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**“Measuring the level of competition in the Argentine
banking industry”**

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Measuring the level of competition in the Argentine banking industry

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Abstract

Loan rates in Argentina are high. The objective of this work is to test if market power is one of the causes of these levels of interest rates and to measure its effects. For that purpose we work with data of the period 1994-1999. The tests indicate that there is market power in the peso operation sector and perfect competition can not be rejected in the dollar operation sector. We also find that there was no significant change in our measure of market power during the years we have analyzed.

JEL: G2, C5

Introduction

Loan rates in Argentina are high, in particular for operations in pesos. Our objective is to test if market power is one of the causes of these levels of lending rates. Two factors might have affected the conduct of banks during the 90s. The first is an important process of concentration. The number of banks decreased from 166 in 1993 to 94 at the end of 1999; the Herfindahl index almost doubled between 1993 and 1999. The second factor is the improvement in the quality of information available for banks.

The literature on the Argentine banking sector provides additional reasons for measuring the level of competition. First, the results of previous tests of competition do not coincide (see Gruben et al. 1996a, Ahumada et al. 1998, Catao 1998, Burdisso et al. 1999, Burdisso et al. 2000). Some of them do not reject perfect competition, while others find evidence of market power. On the other hand, the assumptions made about the market structure in different works also have varied. The assumptions that vary refer to price taking behavior, free entry and product differentiation.

The test presented follows the framework described in Bresnahan (1989). It uses aggregate market data to test if the conduct of banks is competitive. With this test, we also analyze if bank conduct varied in the 90s, and if so, in which ways.

This paper is organized as follows: in section 2, we comment on the determinants of competition in the Argentine Banking System; in section 3, we discuss prior studies on the Argentine banking industry; in section 4, an econometric model is shown; section 5 presents the data and the empirical analysis; section 6 is our conclusion.

2. The determinants of competition in the Argentine banking sector during the 90s

During the 90s lending rates in Argentina were high compared with lending rates in developed countries. Figure 1 shows the lending rates for operations in pesos and dollars. Interest Rates for operations in pesos are clearly higher than those for operations in dollars. It is remarkable that expectations of devaluation are, probably, not enough to explain the difference in the levels of lending rates.

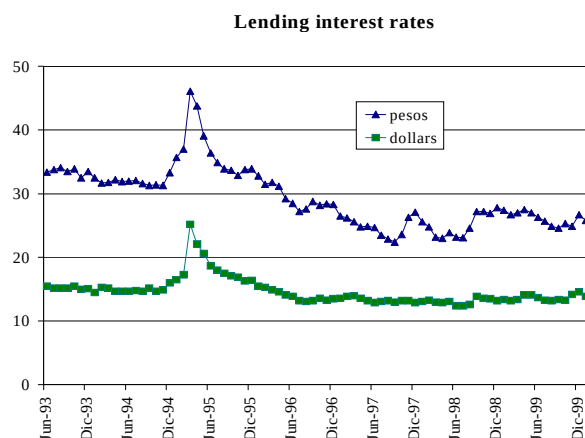


Figure 1:

There are many plausible explanations for these levels of lending rates. These are: high operative costs, credit risk, liquidity risk, precautionary regulation, taxes,

macroeconomic conditions and market power. Our objective here is to analyze the relevance of one of these factors, market power, and measure its importance.

We analyze two factors that determine market power. The first one follows a traditional line of reasoning in industrial organization; competition is determined by the number of firms in the market. We expect to find market power if supply is concentrated. On the other hand, we remark that, in financial markets, the asymmetry of information is another cause of market power. If a bank has exclusive information about a borrower, it can exert monopoly power on it based on its privileged position.

We recognize that more determinants exist, such as observability of firms' strategies and product differentiation. But we believe that the most important factors are the quality of information and the evolution of concentration.

To summarize, we expect market power to increase if concentration increases and we expect market power to reduce if the availability of information about borrowers characteristics improves. In the next paragraphs we discuss the theoretical importance of these two factors and analyze relevant data of the Argentine banking sector.

2.1 The evolution of concentration

The number of firms in a market has traditionally been a very important variable in the analysis of competition. The fewer firms, the easier it is for them to coordinate a higher price.

Concentration in the banking industry has risen sharply since 1995. In this subsection, we analyze this process.

The Herfindahl index is a measure of the level of concentration in an industry. This index is equal to:

$$H = \sum_{i=1}^n x_i^2$$

where:

x_i = market share of firm i .

n = number of firms.

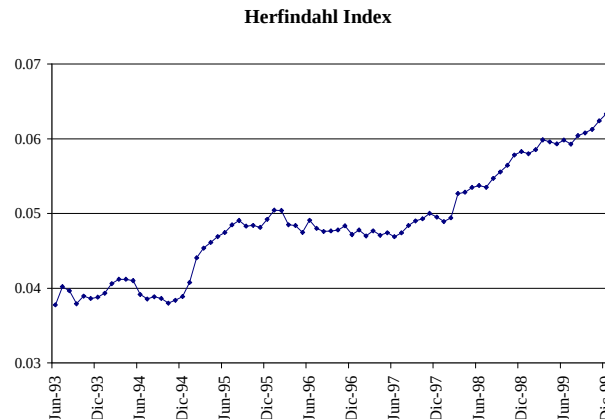


Figure 2:

An increase in the value of the index reflects an increase in the concentration of the industry. This index depends on two characteristics of the structure of an industry: the quantity of firms, and the distribution of market shares between them. In a monopoly the index is equal to 1. If every firm has the same market share, the index is equal to "1/n", this is the minimum of the index for a given number of firms. As the market shares are more different, the index increases.

Figure 2 shows the Herfindahl index calculated using total loan data. Concentration has risen significantly during the last 7 years. The index has almost doubled. The first jump occurred during the "Tequila Crisis" in 1995. Between December 1994 and January 1996, the index rose 30%. Since the beginning of 1998 another process of concentration has developed. Between December 1997 and December 1999 the index rose 29%.

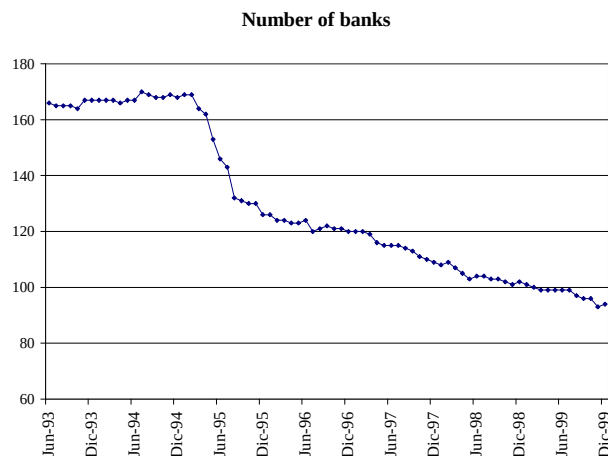


Figure 3:

As we have explained, a rise in the concentration index can be caused by a fall in the number of firms or a more unequal distribution of market shares. Figure 3 shows the evolution of the number of banks. In June 1993 166 banks were operating; this number decreased to 94 in December 1999. Almost half of this reduction is explained by the reduction in the number of co-operative banks, there were 36 in June 1993 while in December 1999 there were only 3ⁱⁱ. The biggest decrease occurred in 1995.

In order to measure how unequal market shares among banks are, it will be useful to work with the coefficient of variation. This is equal to the ratio of the standard deviation of market shares to the mean of the same variable. Figure 4 shows the evolution of this coefficient. It is worth noting that the standard deviation is more than double the mean throughout the entire sample. During 1995 there was a big decrease in the index due to the Tequila Crisis and the consequent closing of small banks. At any rate, since 1998 this coefficient has been growing, reflecting more variability in the distribution of market shares.

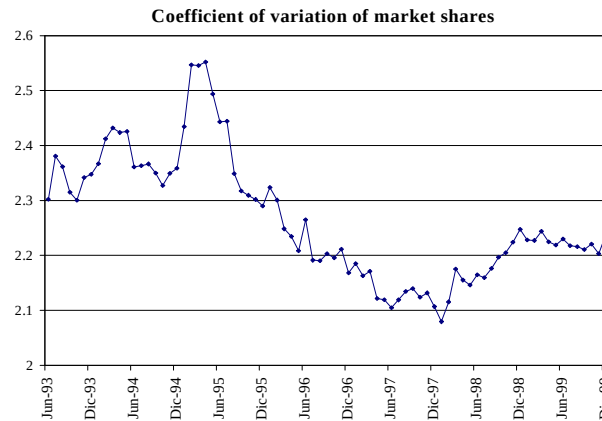


Figure 4:

To summarize, between 1993 and 1999, there were two periods of increase in the level of concentration. The first one took place during the Tequila Crisis and is explained by a reduction in the number of banks. The second started in 1998 and is explained by a reduction in the number of banks and by a more unequal distribution of market shares. We expect that this increase in concentration leads, holding everything else constant, to an increase in the market power of banks.

2.2 Asymmetric information

The dissemination of information on the characteristics of borrowers is a key determinant of competition in financial markets. When a bank lends to a customer, it obtains information that is not available for other banks. In this way, the bank can exert monopoly power on the borrower based on its privileged position. Thus, we can see that asymmetric information among banks is the cause of market power.

This subject is analyzed in Broecker (1990), Sharpe (1990), Rajan (1992) and Hauswald and Marquez (2000). This literature shows that bank financing has not only benefits but also has costs which are derived from the fact that banks have bargaining power over firms profits. In Sharpe (1990) the allocation of capital is shifted toward lower quality and inexperienced firms. In Rajan (1992) the incentives of firms' owners to exert effort are distorted. Hauswald and Marquez develop a model in which banks invest in transaction lending technology. In a related work, Dell'Ariccia et al.(1999) shows how adverse selection caused by asymmetric information can prevent entry into the banking industry. According to this literature, less competition is expected in markets which have poorer information.

In the Argentine banking industry, information about borrowers has been improving. Nevertheless, the quality is not as high as expected; accountancy standards are loose and, until 1996, there was not any nationwide credit rating system(see Cañonero,1997, Vicens, 1997, and Catao, 1998). Nevertheless, we consider that information in the banking market has improved since the second half of 1996 when a Credit Bureau was introduced. The Credit Bureau provides information about borrowers with problem loans, borrowers with questionable credit history or borrowers with loans more than \$200.000. The information

refers to amount of debt, risk factor and creditor institution; this is available on CD-ROM or the Internet.

It is possible too, that accountancy standards have improved as a result having left the high inflation period. As long as access to information keeps improving, ceteris paribus, market power is expected to decrease.

It is worth noting that problems derived from asymmetric information are not equal among borrowers. Some are able to offer collateral or credible accountancy records. This is why we do not think that "local monopoly power" affects all borrowers in the same way.

On average, peso and dollar borrowers are different. For example, those that borrow in pesos are clearly a bigger risk. This fact cannot be observed directly because there is no data on problem loans classified by currency. For this reason, we use regression analysis to verify this. We use a panel of 64 banks with balance sheet information for 1994-1999. We regressed non-recoverable loans in the portfolio of each bank as a function of loans in pesos, dollars, and other loansⁱⁱⁱ. The estimated equation is^{iv}:

$$NRL_{it} = \alpha_{\$} L\$_{it} + \alpha_U LU\$S_{it} + \alpha_O OL_{it} + \varepsilon_{it}$$

where:

NRL_{it} = Non-recoverable loans of bank i in period t .

$L\$_{it}$ = Loans in pesos of bank i in period t .

$LU\$S_{it}$ = Loans in dollars of bank i in period t .

OL_{it} = Other loans of bank i in period t .

Table 1 presents the results of the OLS regression. According to our results, a one peso increase in peso loans is expected to result in an increase of 0.13 pesos in non-recoverable loans; while a one dollar increase in dollar loans is expected to result in an increase of 0.03 dollars in non-recoverable loans. Similar results are obtained using fixed-effects and random-effects estimators.

OLS estimates

	Coefficien t	t-Statistics	p-value
$\alpha_{\$}$	0.13	12.56	0.00
α_U	0.03	5.09	0.00
α_O	-0.00	-1.05	0.29
R-Squared		0.60	

Table 1:

The average amount of a loan in pesos is less than the average amount of a loan in dollars. Table 2 shows the average loan amount. This figure is equal to the ratio of the value of loans to the quantity of loans in each category. In December 1999, the average amount of

a loan in dollars was 5.95 times the amount of the average loan in pesos. This difference can also be observed using more detailed data. For example, in December 1999, the average amount of a pledge loan in dollars was 5.7 times the amount of the average pledge loan in pesos. For mortgages this figure was 2.4. It can be assumed that the amount of the loan is directly related to the size of the borrower, that is, it can be assumed that peso borrowers are smaller than dollar borrowers.

Average amount of loans – December 1999

	Peso loans (1)	Dollar loans (2)	Ratio (2) / (1)
Total	4178.1	24864.7	5.95
Pledge	2451.3	13862.5	5.73
Mortgage	18092.0	44055.2	2.43
Other loans	3699.4	23609.2	6.38

Table 2:

We consider that small and risky borrowers, mostly peso borrowers, are the ones who face more serious problems in transmitting information and offering collateral to their creditors. This difference in the quality of information between peso and dollar borrowers is expected to result in differences in market power between the two groups of borrowers.

To summarize, we have commented on two determinants of market power: concentration and information. The evolution of these factors provides opposite predictions on the evolution of market power, if there is any.

3. Some comments on the literature

Competition in the banking industry has already been tested using diverse methodologies. The results obtained have varied also. These tests include: regression of banks profits, estimation of reduced equations and estimation of an structural system of simultaneous equations.

Ahumada et al.(1998) regressed bank profits as a function of the share of different credit lines in banks' portfolio. The authors remark that some credit lines faced very high interest rates. That's why they were interested in testing to see if market power was a factor explaining these rates. The estimation rejected the hypothesis of varying market power, as profits did not depend on bank shares in different credit lines.

Another test based on regressing bank profits is developed in Burdisso et al. (1999). The authors tested to see if bank's profits depended on a measure of concentration of the markets where each bank operated. This measure was equal to the weighted average of the Herfindahl index by province. The weights used were the share of bank's deposit in each province. The estimation confirmed that concentration affected positively these profits, suggesting the existence of market power. At any rate, the authors interpreted this result as evidence that operations in less developed markets, a variable positively correlated with concentration, was the cause of higher profits.

A reduced equation for bank spreads was estimated in Catao (1998). The Herfindahl index was included in the list of regressors. The author found that concentration was relevant in the equation of the spread for operations in pesos, and not relevant in the equation of the spread for operations in dollars. These results suggest that the market is divided in two sectors: the market for operations in pesos where market power exists, and the market for operations in dollars where perfect competition cannot be rejected. The problem with this test is that concentration is an endogenous variable and the author estimates the equation by OLS. It is well known that in this case OLS is not a consistent estimator.

Gruben et al.(1996a) analyze competition following a test similar to the one used in this paper. They specify a system with two equations: a demand equation for loans, and the first order condition for bank profit maximization. The author could not reject the hypothesis of perfect competition. We claim that this result is a consequence of not dividing the test between the sector of operations in pesos and operations in dollars. The findings of Catao(1998) suggest that a test should allow for different conduct in these two sectors.

Burdisso et al. (2000) also implement a test with a framework similar to ours. They analyze the market dividing it into two sectors: the retail and the corporate loan sectors. They are able to obtain measures of market power in each sector each year using cross-section regressions. Their results indicate that there is no perfect competition or perfect collusion. In the corporate sector market power decreased between 1997 and 1999 while, in the retail sector market power increased.

Our work implements a test that allows for different conduct in the peso and the dollar sectors. And here is where we have one important difference with Gruben et al.(1996a). The division of the market in these two sectors is supported by the differences between the two groups of borrowers shown in Section 2.

4. Econometric model

The test that we use was first implemented by Shaffer(1989), following Bresnahan(1982), for the United States banking industry. Our test consists of the simultaneous estimation of a four equation system.

We work with aggregate data and divide the market in two sectors: the peso transaction sector and the dollar transaction sector. Thus, the estimates will measure the average conduct of banks in peso transactions and dollar transactions. For example, it is possible that some banks act as price-takers while others do not. In this instance, the measured market conduct would be the average between these two cases.

As noted above, the division in these two sectors is due to the clear differences between these two groups of borrowers. Our purpose is to measure, for each group of borrowers, if the average prices they face contain a mark-up which is derived from market power. We expect that borrowers with bigger problems for transmitting information and offering collateral, will face a mark-up.

The demand equations are linear in the lending rate(P_l), the price of a substitute for loans (Z_l) and a measure of macroeconomic activity (I). These equations include also an interaction term between the lending rate and the two other variables (the price of the substitute and the measure of macroeconomic activity). The following are the demand equations for loans in pesos and dollars respectively:

$$Q_s = \alpha_{0s} + \alpha_{1s}P_s + \alpha_{2s}P_s Z_s + \alpha_{3s}Z_s + \alpha_{4s}P_s I + \alpha_{5s}I + \varepsilon_s$$

$$Q_s = \alpha_{0u} + \alpha_{1u}P_u + \alpha_{2u}P_uZ_u + \alpha_{3u}Z_u + \alpha_{4u}P_uI + \alpha_{5u}I + \varepsilon_u$$

According to this specification, industry marginal income in sector j is:

$$MR_j = P_j + \frac{\partial P_j}{\partial Q_j} Q_j = P_j + \frac{Q_j}{\frac{\partial Q_j}{\partial P_j}} = P_j + \frac{Q_j}{\alpha_{1j} + \alpha_{2j}Z_j + \alpha_{4j}I}$$

The second term on the right hand is the semi-elasticity of demand. We differentiate industry marginal income from firms' "perceived" marginal income:

$$MR_j = P_j + \theta_j \frac{Q_j}{\frac{\partial Q_j}{\partial P_j}} = P_j + \theta_j \frac{Q_j}{\alpha_{1j} + \alpha_{2j}Z_j + \alpha_{4j}I}$$

In this specification, θ_j is a key parameter. It measures if firms possess market power. The way in which this parameter is estimated will be shown more clearly in the following paragraphs. Nevertheless, we can comment on the interpretation of the estimates. If this parameter is equal to zero, this means that firms act as price-takers, their "perceived" marginal income is equal to the price. On the contrary, if the estimate of this parameter is different from zero, this implies that a firm perceives there is a change in price due to a change in the quantities offered. That is, firms are not price-takers. We will review these interpretations once firms' "perceived" marginal income is introduced in the first order condition for profit maximization.

We assume that banks maximize profits. Bank i profits are given by the following equation:

$$\Pi(Q_{\$i}; Q_{ui}; Q_{\$} - Q_{\$i}; Q_u - Q_{ui}) = \sum_{j=\$,u} P_j(Q_{ji}; Q_j - Q_{ji})Q_{ji} - C(Q_{\$i}; Q_{ui}; W_1; W_{2\$}; W_{2u})$$

where

$$Q_j = \sum_{i=1}^I Q_{ji}$$

I= number of banks

j=\$,u

and $C(Q_{\$i}; Q_{ui}; W_1; W_{2\$}; W_{2u})$ is the cost function that depends on quantities of loans in pesos $Q_{\$}$ and dollars Q_u and on the prices of inputs(wages (W_1) and interest rates on deposits ($W_{2\$}$, W_{2u})).

By deriving this function with respect to quantities and equaling this derivative to zero, we obtain the first order conditions for profit maximization:

$$P_{\$}(Q_{\$i}; Q_{\$} - Q_{\$i}) + Q_{\$i} \frac{\partial P_{\$}(Q_{\$i}; Q_{\$} - Q_{\$i})}{\partial Q_{\$i}} = \frac{\partial C(Q_{\$i}; Q_{ui}; W_1; W_{2\$}; W_{2u})}{\partial Q_{\$i}}$$

$$P_u(Q_{ui}; Q_u - Q_{ui}) + Q_{ui} \frac{\partial P_u(Q_{ui}; Q_u - Q_{ui})}{\partial Q_{ui}} = \frac{\partial C(Q_{\$i}; Q_{ui}; W_1; W_{2\$}; W_{2u})}{\partial Q_{ui}}$$

This equation implies that firms equate "perceived" marginal income with marginal cost. In a market characterized by perfect competition, firm's "perceived" marginal income is equal to the price; that is, the second term on the left would be equal to zero since price does not change. On the other hand, if perfect competition is not present, a change in the quantities offered by one firm will result in a fall in the price of the product and this is reflected in the marginal income. In this case, firm's marginal income includes a term that represents

the loss in income due to the price decrease; this is the second term on the left in the previous equations. If this term is relevant in the firm's pricing equation, there is evidence rejecting the hypothesis of price-taking behavior, in other words perfect competition is rejected.

The cost function that we propose is a log-normal function. Total cost (C) depends on quantities of loans in pesos (Q_s) and dollars (Q_u) and on the prices of inputs (wages (W_1) and interest rates on deposits (W_{2s}, W_{2u})). This specification is the most flexible we could propose given the size of the sample.

$$\begin{aligned}\ln C &= \gamma_0 + \gamma_{1s} \ln(Q_s) + \gamma_{1u} \ln(Q_u) + \gamma_{2s} \frac{\ln(Q_s)^2}{2} + \gamma_{2u} \frac{\ln(Q_u)^2}{2} \\ &+ \gamma_3 \ln Q_s \ln Q_u + \gamma_{4s} \ln W_1 \ln Q_s + \gamma_{4u} \ln W_1 \ln Q_u \\ &+ \gamma_{5s} \ln W_{2s} \ln Q_s + \gamma_{5u} \ln W_{2u} \ln Q_u + \gamma_6 \ln W_1 + \gamma_7 \ln W_{2s} \\ &+ \gamma_8 \ln W_{2u} + \gamma_9 \frac{\ln(W_1)^2}{2} + \gamma_{10} \frac{\ln(W_{2s})^2}{2} + \gamma_{11} \frac{\ln(W_{2u})^2}{2} + \varepsilon\end{aligned}$$

According to this specification the marginal costs are equal to:

$$\begin{aligned}\frac{\partial C}{\partial Q_s} &= \frac{C}{Q_s} (\gamma_{1s} + \gamma_{2s} \ln Q_s + \gamma_3 \ln Q_u + \gamma_{4s} \ln W_1 + \gamma_{5s} \ln W_{2s}) + \xi_s \\ \frac{\partial C}{\partial Q_u} &= \frac{C}{Q_u} (\gamma_{1u} + \gamma_{2u} \ln Q_u + \gamma_3 \ln Q_s + \gamma_{4u} \ln W_1 + \gamma_{5u} \ln W_{2u}) + \xi_u\end{aligned}$$

Replacing, in the first order conditions, the general specifications of marginal costs and marginal incomes by the specifications presented above, we obtain the two pricing equations to estimate:

$$\begin{aligned}P_s &= -\frac{\theta_s Q_s}{\alpha_{1s} + \alpha_{2s} Z_s + \alpha_{4s} I} + \frac{C}{Q_s} (\gamma_{1s} + \gamma_{2s} \ln Q_s + \gamma_3 \ln Q_u + \gamma_{4s} \ln W_1 \\ &+ \gamma_{5s} \ln W_{2s}) + \xi_s \\ P_u &= -\frac{\theta_u Q_u}{\alpha_{1u} + \alpha_{2u} Z_u + \alpha_{4u} I} + \frac{C}{Q_u} (\gamma_{1u} + \gamma_{2u} \ln Q_u + \gamma_3 \ln Q_s + \gamma_{4u} \ln W_1 \\ &+ \gamma_{5u} \ln W_{2u}) + \xi_u\end{aligned}$$

The first term on the right hand of these equations is the measure of how a firm's income falls due to the price decrease. This is equal to the product of: quantities, the derivative of the inverse demand equation, and the conduct parameter (θ_j). If the estimate of the parameter is not significantly different from zero, this implies that banks act as if the quantity offered by each one of them has no effect on prices; that is, they present competitive conduct. The hypothesis of perfect competition in the j sector is rejected if the estimated parameter θ_j^* is significantly different from zero. If banks acted as a monopoly, this parameter would be expected to be equal to the number one, since a firm's marginal income is equal to industry marginal income. The lower this parameter, the lower the measured market power; industry price is set closer to industry marginal cost.

To summarize, we estimate the following four equation system:

$$Q_s = \alpha_{0s} + \alpha_{1s}P_s + \alpha_{2s}P_sZ_s + \alpha_{3s}Z_s + \alpha_{4s}P_sI + \alpha_{5s}I + \varepsilon_s$$

$$Q_u = \alpha_{0u} + \alpha_{1u}P_u + \alpha_{2u}P_uZ_u + \alpha_{3u}Z_u + \alpha_{4u}P_uI + \alpha_{5u}I + \varepsilon_u$$

$$P_s = -\frac{\theta_s Q_s}{\alpha_{1s} + \alpha_{2s}Z_s + \alpha_{4s}I} + \frac{C}{Q_s}(\gamma_{1s} + \gamma_{2s} \ln Q_s + \gamma_3 \ln Q_u + \gamma_{4s} \ln W_1 + \gamma_{5s} \ln W_{2s}) + \xi_s$$

$$P_u = -\frac{\theta_u Q_u}{\alpha_{1u} + \alpha_{2u}Z_u + \alpha_{4u}I} + \frac{C}{Q_u}(\gamma_{1u} + \gamma_{2u} \ln Q_u + \gamma_3 \ln Q_s + \gamma_{4u} \ln W_1 + \gamma_{5u} \ln W_{2u}) + \xi_u$$

There are five endogenous variables: loans in pesos, loans in dollars, lending interest rate in pesos, lending interest rate in dollars, and costs. The exogenous variables are: the price of a substitute for bank lending, the measure of macroeconomic activity, and the prices of the inputs.

5. Data and estimation

5.1 Data description

The data were provided by different sources. The sample contains 72 observations, it starts in January 1994 and ends in December 1999. Data on loans and costs were provided by a survey of banks made by the Superintendencia de Entidades Financieras (an office of the Central Bank). Data on interest rates is from a survey made by the Banco Central de la República Argentina. The Sistema Integrado de Jubilaciones y Pensiones (National Retirement System) is the source of data on wages in the financial intermediation sector. Following what is common practice in the literature, we use the yield of government bonds as a proxy for the price of a substitute for bank loans. The bonds we will be using (Pre1 and Pre2) were emitted by the government to consolidate social security debt. Pre1 is a bond in pesos and Pre2 is a bond in dollars. The measure of macroeconomic activity is the seasonal adjusted Industrial Production Index (IPI), it is compiled by FIEL.

5.2 Econometric results

Ordinary least squares is inconsistent due to the presence of endogenous variables which are correlated with the disturbances. This is the reason that we estimate the system by non-linear three-stage least squares, this is a consistent estimator.

Two different specifications of the model are estimated; the first one assumes that market power is constant throughout the sample^v. The second specification allows conduct to change in the second half of the sample; we do this by inserting a dummy variable in the pricing equations of banks.

Descriptive statistics

	Loans		Lend. Rates		Bonds ' Yields	
	\$	U\$s	\$	U\$s	\$	U\$s
Mean	35154900916	67644305361	29.0	14.6	15.9	12.9
Median	33673961500	64293822500	27.5	13.9	14.9	11.9
Max.	49043824000	100581349000	46.1	25.2	38.9	28.8
Min.	2724954700	36803902000	22.4	12.4	7.8	7.7
Std. Dev.	5783651495	21626232587	4.8	2.2	6.6	4.5
Skewness	0.6	0.1	1.1	2.5	1.2	1.3
Kurtosis	2.3	1.5	4.5	10.4	4.2	4.3

	IPI	Costs	Dep. Rates		Wages
			\$	U\$s	
Mean	118.2	1023481.0	8.32	6.4	1840.1
Median	117.9	1001226.0	7.7	6.0	1927.3
Max	133.6	1398254.0	19.4	11.1	2129.3
Min	101.9	753274.0	6.08	5.5	1313.3
Std. Dev.	8.13	141572.4	2.4	1.1	239.0
Skewness	-0.1	0.4	3.0	2.5	-0.8
Kurtosis	2.3	2.4	13.1	9.7	2.5

Table 3:

Both models include a dummy variable (*te*) that enters additively in the banks' pricing equations. This variable is equal to 1 in March, April and May of 1995 and is equal to zero in the other periods. The objective of this modification to the specification is to take account of the huge shock suffered by the Argentine economy during those months.

5.2.1 Standard test of market power

Table 4 shows the estimates of the standard model in which the conduct of banks is assumed to be constant throughout the sample.

The hypothesis of perfect competition in the peso transaction sector is rejected. The estimated coefficient that measures the conduct of firms (θ_s) is positive and significant. The t-statistic is equal to 2.02. This result suggests that, on average, banks fix price over marginal cost in the peso sector. On the other hand, the hypothesis of perfect competition in the dollar operations sector can not be rejected. According to the t-statistic, the coefficient that measures firms' deviation from marginal cost pricing (θ_u) is not significant. These estimations confirm the results obtained by Catao(1998).

The previous result, perfect competition for the dollar loans and market power in the peso sector, is robust to several changes in the specification of the model. We have estimated a model in which the demand function doesn't depend on a measure of macroeconomic activity and another model in which the marginal costs in the two sectors were assumed to be equal. On the other hand, the absolute value of the estimated parameters of market power has varied significantly depending on the specification of the model.

Three Stage Least Squares System estimates

	Coefficient	t-Statistic	p-value
Market Power Parameters			
$\theta_{\$}$	0.64	2.02	0.04
θ_u	0.34	1.39	0.17
Cost Function			
$\gamma_{1\$}$	17928.52	1.77	0.07
$\gamma_{2\$}$	-1011.17	-1.26	0.21
$\gamma_{3\$}$	-190.75	-0.91	0.36
$\gamma_{4\$}$	451.94	2.11	0.03
$\gamma_{5\$}$	29.51	0.17	0.86
γ_{1u}	-4884.51	-1.99	0.05
γ_{2u}	500.33	2.89	0.00
γ_{4u}	36.13	0.11	0.91
γ_{5u}	-124.32	-0.66	0.51
Demand Functions			
$\alpha_{0\$}$	49097931.00	0.84	0.39
$\alpha_{1\$}$	-1375861.00	-0.78	0.43
$\alpha_{2\$}$	19726.55	1.17	0.24
$\alpha_{3\$}$	-150346.50	-0.28	0.77
$\alpha_{4\$}$	-2366.59	-0.18	0.85
$\alpha_{5\$}$	227244.10	0.56	0.58
α_{0u}	-	-3.34	0.00
	818166530.23		
α_{1u}	63058538.54	3.32	0.00
α_{2u}	1003425.74	2.97	0.00
α_{3u}	-12404553.08	-2.69	0.00
α_{4u}	-842920.69	-3.68	0.00
α_{5u}	116199838.36	4.01	0.00
Tequila Crisis Dummies			
$t_{\$}$	2.55	1.35	0.17
t_u	4.94	2.46	0.01

R-Squared:

Equation N° 1 (Peso loans demand)	0.76
Equation N° 2 (Bank pricing eq.-pesos)	0.89
Equation N° 3 (Dollar loans demand)	0.33
Equation N° 4 (Bank pricing eq.-dollars)	0.72

Table 4:

We consider that these results are the consequence of different characteristics of peso and dollar borrowers. In a previous section we have shown that peso borrowers are riskier and apply for smaller loans than dollar borrowers. These characteristics are more probably found in borrowers who have problems in transmitting information credibly or offering collateral. And this is why, on average, the loans in pesos present a mark-up.

Additional evidence of the differences between these two groups of borrowers is provided by the estimated elasticity of their demands. We compare the elasticities calculated at the average values of the variables of the model. The elasticity of demand of peso loans is 1.1 in absolute value, and the elasticity of demand of dollar loans is 5.1. Peso borrowers

present a lower elasticity of demand; this may suggest that they have less access to alternative sources of funds. Since the elasticity in both sectors is bigger than one, marginal income is positive; this is a necessary condition for profit maximization.

Some comments should be made about the significance of the parameters of the model. With respect to the key parameters of the model, the ones concerning market power, we found that their significance was robust to several model specifications; this is why we believe our results about market conduct are reliable.

The significance of the other parameters has varied with different specifications of the model. We consider that this is due to the small number of observations. The values of the parameters are very sensible; this will be checked below. Also, we would like to point out that the high levels of the R-squared of the equations is another good sign. The dollar demand equation is the only one with a low R-squared, but all its parameters are significant.

For example in the peso demand equation, no parameter resulted significant. Nevertheless, the high R-squared suggests that the hypothesis of non-significance of the slopes in the equation will be rejected. We can test the joint significance of the parameters with the Wald test of coefficient restriction. This test can be applied to equations estimated by system methods. Our null hypothesis is:

$$H_0 = \alpha_{1\$} = \alpha_{2\$} = \alpha_{3\$} = \alpha_{4\$} = \alpha_{5\$} = 0$$

The W statistic is 218.5, a high number that allows us to reject the null hypothesis at the 0.01 level. Thus, both demand curves have significant downward slopes.

The cost function also deserves some comments. We find no evidence of economies of joint production. The sign of parameter " γ_3 " indicates if there is any economy or diseconomy of joint production. According to our estimates, this parameter is not significant; this finding coincides with the results of Burdisso et al.(2000).

5.2.2 Test of change of conduct

The following table presents the estimation of a model that tests if conduct of banks has changed in the second half of the sample. In this second model we introduce a dummy variable (du) in the pricing equations. This variable is equal to 0 between January 1994 and December 1996, and it is equal to 1 from January 1997 until December 1999. The firms' pricing equations change in the following way:

$$P_s = -\frac{(\theta_{0\$} + \theta_{1\$} du)Q_s}{\alpha_{1\$} + \alpha_{2\$} Z_s + \alpha_{4\$} I} + \frac{C}{Q_s} (\gamma_{1\$} + \gamma_{2\$} \ln Q\$ + \gamma_{3\$} \ln Q_u + \gamma_{4\$} \ln W_1 + \gamma_{5\$} \ln W_2) + \xi_s$$

$$P_u = -\frac{(\theta_{0u} + \theta_{1u} du)Q_u}{\alpha_{1u} + \alpha_{2u} Z_u + \alpha_{4u} I} + \frac{C}{Q_u} (\gamma_{1u} + \gamma_{2u} \ln Q\$ + \gamma_{3u} \ln Q_s + \gamma_{4u} \ln W_1 + \gamma_{5u} \ln W_2) + \xi_u$$

If the estimate of the coefficient of the dummy variable is significant, this means that the average conduct of banks has changed in the second period. According to the comments in a previous section, the expected sign of this estimate is undefined. In that section, there are remarks on two opposite effects: on the one hand, concentration has increased, which can lead to an increase in market power; on the other hand, the information available to banks has improved, which can lead, as noted above, to more competition in the market.

Three Stage Least Squares System estimates

	Coefficient	t-Statistic	p-value
Market Power Parameters			
$\theta_{0\$}$	0.59	1.76	0.07
$\theta_{1\$}$	0.00	0.02	0.98
θ_{0u}	0.30	1.21	0.22
θ_{1u}	0.61	0.61	0.17
Cost Function			
$\gamma_{1\$}$	11079.84	0.62	0.53
$\gamma_{2\$}$	-421.43	-0.33	0.73
$\gamma_{3\$}$	-356.42	-1.23	0.21
$\gamma_{4\$}$	402.84	1.33	0.18
$\gamma_{5\$}$	25.67	0.13	0.89
γ_{1u}	-635.03	-0.09	0.93
γ_{2u}	409.22	1.45	0.14
γ_{4u}	81.15	0.19	0.84
γ_{5u}	-202.25	-0.71	0.47
Demand Functions			
$\alpha_{0\$}$	18012447.00	0.29	0.77
$\alpha_{1\$}$	-348151.40	-0.18	0.85
$\alpha_{2\$}$	18328.59	1.07	0.28
$\alpha_{3\$}$	-117807.50	-0.22	0.82
$\alpha_{4\$}$	-10738.05	-0.78	0.43
$\alpha_{5\$}$	480242.10	1.09	0.27
α_{0u}	-	-3.26	0.00
	910561927.15		
α_{1u}	68989521.00	3.42	0.00
α_{2u}	982656.90	2.69	0.00
α_{3u}	-12375755.00	-2.40	0.01
α_{4u}	-883423.80	-3.97	0.00
α_{5u}	12282104.00	4.25	0.00
Tequila Crisis Dummies			
$t_{\$}$	3.18	1.76	0.07
t_u	6.29	1.87	0.06

R-Squared:

Equation N° 1 (Peso loans demand)	0.77
Equation N° 2 (Bank pricing eq.-pesos)	0.90
Equation N° 3 (Dollar loans demand)	0.34
Equation N° 4 (Bank pricing eq.-dollars)	0.62

Table 5:

The estimates confirm the previous result about the sector for operations in dollars: perfect competition cannot be rejected. Both parameters of market conduct are not significant.

In the peso sector we find market power, but, we do not find a significant change in conduct. The constant term is positive, significant, and similar to the value obtained in the previous model. This confirms the previous result about the existence of market power in the peso sector. On the other hand, the coefficients that measure a change in bank conduct is not significant. These results suggest that market power did not change.

The constancy in the level of market power can be the result of two offsetting forces. On the one hand, the observed increase in concentration in the market is expected to result in more market power. On the other hand, it is possible that an improvement in the information available to banks could have offset the first effect leaving the level of competition unchanged.

Another possible interpretation is that there has not been any significant change in the determinants of competition in the market, and this is why the index that measures market power has not changed.

As in the previous model, no parameter resulted individually significant in the peso demand equation. As we did for that model, we can test the joint significance of the parameters with the Wald test of coefficient restriction. Our null hypothesis is:

$$H_0 = \alpha_{1\$} = \alpha_{2\$} = \alpha_{3\$} = \alpha_{4\$} = \alpha_{5\$} = 0$$

The W statistic is 226.9, a high number that allows us to reject the null hypothesis at the 0.01 level.

5.2.3 Summary

Some comments can be made based on these results. Since perfect competition can not be rejected for the operations in dollars, and the same number of banks operate in the two sectors, the number of banks does not seem to be an important determinant of market power in this context. In this way, we consider that market power is determined principally by information problems. We found that market power was present in the peso transactions because the average borrower in pesos faces more information problems than the average dollar borrower. On the other hand, we consider that the constancy in the level of market power could reflect two possible scenarios. In the first one, the two opposite forces, information and concentration, offset each other. In the other, there has not been any significant change in the determinants of market power in the market.

6. Concluding remarks and future research

This paper has tested the presence of market power in the Argentine banking market for the period 1994-1999. The tests consist of the estimation of non-linear systems of equations. We used aggregate data, and the market was divided in two sectors: the peso transaction sector and the dollar transaction sector. In this way, the estimates measured the average conduct of banks in the peso transactions and the dollar transactions.

According to our results, perfect competition can not be rejected for the transactions in dollars. However, we have rejected the existence of perfect competition for the transactions in pesos. This result suggests that market power is principally a consequence of characteristics of peso borrowers. In particular, we consider that difficulties in the transmission of information, and problems in offering collateral, are the characteristics that explain why peso borrowers face banks which offer credit with mark-up. The estimations showed also that our measure of market power remained constant when we allowed it to vary. We consider that this might be the result of two offsetting forces: the improvement in the information about borrowers available to banks and the increase in the concentration in the market.

These results stress the importance of information as a determinant of competition in the credit market. In particular, these findings can reduce the concern that exists about the increase in concentration in the banking market, and raises the existent interest in the quality of information available to banks.

It would be interesting to follow the evolution of the banking sector as information improves and the number of banks changes. More detailed data would be useful to analyze competition. First, with these data it would be possible to obtain more precise estimates. Second, additional hypotheses could be tested. With a panel of banks it is possible to analyze how conduct differs among banks. For example, it is possible that the conduct of state banks differs from the conduct of private banks. Another possibility is to test the presence of market power for different credit lines. These could be: mortgages, pledge loans, overdrafts, personal loans, and documents.

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Notes

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ⁱⁱ In Dabós (1998) the closures of co-operative banks during the Tequila Crisis are analyzed

ⁱⁱⁱ Other loans are assets that could not be classified as peso loans or as dollar loans.

^{iv} The equation presents no constant term, since, if the quantity of loans is zero, the expected quantity of non recoverable loans is zero.

^v In our model, this is equivalent to specifying the parameters of market power ($\theta_{\$}$, θ_u) as constants.