness of lending and deposit rates to movements in interbank rates, according to the institutions' product specialisation. To this end, it explores the information available for each institution over the period 1991-1994, drawing on quarterly data.

The results obtained evidence of the differences between banks whose core business is traditional retail banking and more specialised banks, which are much more sensitive to market conditions, particularly on the deposit side.

In addition, the findings point towards more competitive behaviour in the establishment of lending rates than in the case of deposits.

I. INTRODUCTION

The analysis of the monetary policy transmission mechanism is decisive in understanding and assessing the impact of the measures taken by the monetary authority -through the instruments available to it, above all the intervention rate- on the variables that affect its final targets.

The monetary policy target of the Banco de España is the control of inflation, and it uses the intervention rate to send signals to the system. Monetary impulses pass through a complex transmission process in which diverse markets, agents and variables intervene, ultimately affecting the nominal expenditure of the economy.

Basically, the transmission mechanism operates via the behaviour of three variables[1]: the exchange rate, market interest rates, and expectations -variables which are, in turn, inter-related.

The transmission mechanism via interest rates has been specifically addressed in a number of studies, both at the aggregate level (see, for example, Sastre, 1991, and Mestre, 1995) and the disaggregated level, that examine its effects on different sectors of the economy (see, for example, Escrivá and Haldane, 1994, Estrada et al., 1994, Hernando, 1995, and Peñalosa, 1995). The latter works have shown the importance of disaggregation by type of agent, instrument and term in analysing the transmission process.

Given the significant role played by credit institutions in the intermediation of the financial flows of an economy, one particularly important area of study is how they set their price policies. In this respect, the product specialisation of credit institutions (see Sánchez and Sastre, 1995) -and, by extension, the type of customer with which they

[1] For a more detailed analysis, see, for example, Peñalosa (1995).

deal- deserves special attention. The fact that the institutions' price policies differ raises the question of the importance of the structural elements of the markets where they operate and the degree and the velocity of the adjustments of lending and deposit rates to money market rates (see, for example, Borio and Fritz, 1995).

This paper is a first approximation to these issues for the Spanish case, using the information available for each institution -here banks and savings banks are considered- for a given period -panel data.

The first problem that arises in analysing the prices of credit institutions is the choice of representative indicators, due to the high degree of substitutability among the bank assets and liabilities for which interest rates are set. If the study is to be manageable, each and every instrument, and the relations between them, cannot be analysed. Either several of these instruments must be selected more or less discretionally, or composite indicators, reflecting the institutions' price policies, must be constructed.

In this paper, we chose the second method, constructing the aforementioned indicators to obtain composite rates for the lending and borrowing transactions of Spanish banks and savings banks with their customers. The use of composite rates, rather than a selection of interest rates of representative transactions, is preferable in view of the fact that cost accounting, which allows individual price-setting for each product and service, is so far not a very widespread practice in Spain, and thus it seems plausible to assume that credit institutions set their price policies for certain groups of highly substitutable assets and liabilities. Within these groups of assets/liabilities, the institutions practice a certain price discrimination, depending on the type of customer at which the transactions are targeted. By way of example, credit institutions can attempt to offset changes in the yield of a given type of deposit characterised by a high degree of sensitivity to prevailing market conditions with changes in other deposits characterised by a greater degree of customer loyalty.

Composite rates were computed for each of the institutions, taking account of the heterogeneity observed among them. In this respect, our study differs from others in which composite rates are calculated for aggregate groups of institutions, namely banks and savings banks (see Cuenca, 1994). Thus, the characteristics of the price policies of banks and savings banks in their customer relations were drawn up at an individual level for the period 1988-1994, and this in turn allowed the construction of indicators for the different groups of institutions, classified according to their product specialisation (see Sánchez and Sastre, 1995).

These indicators allowed us to analyse the characteristics of credit institutions' price policies and their relation to one of the key determinants in prices, i.e. interbank rates, whose behaviour is closely related to the signals sent by monetary policy. The study shows that the dynamics of the institutions' price adjustments to changes in interbank rates depend on each one's product specialisation.

These findings are consistent with the conclusions of studies focusing on concrete countries (see, for example, the case of Italy in Cottarelli, Ferri and Generale, 1995, and Angeloni et al., 1995) and of others that analyse the differences in the monetary policy transmission mechanisms in several OECD countries in terms of the characteristics of their respective financial and banking systems (see Cottarelli and Kourelis, 1994).

Starting from the relationship between the price policies of credit institutions and interbank rates, it is possible to arrive at hypotheses on the degree of competition that exists in the markets where these prices are set and the price elasticities of the institutions' customers (see Sumner, 1981, Catalao, 1994, and Hannan and Liang, 1993).

The paper is structured as follows. Section II presents the main features of the lending and deposit rates calculated for each group of institutions. An estimation is also given of the percentage of interest-bearing sight deposits at banks and savings banks, demonstrating the heterogeneous behaviour within the group formed by banks. Section III

describes the differences in the price policies of the groups of banks and savings banks classified by product specialisation. Section IV gives an estimation of the relationship between the price policies of the groups in question and interbank rates, from which hypotheses can be drawn as to the institutions' leeway for setting prices according to the markets where they operate. Lastly, Section V presents the conclusions, including several macroeconomic implications derived from the results obtained. The details of the construction of the composite rates and the models used are given in Appendices I and II, respectively.

II. MAIN FEATURES OF THE INTEREST RATE DISTRIBUTION OF BANKS AND SAVINGS BANKS

The composite interest rates used as indicators of the price policies of banks and savings banks in transactions with customers were calculated as the weighted averages of their lending and deposit rates, in which the weighting was determined by the share of each instrument in the total lending and deposit transactions considered (see Appendix I for fuller details).

Tables 1 and 2 give the distribution of the composite lending and deposit rates of banks and savings banks. As shown, during the 1988-1994 period, the composite deposit rate of banks was approximately one percentage point higher than that of savings banks. This reflects the historically stronger competition among banks than among savings banks to capture deposits, derived from the differences in the type of customer of the two groups. Since 1990, however, the composite deposit rates of banks and savings banks have become steadily more aligned, a process that became particularly intense in 1994. This phenomenon is not unrelated to the increasingly more competitive behaviour of several major savings banks, whose activity has become increasingly similar to that of banks, and it also reflects the more homogeneous regulations governing the two groups. The composite lending rates of both groups also trended in the same direction, with their respective rates reaching very similar levels.

Meanwhile, throughout the period, the intra-group variability of the price policies of banks was notably greater than that of savings banks. This is explained by the fact that the bank aggregate is more heterogeneous than in the case of savings banks, due to the more diverse activities of banks. This result raises the question of whether the traditional disaggregation between banks and savings banks adequately reflects the differences in their conduct, or whether the bank aggregate includes a group of institutions that is so heterogeneous that it could bias the analysis of the relationship between the variables in aggregate terms.

Table 1

DISTRIBUTION OF THE COMPOSITE LENDING RATE

Year	1st quartile (Q1)		Median		3rd quartile (Q1)		Inter-quartile range (Q3 - Q1)	
	Banks	Savings banks	Banks	Savings banks	Banks	Savings banks	Banks	Savings banks
1988	13.7	14.3	14.7	14.8	15.7	15.6	2.1	1.3
1989	15.4	14.7	16.2	15.4	17.0	15.2	1.6	1.5
1990	16.2	15.1	17.0	16.7	17.9	17.6	1.7	1.5
1991	15.0	15.7	15.3	16.5	17.2	17.3	2.2	1.6
1992	14.7	14.9	15.8	15.7	16.6	16.4	1.9	1.5
1992	13.1	14.1	14.9	15.0	16.3	16.1	3.1	2.0
1994	10.0	11.1	11.0	11.7	12.1	12.5	2.5	1.4
1988-1994	13.7	14.3	15.6	15.4	16.9	16.5	3.1	2.1

Table 2

DISTRIBUTION OF THE COMPOSITE DEPOSIT RATE

Year	1st quartile (Q1)		Median		3rd quartile (Q3)		Inter-quartile range (Q3 - Q1)	
	Banks	Savings banks	Banks	Savings banks	Banks	Savings banks	Banks	Savings banks
1989	6.2	5.6	7.1	6.1	8.5	7.3	2.3	1.7
1989	6.9	5.9	8.0	6.7	10.5	7.9	3.7	2.0
1990	8.1	6.8	9.5	7.5	11.4	9.1	3.2	2.3
1991	8.0	6.9	9.2	7.6	10.8	9.0	2.8	2.1
1992	8.0	7.0	9.1	7.7	10.6	9.1	2.6	2.1
1993	7.5	6.7	8.8	7.7	10.1	8.9	2.6	2.2
1994	5.3	5.0	6.1	5.6	7.2	6.3	1.8	1.3
1988-1994	7.0	5.9	8.4	6.8	10.2	7.7	3.3	1.7

Table 3 shows the distribution of the estimated proportion of low-yield sight deposits in the two groups. Interestingly enough, the proportion is higher for savings banks than for banks, once again reflecting the behavioral differences between the two. Savings banks have characteristically obtained most of their funds from term deposits, conferring little importance to yields on sight deposits. However, beginning in 1990, with the greater competition for customers' funds, they were forced to increase the remuneration on these deposits to prevent their shift to other institutions offering higher yields. As a result, in the years 1991-1993, the difference in the percentage of interest-bearing sight deposits of banks and savings banks narrowed. In any case, the percentage of low-yield deposits within the total volume of sight deposits in both groups of institutions is still high, surpassing 40%, according to our estimates[2].

One point worth underscoring is that, until 1990, the intra-group variability of this percentage -measured by the inter-quartile range- was higher for banks than for savings banks, due once again to the greater heterogeneity in the business of institutions in the bank group. As of that year, the heterogeneity of savings banks tended to increase and that of banks to decrease, causing the degree of dispersion within the two groups to converge.

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[2] These estimates are similar to those at the aggregate level in Cuenca (1993).

Table 3

DISTRIBUTION OF THE PROPORTION OF LOW-YIELD DEPOSITS

Year	First quartile Q1		Median		Third quartile Q3		Inter-quartile range (Q3 - Q1)	
	Banks	Savings banks	Banks	Savings banks	Banks	Savings banks	Banks	Savings banks
1988	0.42	0.70	0.61	0.83	0.81	0.94	0.39	0.24
1989	0.37	0.60	0.60	0.77	0.75	0.90	0.38	0.30
1990	0.28	0.47	0.46	0.60	0.64	0.77	0.36	0.30
1991	0.27	0.30	0.41	0.51	0.56	0.65	0.29	0.35
1992	0.25	0.30	0.43	0.52	0.56	0.62	0.31	0.32
1993	0.26	0.31	0.43	0.51	0.55	0.63	0.29	0.32
1994	0.24	0.33	0.43	0.51	0.57	0.64	0.34	0.31

III. PRODUCT SPECIALISATION AND PRICE POLICIES

As already shown in the preceding section and in a number of studies (see, for example, Sánchez and Sastre, 1995, and Manzano and Sastre, 1995), the behaviour of credit institutions, and the bank group in particular, is highly heterogeneous. This makes it more difficult to analyse the bank group in aggregate terms.

In Sánchez and Sastre (1995), there is evidence that product specialisation is a basic factor in explaining the differences in the behaviour of credit institutions. Product specialisation is related to the activity in certain markets, size, and other features of a markedly structural nature.

For these reasons, it is worthwhile examining the extent to which the price policies of the groups differ, depending on their product specialisation.

Sánchez and Sastre (1995) distinguish the following groups in terms of product specialisation:

Group 1: Basically formed by national banks specialised in commercial banking, representing 37% of the total credit institutions studied.

Group 2: Consisting almost entirely of savings banks, accounting for 33% of the total.

Group 3: Mostly formed by foreign banks, representing 18% of the total.

Group 4: Encompassing merchant banks and banks active in lines of business other than commercial banking, accounting for around 12% of the total.

Charts 1 and 2 show the lending and deposit rates applied to customers[3], reflecting the differences in the behaviour of the four groups.

In general, the rates of Groups 1 and 2, mostly specialised in retail banking, present similar patterns of behaviour and also a lesser degree of intra-group variability (see Tables 4 and 5).

Note that in Groups 3 and 4, mainly formed by foreign banks and non-commercial banks, the lending rate as of 1990 remained clearly below that of the other groups, whose rates were more similar. Also, the deposit rates of Groups 1 and 2, specialised in commercial banking, were

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(3) The rates for each strategic group were calculated from a weighted average based on the composite rates obtained for each institution.

Chart 1

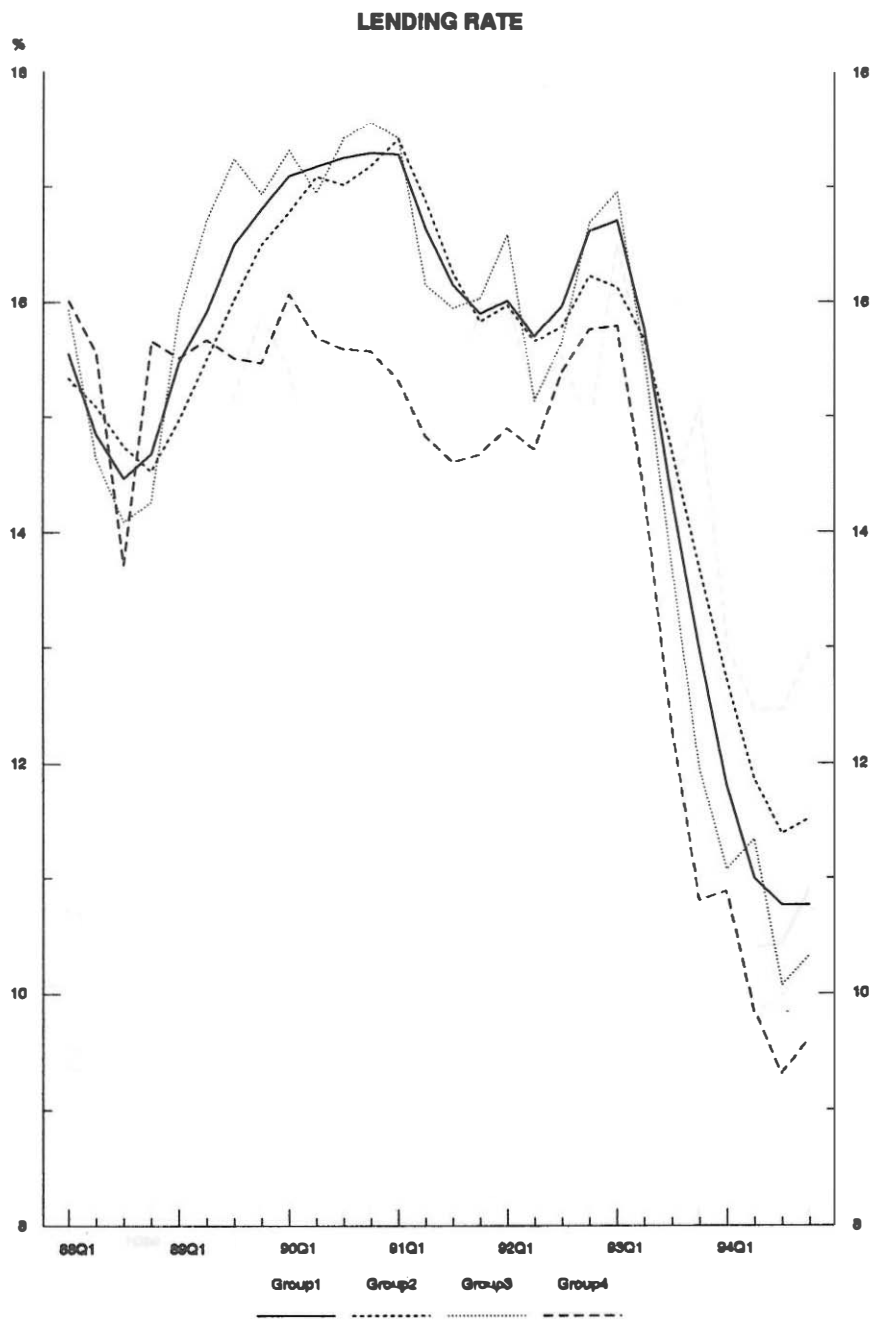

LENDING RATE
%
18
16
14
12
10
8
88Q1
89Q1
90Q1
91Q1
92Q1
93Q1
94Q1
Group1
Group2
Group3
Group4

Chart 2

DEPOSIT RATE

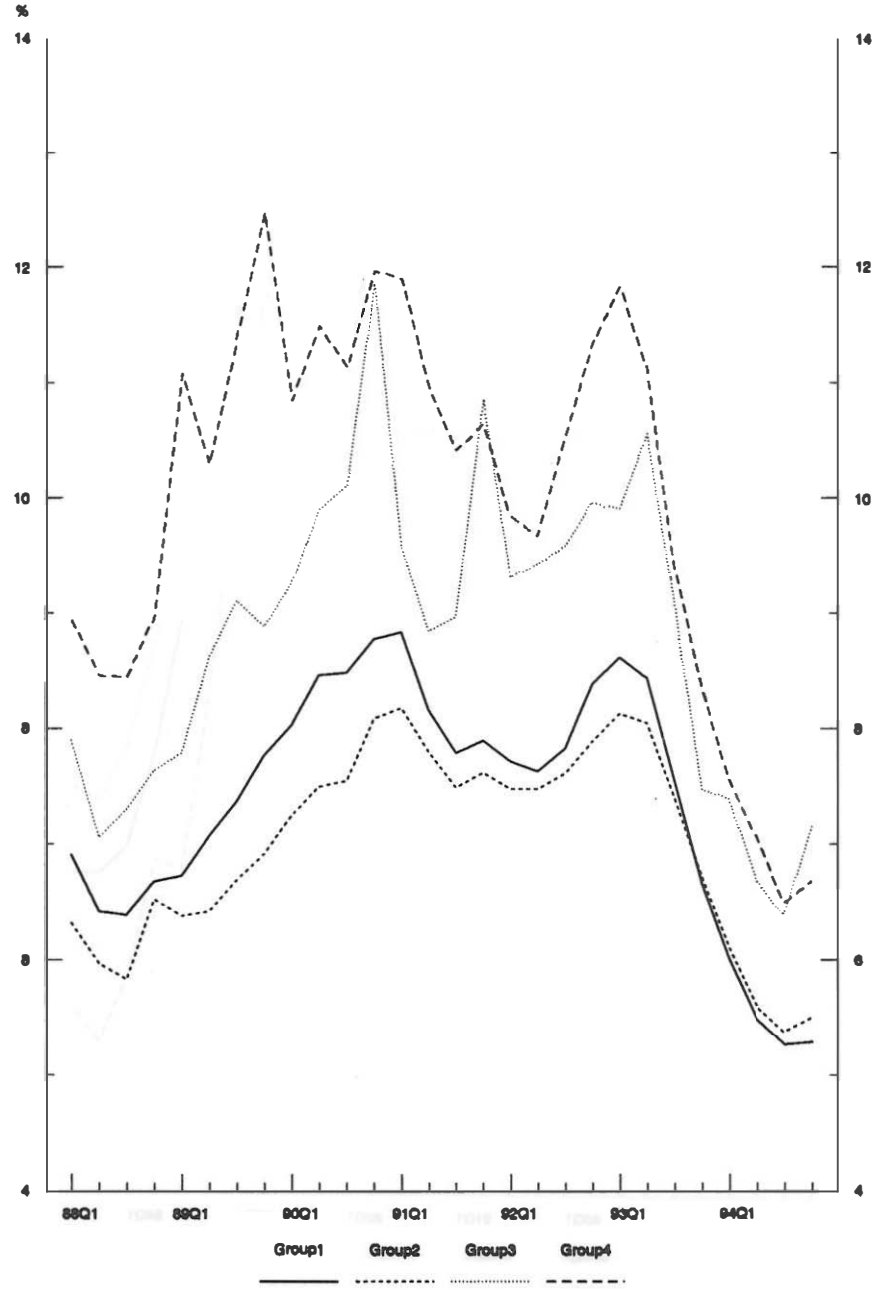


Table 4

COMPOSITE LENDING RATE

YEAR	GROUP 1 NATIONAL COMMERCIAL BANKS			GROUP 2 SAVINGS BANKS			GROUP 3 FOREIGN BANKS			GROUP 4 MERCHANT BANKS		
	Average	Median	Inter-quartile range	Average	Median	Inter-quartile range	Average	Median	Inter-quartile range	Average	Median	Inter-quartile range
1990	17.3	17.3	1.4	17.0	16.9	1.7	16.5	16.4	1.6	16.5	16.9	2.0
1991	16.7	16.7	1.6	16.6	16.5	1.7	15.2	15.2	2.6	15.6	15.8	3.0
1991	16.2	16.8	1.3	15.8	15.7	1.5	14.9	14.7	1.9	15.5	15.2	1.9
1991	15.4	15.6	2.5	14.9	15.0	2.0	13.9	14.0	3.5	14.2	14.3	3.3
1994	11.7	11.5	1.6	11.7	11.6	1.5	10.3	9.7	2.2	10.9	10.3	2.1
1990-1994	15.6	16.1	2.6	15.2	15.6	2.7	14.2	14.8	3.4	15.5	14.9	4.2

Table 5

COMPOSITE DEPOSIT RATE

YEAR	GROUP 1 CENTRAL COMMERCIAL BANKS			GROUP 2 SAVINGS BANKS			GROUP 3 FOREIGN BANKS			GROUP 4 MERCHANT BANKS		
	Average	Median	Inter-quartile range	Average	Median	Inter-quartile range	Average	Median	Inter-quartile range	Average	Median	Inter-quartile range
1990	8.8	8.8	1.8	8.2	7.7	2.4	10.1	10.3	4.6	10.4	10.6	3.1
1991	8.8	8.9	1.6	8.2	7.8	2.2	9.1	9.2	4.4	10.0	10.6	2.9
1992	8.6	8.7	1.4	8.1	7.8	2.0	8.8	9.1	4.4	10.3	10.8	3.2
1993	8.5	8.4	1.9	7.9	7.7	2.2	8.5	8.8	3.7	10.5	10.3	3.0
1994	6.0	6.5	1.0	5.7	5.6	1.3	6.0	6.1	2.1	6.9	7.1	1.1
1990-1994	8.2	8.3	2.1	7.6	7.4	2.2	8.5	8.5	4.8	9.6	10.2	4.1

systematically lower than the yields offered by Groups 3 and 4, formed by foreign and merchant banks. As of 1993, a clear response to the decline in money market interest rates is observed in both the lending and deposit rates of all four groups.

Groups 1 and 2 obtained larger financial margins (difference between lending and deposit rates), surpassing those of foreign and merchant banks by 2 to 3 points throughout the period 1990-1994. In addition to factors related to operating costs, this phenomenon undoubtedly reflects the type of customer of commercial banks, characterised by a greater degree of loyalty than in the case of more specialised institutions.

The financial margins of all groups tended to narrow over time (see Table 6) due, among other factors, to heightened competition. During the period in question, Groups 3 and 4 showed greater intra-group variability than the other two. This appears to be due to the greater homogeneity in the business lines of commercial banks than in the activities of institutions more specialised in specific market niches. Nonetheless, throughout the period studied, all four groups registered a decline in intra-group variability, and this decline was more intense in the groups characterised by greater variability (Groups 3 and 4).

In analysing the financial margin of the total bank group (see Table 6), it becomes obvious that an aggregate analysis does not provide a clear picture of the behaviour of these institutions. In 1994 the median of this variable was 5% for banks as a whole, whereas this percentage was around 6% for Group 1, 4% for Group 3, and 3% for Group 4. The aggregate financial margin of the bank group fails to reflect the different behaviour of the credit institutions that form this group.

It should be noted that a portion of the financial margin is used to cover costs that are not explicitly taken into account, such as the cost related to the legal reserve requirement and other expenses of a non-financial nature. By way of example, Chart 3 gives an estimation of the cost borne by credit institutions due to the existence of the reserve

Table 6

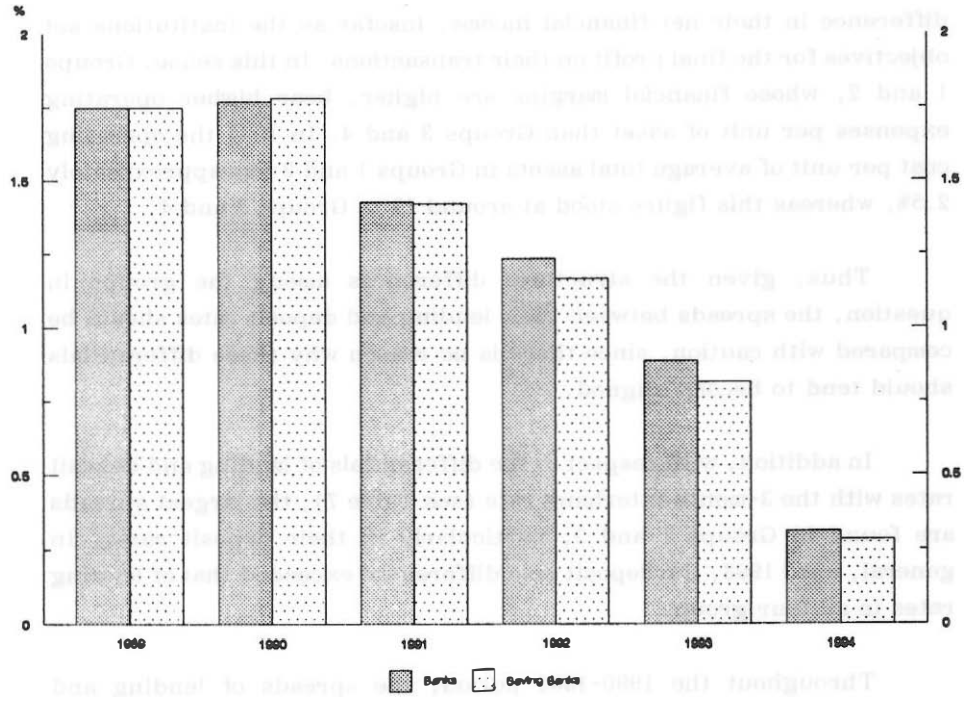
FINANCIAL MARGIN[3] MEDIAN AND INTER-QUARTILE RANGE

YEAR	GROUP 1		GROUP 2		GROUP 3		GROUP 4		MEMORANDUM ITEM	
	Median	Inter-quartile range	Median	Inter-quartile range	Median	Inter-quartile range	Median	Inter-quartile range	BANKS	SAVINGS BANKS
									Median	Median
1990	8.4	2.6	9.1	3.2	6.5	4.5	5.7	3.3	7.8	9.1
1991	7.9	2.1	8.4	3.0	6.2	4.6	4.5	4.1	7.3	8.7
1992	7.6	1.8	8.1	2.8	6.1	4.8	4.9	3.0	7.1	7.8
1993	7.0	2.3	7.3	3.0	5.4	4.9	3.4	3.4	6.2	7.1
1994	5.5	2.0	6.2	2.1	4.3	3.0	3.2	2.1	5.0	5.9
1990-1994	7.3	2.5	7.7	3.2	5.6	4.7	4.1	3.3	6.8	7.9

[3] Difference between composite lending and deposit rates.

Chart 3

COST DERIVED FROM RESERVE REQUIREMENT



requirement[4], which is now low but in the past was fairly high; notably, in 1990, it was still estimated at around 1.5 points. In addition, the groups bear different operating costs, and this partly explains the difference in their net financial income, insofar as the institutions set objectives for the final profit on their transactions. In this sense, Groups 1 and 2, whose financial margins are higher, bear higher operating expenses per unit of asset than Groups 3 and 4. In 1994 the operating cost per unit of average total assets in Groups 1 and 2 was approximately 2.5%, whereas this figure stood at around 1% in Groups 3 and 4.

Thus, given the structural differences among the groups in question, the spreads between their lending and deposit rates should be compared with caution, since there is no reason why these differentials should tend to become aligned.

In addition, with respect to the differentials of lending and deposit rates with the 3-month interbank rate (see Table 7), the largest spreads are found in Groups 1 and 2, particularly in their deposit rates. In general, until 1993, the deposit rate differential exceeded that of lending rates in all four groups.

Throughout the 1990-1994 period, the spreads of lending and deposit rates vis-à-vis the interbank rate trended differently. Thus, lending rates evolved at a pace quite similar to that of the interbank rate, with the spread between the two remaining fairly stable. By contrast, the spread between deposit rates and interbank rates tended to narrow in all four groups, albeit more sharply in those with lower deposit rates (Groups 1 and 2). Even so, in 1994, the deposit rates of Groups 3 and 4 remained closer to the interbank rate than those of Groups 1 and 2.

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[4] For this estimation, it was assumed that the opportunity cost of the assets retained by the reserve requirement is the interbank lending rate. As from May 1990, after this requirement was lowered, the mandatory investment of credit institutions in Banco de España certificates and the opportunity cost of the same were taken into account.

Table 7

COMPOSITE RATES. DIFFERENTIAL WITH 3-MONTH INTERBANK RATE
(Average value)

YEAR	LENDING RATE						DEPOSIT RATE						Change in interbank rate
	GROUP 1	GROUP 2	GROUP 3	GROUP 4	BANKS	SAVINGS BANKS	GROUP 1	GROUP 2	GROUP 3	GROUP 4	BANKS	SAVINGS BANKS	Memorandum item:
1990	2.1	1.9	2.2	0.6	2.1	1.8	-6.7	-7.5	-4.9	-3.8	-6.6	-7.7	0.8
1991	3.2	3.3	3.1	1.6	3.4	3.3	-5.1	-5.5	-3.7	-2.3	-4.9	-5.6	-1.5
1992	2.7	2.6	2.7	1.9	2.7	2.6	-5.4	-5.7	-3.7	-3.0	-5.2	-5.7	-0.6
1993	3.2	3.3	2.8	1.6	3.2	3.4	-3.9	-4.1	-2.5	-1.5	-3.7	-4.1	-0.5
1994	3.1	3.9	2.7	1.9	3.3	3.9	-2.5	-2.3	-1.1	-1.0	-2.3	-2.4	-4.3
1990-94	2.9	3.0	2.7	1.5	2.9	3.0	-4.7	-5.0	-3.2	-2.3	-4.5	-5.1	

The differentials vis-à-vis the interbank rate are explained by differences in operating costs, the price elasticities in the demand/supply of loans/deposits[5], the nature of the interaction among institutions that operate in the same market segments, and, probably, the risk premium charged by the institutions according to their type of customer. Consequently, on the basis of these differentials, conclusions cannot be drawn regarding the degree of competition in markets without taking other factors into consideration, as we shall see in the next section.

In conclusion, differences are observed between the price policies of the groups primarily engaged in traditional commercial banking, Groups 1 and 2, and those of foreign banks and merchant banks, Groups 3 and 4. These differences stem from the nature of their activity and, by extension, from the features specific to the markets where they operate. This gives an idea of the importance of disaggregation in an analysis of the monetary policy transmission mechanism.

IV. PRICE POLICIES AND INTERBANK RATES

Credit institutions set their price policies according to the information derived from the rates which they use as a reference, and they also take into account structural factors that characterise the markets where they operate.

Interbank rates play a crucial role as rates of reference reflecting the actions of the monetary authority. Their role has undoubtedly become stronger as a result of the gradual reduction in the variability of the Banco de España's intervention rate. This milder variability has reduced the uncertainty surrounding the interpretation of the movements in the monetary authority's rates and has thus helped to strengthen the relationship between the interest rates of the system.

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(5) The terms loan and deposit are used in the broad sense to reflect lending and borrowing transactions, respectively, with customers.

In setting the rates for their transactions, credit institutions take as their reference several indicators of interest rates, both short-term interbank rates and rates at longer terms, since they establish rates for different maturities and different types of transaction, such as loans with fixed and variable rates, for example.

Long-term rates basically reflect agents' expectations about the future course of short-term rates, if we accept the expectation hypothesis regarding the conduct of the yield curve. In the Spanish case (see Restoy, 1995), even though this hypothesis does not hold in the strict sense, it can be accepted that spot rates for time frames of less than 10 years provide a reasonable approximation to these expectations.

This analysis does not contemplate long-term rates, in that expectations about interest rates are considered to be essentially a function of observed interbank rates, and the forecasting errors derived from the expectations thus formed are stationary. As a result, the relationship between the rates set by credit institutions and interbank rates can be consistently estimated without taking into account other reference rates[6]. Consequently, the estimated relationships will take into consideration the effect of interbank trends on expectations.

The aforementioned simplification is due to the fact that the basic objective of this study is to analyse the relationship between interbank rates and the price policies set by credit institutions, taking into account the peculiarities of each institution and, by extension, the structural characteristics of the markets where they operate, leaving the analysis of the role of expectations for a later development of the study.

In this sense, the empirical evidence shows that the relationship between bank rates and interbank rates depends on the nature of the institutions' business and structural factors in the markets where they

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[6] It should be noted that, having used a data panel method in the estimations, variables with cross-sectional change over time cannot be explained solely with a set of variables that only changes over time, due to identification problems.

operate (see, for example, Hannan and Liang, 1993, and Angeloni et al., 1995). For this reason, it seemed worthwhile to study this relationship in terms of the groups of institutions classified by product specialisation.

In the next section, these relationships are formalised under a simple model.

4.1. Price behaviour model

Let us assume a simple model in which the institutions participate in credit and deposit markets in a context of more or less imperfect competition. Each credit institution takes funds from the private sector in the form of deposits, D_i, which it uses in turn to grant loans to this sector, C_i. Additionally, let us suppose that there is an interbank market where each institution can borrow (loan) the surplus (shortfall) between loans and deposits, at the interest rate set by the market and which is considered exogenous for each institution. In addition, the institutions bear operating costs, CO_i, derived from their activity[7].

In this context, each institution has the objective of a profit maximising function, π_i , setting a price for loans and a price for deposits, P_i^c y P_i^D [8].

Therefore, the profit function of the institution, i, is:

$$\pi_i = P_i^c C_i - P_i^d D_i - r(C_i - D_i) - CO_i$$

[7] The existence of the legal reserve requirement is left aside, because its low level during the period covered in the estimations (1991-1994) is not likely to alter the results of the analysis. Moreover, studies at the aggregate level reflect no influence of the reserve requirement on the rates applied by credit institutions to new transactions in the period considered.

[8] For simplicity, we will assume the separability of the credit market and the deposit market.

From the first-order conditions of profit maximisation, we find that the institutions will set the following prices:

$$P_i^c = \frac{1}{1 + \frac{1}{\varepsilon_i}} \left(r + \frac{\partial CO_i}{\partial C_i} \right) \qquad (1)$$

$$P_i^D = \frac{1}{1 + \frac{1}{\theta_i}} \left(r - \frac{\partial CO_i}{\partial D_i} \right) \qquad (2)$$

where:

$$\varepsilon_i = \frac{\partial C_i}{\partial P_i^c} \frac{P_i^c}{C_i} \quad y \quad \theta_i = \frac{\partial D_i}{\partial P_i^D} \frac{P_i^D}{D_i}$$

i.e. ε_i y θ_i are the price elasticities of loan demand and deposit supply[9].

Thus, each institution will set its price policy to ensure that the loan granted is such that the marginal income is equal to the marginal cost, and that the deposits received are such that the marginal cost of obtaining funds on the interbank market -interbank rate- is equal to the marginal cost of obtaining funds via deposits.

[9] These elasticities not only take into account the sensitivity of the demand and supply of each institution's loans and deposits to the price which it sets, but also the impact of the reaction of the other institutions' prices on said demand and supply -conjectural changes and cross price elasticities; in other words, these elasticities refer to the so-called residual demand curve (see Bresnahan, 1989).

Expressions (1) and (2) can be re-ordered such that:

$$P_i^c = \left(r + \frac{\partial CO_i}{\partial C_i}\right) + \frac{1}{\zeta_i} \qquad (1')$$

$$P_i^p = \left(r - \frac{CO_i}{\partial C_i}\right) - \frac{1}{\vartheta_i} \qquad (2')$$

where ζ_i y ϑ_i are, respectively, price semi-elasticities of loan demand and deposit supply.

Expression (1') can be interpreted in the usual sense that institutions establish the price of loans by adding a margin to the marginal costs, with this margin depending on the price elasticity of credit demand.

The price equations (1)-(2) and (1')-(2') are equivalent expressions. If we want to find the equilibrium price that the institutions will finally set (reduced-form equation for prices), we must solve a system of equations in which the specification of the functions of the demand and supply of loans and deposits are taken into account to substitute the elasticities/semi-elasticities with their corresponding expressions.

If the specifications of the demand and supply functions are not available, and we want to estimate a reduced form for prices from expressions (1) and (2), or alternatively (1') and (2'), under certain hypotheses relative to the form of these functions, we can assume a linear relation[10] between prices, the interbank rate and marginal operating costs. If, in addition, we assume that the marginal operating costs are

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[10] In this paper, as in other studies at the aggregate level, a linear relation will be assumed to exist between bank rates and the interbank rate. This assumption should be tested, especially if asymmetrical reactions to rises and falls in interbank rates seem to exist. But, given the simplicity of the equations estimated here, this subject will be addressed in later research.

independent of the interbank rate, a linear relationship between the prices set by the institutions and the interbank rate can be consistently estimated.

Thus, we would obtain the following reduced forms:

$$P_i^C = m_i^c \, r + u_i \qquad (3)$$

$$P_i^D = m_i^d \, r + v_i \qquad (4)$$

where m_i^c y m_i^d are parameters to be estimated, and u_i y v_i are random shocks.

However, unless the functional forms of deposit demand and supply are known, we have no information on the values that the parameters m_i^c y m_i^d can take. In effect, if we substitute in the expressions (1)-(2) or (1')-(2') the price elasticities or semi-elasticities derived from their demand and supply functions, the coefficients m_i^c y m_i^d will depend on the characteristics of these functions. To interpret the coefficients estimated, we must necessarily refer to the characteristics of these functions.

For simplicity's sake, we will refer to the case of the demand function of loans, although the analysis is, of course, equally applicable to the case of the supply of deposits.

There are three types of demand function that can give rise to a linear relation such as the one shown in equation (3) (see Hannan and Liang, 1993):

1. Isoelastic demand functions[11], which cause a bi-univocal relation to be established between the sensitivity of the lending price to the interbank rate and the elasticity of the demand curve, such that:

$$m_i^c = \frac{1}{1 + \frac{1}{\varepsilon}} \qquad (5)$$

and, therefore, said coefficient will be unitary if and only if demand is perfectly elastic.

2. Demand functions with constant semi-elasticity[12], which cause the lending price to be exactly the same as the marginal cost plus a margin independent of the price, such that m_i^c always has a unitary value independent of the value of the semi-elasticity and, therefore, irrespective of the competitive conditions of the market.

3. Demand functions with elasticities and semi-elasticities that change according to the price.

These functions are of the type:

$$P_i^c = \alpha + \beta C_i^{\delta} \qquad \alpha > 0,\ \beta > 0,\ \delta < 0,\ \acute{o},\ \beta < 0,\ \delta > 0$$

where the linear functions are a particular case when $\delta = 1$.

In this case it can be demonstrated that:

$$m_i^c = \frac{1}{1 + \delta}$$

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[11] These functions are of the form: $P_i^c = \beta C_i^{\frac{1}{\varepsilon}}$

[12] These functions are of the form: $P_i^c = \alpha + \beta \ln(C_i)$

Concretely, for the case of linear demand:

$$m_i^c = \frac{1}{2}$$

Therefore, with these functions, m_i^c can be more than, less than or equal to unity, unless the price does not depend on the quantity, in which case this coefficient will be exactly unity.

It seems plausible to assume that both the demand elasticity in case 1 and the coefficient δ of the demand function in case 3 depend on the market structure of the product in question (see Hannan and Liang, 1993), and, by extension, on prevailing competitive conditions. Thus, the lesser the leeway of firms to set their prices, the greater the perceived elasticity of their demand curves[13], insofar as they anticipate the reactions of their closest competitors.

The greater the perceived elasticity of demand, the higher the value of ε and the lower the value of δ will be, and the closer the coefficient linking price and marginal cost will be to unity (see Sumner, 1981, and Catalao, 1994).

In concluding, if we estimate reduced forms in which the prices set by institutions are related to the interbank rate, their interpretation will depend substantially on the functional forms of the demand and supply of loans and deposits. Thus, the coefficient that links the lending price with the interbank rate, if a linear relation between them exists, can be more than, less than or equal to one. In the case of the deposit price, this coefficient can be less than or equal to one.

In view of the above, the question arises as to whether any conclusion can be drawn regarding the price elasticity of the demand (supply) of loans (deposits) from the linear relation between prices and

[13] The perceived elasticity will be the elasticity of residual demand, e.g. that remaining after the reactions of competitors are taken into account.

the interbank rate. In the absence of information on the functional form of demand (supply), other than the fact that it gives rise to a linear relation between the price and the interbank rate (see footnote 9), there are several possibilities:

1. Demand and supply functions have constant semi-elasticity, in which case the coefficients m_i^c y m_i^d are always unity, irrespective of price elasticity and market conditions.

2. Demand and supply functions have constant elasticity. In this case, there is a bi-univocal relation between the coefficients m_i^c y m_i^d and price elasticities. Thus, if these coefficients are equal to unity, price elasticities tend to infinity, in which case the situation would be similar to that resulting from competitive equilibrium (Bertrand-Nash).

3. The elasticities and semi-elasticities of demand and supply functions are not constant -the case of linear functions, for example. Here m_i^c y m_i^d will be unity only if prices do not depend on the quantity of loans and deposits negotiated by each institution; in this case, the situation would be similar to that resulting in competitive equilibrium.

In conclusion, in demand/supply functions with constant semi-elasticity, the coefficients m_i^c y m_i^d will always be equal to unity, irrespective of the market's competitive conditions. With isoelastic functions or with elasticity and variable semi-elasticity, the closer these coefficients are to unity, the greater the price elasticities of loan demand and deposit supply will be, and the markets' behaviour will be more competitive.

Several factors explain why each institution's demand and supply of loans and deposits are not perfectly elastic, including, for example, the existence of switching costs, which induce a certain degree of customer loyalty, and the absence of substitutes similar to bank products (see Hannan and Berger, 1991, and Cottarelli and Kourelis, 1994). Moreover, there is reason to believe that these elasticities are greater in

the long run than in the short run, as demonstrated in the empirical evidence in different financial systems (see Cottarelli and Kourelis, 1994).

For these reasons, in the short run, lags may be observed in the response of lending and deposit rates to changes in interbank rates, which could be due to the adjustment costs borne by the institutions (see Hannan and Berger, 1991) and also to a certain stickiness in the demand and supply of loans and deposits.

In the short run, the adjustment costs can cause institutions to deviate from equilibrium behaviour, as reflected in equations (1) and (2), insofar as demand and supply are inelastic and the cost of deviating from the new equilibrium does not exceed the internal adjustment costs derived from a change in price policy. In the long run, the adjustment costs fade away, and, if they do not, the cost of deviating from an equilibrium situation would surpass the adjustment costs, due to the increase in the elasticity of demand and supply, in which case the institutions would tend to move towards the equilibrium position.

Taking into account these considerations, we estimated the response of lending and deposit rates to changes in interbank rates for banks and savings banks, and also analysed the differences between institutions that could be attributable their product specialisation.

4.2. Sensitivity of price policies to interbank rates

Equations (3) and (4) were estimated for the period 1990-1994 for the four groups of banks and savings banks classified by product specialisation, since they deal with different types of customer and, in consequence, the demand and supply functions of their loans and deposits may differ.

Likewise, within each specialised group, separate information on each institution was taken into account in order to enhance the degree of freedom in the estimates and to consider the possible existence of

individual effects. Thus, drawing on quarterly data, we used panel data[14] for each group for the years 1990-1994. The use of panel data meant that a relatively short period of time could be considered in estimating relations of interest, thereby strengthening the plausibility of the hypothesis that the estimated relations were not appreciably altered by changes of a structural nature.

Equations (3) and (4) were estimated separately[15], using the composite rates of each institution's transactions with customers and taking the 3-month rate[16] as an indicator of interbank market rates.

In addition, it was assumed that institutions do not immediately adjust to the equilibrium situation, due to the existence of adjustment costs and different long- and short-term price elasticities. Therefore, in estimating equations (3) and (4), the responsiveness of prices to the interbank rate was allowed to differ in the short and long run.

The details of the procedures used in the estimates are given in Appendix II.

4.2.1 Lending rates

In the short run, the estimated response of lending rates to the interbank rate differed significantly from one group to another (see Table 8). In the long run, there was generally no significant difference in their

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[14] Incomplete panel data were used, e.g. not all the institutions necessarily had data for the entire period, since some began or ceased to operate in the period considered -the case of mergers, for example.

[15] The error terms of these equations are probably correlated, but their joint estimation offers no advantages over individual estimates because the same regressors are used.

[16] Estimates were made both with the 3-month interbank rate and the average interbank rate on all outstanding transactions in this market. The results given here are those based on the 3-month rate, although the total estimated effects of both rates are similar, with differences arising only in the initial impact, since the rate on outstanding operations is "softer" (see Manzano and Galmés, 1995).

Table 8

COMPOSITE LENDING RATES: ESTIMATION OF RESPONSE TO A CHANGE IN "t" IN THE INTERBANK RATE

GROUP	Short-term impact			Total impact(*)
	t	t + 1	t + 2	
Group 1	0,42 (0,35; 0,48)	0,83 (0,75; 0,90)	--	1.20 (1.18; 1.22)
Group 2	0,25 (0,20; 0,29)	0,24 (0,18; 0,31)	0,16 (0,12; 0,21)	0.66 (0.62; 0.70)
Group 3	0,74 (0,59; 0,89)	0,40 (0,24; 0,57)	--	1.15 (1.10; 1.18)
Group 4	0,75 (0,55; 0,95)	0,43 (0,23; 0,63)	--	1.18 (1.09; 1.26)

(*) The 95% confidence interval of the estimations are given in parentheses.

responsiveness, with the exception of Group 2, whose response was significantly different from that of the other groups.

In the case of Group 2, primarily formed by savings banks, the average estimated response of loan prices to the interbank rate was the weakest among the groups considered. It should be noted that, in Group 2, unlike the other groups, there were signs that the levels of lending rates are not entirely explained by the levels of interbank rates (it is not clear whether these variables are cointegrated), and, for this reason, we chose to explain the changes in this group's lending rate in terms of the changes in the interbank rate. This situation might be attributable to the fact that, in the case of savings banks, due to the weight of mortgage loans, lending rate levels reflect the combined effects of the interbank rate and the public debt rate.

The confidence interval for the response of Group 4 is the widest of those estimated. Most likely this is related to the considerable heterogeneity of the institutions in this group and the scant importance of lending in comparison with other activities (see Sánchez and Sastre, 1995).

In all groups other than Group 2, mainly formed by savings banks, the estimated total average impact of a change in the interbank rate on the lending price is more than unity, for a confidence level of 95% (see Table 8). This result coincides with the findings for the case of Spain and other countries in Cottarelli and Kourelis (1994).

In estimating responses significantly different from unity, it can be rejected that the demand functions of loans present constant semi-elasticities, which would imply estimated coefficients equal to unity; here we would be dealing with another type of demand function in which the value of the price elasticity of customers affects the estimated relation. Considering that the estimated responses are somewhat higher than unity and that the assumption of constant elasticity is very strong and implies, for example, that the impact on the relative change in the lending rate is the same if rates rise from 1% to 2% (a 50% increase) or if they go from 10%

to 20%, which seems quite improbable, then it is plausible to assume the existence of demand functions of the type:

$$P_i^c = \alpha + \beta\ C_i^{\delta}$$

with such functions, as noted earlier, the sensitivity of the lending rate to the interbank rate is:

$$m_i^c = \frac{1}{1 + \delta}$$

such that, starting from the total estimated effects, the values of δ can be found (see Table 9). As shown, the demand functions do not appear to be linear, and, in the case of Groups 3 and 4, loan demand is significantly more elastic than in Groups 1 and 2. Nonetheless, the existence of very dissimilar behaviour within Group 4 should be borne in mind.

In line with the results obtained, the hypothesis that institutions have a certain leeway to set prices cannot be rejected, since they confront demand curves that are not perfectly elastic, which could be due, among other reasons, to the existence of product differentiation.

As to the dynamics of the estimated relations, it should be pointed out that, within three quarters, the interest rate of loans was fully adjusted to a change in the interbank rate. Group 2, formed by savings banks, showed a significantly slower response than the other groups. Groups 3 and 4 were significantly swifter in their response.

As a result, even though the total effect of a change in the interbank rate on lending rates is high and similar in all groups (except Group 2), the response in the short run differs significantly by group

Table 9

ESTIMATION OF THE δ OF THE LOAN DEMAND FUNCTION		
GROUP	δ	95% confidence interval
Group 1	-0.17	(-0.18; -0.15)
Group 2	0.51	(0.43; 0.61)
Group 3	-0.13	(-0.15; -0.13)
Group 4	-0.15	(-0.21; -0.08)

(see Table 8[17]). Groups 3 and 4 establish lending rates in a very competitive setting, whereas Groups 1 and 2 deal with customers whose demand is more rigid, thus providing these institutions with greater leeway in setting their rates. Among other reasons, this could be attributable to the fact that their "product" is more differentiated -in other words, their customers place a higher value on factors other than price.

4.2.2 Deposit rates

The responsiveness of deposit rates to the interbank rate differs in the short and long run (see Table 10) in all groups. Differences by group are also detected both in the short and long run.

Group 2 is estimated to be the least sensitive to changes in the interbank rate, both in the short and long run, and Group 4 is the most sensitive. With respect to Group 2, it should be noted that, unlike what occurred in the case of the lending rate, the deposit rate level does appear to be explained by the level of the interbank rate.

In rejecting the hypothesis of a unitary coefficient for the interbank rate in the estimated reduced forms, the existence of supply functions of deposits with constant semi-elasticity is rejected. Hence we either have supply functions with constant elasticity, which seems quite restrictive, or functions of the type:

$$P_i^d = \alpha + \beta\, d_i^{\delta} \qquad \alpha\ ,\ \beta > 0 \quad \delta \geq 0$$

Assuming the above functions, the estimated values for the coefficient δ (see Table 11) indicate that the deposit supply in Groups 3 and 4 is characterised by higher elasticities than in the case of Groups 1 and 2, which appear to have more leeway in setting their deposit rates,

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(17) This result coincides with the findings in Cottarelli and Kourelis (1994) for a sample of OECD countries in which Spain was included.

Table 10

COMPOSITE DEPOSIT RATES: ESTIMATION OF RESPONSE TO A CHANGE IN "t" IN THE INTERBANK RATE

GROUP	Short-term impact(*)		Total impact(*)
	t	t + 1	
Group 1	0,21 (0,16; 0,26)	0,46 (0,41; 0,50)	0.67 (0.65; 0.69)
Group 2	0,20 (0,11; 0,30)	0,42 (0,33; 0,51)	0.63 (0.60; 0.66)
Group 3	0,24 (0,03; 0,50)	0,45 (0,20; 0,69)	0.69 (0.62; 0.76)
Group 4	0,46 (0,26; 0,67)	0,34 (0,16; 0,53)	0.81 (0.75; 0.87)

(*) The 95% confidence interval of the estimations are given in parentheses.

Table 11

ESTIMATION OF THE δ OF THE DEPOSIT SUPPLY FUNCTION		
GROUP	δ	95% confidence interval
Group 1	0.49	(0.44; 0.53)
Group 2	0.58	(0.51; 0.67)
Group 3	0.44	(0.31; 0.61)
Group 4	0.23	(0.14; 0.33)

either because the structure of the markets where they operate is less competitive or because of the existence of product differentiation. In any event, according to the results obtained, deposit rates are set in less competitive conditions than those of lending rates.

As to the dynamics of the estimated relations, the total effect of a change in the interbank rate on the deposit rate arises within two quarters.

Unlike the case of lending rates, the initial impact of a change in the interbank rate is less than the subsequent effect (except in Group 4); thus, in the case of deposits, the institutions take longer to revise their prices than in the case of loans.

In conclusion, different behaviour is observed in lending and deposit markets in nearly all the groups in question, albeit to a lesser degree in Groups 3 and 4. This could indicate that customers in these two markets are different or, what is more probable, that the behaviour of the same type of customer changes from one market to another. Several factors explain this behaviour: first, the switching costs perceived by customers may be greater in the case of deposits than in the case of loans[18], and, second, a significant percentage of deposits have a transaction motive and are not significantly determined by interest rate considerations[19].

V. CONCLUSIONS AND MACROECONOMIC IMPLICATIONS

This paper presents a disaggregated analysis by institution to examine the relationship between money market interest rates and the rates set by deposit institutions. For this purpose, we compiled indicators

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[18] Most probably, in the case of deposits, customers' decisions are more related to factors other than price, such as the location of branches, number of tellers, personal relationship with the institution, reputation, etc.

[19] The fact that around 45% of sight deposits generate practically no yield would support this explanation.

for the price policies of each institution, and this allowed us to analyse the characteristics of these policies and the differences between one group of institutions and another.

The findings underscore the heterogeneity in the rate-setting procedure for transactions with customers, not only between banks and savings banks, as traditionally evidenced, but also within the group of banks. These differences reflect the diversity in the institutions' product specialisation.

On average, those institutions whose core business focuses on retail banking tend to set the highest rates on loans and also the lowest yields on deposits. This could be due not only to the composition of their transactions, with a smaller share of operations that are more sensitive to market rates, but also to the fact that their customers, regardless of the nature of their transactions with the institution, are generally less sensitive to the market situation. Moreover, the price policies of these institutions are characterised by greater uniformity than those of banks specialised in merchant and wholesale banking, although there is an increasing tendency towards homogeneity among all the groups in question.

This behaviour is reflected in the larger financial margin per transaction generated by the groups that focus more on retail banking. It should be noted that there is no reason why these margins should be the same in all cases, since the operating costs of these institutions and the risks they assume are not the same.

In analysing the differentials of lending and deposit rates with the 3-month interbank rate, we find that, throughout the period 1990-1994, the lending rate spread remained quite stable, whereas the deposit rate spread tended to narrow in all the groups considered. Here, too, traditional retail banks presented the largest differentials, in both lending and deposit rates.

In the financial margin per transaction, one aspect worth highlighting is that the behaviour of credit institutions classified by

product specialisation tended to become less heterogeneous, possibly indicating greater competition among institutions that interact on the same markets.

The relationship between the price policies of credit institutions and interbank rates provides information on the competitive conditions in which prices are set. In the absence of a complete structural model for the behaviour of institutions, under certain hypotheses, such as the ones used this paper, it is possible to estimate reduced forms in which a relationship is drawn between the prices set by these institutions and interbank rates. Starting from these forms, inferences can be made as to the different groups' leeway in setting prices.

On the basis of our analysis, several observations can be made:

1. The total impact of a change in the interbank rate on the rates set by credit institutions occurs over a period of two quarters.

2. Lending and deposit rates differ in their sensitivity to the interbank rate. In general, whereas the institutions set interest rates on loans under quite competitive conditions, the same cannot be said of deposits, where their room for manoeuvre in setting prices is less dependent on market conditions.

3. Responsiveness to the interbank rate differs according to each institution's product specialisation, particularly in the case of deposit rates, where there seem to be significant differences between traditional retail banks and more specialised institutions.

4. Among the groups considered, savings banks generally reflect less sensitivity to changes in interbank rates.

5. The greater leeway detected in the setting of deposit rates may be related to the importance of factors other than prices, such as the size of the institutions' branch network, the services offered, etc., which their customers value. This would explain the weaker sensitivity of the deposits of traditional banking institutions with

extensive branch networks, for example, vis-à-vis the greater sensitivity of other institutions that lack networks of this type.

6. The price policies of the groups primarily formed by foreign and merchant banks are the most sensitive to changes in interbank rates. These groups do not normally engage in retail banking, and tend to specialise in the wholesale sector. As a result, part of their customers are firms, which are likely to be particularly affected by the high sensitivity of interest rates to the interbank rate and, therefore, will bear the impact of changes in interest rates to a greater degree than other agents if they are unable to cover their financing requirements internally or via other alternative sources (see Peñalosa, 1995).

7. The findings in this paper signal the importance of the behavioral heterogeneity among the institutions considered, with indications that the price elasticity of the customers of traditional retail banks is lower than that of the customers of more specialised banks. The heterogeneity in the institutions' price policies -albeit now less pronounced- is related to the type of market where they operate, and differences will persist as long as there are structural differences between one market and another. These markets not only influence the composition of the institutions' assets and liabilities, but also probably affect the degree of sensitivity of the same asset and/or liability at different types of institution.

8. According to our estimations, the financial margin obtained by the institutions on new transactions tends to increase when interbank rates increase, and to decrease when these rates decrease. If this situation is contemplated from the standpoint of the economies of households and firms, we can conclude that monetary policy -via the channel of interest rates- has a greater impact on the financial costs than on the financial income of the private sector of the economy, in both the long and the short run. Thus, ceteris paribus, it could be inferred that the so-called income effect helps to enhance the efficiency of monetary policy (for an analysis of this effect, see Peñalosa, 1995).

9. The study shows that the differences between institutions that operate in different markets must be taken into account in macroeconomic analysis, because, unless they are, it is uncertain how representative the aggregate data actually are, in that they are an average based on clearly differentiated behaviour. At the aggregate level, possibly the simplest way to address this heterogeneity is to consider at least two sets of institutions within the bank group, i.e. those engaged in commercial banking of a retail nature and the more specialised institutions.

10. Our estimations signal several consequences regarding the functions of loan demand and deposit supply that affect credit institutions. Thus, the hypothesis that these functions have constant price semi-elasticities is rejected, and indications of non-linearity are found.

In the period analysed (1991-1994), the long-term behaviour of the loan market, irrespective of the type of institution considered, was much more competitive than that of the deposit market. In this sense, there appears to be a certain margin for an increase in the sensitivity of deposit rates to market conditions.

APPENDIX I. CONSTRUCTION OF COMPOSITE INTEREST RATES

Banking institutions handle a large number of transactions involving diverse instruments, with different terms and different customer segments. Since each and every interest rate applied in private-sector transactions cannot be taken into account, either several representative rates must be used or an attempt must be made to synthesise the information in composite indicators. In this paper, we decided to construct composite indicators, basically because of the difficulty in choosing the interest rate of a given instrument as the most representative of credit institutions' price policies.

These indicators (see Cuenca, 1994) are a weighted average of the rates reported by the institutions for their new transactions with customers, with the weightings reflecting the relative importance of each transaction within the total considered. Since no data are available on the volume of new transactions, the information on the outstanding balance of each transaction is used.

In other studies (see Cuenca, 1994), these rates are obtained for banks and savings banks at an aggregate level. In this paper, a similar method is used to construct individual rates for each institution. Thus, composite rates can then be estimated for groups of institutions classified by criteria such as size, operational sphere and product specialisation.

Composite interest rates for private-sector loans were obtained by aggregating the interest rates on transactions entailing peseta-denominated credit granted by banking entities. Here a distinction was drawn between transactions involving fixed rates and those with variable rates. With respect to the former, credit institutions report the rates and balances of the following instruments: trade discounts, credit accounts, unsecured loans and mortgage-backed loans.

For transactions involving variable interest rates, the information is less precise. Here institutions report the rates on transactions in terms of the period when the rate is to be revised, but, in the absence of

information on the balance, a simple arithmetic mean is calculated. The resulting figure is then averaged out with the fixed rate by using as a weighting the ratio of variable-rate loans to the total credit granted.

Composite interest rates for deposits were obtained by aggregating the interest rates of sight deposits, savings deposits, term deposits, debt instruments issued at a discount, and repos. With respect to interest rates on sight deposits, several specific problems are discussed below.

The balance of sight deposits can be classified into two categories according to their remuneration: high-yield deposits and deposits generating little or no yield. The interest rates on sight deposits reported by credit institutions refer to high-yield deposits, for which information in terms of volume is unavailable[20]. To estimate the percentage of the total balance of sight deposits represented by accounts that fall within the interest-bearing category, the effective interest rate of low-yield deposits must be known, but here again no information is available. To overcome this, several assumptions were made regarding the interest rates of these accounts in an interval of 0.5% to 1.5%; as the results were practically the same in all cases, we assumed an annual yield of 1%. Since information is available on the average cost of sight deposits, with this hypothesis we estimated the percentage of low- and zero-yield deposits (a_1), starting from the following relation[21]:

$$c = a_1 b_0 + (1 - a_1) b_1$$

where:

c = annualised average cost of sight deposits.

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[20] Under Banco de España Circular 15/88, institutions are only required to report their rates for high-yield deposits.

[21] It is assumed that the entire outstanding balance of interest-bearing deposits is remunerated at the rate reported for new transactions.

$$c = \left[\left(1 + \frac{\text{interest paid c/a}}{\text{average quarterly balance c/a}} \right)^4 - 1 \right] \times 100$$

a_1 = percentage of low-yield deposits.

b_0 = 1% annual rate (low yield).

b_1 = interest rate on sight deposits reported by credit institutions (high yield).

whence the percentage of low-yield deposits:

$$a_1 = \frac{c - b_1}{b_0 - b_1}$$

The calculation of the lending and deposit rates for each institution's transactions with customers provides a way of obtaining, through aggregation, the rates for the bank group and the savings bank group, whose level and behaviour were found to be similar to those of the rates calculated in Cuenca (1994)[22].

The composite rates were constructed with a quarterly periodicity (the frequency of the data that were available for the transactions' breakdown by term) and were calculated for each institution for the period 1988-1994.

The following procedure was used to calculate the composite interest rates:

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[22] In theory, these rates should be the same. However, small discrepancies arise due to the different criteria applied in the data-editing process and, as of 1992, the different weight of term transactions.

1. Calculation of the simple quarterly average for all variables for which monthly data were available.

2. Calculation of the aggregate rates of each instrument, using the balance at each term as the weighting[23]. In this calculation, if the terms do not coincide, they must be presented in a homogeneous form with respect to interest rates and the outstanding balances of the transactions.

3. Construction of a composite rate starting from the aggregate rate of each instrument, weighted by the instrument's balance in the balance sheet.

The procedure used to construct these rates differs from the one used in Cuenca (1994) in the following aspects:

1. Order of aggregation for instruments and institutions

In Cuenca (1994) information on the rates and balances of aggregate transactions for the total of banks and the total of savings banks is used, and the aggregation is then made by instrument, distinguishing within each instrument the different terms of issue. In this paper, composite rates are obtained for each institution; afterwards, if necessary, the rates for groups of institutions can be calculated.

2. Time order of aggregation

In Cuenca (1994) the rates calculated had a monthly periodicity, whereas the individually calculated rates were quarterly, since part of the information used was that reported by the institutions on a quarterly basis.

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[23] It should be borne in mind that the information by term and rate changed as of 1992, in accordance with Banco de España Circular 4/91.

3. Weightings of assets and liabilities in the aggregation

Until 1992, credit institutions reported on a monthly basis the rates applied in each transaction and the balances of the same. However, Banco de España Circular 4/91, effective as of 1992, led to several changes in the information about the term structure of the balances. As a result, institutions no longer reported on a monthly basis the disaggregated balances of each instrument for each term, although they continued to provide this information on a quarterly basis. As of 1992, the information on interest rates for each instrument and each term was weighted in Cuenca (1994) by each institution's global balance in said instrument, with no distinction drawn by the transaction's term, obtaining this balance directly from the monthly balance sheet of each institution. In this way, for each instrument, each institution has the same relative weight in all the terms at which transactions are carried out.

However, the present paper, based on a quarterly time frame for which sufficient information is available, obtains a composite rate for each institution, in which the rates of each instrument at each term are weighted by the respective balance.

APPENDIX II. MODELS

The definitions of the variables used in the analysis are presented in Table A2.1, and the models estimated for lending and deposit prices by group of institution are given in Tables A2.2 and A2.3.

The equations were estimated in levels (except in the case of the lending rate of Group 2, which was estimated in differences), since there is no indication that any type of correlation exists between the regressor used -the interbank rate- and the individual effects. Indeed, the absence of said correlation is evidenced in the fact that both the intra-group estimations and the estimations in levels are practically the same.

In the aforementioned case of Group 2, there were indications of non-stationarity in the residuals of the equations estimated with the intra-group estimators, and it was deemed more appropriate to estimate the model in first differences.

The estimation method of ordinary least squares was used, calculating standard errors by applying formulas similar to those proposed by White (1980) to take into account the heteroscedasticity in the cross section and the autocorrelation in the residuals[24].

In the estimations, we alternatively used the interbank rate on outstanding transactions and the 3-month interbank rate, obtaining similar results in the total responses of prices to the interbank rate, although in the short run the responsiveness to the 3-month rate was weaker than to the rate on outstanding transactions[25]. Tables A2.2 and A2.3 give the estimates under which the best results were obtained. In these estimates, as would be expected in the presence of individual effects, the first- and second-order correlations in the residuals appear to be significant, unlike the case of intra-group estimations, which are practically the same as those presented.

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[24] In the presence of heteroscedasticity in the cross section, this method is more efficient than generalised least squares.

[25] The rate on outstanding transactions is a weighted average of rates on these transactions and, consequently, is "softer" than the 3-month rate (see Manzano and Galmés, 1995).

Table A.2.1

DEFINITION OF VARIABLES

ta_{it}	Lending rate of institution i at moment t
tp_i	Deposit rate of institution i at moment t
$I3_t$	3-month interbank rate at moment t

Table A.2.2

LENDING RATES[1]

GROUP 1.

Variable	Coefficient	Statistic t
$I3_t$	0.42	13.4
$I3_{t-1}$	0.83	21.9
First-order autocorrelation test[2]		4.49
Second-order autocorrelation test[2]		3.87

GROUP 2.

Variable	Coefficient	Statistic t
$I3_t$	0.25	10.3
$I3_{t-1}$	0.24	7.1
$I3_{t-2}$	0.16	7.5
First-order autocorrelation test[2]		-2.97
Second-order autocorrelation test[2]		0.27

GROUP 3.

Variable	Coefficient	Statistic t
$I3_t$	0.74	9.94
$I3_{t-1}$	0.41	5.00
First-order autocorrelation test[2]		2.81
Second-order autocorrelation test[2]		2.70

GROUP 4.

Variable	Coefficient	Statistic t
$I3_t$	0.75	7.53
$I3_{t-1}$	0.43	4.32
First-order autocorrelation test[2]		1.77
Second-order autocorrelation test[2]		1.66

[1] All models were estimated in levels except in the case of Group 2.

[2] These statistics are distributed according to N(0,1), where the null hypothesis is the absence of autocorrelation.

Table A.2.3

DEPOSIT RATES[1]		
GROUP 1.		
Variable	**Coefficient**	**Statistic t**
$I3_t$	0.21	8.02
$I3_{t-1}$	0.46	19.54
First-order autocorrelation test[2]		4.11
Second-order autocorrelation test[2]		3.88

GROUP 2.		
Variable	**Coefficient**	**Statistic t**
$I3_t$	0.20	4.21
$I3_{t-1}$	0.42	9.64
First-order autocorrelation test[2]		4.65
Second-order autocorrelation test[2]		4.32

GROUP 3.		
Variable	**Coefficient**	**Statistic t**
$I3_t$	0.24	1.80
$I3_{t-1}$	0.45	3.64
First-order autocorrelation test[2]		3.24
Second-order autocorrelation test[2]		3.19

GROUP 4.		
Variable	**Coefficient**	**Statistic t**
$I3_t$	0.46	4.47
$I3_{t-1}$	0.34	3.72
First-order autocorrelation test[2]		2.79
Second-order autocorrelation test[2]		2.76

[1] All models were estimated in levels.

[2] These statistics are distributed according to N(0,1), where the null hypothesis is the absence of autocorrelation.

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