

BANKING SECTOR IN ARMENIA: WHAT WOULD IT TAKE TO TURN A BASKET CASE INTO A BEAUTY CASE?

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Despite the fact that the Armenian banking sector has benefited from a relatively stable macroeconomic environment, severe weaknesses and vulnerabilities remain, leading to low rates of financial intermediation. The paper discusses issues related to structural and exchange rate risks, legal and regulatory regimes, and corporate governance as sources of those vulnerabilities. The analysis points to the size of the banks, their technological and management capacity, and connected lending as the main sources for the poor quality of their loan portfolios. To address inefficiencies in performance and determine the factors influencing them, the paper builds a multiple-input-multiple-output framework for banking operations. Regression analysis based on bank-level data from a wide range of transition countries (including Armenia) suggests that: (1) consolidation is likely to improve the efficiency of banking operations, (2) foreign ownership with controlling power is the only ownership type that enhances commercial bank efficiency in a statistically significant manner, and (3) the effects of prudential tightening on the efficiency of banks vary across prudential norms. As a results, the paper advocates for swift and credible measures to consolidate the banking system, attract foreign ownership, improve corporate governance, and strengthen the analytical capacity of the banking supervision.

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I. INTRODUCTION

The importance of the financial sector for promoting economic growth and development, and, through that, reducing poverty is well documented (see, for instance, King and Levine (1993), Levine (1998), and Dollar and Kraay (2002)). Not only does the financial sector help to finance activities and create employment in various sectors of the economy, but it also creates a safe haven for household deposits, remunerating them against loss of value caused by inflation, thereby providing a second channel for poverty reduction.

Where does Armenia stand in terms of its financial sector development? How important a role does the financial sector play in the development of the Armenian economy? Armenia's banking system is by far the largest and most important component of the financial system (hence the focus of this paper). In spite of this, the banking sector remains very small relative to the size of the overall economy: total loans comprised 8 percent and total deposits comprised approximately 10 percent of GDP in 2001. Contractual savings (i.e., insurance companies and pension funds) and capital-market-related financial institutions are underdeveloped. The network of micro-finance and rural credit institutions is not extensive enough to satisfy the demand for credit generated by the SMEs and farms in rural areas. These factors result in a very shallow financial system, relative to other countries in transition, as shown in Table 1.

Attempts to consolidate the banking system have not yielded any tangible results. The minimum capital requirements for the existing banks are currently at a low US\$1.65 million, and will be raised to US\$2 million by mid-2003, with a subsequent increase to US\$5 million by mid-2005. To boost confidence in the banking sector, the Central Bank of Armenia (CBA) recently announced plans to introduce a deposit insurance scheme, which will start to collect premiums in 2003 and become operational in 2005. Commercial banks will be the main and regular contributors to the scheme (MEFP, 2002), which will aim at securing deposits up to 5 million drams (\$8,600) each. In another development, recently, three new banks (with US, Swiss, and Russian capital) have applied for licenses, each obligated to invest \$5 million in Armenia (i.e., the minimum capital requirement for the new banks).

On the legal and regulatory front, the key laws governing the system are the Law on the Central Bank and the Law on Banks and Banking Activities. Other laws relevant to the sector are the Law on Bankruptcy of Banks and the Law on Secrecy. The overall level of CBA's general technical and supervisory capacity is broadly adequate: the Banking Supervision Department has received substantial technical assistance in the past, including through foreign resident advisors based in Yerevan. Supervisors typically also receive training in the form of short courses abroad. However, in recent years many well-trained supervisors have accepted positions with private commercial banks, hence weakening the overall quality of supervision. Also,

as the compensation level of supervisors—a proxy for supervisory quality—lags somewhat behind that of private bankers, potential problems in the incentive structure remain.

What are the underlying problems facing the banking system in Armenia? Analysts studying the Armenian banking sector emphasize the following characteristics of the system: (1) generally weak credit culture, including inadequate credit evaluation and monitoring methodology, (2) weak corporate governance with severe problems in connected lending, and (3) small size of banks which would not allow them to take advantage of economies of scale.

Table 1. Indicators of Financial Depth in Selected Transition Countries, 2001.

Country	Liquid Monetary Aggregates to GDP (percent)	Private Sector Credit by Commercial Banks to GDP
Armenia	12	8
Bulgaria	31	...
Czech Republic	74	...
Estonia	33	44
Hungary	47	...
Latvia	32	29
Lithuania	26	13
Moldova	21	15
Poland	46	...
Romania	21	...
Russia	18	16
Slovak Republic	69	...

Source: International Monetary Fund.

All these factors have led to the situation sarcastically described in the title of this paper. The population in general has little contact with the banking system either by means of depositing their savings or by means of borrowing. With virtually no cash-flow-based lending taking place, loans are heavily collateralized. Margins of lending remain significant, suggesting high administrative costs and inefficiencies. Foreign currency exposure to borrowers engaged in the production of non-tradable goods and services (i.e., without foreign currency earnings) is high.¹ Gradual reduction in the volume of Treasury Bills offered on the market, led to reduction of (risk-free) interest earnings of banks (see below). If it were not for the market for private transfers from abroad, some (smaller) banks would have found their revenue streams

¹ Only 19 percent of total credit to enterprises as of end 2001 were made in drams (IMF, 2002, Table 17).

dried up significantly. New services are developing extremely slowly: a local system of credit cards—ArCa—was introduced only recently.²

Before discussing these problems in more detail, let us review some aggregate numbers and get a sense of the macroeconomic environment surrounding the banking system.

II. A REVIEW OF AGGREGATE MONETARY AND FINANCIAL INDICATORS

The banking sector in Armenia enjoys a stable macroeconomic environment. The “typical suspects” known to cause problems in this regard—such as exchange rate and price stability, bank financing of the deficit, and state control of the banking system—have not been perceived as much of a problem for the Armenian banking

Table 2. Armenia: Monetary and Financial Sector Indicators.

	1998	1999	2000	2001	2002
	<i>(in billions of drams)</i>				
Total deposits (end of period)	54.1	65.9	77.1	92.0	123.3
Foreign exchange (FX) deposits	38.0	52.3	61.4	73.6	87.0
Dram deposits	16.2	13.7	15.6	18.4	36.3
Reserve money (RM)	53.8	53.9	72.4	80.4	111.3
Broad money (BM)	95.5	108.5	136.6	157.0	211.9
	<i>(ratio)</i>				
Indirect Indicators of Confidence and Fin. Sector Development					
Money multiplier (=BM/RM)	1.78	2.01	1.89	1.95	1.90
Total deposits/Broad money	0.57	0.61	0.56	0.59	0.58
Indicators of Dollarization					
FX deposits/Total deposits	0.70	0.79	0.80	0.80	0.71
FX deposits/Broad money	0.40	0.48	0.45	0.47	0.41
	<i>(percent per annum)</i>				
Interest Rates					
Commercial banks' 6-month dram lending rate 1/	50.0	35.1	29.1	27.8	25.0
Treasury Bill rate (41-52 week maturity) 1/	45.4	61.4	23.0	19.0	15.0
Memorandum items					
Consumer Price Inflation, annual average	8.7	0.6	-0.8	3.1	1.1
Exchange Rate (Dram/USD), annual average	505	535	540	555	574
Gross Domestic Product (million USD) 1/	...	1,847	1,912	2,119	2,365
Broad Money as a share of GDP	0.10	0.11	0.13	0.13	0.16

Source: International Monetary Fund; Armenian authorities; and own calculations.

1/ 2002 data is preliminary and estimated.

² Arimpexbank was the first bank to issue conventional credit cards (as a member of VISA) in October 2002.

sector, at least in the past few years. Yet, a brief look at the aggregate numbers reported in Table 2 turns out to be quite eye-opening and offers a less optimistic picture of the macro-financial framework of Armenia.

The aggregate monetary and financial sector numbers show a highly dollarized financial sector: dram deposits in the banking system account for less than ¼ of total deposits. Indicators of confidence continue to be low, with little or no signs of improvement. A sizable portion of transactions are still being carried out in cash (partly also a reflection of the size of the underground economy), with the share of deposits in broad money continuing to be low. The real interest rate is still prohibitively high despite the trend of declining nominal rates, pointing out systemic risks and macro imbalances.

With this picture in mind, the next section will attempt to decompose the interest rates and review the dynamics of implied currency and credit risks contained in the interest rate data. In the subsequent section, we will see how these risks are being further propagated by inefficiencies in the banking sector.

A. Decomposition of Interest Rates

If we assume i to be the rate of interest on domestic currency denominated government securities, i^* to be the risk-free (dollar denominated) international rate, and i_s to be the interest rate on dollar denominated domestic securities, then the implied currency and country risk can be calculated as follows:

$$1 + CurR = \frac{1+i}{1+i_s} \quad \text{or, for small values of } i \text{ and } i_s, CurR = i - i_s \quad (1)$$

$$1 + CntR = \frac{1+i_s}{1+i^*} \quad \text{or, for small values of } i_s \text{ and } i^*, CntR = i_s - i^* \quad (2)$$

However, because Armenia does not issue dollar denominated debt, the data on i_s is not readily available. Therefore, assuming uncovered interest rate parity, i_s could be presented as the rate on dram denominated securities, adjusted for the expected depreciation of the dram, or:

$$i_s = i - e^e$$

where e^e is the expected rate of depreciation of the dram. With this in mind, and after minor manipulations equations 1 and 2 can be re-written as follows:

$$CurR = e^e \quad (3)$$

$$CntR = i - i^* - e^e \quad (4)$$

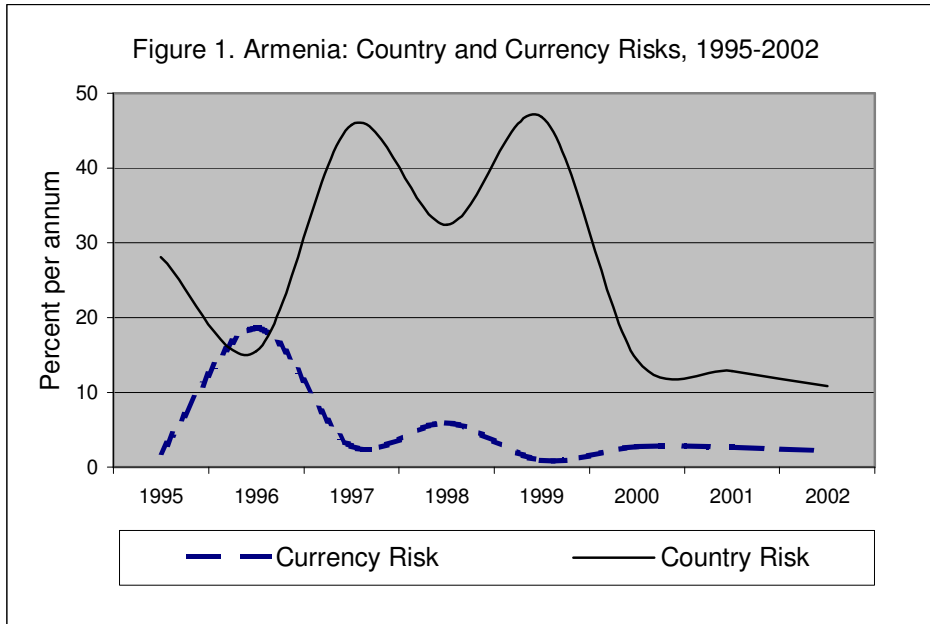
Equation 3 simply states that the currency risk equals the rate of depreciation of the dram. Equation 4, in turn, states that the country-specific risk is the residual obtained by subtracting the risk-free rate and the currency risk from the domestic interest rate.

To arrive at currency and country risk values for Armenia, I used the average annualized rate for 3-month U.S. Treasury Bills (for i^*). By assuming perfect foresight, I used the *ex post* rate of dram depreciation to proxy for e^e . Finally, I use 91-day Armenian Treasury Bill rates for i . Figure 1 below depicts the results of the calculations for 1995-2002.³ It is noteworthy that both country and currency have stabilized in the past 3 years, averaging approximately 12 and 2.5 percent respectively. Despite this positive development, the level of country risk is still alarmingly high,⁴ holding the entire system of interest rates high as a result. Until the sum of the country and currency risks is brought down, the rates will remain high, staying just above the sum in the limit.

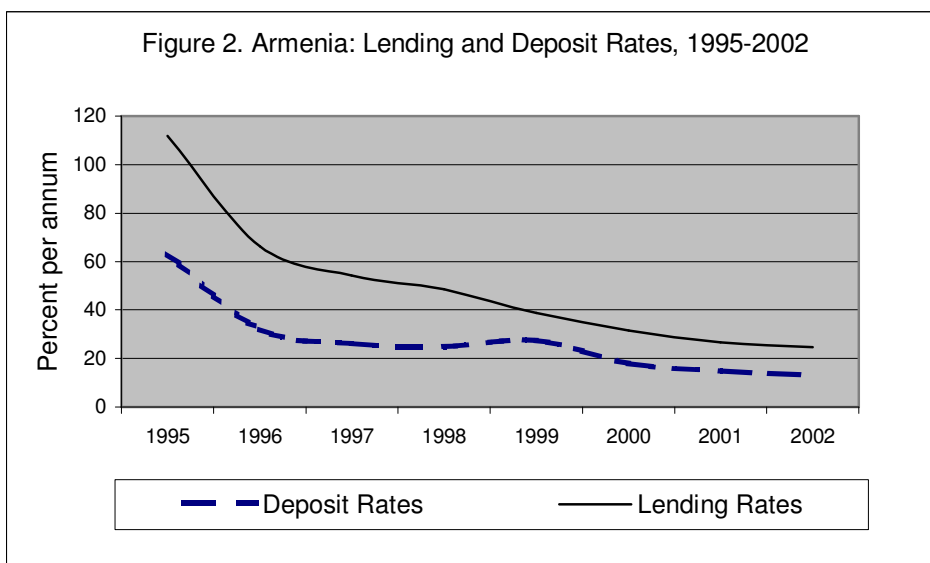
However, things may not be as bad as they seem at present. Even though the implied country risk is high, it carries the impact of the size of the market and the implicit functions performed by the Treasury Bills, and, therefore, can be successfully reduced. To see this, note that the primary role of the Treasury Bills in Armenia is not to finance the deficit (partially because they are too expensive to use), but to be used as a monetary policy tool. If it were not for the monetary system's need for those bills, there is little fiscal reason to have Treasury Bills at such high rates. It is exactly because the banking system needs to hold liquid and risk-free assets, that the Central Bank consciously reduces their volume in the system. Therefore, banks are being effectively subsidized to be able to weather the shocks they are facing on other fronts. If the rates were to go down, this would reduce banks' interest earnings, putting them in an even more difficult situation than they presently are. However, the implication of a reduction in the Treasury Bill rates would be that the banks would have to find ways to improve the efficiency of their operations and modes of making money.

³ For calculations, the large-value version of Equation 4 was used: $CntR = \frac{1+i}{(1+i^*)(1+e^e)} + 1$.

⁴ Under normal circumstances, this rate would be indicative of the spread (over the rate on risk-free securities) which Armenia would have paid if it were to access the international capital markets.



However, it would be misleading to suggest that reducing the stock of outstanding Treasury Bills alone would drive the country risk (and therefore the entire interest rate structure) to zero overnight. In fact, the observed country risk would at least partially depend on other systemic issues, including government's creditworthiness, credibility of reforms, level of public confidence, among others. As important as these factors are in driving down the interest rate structure and making the environment more conducive to investment and growth, the discussion of these topics is outside of the scope of this paper, and will therefore be omitted. Instead, we will focus on the banks' role in propagating these systemic inefficiencies.



To do this, let us observe where the banks stand in terms of their efficiency, and how much mark-up they add to the currency and country risks discussed above. A brief reference to deposit and lending rates reveals a gloomy picture (Figure 2 above contains the average annualized rates for the aggregate banking sector). As expected, there has been a tendency for both lending and deposit rates to decline. Moreover, the difference between the two (the interest margin)—a measure of the efficiency of banking operations—is also declining. Yet, the magnitude of the margin, even the one observed since 1999, leaves much more to be desired. The margin has remained above 10 percent, a sizable difference indicative of significant inefficiencies at the commercial bank level. It should be noted that in addition to reflecting the extent of non-interest expenses of bank operations (such as wages, overhead, depreciation, etc.), this margin also reflects the (poor) performance of the banking industry's loan portfolio: banks tend to raise their lending rates to recover from losses they occasionally make on their loan portfolio.⁵ In both cases, the interest margins reflect unsound financial decisions, bad management, and outdated banking technologies, and at least in the Armenian context, are as important (i.e., are of the same order of magnitude) as the country risks described above.

III. RECENT DEVELOPMENTS AND PROBLEMS IN THE BANKING SECTOR

Recent events surrounding the Armenian banking sector are indicative of an ailing system which is struggling to survive. The CBA recently moved to place eight out of thirty banks under temporary administration.⁶ The licenses of three out of these eight banks (i.e., Lend Bank, Akunk Bank, and Trust Bank) were withdrawn in December 2002, and petitions were filed with the Economic Court to recognize them as bankrupt. The authorities intend, by February 2003, to liquidate or rehabilitate the five banks remaining under interim administration (MEFP, 2002). A bank resolution department was recently established to oversee the management of interim administrators dealing with problem banks. Inter-bank credit market is virtually non-operational. For their liquidity management needs, the banks are dealing primarily with the CBA—and perhaps rationally so—to avoid excessive risk-taking.

What are the causes of this outcome in Armenia? Are there problems related to solvency or liquidity of the banks in question, or both? Without going into great length on each source of the problem, I list them below as follows:

⁵ As more loans go bad, and driven by the desire to cover their costs (both interest and non-interest), banks tend to increase the interest they charge on the loans, further reducing their chances to collect on those loans.

⁶ In February 2002, two banks were merged and the new bank was placed under interim administration, bringing the total of such banks to eight.

A. Problems of the Asset Side

Loan quality: The issues related to bank portfolio quality—which have been masked for a number of years by weak supervisory control and fraudulent banking practices—are coming back to haunt the banking system. The most notorious of these is the commonly used practice of rolling over non-performing loans, which enables banks to inflate the balance sheet and overstate performance. Since some of these loans are not going to be paid off, these problems have the potential to eventually wipe out a bank's capital, once the loan portfolios' true quality is taken into account.

Connected lending: Problems with related and insider lending seem to be particularly severe and constitute a major concern for the banking system. Some financial institutions still perform the functions of pocket banks for their shareholders, and manage to find ways to channel depositors' funds to finance their related activities. The monetary authorities have managed to achieve only partial success in curbing insider lending.

Size and economies of scale: The small size of most banks inhibit preclude them from attaining economies of scale. This also prevents the banks from incurring (typically large) fixed costs of technological modernization.

Interest rates: The prohibitively high level of interest rates is likely to attract either projects with very high expected rates of return, or simply crooks! All others in between will be unable or unwilling to borrow. This, of course, has an indirect impact on the quality of loan portfolios. Anecdotal evidence suggests that bank officers collect kick-backs in return for issuing loans, which effectively raises the cost of borrowing and may discourage borrowers from financing otherwise viable projects. Especially worrisome is the situation with low interest rate loans from international donors (which are being channeled through local commercial banks): the lower interest rates that these loans typically carry, leave more room for kick-backs to be demanded from the borrowers.

Collateral repossession and credit risk: Issues related to the transfer of ownership (i.e., registration, repossession, and, to a lesser extent, realization) of collateral contribute to excessive conservatism in lending decisions made by banks. In addition, the absence (or weakness) of secondary markets for some assets predominantly used by enterprises as collateral (such as buildings, productive assets, warehouse receipts, etc.) make banks accept these types of collateral at heavy discounts, further reducing enterprises' ability to borrow. Being a result of insufficient progress in enterprise and legal reforms themselves, the difficulties in collecting on collateral of delinquent borrowers lead to higher credit risk, as reflected in the difference between the Treasury Bill rates and average lending rates (Table2).

Credit culture: The credit culture is under-developed. The long-term implications of not repaying of bank loans are negligible, which encourages imprudent behavior on the side of borrowers.

B. Problems of the Liability Side

Supply of savings: Even though aggregate figures suggest an improving trend in gross national private savings (see IMF, 2002), the level of private savings remains low, leading to a weak supply of deposits. This is also a reflection of a large unofficial economy—which by the virtue of being cash-based—operates mostly outside of the banking system.

Confidence issues: Concerns about the stability of the macroeconomic and financial sector (partially as a result of the hyperinflation in early 1990s), and perceived currency risk lead to generally low levels of confidence in the banking system. Perceptions of mismanagement and corruption in the banking sector still play an important role in keeping depositors away from the banks.

As ironic as this may sound, the good news from all this is that the recent developments in the Armenian banking sector are unlikely to have any large systemic (negative) impact on economic growth. Because the size of the banking system—measured by the amount of credit it channels to productive activities—is relatively small, large scale bank runs are unlikely to create a sharp decline in real activities (i.e., production of goods and services). However, to the extent that this will shatter the general public's confidence in the ability of authorities to prevent the loss of their deposits, this may result in a loss of confidence in the overall financial system (including banks that are otherwise in good shape) and may lead to social unrest, if not handled properly.⁷

IV. DETERMINANTS OF BANKING EFFICIENCY: DATA ENVELOPMENT ANALYSIS

The current chapter and subsequent conclusions draw heavily on Grigorian and Manole (2002). The basic model built in that study recognizes *profit maximization* and *service provision* as the two main functions performed by commercial banks. Without putting any weight on each of these functions and looking at the problem as one-dimensional one, the paper incorporates both into the model, making it two-dimensional. The data set used in the study contains comprehensive financial data on

⁷ It remains to be seen whether there was any intention on the side of the monetary authorities to delay the disclosure of the true extent of problems in the banking sector prior to presidential elections in February 2003.

a large number of banks from seventeen transition economies, including Armenia.⁸ The distribution of sample banks by countries for 1995–98 is shown in Tables 3 and 4. By referring to this cross-country study, We will make inferences about policy variables that determine banking sector efficiency, which will be relevant to the study of the Armenian banking sector. Theoretical foundations of the methods employed in the paper are summarized in the Appendix.

A. Definitions and Measurement Issues

Before analyzing bank-level productivity indicators, we start by specifying its respective inputs and outputs. The following three inputs to the banking “production process” are considered: *labor*, *fixed assets*, and *interest expenditures*. Doing so accounts for all three essential inputs to commercial bank operations: (1) personnel and management, (2) computer hardware and premises (which also captures the

Table 3. Sample Banks, by Country, 1995–98.

	1995	1996	1997	1998	Total observations
Armenia	...	4	7	6	17
Belarus	6	9	10	8	33
Bulgaria	10	13	17	17	57
Croatia	19	25	32	31	107
Czech Republic	10	20	23	15	68
Estonia	5	6	6	3	20
Hungary	20	22	22	19	83
Kazakhstan	1	4	12	11	28
Latvia	13	13	12	12	50
Lithuania	5	6	7	7	25
Moldova	1	1	7	5	14
Poland	24	31	33	30	118
Romania	9	9	18	17	53
Russian Federation	53	58	66	40	217
Slovak Republic	10	16	17	13	56
Slovenia	14	16	27	17	74
Ukraine	9	12	18	15	54
Total	209	265	334	266	1,074

Source: Grigorian and Manole (2002).

⁸ Prior to turning to the results of the estimation, it is worth mentioning the limitations of transition-specific data which are likely to have implications for the analysis. Problems primarily stem from imperfections in accounting standards, which generally allowed doubtful treatments of some transactions and financial positions. However, to the extent that these practices were common in practically all transition countries and all banks, the analysis is unlikely to be significantly affected by these imperfections in our measures of bank revenues and net loans.

extensiveness of a bank's branch network), and (3) leveraged funds, respectively. Holding output (however specified) and two other inputs constant, the lesser amount of the third input used in the "production" would imply higher efficiency.

Next, we define the two sets of outputs as follows: (1) *revenues*,⁹ *net loans*,¹⁰ and *liquid assets*,¹¹ and (2) *deposits*, *net loans*, and *liquid assets*. As mentioned above, the efficiency indicator constructed based on the first set of outputs (hereafter denoted as DEA1) places greater emphasis on profit generation. Similarly, an indicator based on the second set of outputs (hereafter denoted as DEA2) would stress service provision as a goal. Both indicators, DEA1 and DEA2, however, recognize the quality of loans (and, therefore, ex post returns) and the provision for liquidity services as an objective of a bank's operations. Since the objective of the analysis is to search for potential links between policies and the various functions performed by a bank, contrasting these indicators and the ways they are affected by policy instruments will prove interesting.

To keep things simple, we will escape the discussion of the DEA results, and move on to the next stage which looks at the policy determinants of banking sector productivity (DEA) indicators across countries. In doing so I assume that the provision for banking services can be presented, in a simplified setting, by the following function:

$$y_{ij} = f_i(B_{ij}, M_j, R_j, E_j) \quad (5)$$

where y_{ij} measures output or efficiency of i^{th} commercial bank operating in country j , B_{ij} denotes bank specific variables, M_j describes the macroeconomic environment in country j , and R_j and E_j define the regulatory and general business environment respectively. Assuming that the above factors affect the bank efficiency and productivity in an additive fashion, the coefficients of interest could be estimated using the following specification:

$$DEA_{ij} = \alpha + \sum_p \beta_p B_{ij,p} + \sum_k \gamma_k M_{j,k} + \sum_m \eta_m R_{j,m} + \sum_n \lambda_n E_{j,n} + \varepsilon_{ij} \quad (6)$$

To account for bank-specific features, Grigorian and Manole include: (1) equity as a share of total assets, (2) a bank's assets as a share of total assets of the banking system of its country of origin (i.e., market concentration), (3) a dummy variable for

⁹Revenues are defined as the sum of interest and non-interest income.

¹⁰Net loans are defined as loans net of loan loss provisions.

¹¹Liquid assets include cash, balances with monetary authorities, and holdings of treasury bills.

Table 4. Assets of Sample Banks, 1995–98.
(Percentage of Total Banking System Assets)

	1995	1996	1997	1998
Armenia	...	50	66	47
Belarus	...	...	48	82
Bulgaria	5	5	24	28
Croatia	80	92	93	92
Czech Republic	25	54	62	44
Estonia	50	59	70	93
Hungary	41	42	47	45
Kazakhstan	2	9	44	52
Latvia	...	66	68	67
Lithuania	38	42	50	54
Moldova	...	...	61	63
Poland	25	39	45	45
Romania	22	60	64	44
Russian Federation	4	37	34	22
Slovak Republic	48	50	50	39
Slovenia	73	79	92	89
Ukraine	...	...	25	20

Source: Grigorian and Manole (2002) based on BankScope and various publications of national monetary authorities.

foreign controlled banks,¹² and (4) a dummy variable to account for new versus old banks.¹³ The following are indicators describing the underlying macroeconomic environment: GDP per capita, annual average rate of inflation, and monetary depth and size of the financial sector (measured by the ratio of broad money to GDP).

Because of difficulties in obtaining a consistent series on a broad range of prudential requirements, the selection of indicators describing the regulatory environment was a difficult one. Nevertheless, the following series were constructed to be used in the study: (1) capital adequacy, (2) maximum exposure to a single borrower, and (3) a limit on the foreign exchange open position for four consecutive years, 1995–98.

B. Regression Outcome

Regression Estimates for a number of specifications are reported in Table 5. First, the results suggest that well-capitalized banks are ranked higher in terms of their ability to generate deposits than their poorly capitalized counterparts. This is in line with the conventional wisdom that capital plays a role of implicit deposit insurance,

¹²This variable takes the value of 1 if a bank is more than 30 percent foreign owned, and 0 otherwise.

¹³This variable takes the value of 1 if a bank is established after 1990, and 0 otherwise.

which in turn encourages more deposits to be made. The reasoning behind the observed positive link between capitalization and revenues is, however, less obvious. Although the causality might run both ways, most studies have found that well-capitalized banks are more efficient (see, for example, Berger and Mester (1997)). A possible explanation for this can be based on the theory of moral hazard: the managers of banks that are closer to bankruptcy will be more inclined to pursue their own goals (knowing the bank closure is in sight), which are not necessarily in line with the owners' objectives.

Second, it appears that banks with a larger share of a given country's market are likely to be more efficient than those with a smaller share. This might be the case if banks were to take advantage of economies of scale (or at least a wider array of borrowers), or play the role of a market maker on the loanable funds market. As far as the deposit-based performance is concerned (DEA2), larger banks are likely to be viewed as too-big-to-fail, and, therefore, enjoy higher credibility than their smaller counterparts. This could lead to lower premiums that depositors charge banks for their willingness to deposit their savings with them, hence lowering the bank's interest expenditures.

Third, banks with a controlling share of foreign ownership are more likely to be efficient than their domestically owned counterparts (including state-owned and private domestic). This should come as no surprise because of the ability of foreign owned banks to capitalize on their access to better risk management and operational techniques, which is usually made available through their parent banks abroad. In addition, since foreign ownership is likely to be concentrated, foreign owned banks are less prone to typical corporate governance conflicts between (dispersed) owners and the management. The anecdotal evidence also shows that foreign owned banks are more likely to cherry-pick the best borrowers available on the market (especially those from their own countries of origin), thereby improving the quality of their portfolio and increasing *ex post* returns. On the deposit side, owing to a popular perception that, if necessary, a foreign owned bank will be bailed out by its more powerful parent institution abroad, foreign ownership plays a role of implicit deposit insurance. Therefore, foreign owned banks would be likely to attract deposits by paying lower rates than their domestically owned counterparts.¹⁴

Fourth, on another bank specific variable included in the regressions (i.e., dummy variable for new vs. old banks) the outcome is just as intriguing. It turns out that after controlling for ownership, newly established banks are not necessarily more efficient than those that existed prior to 1990. Note that if viewed as a proxy for overall

¹⁴A notable example of this taking place in a transition environment is Yerevan-based HSBC-Armenia bank (originally set up as Midland-Armenia bank). For years being the only foreign owned bank in Armenia and having offered deposit rates, which are three to four times lower than those offered by its domestic counterparts, the bank has managed to increase its share of deposits over time.

private ownership¹⁵ (since banks that were established after 1990 are likely to have a larger share of private ownership—both domestic and foreign—than banks that existed prior to 1990), the results shed some light on the effect of domestic private ownership on efficiency. It appears that although positive, its effect is not statistically significant. If viewed together with the point made in the previous paragraph (i.e., banks with controlling share of foreign ownership are more efficient), this suggests that unless privatization leads to a controlling foreign ownership, privatization of banks does not lead to statistically significant improvements in efficiency. This finding reiterates the importance of factors that are usually associated with foreign ownership for banking operations in a transition environment: transfer of technology, better management, and favorable (transition country) public opinion.

Finally, although there seems to be some indication that prudential regulations have an impact on the efficiency of banks, the effects are not uniform across different prudential norms. Tighter minimum capital adequacy ratios seem to be associated with improved revenue generating capacity (DEA1) and more aggressive deposit taking behavior (DEA2).¹⁶ On the other hand, the impact of a single borrower limit on efficiency is insignificant.¹⁷ This is perhaps explained by banks' increasing interest in diversifying away from large credit exposures, which is in turn facilitated by the availability of more advanced market instruments (including wider use of Treasury securities). This suggests that diversification objectives of regulatory authorities are generally in line with those of the banks, and that the further tightening of single borrower exposure limits should come at no cost to banks. This could also be because statutory limits do not mimic the reality on the ground—because the single borrower exposure is hard to measure and enforce—and the link is therefore subject to measurement error. Finally, banks in countries with relatively lax foreign exchange exposure regulations seem to be doing better than those in countries with tighter policies. This could be explained by the fact that in some countries in transition, foreign exchange earnings constitute a big share of non-interest income, and tightening limits on foreign exchange effectively limits a bank's ability to make extra income on foreign exchange transactions. Tighter standards on foreign exchange positions seem to affect banks' intermediation function as well (DEA2). This could be explained by the fact that most depositors in the region, perhaps rightfully so, still prefer foreign currency denominated instruments to those denominated in domestic currency. Of course, should this be the case, depending on

¹⁵It should be noted that the data set did not contain information on state ownership of the banks, and therefore it was impossible for us to explicitly control for domestic private ownership.

¹⁶This result runs contrary to Barth, Caprio, and Levine (2001) who find that there is no relationship between stringency of capital requirements and bank performance.

¹⁷Note that, unlike the capital adequacy ratio, higher values of single borrower and foreign exchange exposure limits imply less stringent control.

their asset position, banks will be restricted in their ability to borrow in foreign currency. Overall, this indicates that further limiting foreign exchange related exposure is likely to come at a cost.

V. CONCLUSION

The paper reviews the current state of affairs of the banking sector in Armenia. The aggregate monetary and financial sector numbers show a highly dollarized financial sector. Indicators of confidence continue to be low. In 2002, the banking sector was a victim of turbulent shocks, with eight out of thirty banks placed under interim administration by the CBA in a move to limit the extent of the problem and its potential impact on the banking system as a whole. Inefficiencies in banking operations persist, as evident in high interest rate mark-ups offered by the banks.

As a tool for assessing the efficiency of banking operations and determining policy measures influencing the latter, I utilized the approach used in Grigorian and Manole (2002), which looks at profit maximization and service provision as main functions performed by commercial banks. The following general recommendations seem to hold on bank-level data from a wide range of transition countries. First, banking sectors with a few large, well-capitalized banks are likely to generate better efficiency and higher rates of intermediation. Second, when it comes to types of owners, the results suggest that only foreign ownership leads to statistically significant improvements in efficiency. Finally, contrary to conventional wisdom, not all prudential requirements are detrimental to efficiency, suggesting that case-by-case studies are necessary to find the best (i.e., efficiency-enhancing) combination, which would also address the banking sector soundness and security issues.

What are the implications of these results for policy making in Armenia? In the short run, confidence boosting measures (to be undertaken to educate the general public about the state of affair in the banking system) should be undertaken to prevent runs in otherwise healthy banks. Individuals responsible for recent fraudulent activities should be brought to justice: sanctions against those managers and owners are likely to improve the confidence in the system. Any interventions by state officials (either acting in private or official capacity) to change the course or otherwise tamper with any CBA actions in this regard (or on the way of liquidating problem banks) should be brought to light in order to prevent such acts in the future. Once the immediate risk of bank runs (especially following the elections) are eliminated, the CBA should take measures to further improve the accountability of bank management and owners. Tightening prudential control itself may not be effective unless bank owners and managers are called to justice for embezzlements and made personally liable for their actions: as long as assets are greater than equity, the owners have incentives to tamper with assets of the bank, knowing that they will be liable only to the extent of their equity.

On the medium-term agenda, the CBA should undertake swift and credible measures to consolidate the banking system. A weak and inefficient banking sector represents a serious drain on private and public resources, and hence the “political economy” considerations should be set aside while curing it. Currently adopted faded plans of increasing the minimum capital requirement might be too liberal, considering the challenges the CBA faces in the way of implementing even current standards and requirements.

Unfortunately, at present, all measures taken by the CBA in this direction are likely—as it happened in the past—to be overturned in commercial courts. Therefore, authorities should strengthen the role of the CBA by reinforcing its ability to revoke licenses, proceed with the liquidation of problem banks, and initiate legal proceedings against faulty managers and owners.

Related and insider lending have proven extremely hard to detect. Because these problems are generally hard to account for in any developing country, especially in a closely linked environment such as Armenia’s, authorities should rely on indirect ways of dealing with this problem. More specifically, policy makers should be doing everything in their power to encourage foreign entry as a source of un-related and, therefore, unbiased lenders. In the limit, if there are benefits to be had—as unorthodox as this might sound—the CBA should not hesitate to go for full (100 percent) foreign ownership of the banking system, with some temporary short-term limits (i.e., floors) on banks’ domestic investments (to make sure they finance at least some domestic activities). This limit should, however, gradually be replaced by tangible steps towards improving the lending environment and contract enforcement to make sure the (foreign owned) banks choose to, as opposed to being forced to, invest in Armenia.

Finally, regarding the impact of prudential control, the CBA should continue its efforts to attract best practitioners to its Banking Supervision Department. As suggested by the above regression results, prudential tightening does not have to be detrimental for efficiency and profitability of banks, and should certainly be pursued with an aim of guaranteeing stability to the sector. Therefore, the CBA would be well advised to improve the analytical capacity of bank supervisors so they are not only able to detect problems and fraudulent activities by banks, but also able to design regulatory framework which would—with banking sector soundness and security as main objectives—have minimal impact on commercial bank profitability and efficiency.

Table 5. Second-Stage Regression Results: Censored Tobit Analysis

Dependent Variable	DEA1	DEA2	DEA1	DEA2	DEA1	DEA2	DEA1	DEA2	DEA1	DEA2	DEA1	DEA2
GDP per capita	4.36E-05** (4.261)	7.74E-05** (4.698)	4.56E-05** (4.374)	8.91E-05** (5.118)	4.77E-05** (4.549)	8.47E-05** (4.940)	5.48E-05** (4.869)	8.33E-05** (4.670)	4.53E-05** (4.204)	9.57E-05** (5.403)		
Inflation	4.15E-05 (0.513)	-5E-05 (-0.597)	5.71E-05 (0.673)	-7.5E-05 (-0.861)	7.82E-05 (0.911)	3.14E-06 (0.036)	7.0E-05 (0.796)	7.82E-06 (0.088)	8.9E-05 (1.029)	-4.8E-05 (-0.535)		
M2/GDP	0.118 (0.825)	0.126 (0.672)	0.126 (0.811)	-0.01015 (-0.052)	0.072 (0.454)	0.028 (0.147)	0.117 (0.727)	0.028 (0.148)	0.085 (0.533)	-0.089 (-0.453)		
Equity/assets	0.444** (4.964)	0.226** (2.376)	0.414** (4.426)	0.156 (1.531)	0.4079** (4.368)	0.145 (1.446)	0.402** (4.315)	0.146 (1.451)	0.415** (4.433)	0.140 (1.398)		
Market concentration	2.031** (8.018)	1.450** (5.849)	1.974** (7.577)	1.483** (5.713)	1.980** (7.621)	1.512** (5.907)	2.015** (7.723)	1.504** (5.847)	1.996** (7.679)	1.472** (5.755)		
New vs. old	0.026 (0.914)	0.034 (1.157)	0.025 (0.833)	0.029 (0.919)	0.025 (0.842)	0.037 (1.210)	0.0202 (0.680)	0.038 (1.228)	0.026 (0.863)	0.032 (1.026)		
Foreign ownership	0.229** (9.376)	0.242** (9.072)	0.237** (9.407)	0.251** (9.118)	0.239** (9.475)	0.252** (9.296)	0.247** (9.644)	0.250** (9.145)	0.241** (9.527)	0.252** (9.344)		
Capital adequacy	0.017 (1.612)	0.064** (5.004)	0.022** (1.968)	0.069** (4.665)	0.025** (2.159)	0.068** (4.683)	0.021* (1.789)	0.069** (4.519)	0.026** (2.248)	0.074** (5.073)		
Single borrower limit	8.95E-05 (0.814)	0.002 (0.975)	0.0001 (1.142)	0.001 (0.364)	0.0001 (1.130)	-0.0003 (-0.172)	0.0002 (1.259)	-0.00026 (-0.148)	0.00014 (1.097)	0.004 (1.601)		
Forex exposure limit	0.003** (2.285)	0.004** (3.063)	0.004** (2.454)	0.004** (2.680)	0.002 (1.270)	0.002 (1.549)	0.0028 (1.593)	0.002 (1.531)	0.0014 (0.730)	0.003** (2.207)		
Legal/institutional quality			0.013 (0.483)	-0.006 (-0.181)	0.003 (0.095)	0.005 (0.146)	0.0138 (0.504)	0.005 (0.153)	-0.006 (-0.216)	-0.00028 (-0.009)		
Enterprise restructuring					0.087 (1.540)	0.241** (4.075)	0.114** (1.957)	0.234** (3.639)	0.087 (1.551)	0.221** (3.703)		
Market capitalization							-0.005* (-1.723)	0.001 (0.296)				
Securities market									0.037 (0.959)	-0.142** (-2.395)		
Sub-regional dummies	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes	Yes		
Constant	-0.190 (-1.303)	-0.781** (-4.303)	-0.277 (-1.490)	-0.765** (-3.496)	-0.398** (-1.973)	-1.174** (-4.935)	-0.494** (-2.365)	-1.168** (-4.892)	-0.445** (-2.146)	-1.042** (-4.286)		
No. of observations	700	630	661	589	661	589	661	589	661	589		
R-squared	0.31	0.31	0.31	0.32	0.32	0.35	0.32	0.35	0.32	0.37		

Source: Grigorian and Manole (2002).

Notes: *t*-statistics are in parentheses. ** and * indicate significance at 5 percent and 10 percent confidence levels, respectively.

APPENDIX

Data Envelopment Analysis (DEA) has been used extensively in studies of the banking industry in developed market economies. The method has been applied to individual countries as well as inter-countries comparisons.¹⁸ The focus of the DEA literature is on determining the efficiency of Decision-Making Units (DMUs) in our case banks. The method establishes which of the banks determine the envelopment surface. The latter is referred to as the empirical production function or efficiency frontier. This benchmark frontier is a linear combination of the efficient banks in the sample. The set of best practice or frontier observations are those for which no other decision making unit or linear combination of units has as much or more of every output (given a fixed amount of inputs, for an output-oriented model) or as little or less of every input (given a fixed amount of outputs, for an input-oriented model). The DEA frontier is formed as the piecewise linear combination that connects the set of these best practice observations, yielding a convex production possibility set. The DEA provides a computational analysis of relative efficiency for multiple input/output situations by evaluating each decision-making unit and measuring its performance relative to an envelopment surface composed of best practice units. Units that do not lie on the surface are termed inefficient. Thus this method provides a measure of relative efficiency.

Let us provide a brief description of the underlying linear programming model. We assume that there are K inputs and M outputs for every DMU. For the i^{th} DMU the inputs and outputs are represented by vectors x_i and y_i respectively. For each DMU we intend to obtain a measure of the ratio of all outputs over all inputs, such as $u_i' y_i / v_i' x_i$, where u_i and v_i are vectors of weights. To select the optimal weights, the following problem is proposed:

$$\begin{aligned}
 \max_{u_{ik}, v_{im}} \quad & \frac{u_i' y_i}{v_i' x_i} \\
 \text{s.t.} \quad & \frac{u_i' y_j}{v_i' x_j} \leq 1 \\
 & u_{ik}, v_{im} \geq 0 \\
 & i, j = 1, 2, \dots, N \\
 & k = 1, 2, \dots, K \\
 & m = 1, 2, \dots, M
 \end{aligned} \tag{A-1}$$

A problem with this formulation is that it has an infinite number of solutions. This can be avoided by introducing a constraint $v_i' x_i = 1$, and obtaining the multiplier form of the linear programming problem:

¹⁸ See Berger and Humphrey (1997) for a detailed survey.

$$\begin{aligned}
& \max_{\mu_i, \sigma_{im}} \mu_i' y_i \\
& \text{s.t. } \sigma_i' x_i = 1 \\
& \mu_i' y_j - \sigma_i' x_j \leq 0 \\
& \mu_{ik}, \sigma_{im} \geq 0 \\
& i, j = 1, 2, \dots, N \\
& k = 1, 2, \dots, K \\
& m = 1, 2, \dots, M
\end{aligned} \tag{A-2}$$

where vectors u_i and v_i are replaced with μ_i and σ_i . Using the duality property of this linear programming problem, Charnes, Cooper, and Rhodes (1978) derive an equivalent envelopment form as:

$$\begin{aligned}
& \min_{\theta, \lambda} \theta \\
& \text{s.t. } -y_i + Y\lambda_i \geq 0 \\
& \theta_i x_i - X\lambda_i \geq 0 \\
& \lambda_m \geq 0
\end{aligned} \tag{A-3}$$

where λ is an $(N \times 1)$ vector; and θ , a scalar, is the efficiency score for the i^{th} DMU.¹⁹ The combination $(X\lambda_i, Y\lambda_i)$ can be interpreted as the projection of the DMU onto the efficiency frontier, with constraints interpreted accordingly. Note that $\theta_i \leq 1$, with $\theta_i = 1$ implying a DMU, which is located on the efficiency frontier.²⁰ Due to fewer number of constraints, this formulation is usually used for computations.

¹⁹ $X = [x_1, \dots, x_N]$ is a $(K \times N)$ input matrix with columns x_i and $Y = [y_1, \dots, y_N]$ is an $(M \times N)$ output matrix with columns y_i .

²⁰ Essentially, θ_i measures the distance between a bank and the efficiency frontier, defined as a linear combination of best practice observations (a convex set thereof), with $\theta_i < 1$ implying that the bank is inside the frontier (i.e., it is an inefficient bank), while $\theta_i = 1$ implying that the bank is on the frontier (i.e., it is an efficient bank).

REFERENCES

- Berger, A.N., and D.B. Humphrey, 1997, Efficiency of Financial Institutions: International Survey and Directions for Future Research, *European Journal of Operational Research*, Vol. 98, No. 2, 175–212.
- Berger, A.N., and L.J. Mester, 1997, Efficiency and Productivity Change in the U.S. Commercial Banking Industry: A Comparison of the 1980s and 1990s, Federal Reserve Bank of Philadelphia Working Paper No. 97-5 (Philadelphia).
- Charnes, A., W.W. Cooper, and E. Rhodes, 1978, Measuring the Efficiency of Decision Making Units, *European Journal of Operations Research*, No. 2, 429–44.
- Dollar, David and Aart Kraay, 2002. Growth is Good for the Poor, *Journal of Economic Growth*, 7, No. 3, 195-225.
- Grigorian, David, and Vlad Manole, 2002. Determinants of Commercial Bank Performance in Transition: An Application of Data Envelopment Analysis, *IMF Working Paper No. 02/146*.
- International Monetary Fund, 2002. Republic of Armenia: Statistical Annex. *IMF Country Report 02/225*.
- King, Robert and Ross Levine. 1993. Finance and Growth: Schumpeter might be right, *Quarterly Journal of Economics* 108, 717-738.
- Levine, Ross. 1998. “The Legal Environment, Banks, and Long-Run Economic Growth, *Journal of Money, Credit, and Banking*, 596-613.
- Memorandum of Economic and Financial Policies (MEFP), September 2002, www.imf.org/external/np/loi/2002/arm/01/index.htm.