ASECU South-Eastern Europe Journal of Economics 2 (2008) 145-167 SEEJE

BANK COMPETITION AND EFFICIENCY IN THE FYR MACEDONIA

ALESSANDRO GIUSTINIANI
KEVIN ROSS*

International Monetary Fund

Abstract
This paper assesses the degree of competition and relative efficiency of the FYR Macedonia's banking system – a sector which has undergone a substantial amount of change since the mid-1990s. In general, the results indicate that competition in the banking sector remains relatively weak and that improvements in bank efficiency have been limited to date. However, the presence of a small number of "pocket banks", which may pursue different objectives than those of standard banking businesses, suggest that these results should be interpreted with caution.

JEL classification : C4, G21.
Keywords: Panzar-Rosse, Malmquist, data envelopment analysis.

* *Corresponding author:* 700 19th Street, N.W., Washington, D.C. 20431, USA
e-mail: kross@imf.org

We are grateful to the editor and to a referee for useful comments. The views expressed in this paper are those of the authors and do not necessarily reflect those of the International Monetary Fund.

I. Introduction

There is considerable evidence that weak and inefficient financial systems can be a significant obstacle to economic growth.[1] This is due to the fact that financial intermediation – the process of channeling savings into productive investment – is an essential part of private sector development. A weak and inefficient financial sector, with limited competition, can adversely affect savings decisions and the optimal allocation of credit, thus hindering investment and economic growth.

In the FYR Macedonia, the banking sector has undergone a substantial amount of restructuring since the early 1990s. State banking institutions have been privatized, the problem of non-performing loans and frozen foreign currency deposits has been addressed, and the legal and regulatory structure has been strengthened. While lending to the private sector has picked up of late, the banking sector still remains somewhat underdeveloped with relatively low rates of financial intermediation.

Against this background, the aim of this paper is to assess the current state of the FYR Macedonia's banking sector, particularly with respect to the degree of competition among banks and their relative efficiency. The analysis focuses on the banking sector since it is the linchpin of the financial sector in the FYR Macedonia. In general, the results indicate that competition in the banking sector is relatively weak and that improvements in bank efficiency have been limited to date. However, the presence and behavior of a small number of "pocket banks", which may pursue different objectives than those of standard banking businesses, suggest that these results should be interpreted with considerable caution. These banks' reactions to input prices – used to assess competitive behavior – should perhaps not be interpreted in the same fashion as the reactions of strictly profit-maximizing banks. Similarly, the input-output ratios – used to assess relative efficiency – may differ between pocket and normal banks due to their different objectives.

The paper is organized as follows. Section II provides a brief overview of the banking sector's structure and financial soundness. Section III describes some relevant aspects of the current institutional and legal framework. Section IV discusses the degree of competition in the FYR Macedonia's banking industry through the application of the Panzar and Rosse test on market structure. Section V analyzes developments in the banking sector's efficiency and productivity by applying non-parametric techniques (Data Envelopment Analysis and Malmquist index). Section VI concludes.

1. See Levine (2004).

II. Some Stylized Facts

In terms of financial deepening, the FYR Macedonia does not compare favorably with other countries in the region. Regional comparisons of financial intermediation indicators – ratios of broad money, private sector credit and bank capital to GDP – among other central and eastern-European countries (CEECs) demonstrate that the degree of monetization and credit provision in the FYR Macedonia remains below the CEECs average (Figure 1).[2]

Although the number of banks in the FYR Macedonia is large, the market is rather concentrated. As of end-2005, there were 20 banks operating in the FYR Macedonia – a number marginally lower than in 1998 – and they had the lion's share of the financial system's assets (Table 1).[3] In addition, there were 14 savings houses (down from 18 in 1998), which play a very minor role in the system. Although this is a considerable number of banking institutions for a country of a population of 2 million, the degree of market concentration is high. Market structure indicators, such as the share of total bank assets held by the five largest institutions and the Herfindhal-Hirshman Index (HHI), suggest that the Macedonian banking market is relatively concentrated even compared with other countries in the region (Table 2).[4]

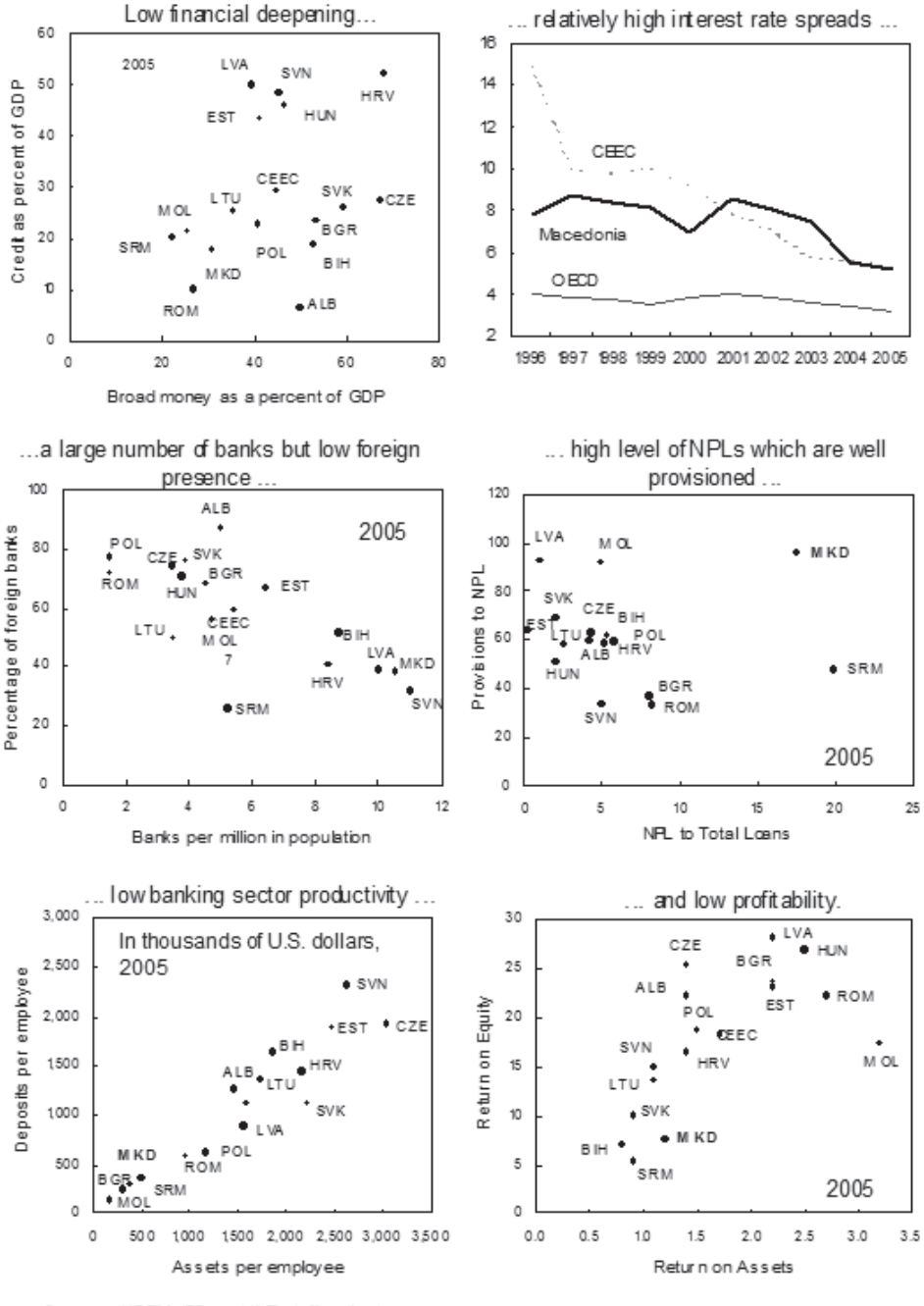
Foreign bank presence, compared to other Eastern European countries, is limited and mostly not from first-tier foreign banks. Around 48 percent of total assets are controlled by foreign majority owned banks. The foreign banks are from neighboring countries – namely Bulgaria, Greece, Slovenia and Turkey – and in some cases, appear to service mainly their nationals' business interests. Until recently the country has been unable to attract top-notch banks, likely due more to the overall political and economic environment than to the state of the banking system. As a consequence, the transfer of know-how, innovative technology, good governance and other international best practices (e.g. risk management) from abroad remains slow. However, the purchase of the fourth largest bank by Société Générale in 2007, and increasing

2. The Central and East European Country (CEEC) data include: Albania (ALB), Bosnia-Herzegovina (BIH), Bulgaria (BGR), Croatia (HRV), Czech Republic (CZE), Estonia (EST), FYR Macedonia (MKD), Hungary (HUN), Latvia (LVA), Lithuania (LTU), Moldova (MOL), Romania (ROM), Poland (POL), Serbia-Montenegro (SRM), Slovakia (SVK), and Slovenia (SVN).

3. In 2006, two small-medium sized banks merged under the aegis of the EBRD.

4. The HHI is the sum of squares of the markets shares (s_i) of all firms in a sector (HHI = $\sum_{i=1}^{N} s_i^2, i = 1, \ldots, N$). When all banks (n) are of equal size, HHI is equal to $\left(\frac{100}{n}\right)^2$, which tends to be 0 when n tends to be very large. When HHI is between 1,000 and 1,800, the market structure is somewhat concentrated. When HHI assumes a value above 1,800, the market is highly concentrated.

Figure 1. Banking Sector Comparisons



Sources: NBRM; IFS; and IMF staff estimates.

Table 1. FYR Macedonia: Structure of the Financial System; 1998-2005

	1998				2002				2005			
	Number	Assets in Millions of MKD	In Percent of Total Assets	In Percent of GDP	Number	Assets in Millions of MKD	In Percent of Total Assets	In Percent of GDP	Number	Assets in Millions of MKD	In Percent of Total Assets	In Percent of GDP
Banks	23	59,093	86.5	30.3	21	93,213	87.9	39.0	20	140,436	90.0	49.4
Largest three banks	3	34,818	58.9	17.8	3	59,619	64.0	24.9	3	92,835	59.5	32.7
Private banks	22	58,254	86.3	29.9	20	91,362	86.2	38.2	19	138,194	88.6	48.7
Domestic	16	50,533	74.0	25.9	13	50,335	47.5	21.1	11	66,119	42.4	23.3
Foreign	6	7,721	11.3	4.0	7	41,027	38.7	17.2	8	72,075	46.2	25.4
MDB 1/	1	839	1.2	0.4	1	1,851	1.7	0.8	1	2,242	1.4	0.8
Savings houses	18	755	1.1	0.4	17	956	0.9	0.4	14	1,934	1.2	0.7
Insurance companies	5	8,480	12.4	4.3	7	11,843	11.2	5.0	10	13,618	8.7	5.4
Life	1	132	0.2	0.1	1	611	0.6	0.3	1	818	0.5	0.3
Nonlife	4	8,348	12.2	4.3	6	11,232	10.6	4.7	9	12,800	8.2	4.5
Total financial system	45	68,328	100.0	35.0	44	106,012	100.0	44.4	44	156,988	100.0	50.1

Source: NBRM.
1/ FYR Macedonian Development Bank.

Table 2. Banking Market Concentration Indexes in Selected Countries; 2001-05

	Share of the 5 largest credit institutions in total assets					Herfindahl Index				
	2001	2002	2003	2004	2005	2001	2002	2003	2004	2005
Czech Republic	68.4	65.7	65.8	64.0	65.5	1,263	1,199	1,187	1,103	1,155
Estonia	98.9	99.1	99.2	98.6	98.1	4,067	4,028	3,943	3,887	4,039
Latvia	63.4	65.3	63.1	62.4	67.3	1,053	1,144	1,054	1,021	1,176
Lithuania	87.6	83.9	81.0	78.9	80.6	2,503	2,240	2,071	1,854	1,838
Hungary	56.4	54.5	52.1	52.7	53.2	892	856	783	798	795
Macedonia, FYR	**72.1**	**73.6**	**76.1**	**76.3**	**75.0**	**1,735**	**1,666**	**1,756**	**1,689**	**1,605**
Poland	54.7	53.4	52.3	50.2	48.6	821	792	754	692	650
Slovenia	67.5	68.4	66.4	64.6	63.0	1,582	1,602	1,496	1,425	1,369
Slovakia	66.1	66.4	67.5	66.5	67.7	1,205	1,252	1,191	1,154	1,076
Average	70.4	69.6	68.4	67.2	68.0	1,680	1,642	1,582	1,514	1,523
Memorandum items:										
Euro area	39.1	39.3	40.5	41.6	43.0	543	552	580	600	640
EU 25	37.8	38.3	39.8	40.9	41.5	504	520	547	569	584

Sources: ECB, "EU Banking Structures", October 2005 and 2006; NBRM; and Fund staff estimates.

interest shown by a number of foreign banks in purchasing existing banks – especially those which have signaled their desire to be taken over – suggest that the sector may see an increase in foreign investment going forward.

While banks generally enjoy sound capital and liquidity buffers, banks' intermediation activity is hindered by a legacy of a substantial amount of non-performing loans (NPLs) as well as a large share of other non-earning assets. Regional comparisons indicate that the Macedonian banking system is burdened by an above average stock of NPLs and corresponding provisions. As of end-2005, banks' NPLs amounted to around 18 percent of total loans and some 97 percent were provisioned (well above the regional average). This relatively high level of provisioning partially reflects difficulties in the enforceability of foreclosures as well as the relatively low likelihood of collateral collection.[5] On average, foreclosed assets amount to 20 percent of banks' own resources, and in the case of 5 banks are well above 50 percent. In 2005, the share of non-earning assets (foreclosed and fixed assets) ranged between 1.5 and almost 50 percent of banks' total assets, with an average close to 8 percent.[6]

The burden of this legacy together with low banking sector productivity and high operational costs have worked to limit banks' profitability. The FYR Macedonia's indicators of banking sector productivity, such as the amount of deposits and assets per employee, are below the regional average. This tends to suggest that very little consolidation, cost rationalization, and technological progress have taken place in the system to improve productivity.[7] As a result, profitability ratios – measured by the return on assets and the return on equity – while improving, are still below regional averages.

Relatively low financial deepening also reflects limited loan making opportunities and some characteristics of the market structure. Burdened with high NPLs, banks have been cautious in expanding their lending activity, taking also into account the lack of good investment opportunities. In addition, a few small banks are "pocket banks" of enterprise groups or individuals, which use them for treasury operations, as sources of cheap liquidity, and equity investment. As a result, the aggregate banking system has been in a position of structural liquidity surplus since 2001. Under the current pegged exchange rate regime, this structural liquidity surplus must be continually absorbed through the issuance of central bank bills to the banks at relatively

5. In addition, provisions tend to be a result of the legal system blocking the write-offs, further inflating NPLs and provisions.

6. NBRM (2006),

7. Between 2000 and 2005, while the number of banks declined from 23 to 20, employment increased by more than 20 percent.

high interest rates. In terms of commercial bank asset portfolios, these central bank bills assets compete directly with loan placements to consumers and enterprises.

III. The Institutional and Legal Framework

Financial intermediation has been hampered by a weak institutional and legal framework. Table 3 presents a number of financial sector reform and transparency indices which provide a flavor of the level of financial sector development and credit environment. In general, this scorecard suggests there are a number of framework deficiencies that have deleterious effects on financial intermediation, causing higher bank lending rates and spreads. For example, the FYR Macedonia scores below average in bank and non-bank sector reform, indicating significant deficiencies in meeting BIS standards in bank lending and supervision, and IOSCO standards in securities laws and regulations. However, the institutional framework has recently been strengthened by the passage of a new Banking Law in mid-2007, which is more in line with international best practices. In particular, the law strengthens banking supervision by limiting court oversight to procedural issues only, and establishes clear frameworks for consolidated supervision and corrective action against weak banks. Moreover, it eases restrictions on foreign bank branching while preserving supervisory safeguards. These measures should improve the quality of the banking system.

The reform scorecard also reports some defects in the FYR Macedonia's current legislation governing immovable assets. Collateral laws and the practices relating to secured transactions directly affect the willingness of institutions to provide credit and the terms of the loans granted. The EBRD survey on secured transactions indicates that while considerable reform efforts have been undertaken, the system falls short of the requirements of a modern market for secured credit.[8] In particular, survey results indicate that while a secured creditor could recover a sizeable amount of any debt, the time required for successful enforcement and the complexity of the legal recovery process are major drawbacks. The weakness of courts, corruption, unreliability of the enforcement process, as well as the complexity and cost of the registration process are also considered to be limitations.

While a new Bankruptcy Law passed in late-2005 should improve the quality of the country's insolvency regime, implementation of the law must be strengthened in order to improve financial intermediation. An effective insolvency regime helps to enhance the credit culture – e.g. by improving credit discipline and encouraging the payment of obligations as they fall due – and hence to promote financial intermediation. From the 2004 survey, the insolvency legislation in the FYR Macedonia appears to be in only average compliance with OECD best practices. However, the new

8. See EBRD (2004).

Table 3. Transition Country Financial Sector Reform Index

	Banking sector reform 1/	Non-bank financial institutions 1/	Secured transactions law 2/	Quality of insolvency regime 3/	Implementation Gap 4/	Transparency (score) 5/	Transparency (rank) 5/
Albania	2.7	1.7	Advanced	High	-28	2.40	126
Bosnia Herzegovina	2.7	1.7	Inefficient	High	-22	2.90	88
Bulgaria	3.7	2.3	Advanced	High	-35	4.00	55
Croatia	4.0	2.7	Inefficient	High	-27	3.40	70
Czech Republic	4.0	3.7	Inefficient	Medium	-20	4.30	47
Estonia	4.0	3.3	Inefficient	Medium	-10	6.40	27
Hungary	4.0	4.0	Advanced	Low	3	5.00	40
Latvia	3.7	3.0	Advanced	Low	-19	4.20	51
Lithuania	3.7	3.0	Advanced	Very Low	2	4.80	44
FYR Macedonia	**2.7**	**2.0**	**Some defects**	**Medium**	**-21**	**2.70**	**103**
Moldova	2.7	2.0	Some defects	High	-22	2.90	88
Poland	3.7	3.7	Some defects	Medium	-2	3.40	70
Romania	3.0	2.0	Advanced	High	-17	3.00	85
Serbia Montenegro	2.7	2.0	Some defects	High	-13	2.80	97
Slovak Republic	3.7	2.7	Advanced	Medium	-37	4.30	47
Slovenia	3.3	2.7	Inefficient	Low	12	6.10	31
Average CEEC 6/	3.44	2.70	Some defects	Medium	-16	3.99	

Sources: EBRD (2005a, b)

1/ Scores range from a high of 4 (movement toward BIS standards), to a low of 1 (little progress beyond establishment of a 2-tier system).
2/ Based on EBRD's 10 core principles of secured transactions. Scores are advanced, some defects, inefficient, malfunctioning.
3/ Scores range from very high, high, medium, low, to very low.
4/ Difference between insolvency, legislation, effectiveness and extensiveness scores. A larger negative value indicates capacity to implement has lagged behind quality of legislation.
5/ Score relates to perceptions of the degree of corruption as seen by business people and country analysts and ranges between 10 (highly clean) and 0 (highly corrupt). The survey encompasses 159 countries.
6/ Encluding the FYR Macedonia.

bankruptcy law contains a number of improvements. For example, strict timelines have been imposed, jurisdictions between trustee, creditors and judges have been redefined, trustee training and accreditation have been strengthened, and procedural safeguards implemented. Nevertheless, the FYR Macedonia seems to lack the means or the capacity to implement legislation, as the above average "implementation gap" shows.

IV. Competition

The relationship between market concentration, prices, and market power is indeed a thorny issue, especially as far as a country's banking sector is concerned. In this regard, we can identify three strands of thought. According to the *structure-conduct-performance* paradigm, there is a positive relationship between market concentration, which is treated as exogenous, and prices. Highly concentrated markets would favor some (explicit or implicit) form of collusion among banks, which would be able to exploit their market power through wide interest rate spreads, thus gaining higher-than-normal profits. On the other hand, the approach of *structural efficiency* envisages a negative relationship between market concentration, which is endogenous, and prices. In a nutshell, it is argued that the most efficient banks, which are able to offer intermediation services at lower costs, are able to expand their market share. In an intermediate territory, the *theory of contestable markets* excludes any relationships between the number of operators in a particular market and prices. The "simple" threat of new entry (contestability) is deemed sufficient to induce market operators to set prices at a level which makes unprofitable the entry of new operators in the market.

To better assess the degree of competition in the FYR Macedonia's banking industry, we have applied the Panzar and Rosse (1987) test on market structure. The test is based on a reduced-form equation of individual bank revenue in long-run equilibrium. Banks' revenue ($R_{i,t}$) depends on factor prices ($w_{i,t}$) – namely, funding, labor and capital – and a set of bank-specific variables ($X_{i,t}$) that affect banks' revenue and cost functions as well try to capture the risk associated with banks' intermediation activity. Therefore, we can write:

$$\log R_{it} = \alpha + \sum_{j=1}^{J} \beta_j \log w_{it}^{j} + \sum_{k=1}^{K} \gamma_k \log X_{it}^{k} \qquad (1)$$

for t = 1, …, T, where T is the number of periods observed, i = 1, …, N, where N is the total number of banks, j = 1, …, J where J is the total number of inputs, k = 1, …, K, where K is the number of bank-specific variables. The H-statistic is the sum of the elasticities with respect to factor prices,

$$H=\sum_{j=1}^{J}\beta_j \quad (2)$$

The estimated value of the H-statistic is indicative of a particular market structure. In a perfectly competitive market, an increase in factor prices would raise both marginal and average costs without affecting the optimal level of output of any individual firm.[9] As a result, banks should experience an equivalent increase in revenues and the H-statistic should assume a value equal to (or not significantly different from) 1. On the other hand, if the market is monopolistic, an increase in input prices should raise marginal costs, and reduce equilibrium output and hence revenues. In this case, the H-statistic should be either equal to zero or negative. In the "intermediate" case of monopolistic competition, under the assumption of free entry and hence of zero-profit in equilibrium (Chamberlain model), the H-statistic assumes a positive value lower than 1 (Table 4).

Table 4. Discriminatory Power of the H-Statistic

Values of H	Competitive enviroment
$H \leq 0$	Monopoly equilibrium: each bank operates independently as under monopoly profit maximization conditions (H is a decreasing function of the perceived demand elasticity) or perfect cartel
$0 < H < 1$	Monopolistic competition free entry equilibrium (H is an increasing function of the perceived demand elasticity).
$H = 1$	Perfect competition. Free entry equilibrium with full efficient capacity utilization.

Source: Bikker (2004)

A critical feature of the Panzar and Rosse test is that banks should be at their long-run equilibrium. An equilibrium test used in the literature is provided by equation (1) in which either the rate of return on assets (ROA) or the rate of return on equity (ROE) is included as dependent variable. In this case, if the H-statistic assumes a value not significantly different from 0, the equilibrium condition is deemed to be satisfied, since risk-adjusted rates of return will be equalized across banks and will not be correlated with input prices.

The Panzer-Rosse test was conducted using quarterly observations over the 2002-05 period, during which complete balance sheet and income statement data were available. The sample comprises 20 banks – all of which are commercial institu-

9. See Vasala (1995).

tions with the only exception being the Macedonian Development Bank, which is an export-oriented finance bank that does not collect deposits from the public. During the period considered, one bank exited the market while a new bank started its activity, resulting in an unbalanced panel data set. Focusing on the 2002-05 period avoids the disruptions caused by the required recapitalization of the largest bank in 1999 and ethnic conflict in 2001.

In estimating equation (1) we have used two definitions of banks' revenues as the dependent variable. The first one refers to banks' gross interest income (IR), which is consistent with the view that the core activity of banks is to produce loans and investment. The second one is banks' total revenue (TR), under the assumption that banks have started competing by offering a host of services to their customers, although the share of income fees and commission in banks' gross income is still limited. Following other empirical work[10], where either IR or TR is the dependent variable, we have also estimated equation (1) by scaling banks' interest and total revenues by total assets (IRA and TRA). However, as pointed out by Vasala (1995), this specification would be no longer a revenue equation but a price equation whose behavior with respect to equilibrium revenues remains unexplored.

Three input variables have been considered: cost of funding, labor cost, and capital cost. The cost of funding (FC) has been proxied by the ratio between interest rate expenses and the sum of total deposits and other borrowing. The labor cost (LC) has been calculated as the ratio between salary expenditure and the total number of employees. As for banks' capital cost, we have used, alternatively, two measures: the sum of depreciation, material expenses, and services has been scaled by either fixed assets (KC1) or the sum of fixed and foreclosed assets (KC2). The sign of these three variables is a priori undetermined, depending upon the structure of the market.

Four "bank-specific" variables have been included in the estimated equation: total assets, deposits to total funding ratio, loans to assets ratio, asset to own resources ratio (gearing ratio) and the ratio between non-performing loans and gross loans. Total assets (TA) have been included as scale factor. While the coefficient of the scale variable is expected to be positive, the sign of the other variables is somewhat ambiguous. The deposit to total funding ratio (DFR) and the loan to asset ratio (LAR) try to capture differences among banks' liability and asset structure. Higher values of these two variables are indicative of a more retail-oriented activity of a bank. Under the assumption that deposits are the cheapest form of bank funding and loans are the most remunerative bank investment, DFR and LAR are expected to assume a positive coefficient. The variables gearing ratio (GR) and nonperforming to gross loan ratio (NPL) have been introduced to take into account bank-specific risk factors.

10. For an overview of the literature see Bikker (2004) and Bikker and Groeneveld (2000).

Table 5. Results of the Panzar and Rosse Test on Competition; 2002-05

Dep. Var. / Ind. Var.	IR	IR	TR	TR	TR	IRA	TRA	TRA	ROA
C	1.02982	0.80624	2.50648	2.71024	2.71024	3.01162	4.83123	4.46598	2.07532
	18.58427 ***	5.00819 ***	4.90355 ***	84.69990 ***	84.69990 ***	61.85590 ***	36.74163 ***	29.51258 ***	27.16516 ***
TA	1.06424	1.09365	0.98873	1.07014	1.07014				
	12.92861 ***	21.79977 ***	18.38733 ***	209.38980 ***	209.38980 ***				
FC	0.19848	0.20817	0.20757	0.22535	0.22535	0.18257	0.19811	0.19943	-0.00025
	10.18135 ***	16.49487 ***	7.82419 ***	132.28190 ***	132.28190 ***	56.86267 ***	35.43335 ***	33.85235 ***	-0.24515
LC	-0.13713	-0.11983	-0.29728	-0.43963	-0.43963	-0.09292	-0.37356	-0.31570	-0.00781
	-2.48195 **	-2.10454 **	-3.56726 ***	-63.37406 ***	-63.37406 ***	-22.28326 ***	-15.12826 ***	-8.92972 ***	-0.48466
KC1	0.04124		0.10138			0.06728	0.06308		0.01012
	1.01897		3.81936 ***			5.55027 ***	4.16193 ***		2.10805 **
KC2		0.04215		0.01303	0.01303			-0.00679	
		1.64228		8.14163 ***	8.14163 ***			-0.64372	
DFR	-0.62608	-0.62825	-0.64768	-0.53857	-0.53857	-0.61837	-0.58339	-0.54963	-0.01966
	-59.75676 ***	-97.85553 ***	-9.68167 ***	-61.46602 ***	-61.46602 ***	-486.0083 ***	-14.77799 ***	-31.42084 ***	-1.94411 *
GR	-0.38167	-0.40543	-0.36189	-0.32649	-0.32649	-0.35081	-0.35850	-0.36063	0.00025
	-10.06263 ***	-18.53687 ***	-6.00198 ***	-65.69139 ***	-65.69139 ***	-63.17169 ***	-29.86124 ***	-31.40059 ***	0.13370
LR	0.06684	0.07044	0.06722	0.01621	0.01621	0.09511	0.04626	0.09498	-0.00212
	1.83355 *	1.78702 *	1.87608 *	9.40977 ***	9.40977 ***	4.73662 ***	2.33256 **	9.64256 ***	-0.98204
NPL	-0.01215	-0.01233	-0.03927	-0.03672	-0.03672	-0.00388	-0.03307	-0.02886	-0.00671
	-1.20792	-1.33294	-3.14609 **	-19.84594 ***	-19.84594 ***	-1.72721 *	-7.77693 ***	-12.47569 ***	-4.26121 ***
Weighted statistics:									
Adjusted R-squared	1.00000	1.00000	0.99980	1.00000	1.00000	1.00000	0.99995	1.00000	0.99999
S.E. of regression	0.15766	0.15715	0.11608	0.12236	0.12236	0.15617	0.12619	0.12829	0.02793
Durbin-Watson stat	2.32086	2.35905	2.54863	2.75841	2.75841	2.29251	2.54707	2.53305	2.53406
Standardized residuals:									
Jarque-Bera	3.81629	3.45441	3.09313	3.38901	3.38901	2.68492	2.79729	3.87587	3.19199
Probability	0.14836	0.17778	0.21298	0.18369	0.18369	0.26120	0.24693	0.14400	0.20271
H-statistics	**0.10258**	**0.13049**	**0.01167**	**-0.20126**	**-0.20126**	**0.15693**	**-0.11237**	**-0.12306**	**0.00207**
Wald Test (H = 0)									
F-statistic	1.86915	3.42307	0.02740	524.70470	524.70470	197.63900	15.88069	12.41098	0.02361
probability	0.17770	0.07020	0.86920	0.00000	0.00000	0.00000	0.00020	0.00090	0.87850

Method: Panel EGLS (Cross-section weights)
Cross-section SUR (PCSE) standard errors & covariance (d.f. corrected).
*** significant at 1 percent.
** significant at 5 percent.
* significant at 10 percent.

The results, which are reported in the Table 5, should be considered with caution. The results may be affected by the different business objectives pursued by individual credit institutions. Most of the institutions aim to maximize profits and hence shareholders' return. Others may instead try to gain market share even though this may imply higher costs. As noted above, the small "pocket" banks may pursue quite different objectives based upon their owners' incentive structure. Moreover, the model shows some problems of convergence, which may be partially due to undergoing changes in banks' operating structure. In addition, while the Durbin-Watson statistics indicates the presence of some autocorrelation, a Jarque-Bera test suggests that residuals are distributed normally.

Nonetheless, the results tend to confirm the view that the level of competition in the FYR Macedonian banking sector is rather low, though the estimates of the H-statistics vary somewhat depending on the specification of the revenue function. If we assume that H is a continuous variable between 0 and 1, indicating an increasing degree of competition, the values calculated for the FYR Macedonian banking sector falls toward the lower end of the spectrum. In most of the estimates, the H-statistic assumes a value either not significantly different from zero or even negative (when TR is considered as dependent variable). This is indicative of a market structure which is either monopolistic or a perfect cartel. Even in the cases in which the H-statistics assume a positive value which is significantly different from zero, the result is much lower than the one estimated for other CEECs.[11]

Cost of funding and labor costs are the variables with the largest elasticity, depending on the revenue function specification, followed by labor and capital costs. Considering the coefficient signs of the different input costs, it seems that while banks are able to transfer increases in funding and capital costs to customers, they have to absorb, at least partially, increases in labor costs. The unexpected negative coefficient of the DFR variable may be explained in terms of potential volatility of customer deposits as a source of financing owing to limited, albeit improving, public confidence in the stability and financial soundness of the FYR Macedonian banking sector. As expected, the LAR variable assumes a positive coefficient, which is significantly different from zero in all specifications. The variables which have been used as a proxy of bank-specific risk factors (GR and NPL) assume a significant negative coefficient. This is consistent with the view that the difficult operating environment (weak credit culture, weak creditor rights, and weak judicial system), higher banks' risk-appetite

11. Claessens and Laeven (2004) using data from 1994 to 2001, report H-statistics of 0.56 for Croatia, 0.73 for the Czech Republic, 0.75 for Hungary, 0.54 for the Russian Federation, and 0.46 for Turkey.

(i.e. higher gearing ratio) and larger share of non-performing loans tend to increase banks' monitoring costs and hence depress banks' revenues.

V. Efficiency

The efficiency and productivity of banks can be examined using Data Envelopment Analysis (DEA).[12] DEA is a non-parametric linear programming methodology used to measure best practice technology and relative technical efficiency of decision making units (in this case banks), using the same inputs and outputs.

In this context, DEA can determine the set of banks that make up the technically efficient production frontier and others which lie within interior, inefficient points below the frontier. A number of authors have examined the relative efficiency of different national banking systems. Berger and Humphrey (1997) provide a good survey of these studies. In the Balkan context, Jemric and Vujcic (2002) applied DEA analysis to the Croatian banking system; Grigorian and Manole (2002) used DEA to examine commercial bank performance in transition countries.

The main advantage of DEA is that, unlike regression analysis used above, no *a priori* model specification is required. Instead, DEA constructs a non-parametric envelopment frontier over the sample data such that observed points lie on or below the "efficient" production frontier. It is important to keep in mind, however, that DEA looks at relative efficiency within a particular sample of decision-making units. In our case, DEA cannot say anything about the absolute efficiency of Macedonian banks but rather that a particular bank (or group of banks) is relatively (in)efficient vis-à-vis the other banks in the sample.

The following provides a short description of the DEA methodology.[13] Assume that there are *k* inputs and *m* outputs for each of the *n* banks. For the *i-th* bank these are represented by the vectors $\boldsymbol{x_i}$ and $\boldsymbol{y_i}$, respectively. The *k* x *n* input matrix, **X**, and the *m* x *n* output matrix, **Y**, represent the data of all *n* banks. It is also assumed that banks are operating with constant returns to scale (CRS). For each bank, the purpose is to obtain a measure of the ratio of all outputs over all inputs, such as $\mathbf{u'y_i/v'x_i}$, where **u** is an *m* x 1 vector of output weights and **v** is *k* x 1 vector of input weights (superscript ′ indicates transpose).

To select the optimal weights, the following mathematical programming problem has to be solved:

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12. The analysis in this section looks at the problem of technical efficiency (i.e., the ability of a firm to obtain maximal output from a given set of inputs) and does not elaborate on allocative efficiency (i.e. the ability of a firm to use the inputs in optimal proportions given their respective prices).

13. Coelli (1996).

$$\max_{u,\,v} \quad \mathbf{u'y_i/v'x_i} \qquad (3)$$
$$\text{s.t.} \quad \mathbf{u'y_j/v'x_j \leq 1} \qquad j = 1, 2, \ldots, n$$
$$\mathbf{u, v \geq 0}$$

To avoid infinite solutions to the above problem, the constraint $\mathbf{v'x_i} = 1$ is imposed, which leads to:

$$\max_{\mu,\,v} \quad \mathbf{\mu' y_i} \qquad (4)$$
$$\text{s.t.} \quad \mathbf{v'y_j - v'x_j \leq 0} \qquad j = 1, 2, \ldots, n$$
$$\mathbf{\mu, v \geq 0}$$

where the notation of the weights has changed from **u** and **v** to **μ** and **v**, respectively, in order to reflect the transformation.

Using the duality in linear programming, an equivalent envelopment form of the above problem can be derived:

$$\min \theta' \lambda\theta \qquad (5)$$
$$\text{s.t.} \quad \mathbf{- y_i + Y\lambda \geq 0}$$
$$\mathbf{\theta x_i - X\lambda \geq 0}$$
$$\mathbf{\lambda \geq 0}$$

where θ is a scalar and **λ** is a *n* x 1 vector of constraints. The value of θ is the efficiency score for the *i-th* bank, which ranges between 0 and 1. Therefore the problem has to be solved *n* times, once for each bank, in order to have the full picture.

However, the CRS assumption is rather restrictive. A number of factors, including imperfect market competition, may cause a bank to be not operating at optimal scale, i.e. along the flat portion of the long-run average cost curve. To allow variable returns to scale (VRS), it is necessary to add to the problem in equation (4) the convexity constraint:

$$\mathbf{I'\lambda = 1}$$

where **I** is *n* x 1 vector of ones.

The difference between the efficiency scores calculated under the VRS and the CRS assumptions provides an indicator of scale inefficiency. In other words, the difference between the two efficiency scores indicates the additional gain in efficiency that could be achieved if banks were operating at the long-run equilibrium CRS.

Computing Technical Efficiency Score[14]

In order to measure efficiency, we have to decide how to represent banking activity. In the banking literature, there are two competing theories to describe banking activ-

14. The analysis was undertaken with DEAP software, Coelli (1996).

ity: the *production* and the *intermediation* approaches.[15] The production or operating approach views banks as institutions providing fee-based products and services to customers using various resources. On the other hand, the intermediation approach models financial institutions as intermediaries between savers and investors. Similarly to many other studies, but also given the objective of examining the efficiency of banks as financial intermediaries, we have followed this second approach.

The data sample covers 33 quarters from end-1997 to end-2005. Banks' inputs are *deposits* (sight, bank, short and long-term deposits) and *borrowings* (short and long-term). Taken together these two inputs account for approximately 65 percent of the banking system's liabilities during the sample period. The difference is given by the high amount of "own funds" or core capital held by banks.[16] Banks' outputs include *loans* (placements to other banks and clients) and *securities* (holdings of central bank bills, government treasury bills and other equity investments). In total, these two categories on average account for some 80 percent of the total assets of the banking system over the sample period. Additional disaggregations were used as well, without any noticeable change in the outcome of the analysis. As in the section on competition, the existence of pocket banks may affect the results.

Table 6 presents a summary of the DEA output allowing for constant and variable returns to scale. Although the number of banks in the system has been relatively stable, the number of efficient banks – i.e., those on the frontier – has steadily declined under both the CRS and VRS models. The average efficiency score under VRS declined from 0.92 in 1997 to 0.75 in 2001 and then started to pick back up to 0.83 in 2005. This means that if the average bank in 2005 was producing on the frontier instead of its actual location, it would only need 83 percent of the inputs it actually used. The average bank would only need 75 percent of the inputs it actually used in 2001.[17] While a similar pattern emerges in the CRS analysis, the difference between the CRS and VRS efficiency scores is relatively large and indicates a rela-

15. Other conceptual approaches, (i.e., asset, value added and user-cost) which tend to be variations of the intermediation and production approaches, have also been used to divide bank inputs and outputs. Favero and Papi (1995) provide a good discussion and survey.

16. These high figures of bank capitalization reflect more the limited role of banks in intermediation than strong profitability or fresh injections of capital.

17. The average inefficiency score indicates the amount of additional inputs an inefficient bank would need to be on the frontier. For example, in 2005 the average bank needed 20 percent more inputs to produce the same outputs as the efficient bank. In 2001, the average bank would have required 34 percent more inputs to produce the same amount of outputs as an efficient bank. Only 9 percent more inputs were needed to reach the frontier in 1997

tively high level of scale inefficiencies among banks.[18] Additionally, the dispersion of efficiency scores widened, with many banks reporting sharp declines.

Table 6. Summary of DEA Results; 1997-2005

Intermediation Approach
(Inputs: Deposits and Borrowing Liabilities; Outputs: Loans and Securities)

	1997	1999	2001	2003	2005
	Variable Returns to Scale				
Number of banks	22	22	21	21	21
Number of efficient banks	19	10	8	9	9
Average efficiency (θ')	0.92	0.79	0.75	0.83	0.83
Average inefficiency ((1-θ')/θ')	0.09	0.26	0.34	0.20	0.20
Standard deviation of inefficiency (σ)	0.16	0.26	0.27	0.21	0.21
Range (θ' - σ.; θ' + σ)	(0.76; 1.07)	(0.53; 1.06)	(0.48; 1.02)	(0.63; 1.04)	(0.63; 1.04)
Percentage of banks in the range	0.86	0.82	0.76	0.86	0.86
	Constant Returns to Scale				
Number of banks	22	22	21	21	21
Number of efficient banks	7	2	2	4	4
Average efficiency (θ')	0.77	0.51	0.45	0.64	0.64
Average inefficiency ((1-θ')/θ')	0.30	0.95	1.24	0.55	0.55
Standard deviation of inefficiency (σ)	0.21	0.25	0.24	0.25	0.25
Range (θ' - σ.; θ' + σ)	(0.56; 0.98)	(0.26; 0.77)	(0.21; 0.68)	(0.40; 0.89)	(0.40; 0.89)
Percentage of banks in the range	0.55	0.73	0.76	0.57	0.57

This pattern of a decline in efficiency, with its nadir in 2001 and a recovery until 2005 corresponds well with political and economic events in the country. As highlighted in Drummond (2000), weak credit portfolios, hidden losses, and connected lending led to a marked deterioration in the banking system in the late 1990's and to the insolvency of the largest bank, Stopanska Banka, as the Kosovo crisis hit in early 1999. While the Stopanska was recapitalized by the government and sold to a strategic foreign investor – the National Bank of Greece – the system was weakened further by the crisis in confidence and deterioration in liquidity engendered by the armed conflict within the FYR Macedonia in 2001. The improvements in efficiency since then have been modest and correspond with a return of confidence in the banking system and improved economic prospects in the country as EU integration has progressed.

18. Running additional DEA models with non-increasing returns to scale imposed and comparing them to the VRS scores indicate that the average bank is operating in an area of increasing returns to scale.

Table 7 reports the evolution of banking efficiency scores for the two subgroups of banks used in the analysis – foreign and domestic banks as well as large and small banks. The results indicate that most of the deterioration and improvement was motivated by changes in efficiency scores in small banks. Foreign-owned banks appear to have become more efficient over time since, under the influence of their respective parent banks, they adjusted their size and banking practices. Nevertheless, while this result mimics the evolution seen in the previous table, it is interesting to note that the difference between the VRS and CRS efficiency scores of foreign-owned banks has increased over the time period. This would suggest that these banks are still not operating at the correct scale.

Table 7. Bank Average Efficiency Scores for Subgroups of Banks; 1997-2005

Intermediation Approach
(Inputs: Deposits and Borrowing Liabilities; Outputs: Loans and Securities)

	1997	1999	2001	2003	2005
	Variable Returns to Scale				
All Banks	0.92	0.79	0.75	0.83	0.83
Large 3	1.00	1.00	0.93	1.00	0.90
Small	0.90	0.76	0.72	0.81	0.81
Foreign	1.00	0.77	0.94	0.95	0.98
Domestic	0.90	0.80	0.65	0.76	0.71
	Constant Returns to Scale				
All Banks	0.77	0.51	0.45	0.64	0.45
Large 3	0.65	0.41	0.27	0.47	0.40
Small	0.79	0.51	0.48	0.67	0.46
Foreign	1.00	0.51	0.50	0.73	0.54
Domestic	0.73	0.50	0.42	0.59	0.38

To better understand the evolution of banking sector activities in the FYR Macedonia, we also estimate changes in productivity growth using the Malmquist total factor productivity (TFP) index (M). Malmquist productivity indices are based upon the concept of the distance function, and contain the same information as the production function. The index measures changes in total output relative to inputs utilized, relative to the frontier of production technology. The index can also be broken down into components which indicate the extent to which a productivity change for an individual bank is due to a shift in the efficient frontier or to a movement of the individual bank in relation to the efficient frontier. Thus it provides a useful description of productivity and efficiency dynamics overtime.

Specifically, the distance function (D) measures the maximum proportional change in outputs required to make the input-output combination (x_{t+1}, y_{t+1}) feasible in relation to the technology at time t. Following Färe *et al.* (1994), the Malmquist (output) oriented TFP change index between time t (the base period) and time $t+1$ is given by:

$$M(y_t,x_t,y_{t+1},x_{t+1}) = \left[\frac{D^t(y_{t+1},x_{t+1})}{D^t(y_t,x_t)} \times \frac{D^{t+1}(y_{t+1},x_{t+1})}{D^{t+1}(y_t,x_t)} \right]^{1/2} \quad (7)$$

where the notation $D^t(y_{t+1},x_{t+1})$ represents the distance from the time $t+1$ observation to the time t technology. The M index is, in other words, the geometric mean of two TFP indices, the first evaluated with respect to time t technology and the second with respect to time $t+1$ technology. A value of M greater than one indicates that TFP has increased between the two periods, while a value of M less than one indicates that TFP has declined.

An equivalent way to write equation (5) is the following:

$$M(y_t,x_t,y_{t+1},x_{t+1}) = \frac{D^{t+1}(y_{t+1},x_{t+1})}{D^t(y_t,x_t)} \left[\frac{D^t(y_{t+1},x_{t+1})}{D^{t+1}(y_{t+1},x_{t+1})} \times \frac{D^t(y_t,x_t)}{D^{t+1}(y_t,x_t)} \right]^{1/2} \quad (8)$$

where the first component outside of brackets measures the *change in technical efficiency* while the square root term in brackets measures the *change in production technology* between the two periods. The breaking down into the two components reflect: (i) a "catching up" component that captures whether banks are moving closer or farther away from the best practice frontier; and (ii) a "frontier shift" which indicates how the best practice frontier is moving due to improvements in technology. Values greater than one reflect improvements.

The analysis was conducted on 15 banks for which continuous annual data over the 1997-2005 period were available. Banks that entered or exited during this period are not included, thus prohibiting an exact comparison with the previously reported DEA results. Table 8 reports the geometric means of the decomposed Malmquist TFP index for all banks, as well as large and foreign banks. Results for the pre and post-2001 conflict period are also presented. The indices indicate that for the full period productivity has declined – on average by about 3.5 percent – with the sharpest reduction recorded in the 1998-2001 period.

Table 8. Malmquist Productivity Index, 1997-2005[1/]

	Malmquist Productivity Index (TFP change)	Frontier Shift Component (Technical Change)	Catching Up Component (Technical Efficiency Change)
All banks	0.966	1.042	0.928
1998 to 2001	0.954	1.099	0.868
2002 to 2005	0.978	0.986	0.992
Large banks	0.985	1.044	0.943
Foreign banks	1.064	1.087	0.979

1/ All values are geometric means.

The average annual decline in technical efficiency was approximately 7 percent, which was offset by an outward shift of the production frontier by 4.2 percent. In fact, the greatest improvement in technology or frontier shift took place in 1998-2001, as bank acquisitions and recapitalization were ongoing. Foreign-controlled banks in particular appear to have experienced a large outward shift (on average 8.7 percent) in their frontiers, while large banks' frontier shifts were more in line with the full sample average. In all periods and sub-samples, technical efficiency change was negative. However, a further breakdown of this catching up component (not shown here) into "pure" technical efficiency and scale changes revealed that most of the deterioration in technical efficiency was due to strong declines in scale efficiency suggesting that the banking industry is moving away from its long-term optimal scale.[19]

VI. Conclusions

The banking system in the FYR Macedonia has made significant improvements since the breakup of Yugoslavia. Despite these gains, a comparison of standard banking indicators with other regional systems suggests that the FYR Macedonian banking sector remains relatively underdeveloped. Persistent institutional and legal deficiencies may offer one possible explanation.

The empirical examination of the banking sector indicates that competition remains relatively weak and that improvements in bank efficiency have been limited to date. Panzar-Rosse market structure tests, in particular, point toward a finding of monopolistic market structures.

The results of a non-parametric analysis of bank efficiency indicate some improvements after the 2001 internal security crisis but they also show a relatively high

19. Färe *et al.* (1994) further decomposed technical efficiency change into "pure" technical change and scale efficiency change. Scale efficiency change represents divergence between variable and constant returns to scale technology.

level of scale inefficiencies among banks. The banking sector's productivity decline observed over the 1997-2005 period seems mainly due to a deterioration in technical efficiency that has more than offset some improvements in the technically efficient production frontier. However, the presence of a small number of "pocket banks", which may pursue different objectives than those of standard banking businesses, suggest that these results should be interpreted with caution. Going forward, the recent take-over of a medium sized bank by Société Générale and the liberalization of foreign banks' branching by the new Banking Law may signal an important turning point by encouraging competition and banking consolidation.

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