Financial Crisis and Sectoral Diversification of Argentine Banks, 1999-2004

Ricardo Bebczuk y Arturo Galindo

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Ricardo Bebczuk
Universidad de la Plata

Arturo Galindo
Universidad de los Andes

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Abstract

We explore the impact and evolution of loan portfolio diversification during the 2001-2002 Argentine financial crisis. Using a novel dataset that combines public information on the main activity of the largest 930 Argentine firms with their borrowing from each bank operating in the country during the 1999-2004 period, we find that banks did not modify much their loan portfolio mix as a response to the crisis, even though the econometric results point to a positive effect of sectoral diversification and lending to tradeable sectors on bank profitability and risk mitigation. Our results suggest that larger banks benefit more from diversification that smaller ones, and that the benefits of diversification are greater during the downside of the business cycle.

Keywords: Focus, Diversification, Bank risk, Bank return
JEL Code: G20, G21, G28

1. Introduction

The recent 2001-2002 Argentine financial crisis has attracted a great deal of attention in academic and professional circles as a result of its peculiar genesis and far-reaching consequences. While the macroeconomic roots of the crisis have been properly investigated, other aspects have been plainly overlooked. One particularly appealing, yet disdained, research topic is the loan portfolio diversification of the Argentine banks before and after the crisis. Although some analysts have advanced that the lack of proper diversification of the loan portfolio was a key catalyst of the banking crisis (see Fanelli (2002) and Perry and Servén (2002)), no hard evidence has so far been produced whatsoever. In this spirit, the present study aims to shed some light on the following questions: (i) In view of the massively anticipated currency devaluation of 2002, did banks change beforehand their loan sectoral composition, especially in favor of tradeable goods?, (ii) In any case, did all banks behave in a similar fashion in the face of the crisis, or can differences be found according to the size or ownership structure of the banks?; and (iii) Did diversified banks perform comparatively better around the crisis, as measured by their returns and non-performing loans?

Beyond this specific application, the benefits of diversification are *per se* a relevant line of research in the corporate finance literature (see for instance Graham et al. (2002)). However, the banking literature on diversification is strikingly scarce. Two notorious and recent exceptions are Winton (1999) at the theoretical level, and Acharya, Hasan and Saunders (2001), who conduct an empirical study on the Italian banking system, and find that the benefits of diversification depend on the risk exposure of banks. The lack of more work in this field is to a great extent explained by the unavailability of information on the sectoral breakdown of total loans in most countries. Argentina is no exception, as bank reports to the Central Bank are for exclusive use of the regulator and are, as acknowledged by experts and Central Bank officials, incomplete and often misleading due to misclassification and clerk errors. As explained below, in order to circumvent these obstacles, we put together a new database that combines public information on the main activity of the largest 1,100 Argentine firms with their borrowing from each bank operating in the country during the 1999-2004 period.

While the cited research contributions defy the conventional wisdom that bank diversification is always beneficial –thus becoming an empirical matter-, it is much less disputable that a higher share of loans to tradeable sectors (namely, those whose prices are mostly governed by the so-called law of one price) should boost bank returns and contain bank risk in the aftermath of a steep real devaluation like the one that took place in 2002 once the fixed peso-dollar parity maintained since 1991 was abandoned. Over and above this effect, one should expect that, during the run-up to the crisis –which became an increasingly foreseeable event since as early as 2000- bank loan portfolios would have been gradually rebalanced in favor of tradeable-producing firms. Summarizing our results, we find that banks did not modify much their loan portfolio mix as a response to the crisis, even though the econometric results point to a positive effect of sectoral diversification and lending to tradeable sectors on bank profitability and risk mitigation.

The structure of the paper is as follows. In Section 2, we review the recent literature on bank diversification. In Section 3, we present some descriptive statistics about the database as a prelude to the econometric work developed in Section 4. Some conclusions close.

2. Literature Review

Against the common knowledge that well-diversified firms should do better than focused firms, some scholars argue otherwise. Prominently, Winton (1999) points out on theoretical grounds that portfolio diversification may have a non-linear, U-shaped association with the bank's probability of default, depending on the downside risk of the loan portfolio. The rationale behind the claimed U-shaped relationship between diversification and probability of default goes as follows. The assertion that an efficient diversification policy diminishes the likelihood of bad outcomes explains the decreasing arm of the U-shaped function. However, Winton (op.cit.) notices that this holds true only for moderate levels of downside risk. When the downside risk of loans is low, being focused or diversified should actually leave the probability of default unaltered – as an extreme example, if all sectors are able to repay their loans in full even under the worst scenario, diversifying would have a null effect on the bank's probability of default. Conversely, when the downside risk is high –meaning that many or all indebted sectors have positive probabilities of going bankrupt in different states of nature–, the focus strategy may be the efficient one by exposing the bank to the downturn of one or few sectors instead of to the downturn of all sectors –in this case, default will be realized in only some states of nature.

Diversification comes at a cost, though. The incursion into new sectors in order to reach a more diversified portfolio may entail substantial learning costs. Banks are good at collecting and processing information, but they need some time to establish meaningful lending relationships (see Petersen and Rajan (1994)). In the meantime, the ability to pick and monitor these new borrowers may be jeopardized. Moreover, under an aggressive interbanking competition in the new loan sector, the bank may attain lower returns, especially if a winner´s curse is at work, by which the bank may be likely to select the firms that other banks, more familiar with the sector, have already rejected.

The evidence on Italy by Acharya et al. (op.cit.) corroborates the rather heterodox Winton's view, showing that focus improves bank's performance by increasing return and reducing risk, and that the nexus is non-linear in that high-risk banks are the ones suffering the most from this effect.

Before proceeding, it is worth mentioning that another branch of the banking literature deals with diversification across financial activities. Here the issue is whether the expansion of banks to the securities, insurance and real state markets contributes to a better risk-return combination. The macro evidence on a large sample of countries seems to favor this type of diversification, as regulatory restrictions to invest in other lines of business increase the probability of financial crisis (see Beck et al. (2003)). Anyway, De Nicolo et al. (2003) document no effects of conglomeration on bank risk using information on developed and developing countries.

3. Database

3.1 Data description and sources

As stated above, the lack of more work in this field is to a great extent explained by the unavailability of information on the sectoral breakdown of total loans. In Argentina bank reports to the Central Bank are for exclusive use of the regulator and are incomplete and often misleading due to misclassification and clerk errors. To circumvent this data constraint, we assembled a database on the bank debt of the 930 largest non-banking Argentine firms, as measured by their annual sales. For each firm, the database contains monthly information from July 1999 through March 2004 on the amount borrowed from each of the 124 banks operating in Argentina during this period of time. In total, the original database included about 305,000 observations. In turn, firms were classified into nine sectors following National Accounts divisions: Agriculture, farming and fishing; Mining; Industry; Electricity, Water and Gas; Construction; Commerce and Hotels; Financial Sector; and Public Administration. The main data sources were the Central de Deudores of the Central Bank of Argentina, Revista Mercado -a monthly business magazine which once a year publishes the list of the 1,000 largest firms with their main activity- and the Bolsa de Comercio –listed firms not included in Revista Mercado were also incorporated in the database-. Banks' balance sheets were obtained from the Central Bank and the IADB Research Department database. One initial caveat to our work is that the sample of firms may not be representative of the total credit to the corporate sector. However, our sample amounts on average to 30.5% of the credit to the private sector and, since the latter includes credit to families, to about 72% of the credit to the corporate sector.[1]

Based on the nine-sector classification, we calculated a Herfindahl index (which equals the sum of the squared proportional exposures to each sector) for each bank and each quarter from July 1999 to March 2004. The Herfindahl index has a maximum of 1 when the bank is completely focused on one sector, so lower values of the index indicate more diversification. Along with this, we compute the share of loans to tradeable-producing firms and to non-tradeable-producing firms. We classify a product as tradeable if, in the period spanning from December 2001 to December 2003, its price increased by no less than 100%, that is, if they more or less kept track of the peso devaluation in the period.[2]

3.2 Descriptive Statistics

We start by showing how the main variables of interest have behaved over 1999-2004. The figures reported in Table 1 are averages from quarterly data of return on assets (ROA). We are presenting separate data for domestic public and private banks, and for

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[1] There is no official information on the breakdown of credit to the private sector between families and firms, but we rely on estimates of Banco Frances, various issues.

[2] The nominal devaluation rate from December 2001 to December 2003 was about 200%. In the same period, wholesale prices –where exportable and importable goods have a significant weight- went up by 150%, while retail prices –which a stronger component of non-tradeable goods- increased by 50%. We thank Abel Viglione and Ezequiel Cabezon at Fundacion de Investigaciones Economicas Latinoamericanas (FIEL) in Buenos Aires for providing us with sectoral price indexes, and carefully double-checking the accuracy of our firm-specific tradeable/non-tradeable classification. One alternative procedure would have been to divide the nine broad sectors into tradeables and non-tradeables using standard a priori criteria, but the heterogeneity of activities within each sector would have created undesirable noise and errors.

foreign-owned banks, as well as for 1999-2001 (pre-crisis period), 2002 (full-fledged crisis), and 2003-2004 (post-crisis period). Additionally, we discriminate between large banks (those with at least 1% of the assets of the banking system) and small banks (those below 1% of system's assets). The return on assets amounted to -4.83% in 1999-2004, but with wide differences across groups and over time. An apparent downward trend was at work over the period reflected in negative values since 2000, reaching the bottom in 2002 with an average of –13.46%. In turn, comparing bank groups by type of ownership, domestic private banks and foreign banks did better than public banks except for 2002, while big banks stand out as better performers than the small ones.

Table 1

Return on Assets of Argentine Banks, 1999-2004

Period	All Banks		Large Banks		Small Banks		Public Banks		Foreign Banks		Private Banks	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1999 III-IV	0,76	4,1	0,78	1,1	0,75	4,6	-2,42	4,8	0,88	2,1	0,17	3,1
2000	0,08	4,5	0,06	2,6	0,09	5,0	-2,71	5,5	0,21	2,8	-0,04	2,8
2001	-0,26	4,8	0,53	1,7	-0,49	5,4	-2,07	3,9	-0,86	5,9	-0,72	5,5
2002	-13,46	26,1	-9,66	10,2	-14,30	28,4	-5,93	10,8	-12,49	19,3	-9,56	19,9
2003	-8,83	19,2	-5,71	8,9	-9,66	21,1	-4,28	5,8	-9,01	13,5	-9,12	13,7
2004	-0,91	9,0	-2,42	6,5	-0,51	9,6	-3,06	4,0	-4,62	9,5	-3,10	9,7
1999-2004	-4,83	16,5	-2,89	7,5	-5,36	18,2	-3,54	6,7	-4,99	12,7	-4,40	12,7
1999-2001	0,07	4,6	0,38	2,0	-0,03	5,1	-2,40	4,8	-0,12	4,3	-0,29	4,2
2002	-13,46	26,1	-9,66	10,2	-14,30	28,4	-5,93	10,8	-12,49	19,3	-9,56	19,9
2003-2004	-7,22	17,9	-5,04	8,6	-7,80	19,7	-4,04	5,5	-8,13	12,9	-7,92	13,2

The other dependent variable, Non Performing Loans, is summarized in Table 2. With an average value for the whole sample of 21.6%, non performing loans appear to positively covary with the level of activity as it abruptly dropped with the crisis unleashed in 2002 but bounced back as the economy recovered in 2003 and 2004. From the breakdown by size and ownership structure, we find a similar pattern to that of ROA, with small and public banks displaying the highest ratios.

Table 2

Non performing loans of Argentine Banks, 1999-2004

Period	All Banks		Large Banks		Small Banks		Public Banks		Foreign Banks		Private Banks	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1999 III-IV	16,8	12,9	10,1	7,2	20,3	13,9	29,5	17,1	10,1	8,3	12,5	11,0
2000	17,9	13,1	12,6	8,5	20,4	14,2	27,7	14,9	10,1	7,7	12,7	11,7
2001	17,8	12,0	12,0	9,5	19,9	12,1	22,7	14,1	10,6	6,6	11,0	6,9
2002	29,4	18,8	18,5	9,8	32,7	19,7	25,5	17,5	23,5	11,2	26,5	17,7
2003	24,8	16,2	19,9	13,6	26,8	16,7	27,6	20,2	23,9	10,6	25,4	13,6
2004	18,6	14,0	16,0	10,3	19,6	15,1	22,1	18,7	20,0	13,1	21,1	13,2
1999-2004	21,6	15,6	15,1	10,9	24,2	16,4	26,1	17,0	16,2	11,3	17,9	14,1
1999-2001	17,7	12,6	11,9	8,7	20,1	13,2	26,0	15,0	10,3	7,4	12,0	9,9
2002	29,4	18,8	18,5	9,8	32,7	19,7	25,5	17,5	23,5	11,2	26,5	17,7
2003-2004	23,6	15,9	19,1	13,0	25,3	16,6	26,5	19,8	23,1	11,2	24,6	13,6

A visual inspection of the Herfindahl indexes in Table 3 rapidly gives us the answer to one of our motivating questions: Argentine banks did not increase their diversification since 1999 onwards. If anything, they become more focused, as the index jumped to 0.6 in 2003-2004 from 0.5 in 1999.[3] While this is observed for each and every bank segment, the Herfindahl is sensibly different across groups. In particular, at all times, large and foreign banks are more diversified than small and domestic ones, respectively. The last row of Table 3 shows a mean difference test between each group of banks and the remaining banks that confirms that the difference is significant in all cases at the 1% significance level.

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[3] It must be noted that changes in the index can be due either to net increases of loans to some sectors or net cancellations to others, but we do not consider this difference of particular relevance for our analysis. Likewise, part of the change since 2002 could be explained by the peso conversion of dollar-denominated debts in 2002. However, we do not have information to check the influence of this valuation effect. Besides, even if this was the case, banks would have been able to rebalance their portfolios in 2003-2002, which evidently did not take place.

Table 3

Sectoral Herfindahl Index for Argentine Banks, 1999-2004

Period	All Banks		Large Banks		Small Banks		Public Banks		Foreign Banks		Private Banks	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1999 III-IV	0.50	0.25	0.34	0.13	0.56	0.26	0.57	0.28	0.43	0.21	0.53	0.26
2000	0.50	0.25	0.36	0.20	0.55	0.26	0.59	0.29	0.43	0.21	0.52	0.26
2001	0.50	0.25	0.36	0.17	0.56	0.25	0.59	0.29	0.43	0.21	0.53	0.26
2002	0.60	0.27	0.35	0.16	0.68	0.25	0.63	0.30	0.48	0.25	0.66	0.26
2003	0.60	0.28	0.36	0.15	0.69	0.27	0.62	0.31	0.51	0.29	0.64	0.26
2004	0.61	0.26	0.38	0.11	0.70	0.25	0.70	0.31	0.54	0.26	0.62	0.25
1999-2004	0.55	0.26	0.36	0.15	0.62	0.25	0.61	0.30	0.47	0.24	0.58	0.26
1999-2001	0.50	0.25	0.36	0.16	0.56	0.25	0.58	0.29	0.43	0.21	0.53	0.26
2002	0.60	0.27	0.35	0.16	0.68	0.25	0.63	0.30	0.48	0.25	0.66	0.26
2003-2004	0.60	0.27	0.37	0.13	0.69	0.26	0.66	0.31	0.52	0.27	0.63	0.25
Diff. in Means t-stat p-value			-19.780 0.000		19.780 0.000		3.351 0.009		-8.570 0.000		7.710 0.000	

The passivity during a banking crisis is at odds with a theoretical body predicting that there might be an optimal degree of diversification. Nevertheless, in a more realistic setting, one must qualify the above assertions and internalize several idiosyncratic and systemic frictions. In a volatile macroeconomic environment, diversification may not pay off because of the difficulties to accurately estimate the downside risk of each sector and, in some cases, to the presence of systemic risk. Also, under these circumstances, it is possible that the bank will prefer to insulate itself against financial distress by reducing its exposure to the credit risk of the private sector as a whole and switching its portfolio towards more liquid assets. Furthermore, changing the loan sectoral composition is not only a slow process but it may be quite demanding in time and resources. If managers and controlling shareholders do not perceive this investment to be profitable, and rather believe that the principal beneficiary of this risk-containment policy will be the bank creditors, no incentives will be in place to do so. Also, the maturity of outstanding loans inhibits banks to rapidly migrate to other sectors.[4] Finally, the widespread use of collateral in lending operations break down the link between the firm´s risk and the loan´s risk, turning sectoral diversification less crucial for the bank.

In Argentina, another aspect that adds to the complexity of this issue is that the asset structure of the banking system in the sample period was dominated by high-yield public debt and considerable liquid reserves, which jointly downplayed the impact of the private sector loan portfolio on the overall risk and profitability of the banks, and hence the incentives to undertake radical revisions in the banks' diversification profile.

In Table 4, we display a stylized structure of the assets side of the banking system. Clearly, the loans to the private sector went down as the crisis unraveled in favor of public debt and cash reserves; for the system as a whole, the proportion of loans to the

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[4] A priori, this maturity aspect, coupled with the learning costs highlighted earlier, imply that the longer the period, the easier and the more effective a change in the sectoral loan mix will be.

private sector reached a peak of 40.1% in 1999-2001 and a minimum of 28.2% in 2003-2004.[5]

Table 4

Stylized Assets Structure of the Argentine Banking System, 1999-2004
As a percentage of total assets

Bank Group	Cash	Loans to the Private Sector	Loans to the Public Sector	Loans to Financial Institutions	Other Assets	Total
All banks						
1999-2004	12.5	34.4	24.1	2.5	26.6	100.0
1999-2001	8.0	40.1	20.1	3.6	28.1	100.0
2002	13.0	29.7	27.2	1.6	28.5	100.0
2003-2004	18.8	28.2	28.5	1.2	23.3	100.0
Large Banks						
1999-2004	9.3	30.0	34.9	1.1	24.8	100.0
1999-2001	6.8	39.7	24.0	1.6	27.8	100.0
2002	6.7	23.8	42.8	0.4	26.3	100.0
2003-2004	14.3	18.4	47.2	0.5	19.5	100.0
Small Banks						
1999-2004	13.3	35.6	21.1	2.9	27.1	100.0
1999-2001	8.4	40.3	18.8	4.2	28.2	100.0
2002	14.5	31.0	23.5	1.9	29.1	100.0
2003-2004	20.1	30.9	23.2	1.3	24.4	100.0
Public Banks						
1999-2004	14.3	30.5	40.7	0.6	14.0	100.0
1999-2001	8.5	41.1	32.9	0.8	16.6	100.0
2002	10.4	24.1	51.7	0.3	13.5	100.0
2003-2004	25.0	17.7	46.9	0.2	10.2	100.0
Foreign Banks						
1999-2004	11.5	26.4	24.3	3.0	34.8	100.0
1999-2001	7.3	33.1	18.1	4.0	37.6	100.0
2002	13.0	20.8	27.4	2.8	36.0	100.0
2003-2004	17.1	19.3	31.9	1.8	30.0	100.0
Private Banks						
1999-2004	12.6	40.4	19.6	2.7	24.7	100.0
1999-2001	8.5	45.3	17.5	4.3	24.5	100.0
2002	13.7	35.9	20.7	1.3	28.3	100.0
2003-2004	18.2	35.5	22.1	1.1	23.1	100.0

Examining the share of tradeable activities in total loans in Table 5, we again notice no significant variation over the period of analysis, although small and private banks maintain higher shares than large and public and foreign banks, respectively.[6] Also, it is worth mentioning that the alleged non-tradeable bias since the 1990s -with its pervasive balance-sheet effects on banks in the face of the currency crisis- is not picked up by the actual data, which conversely show that more than half of the corporate loans were oriented towards tradeables.

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[5] Incidentally, this suggests that the economic recovery since late 2002 was not accompanied by a rebound of credit.

[6] Of course, the observed tradeable share is a market-clearing value. From the credit demand side, it is likely that devaluation-linked windfall profits since 2002 for these sectors may have encouraged them to substitute bank credit with less expensive internal cash flows, counteracting any eventual bank willingness to increase the tradeable loan share.

Table 5

Loans to Tradeable-Producing Firms by Argentine Banks, 1999-2004
As a percentaje of total loans

Period	All Banks		Large Banks		Small Banks		Public Banks		Foreign Banks		Private Banks	
	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.	Mean	Std. Dev.
1999 III-IV	0.57	0.29	0.52	0.17	0.59	0.31	0.48	0.33	0.61	0.20	0.58	0.31
2000	0.52	0.30	0.52	0.18	0.52	0.34	0.41	0.35	0.58	0.20	0.51	0.34
2001	0.53	0.30	0.52	0.17	0.53	0.34	0.32	0.34	0.57	0.21	0.56	0.32
2002	0.56	0.33	0.49	0.15	0.58	0.37	0.39	0.35	0.56	0.23	0.61	0.36
2003	0.56	0.33	0.49	0.18	0.59	0.36	0.32	0.34	0.53	0.27	0.66	0.32
2004	0.58	0.32	0.51	0.17	0.61	0.36	0.29	0.35	0.58	0.27	0.67	0.29
1999-2004	0.55	0.31	0.51	0.17	0.57	0.35	0.37	0.34	0.57	0.23	0.60	0.32
1999-2001	0.54	0.29	0.52	0.17	0.55	0.33	0.40	0.34	0.59	0.21	0.55	0.32
2002	0.56	0.33	0.49	0.15	0.58	0.37	0.39	0.35	0.56	0.23	0.61	0.36
2003-2004	0.57	0.32	0.50	0.18	0.60	0.36	0.30	0.35	0.55	0.27	0.66	0.30

To support our view that banks did not care much about diversifying, in Table 6 we look at the weights of each of the nine sectors in total loans, as the same Herfindahl index can be consistent with quite different sectoral allocations. Once again, this table corroborates that the participations remain more or less unaltered during the period.

Table 6

Sectoral allocation of loans, 1999-2004
As a percentage of total loan portfolio

Period	Agriculture, Farming, and Fishing	Mining	Industry	Electricity, Water, and Gas	Construction	Commerce and Hotels	Transport and Communications	Financial, Real State and Other Intermediation Services	Education, Health, and Other Services	Total
1999 III-IV	7.0	0.7	47.3	3.5	5.3	16.5	6.1	10.1	3.5	100.0
2000	5.6	0.5	44.0	5.0	5.2	16.0	8.2	11.7	3.7	100.0
2001	5.9	0.1	45.0	4.9	6.5	13.2	9.0	12.6	2.7	100.0
2002	4.4	0.1	49.7	6.2	6.7	15.0	7.5	8.1	2.2	100.0
2003	5.6	0.1	49.6	5.7	6.2	14.1	7.7	9.3	1.7	100.0
2004 I	6.3	0.1	50.8	7.8	5.1	12.6	6.2	10.3	0.9	100.0
1999-2004	5.8	0.3	47.7	5.5	5.8	14.6	7.5	10.4	2.4	100.0
1999-2001	6.2	0.4	45.5	4.5	5.7	15.2	7.8	11.5	3.3	100.0
2002	4.4	0.1	49.7	6.2	6.7	15.0	7.5	8.1	2.2	100.0
2003-2004	5.9	0.1	50.2	6.7	5.6	13.4	7.0	9.8	1.3	100.0

4. Econometric Results

In what follows we discuss our main findings on the link of diversification with profitability and non-performing loans. We use quarterly data for the period spanning from 1999-Q3 to 2004-Q1 and pooled cross-section and time-series bank data to run Weighted Least Squares (WLS) regressions, with the weight being the bank's share in the assets of the banking system. This WLS method has the advantage of: (i) capturing the behavior of the representative bank in the system, and (ii) reducing the noise in the data, under the realistic assumption that the measurement error decreases with bank size. The number of observations amounts to 942. All explanatory variables are one-quarter lags to allow for a reasonable delayed effect. Three control variables are included: the bank's provisions, overhead costs, and public debt, all as a ratio of bank

assets. We expect a negative sign on provisions and overhead costs. The inclusion of the public debt share intends to reflect into the ROA equation the peculiar asset composition of the Argentina banking system. It is hard to sign its overall effect, which is likely to have been positive up to 2001, as the government was paying high yields, and negative from them on, in the aftermath of the fiscal default. Bank and year-quarter effects are also controlled for.

4.1 Diversification and ROA

Table 7 displays our baseline results for ROA, lending support to the claim that sectoral concentration has a detrimental effect on bank returns and that a higher exposure to the tradeable sector seems to be beneficial.[7] Results are highly significant and do not vary much after the inclusion of additional bank specific controls. While Overhead Costs turns out to be non-significant, Provisions enter with the expected negative sign at statistically significance levels, as it is the positive loading on public debt holdings. Quantitatively, the effect is far from being negligible: one standard deviation increase in the Herfindahl index (0.26) shrinks ROA by 1.21 percentage points, while the same increase in the Tradeable share (0.31) pushes ROA up by 1.44 percentage points.

Table 7
Diversification and ROA: Baseline Results

	Dependent Variable: ROA	
	Without Controls	With Controls (Baseline regression)
Herfindahl Index	-5.529 [1.977]***	-4.667 [1.953]**
Tradeable Share	7.778 [1.689]***	5.783 [1.688]***
Provisions to Assets		-0.475 [0.074]***
Public Debt to Assets		0.043 [0.020]**
Overhead Costs to Assets		-128.362 [141.066]
Observations	949	942
Method	WLS	WLS
R-squared	0.55	0.57
Bank Fixed Effect	Yes	Yes
Year-Quarter Effects	Yes	Yes

Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

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[7] One may wonder why lending to tradeable sectors is profit-improving at both times of low real exchange rate (the pre-crisis period) and of high real exchange rate (the crisis and post-crisis period). A plausible explanation is that, as far as they remain competitive in international markets, exportable-producing firms are more likely than non-tradeables to smooth production when domestic demand is weak by selling abroad, thus reducing their probability of default.

4.2 Diversification and ROA: Robustness and additional tests

To put to the test our previous results, a battery of alternative model specifications are presented in Table 8. All in all, the econometric evidence in this section reassuringly confirms our baseline results.

Table 8

Diversification and ROA: Additional regressors and robustness checks

	Dependent Variable: ROA		
	Size	GDP Growth	Dummy 2002
	(1)	(2)	(3)
Herfindahl Index	133.622	-3.351	2.409
	[19.202]***	[2.039]	[1.922]
Tradeable Share	-42.632	4.109	1.956
	[14.213]***	[1.810]**	[1.631]
Provisions to Assets	-0.368	-0.484	-0.609
	[0.078]***	[0.074]***	[0.070]***
Public Debt to Assets	0.02	0.053	0.029
	[0.020]	[0.020]***	[0.019]
Overhead Costs to Assets	-220.818	-116.436	-62.814
	[149.567]	[140.624]	[132.098]
Dummy 2002 * Herfindahl Index			-18.142
			[2.381]***
Dummy 2002 * Tradeable Share			11.929
			[2.728]***
Log Assets	3.284		
	[1.050]***		
Log Assets * Herfindahl Index	-9.38		
	[1.301]***		
Log Assets * Tradeable Share	3.16		
	[0.957]***		
Herfindahl Index * GDP Growth		0.397	
		[0.143]***	
Tradeable Share * GDP Growth		-0.019	
		[0.146]	
Observations	942	942	942
Method	WLS	WLS	WLS
R-squared	0.6	0.58	0.63
P-Value, Test Herfindahl Index	0.000	0.002	0.000
P-Value, Test Tradeable Share	0.000	0.074	0.000
Bank Fixed Effect	Yes	Yes	Yes
Year-Quarter Effects	Yes	Yes	Yes

Standard errors in brackets

* significant at 10%; ** significant at 5%; *** significant at 1%

We begin by exploring whether bank size matters. Size is proxied by the logarithm of bank assets. It is hard to sign the expected return-size nexus because of the diverse conflicting arguments advanced in the banking literature. On one hand, large banks enjoy more economies of scale and scope and may have a more dominant position in the

market. But, on the other hand, small banks face less pervasive agency problems and may reap informational rents from serving small and opaque firms –which at the same time are more prone to default. Against this theoretical ambiguity, a positive effect of size on return is unveiled in Column (1) of Table 8. More importantly, the interaction terms in the same equation imply that the positive effect of diversification and of a higher exposure to tradeables materializes only for big banks. The marginal effect of the Herfindahl index (the tradeable share) becomes positive when the logarithm of total assets crosses the threshold of 14.2 (13.5), the sample mean being 12.9.[8] A possible rationale is the comparative advantage of small banks at engaging in close lending relationships. These informational skills are put to a better use the more focused the bank is and the harder is to assess the probability of default –the ability to repay of a non-tradeable producing firm requires a more intimate knowledge of the company and its sector than in the case of a tradeable producing firm, where the ability to pay is more related to macroeconomic factors (exchange rates, international prices, and the like).[9] Moreover, the presence of fixed monitoring costs may induce more specialization in small banks with small average loan size, an assertion consistent with the much more concentrated portfolio of small vis-à-vis big banks that was uncovered in Table 3.

In Column (2) we interact the Herfindahl Index and the Tradeable Share with the GDP growth in the same quarter. The positive estimate on the interaction of the Herfindahl with GDP growth indicates that the gains from diversification are even higher in bad times. During economic slumps, the reigning uncertainty undermines the bank's ability to assess and monitor its borrowers –which tends to bear fruit over longer and rather predictable periods-, and hence a diversified loan portfolio becomes an asset. From here, it appears that the more diversified Argentine banks were better equipped to face the drastic downturn that characterized the period under study.[10] For instance, at the peak of the crisis in 2001-2002 (when the quarterly GDP growth rate was -6.8%), a mere 10-percent decrease in the average Herfindahl Index (from 0.55 to 0.495) would have accounted for a ROA improvement of 0.15 percentage points.[11] As for the tradeable/non-tradeable choice, it maintains its individual significance, but not when interacted with GDP growth. This may come from the already mentioned fact that tradeables are relatively less sensitive to domestic economic cycles.

We pursue yet another avenue to ratify that diversification pays off in bad times by introducing in Column (3) a new interaction term between the Herfindahl index and a time dummy variable with value 1 in 2002 and 0 otherwise. The negative estimate reveals that diversification was particularly valuable at the height of the crisis. In turn,

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[8] Using the estimates in Table 8, the marginal effects are [133.622 -9.38 Log(Assets)] and [-42.632 + 3.16 Log(Assets)], respectively.

[9] For the economy as a whole, one should expect that tradeable producing firms are on average larger than non-tradeable producing ones, and, since small banks tend to be inclined towards small borrowers, this would reinforce the argument. However, let us recall that our diversification measures are based on a sample of large firms, so we cannot take this point at face value without further information on the complete loan portfolio of big and small banks.

[10] We must underline that this argument is not the same as the one advanced in Section 2 based on Winton´s (op.cit.) paper. In that case, diversification is viewed from an ex-ante perspective under alternative future states of nature. Here, we argue that, under the realization of a particular state of nature (the crisis event), diversification seems to have been beneficial.

[11] For this to hold, we should observe that the performance of the different sectors is only moderately correlated to that of other sectors, that is, that systemic risk is not too high. This seems to be the case. Just as a rudimentary indication, the median pairwise correlation of sectoral GDPs with quarterly data for 2000-2004 is 0.39, which drops to 0.18 when only 2002 is considered.

the positive sign on the interaction with the tradeable share likely responds to the windfall gains from the sizable peso devaluation since the beginning of that year.

4.3 Diversification and Non Performing Loans

A move toward a more efficient loan portfolio may of course reflect into higher returns (as investigated in previous sections) and/or lower default risk, which we will measure through the share of non performing loans to total loans. The relationship between diversification and non performing loans is explored in Table 9. The estimated coefficients in the first column imply that a lower Herfindahl index and a higher Tradeable share are beneficial to the bank as a way of containing risk, over and above its effect on returns. It should be noticed that non performing loans data is available for a narrower set of banks and years, shrinking the usable sample from 942 to 666 observations. It is reassuring that the results continue to be significant, thus serving as a robustness check for our econometric investigation.[12] In the second column we add two additional controls. We expect a negative sign on the share of public debt in total assets, as a risk averse bank would have an incentive to have a safer loan portfolio to compensate for the apparent risk of high yield public securities. In turn, the interest rate spread is a direct measure of the default risk of the bank´s borrower pool, thus increasing the ratio of non performing loans. Based on the baseline regression with controls, the magnitude of the estimate indicates that a decrease of one standard deviation in the Herfindahl index (0.26) reduces non performing loans in 1.27 percentage points, that is, a reduction of 5.9% over the sample average of 21.6%. Replicating the exercise for the Tradeable share, an increase of one standard deviation (0.31) diminishes non performing loans in 3.69 percentage point, or 17% of the sample mean. In all cases, the goodness of fit is quite high, with R squares in the range of 0.71 to 0.83.

Column (3) deals with the effect of bank size. As with ROA, we observe that big banks have better loan portfolios. Moreover, the marginal effect of the Herfindahl index becomes positive once a threshold of log bank size 13.2 is surpassed. Being 12.9 the average bank size, this means that sectoral diversification reduces non performing loans only for big banks. The likely explanation lies on the comparative ability of small banks, vis-à-vis big ones, to cultivate personal relationships with a rather focused pool of borrowers –in contrast, big banks have a more imperative need to diversify owing to their less information-intensive lending policies. Unlike ROA regressions, the Tradeable share turns out to be non significant when interacted with size.

In Column (4), we find once again that diversification becomes more valuable during economic downturns, as the interaction of the Herfindahl index with GDP growth yields a negative, yet small in magnitude, effect.

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[12] The ROA regressions do not change much after this sample reduction, either. As before, time and fixed effects are controlled for.

Table 9

Non Performing Loans Regressions

	Dependent Variable: NPL			
	Baseline without controls (1)	Baseline with controls (2)	Size (3)	GDP Growth (4)
Herfindahl Index	0.044 [0.024]*	0.049 [0.025]*	-0.515 [0.255]**	0.046 [0.027]*
Tradeable Share	-0.122 [0.029]***	-0.119 [0.029]***	0.156 [0.211]	-0.105 [0.031]***
Public Debt to Assets		-0.001 [0.000]**	-0.001 [0.000]	-0.001 [0.000]**
Interest rate spread		0.852 [0.218]***	0.275 [0.181]	0.848 [0.219]***
Log Assets			-0.176 [0.017]***	
Log Assets * Herfindahl Index			0.039 [0.018]**	
Log Assets * Tradeable Share			-0.014 [0.014]	
Herfindahl Index * GDP Growth				-0.004 [0.002]*
Tradeable Share * GDP Growth				-0.003 [0.002]
Observations	666	666	666	666
Method	WLS	WLS	WLS	WLS
R-squared	0.71	0.72	0.81	0.73
P-Value, Test Herfindahl Index			0.009	0.037
P-Value, Test Tradeable Share			0.121	0.001
Bank Fixed Effect	Yes	Yes	Yes	Yes
Year-Quarter Effects	Yes	Yes	Yes	Yes

Standard errors in brackets
* significant at 10%; ** significant at 5%; *** significant at 1%

Conclusions

This study is the first attempt to characterize the degree of diversification of the Argentine banks and investigate its impact on their returns and portfolio quality. The sample period covers bank-level, quarterly data for 1999-2004, thus allowing us to observe bank behavior both during the incubation, development and resolution of the financial crisis that reached its highest point in 2001-2002. We measure diversification by calculating: (a) an overall Herfindahl index from the exposure to nine productive sectors; and (b) the share of total corporate loans to tradeable-producing firms. Given the lack of official information, we combine information from private sources with data from the Central Bank to construct our indices. Even though we use the subset of the biggest firms in the country, their loans represents a considerable 72% of total corporate bank borrowing. From the original database of 305,000 observations containing the exposure of each bank to each firm in each quarter, we built a final sample of 942 observations.

At the descriptive level, we find that big banks and foreign banks are on average more diversified than small and national banks, and also that small and private banks hold a higher share of tradeables, but no group seems to have pursued a more diversified portfolio before or after the advent of the crisis. At first sight, this decision clashes against the traditional view claiming that diversification is conducive to a safer portfolio. In Argentina, the expectations of exchange rate devaluation from as soon as 2000 could have encouraged an inclination toward lending to tradeable sectors. However, both theoretical and practical considerations may lead to revisit such belief. On one hand, modern contributions defy the conventional approach by asserting that, in the presence of high downside risk and imperfect information about the borrowers, the focus strategy might be the preferred one. On the other hand, the volatility of demand and relative prices in the recent past in Argentina may have been a serious obstacle to change the lending mix –besides, banks have probably tried to control risks by reducing their overall exposure to the corporate sector in favor of liquid and public sector-issued assets.

With the benefit of hindsight, an econometric analysis is the ultimate test to evaluate the link between bank diversification and performance. According to our results for 1999-2004, banks with a lower Herfindahl index (that is, more diversified) and with a higher tradeable share appear to have done significantly better in terms of stronger returns to assets and lower non-performing loans. Moreover, again in line with the orthodox position, diversifying is more valuable in bad times (lower GDP growth rates). Lastly, the bigger banks are the ones that benefit from more diversified portfolios, an observation consistent with the documented ability of smaller banks to engage in more focused, relationship-based lending.

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