Development and efficiency of the banking sector in a transitional economy: Hungarian experience

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Abstract

The paper analyzes the experiences and developments of Hungarian banking sector during the transitional process from a centralized economy to a market-oriented system. The paper identifies that early reorganization initiatives, flexible approaches to privatization, and liberal policies towards foreign banks' involvement with the domestic institutions helped to build a relatively stable and increasingly efficient banking system. Foreign banks and banks with higher foreign bank ownership involvement were associated with lower inefficiency.
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1. Introduction

The importance of financial sector development and privatization received renewed attention in the context of economic restructuring of transition economies (Dornbusch and Reynoso, 1989; Hetzel, 1990; Sundarajan, 1992; Saunders and

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Sommariva, 1993; Szego, 1993; World Bank, 1996; Sachs, 1997; Popov, 1999; Hermes and Lensink, 2000; Scholtens, 2000). Consequently, in the countries of Eastern and Central Europe (ECE) with the economic and political changes of 1989, the newly elected governments prioritized establishing effective banking and financial systems. In the new era, banking regulatory and supervisory institutions were to be established, market-oriented financial institutions needed to develop from centralized state-owned banking systems and initiatives were to be taken for the entry of privately owned banks.

So far, only a few of the 27 transition economies have made substantial progress toward establishing a market-oriented banking sector. All these countries that have been successful are in the process of totally privatizing their banking institutions and have been involved in opening up their markets to foreign participants. Hungary, for example, took the lead in inviting foreign banking institutions to the country during the late 1980s and within a short period of time, the foreign banking sector has become a dominant force in the industry as well as in the economy. In fact, by 1998, Hungary became the first country in the region to establish a privately owned banking sector that successfully overcame the burden of bad debts, massive under-capitalization, and high concentration (National Bank of Hungary (NBH), 1998). [1] Today, Hungarian banks are mostly profitable despite maintaining a high capital standard and are close to meeting the requirements set by the European Union in respect to its bank regulatory and supervisory measures.

Despite the growing role of banks in transitional economies, financial researchers have paid less attention to evaluating the performance and strategies adopted by these institutions. [2] In fact, a survey (Berger and Humphrey, 1997) documented studies on the bank performance and efficiency of 21 countries, but none of these were from among the transition economies. This paper further aims to fill the gap in the literature by introducing the experiences of Hungarian banks, both domestic and foreign institutions, during the transition process from 1993 to the 1997. During this period, a predominantly private-owned banking sector was established where privatization of all the large commercial banks was completed and newly formed small- and medium-sized banks grew rapidly. The development of this private banking sector had been paralleled by a major increase in the share of capital held by foreign multinational banks.

This paper trails the dynamics of profit efficiency of Hungarian banks and further analyzes the factors correlated to their performance. It traces the extent of efficient

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[1] For a description of the "stylized" symptoms of transition of the financial sector, see Gorton and Winton (1998).

[2] Most studies in the related area focused on the restructuring and development of the financial sector in transition economies (Helmenstein, 1999; Gorton and Winton, 1998; Litwack, 1995; Gros and Steinherr, 1997; Catte and Mastropasqua, 1993; McKinnon, 1991; Csaki, 1993). A few case studies focused on the privatization of individual banks and the changes in the banks' performance and governance subsequent to privatization (Hunter, 1993; Abarbanell and Bonin, 1997; Meyendorff and Snyder, 1997; Abarbanell et al., 1997). Although these studies contributed to a better understanding of the issues and processes involved in financial sector development in transition economies, most are based on conceptual developments on the topics rather than on experiences from empirical perspectives.

use of output and input choices, i.e., management of resources by banks in a transitional period when most state-owned commercial banks have undergone some sort of privatization or joint venture initiatives. The paper primarily explores the role of foreign banking institutions as competitors and partners of domestic banking institutions in shaping the new environment of Hungarian banking market. Such understanding is important from the perspective of banking policy-making in transition economies; moreover, the Hungarian experience may be of additional importance to regulators and policy-makers in regions that are yet to experience similar stages of banking and financial sector developments. The overall findings reveal a decreasing trend of profit inefficiency during the sample period partly due to an effective decrease in cost inefficiency, increased capital infusion, and involvement of multinational banks through joint ventures and establishing affiliates.

2. Banking in Hungary

2.1. Transition to a new system

Following the Soviet Union's system, the Hungarian banking system was established in 1948 when the NBH assumed the monopoly of money circulation and all credit functions in the economy. Despite the centralization of monetary functions with it, the NBH had only limited power to make decisions on credit allocation. Its main role was to allocate credit to enterprises according to the mandate of the plan. The National Savings Bank (NSB) was responsible for collecting deposits from the population while the Hungarian Foreign Trade Bank dealt with foreign-trade-related transactions. All were state-owned institutions with monopoly in their respective specialization.

The reform started relatively early in Hungary when the government permitted a number of foreign banks to set up offshore operations in the early 1980s, even though these banks competed with state-owned banks in the areas of foreign exchange and trade-related transactions. In 1987, the centralized mono-banking system was replaced by a two-tier banking system as NBH assumed the role of central bank and transferred its commercial activities to three new commercial banks. In addition, a number of new specialized banks were established; these banks had very narrow functions. In 1989, when the newly elected democratic government assumed leadership, it inherited a banking sector that was more decentralized than the classical socialist system of most other Eastern European countries. With the exception of the foreign offshore banks, however, ownership and control rested with the state. Yet the reforms of the 1980s were significant as they enabled the post-socialist government to initiate fundamental reforms.

The democratic government established a market-economy type regulatory framework in 1991. It required that banks meet the 8% capital adequacy ratio norm of the Bank of International Settlement and that banks provide reserves against their bad or doubtful loans. The framework also set minimum capital requirements for

new banks and called for the reduction of state ownership in all commercial banks to no more than 25% by 1997.

But in the actual industry scenario during the early years, several of the large state-owned banks had huge negative equity with a high percentage of loans nonperforming at a time period when the existing accounting laws did not require provisions for bad loans. Once the compliance of provision requirement surfaced, the quality of loan portfolios became apparent as banks suffered major losses. In 1992, 15–28% of the credits extended were nonperforming loans and were primarily borrowed by the state-owned enterprises during the pre-1989 era. The structural reform initiatives in the country during the early 1990s caused a major drop in GDP, resulting in heavy losses by the state-owned enterprises that were further unable to service their existing debt to banks. It became evident that unless the state-owned banks are privatized, political decisions will continue to determine their lending practices. However, prior to privatization, the deteriorating loan portfolios of banks needed attention.

Within a year the government undertook two subsequent programs. A loan consolidation program was announced in 1993, which allowed banks to swap their "bad loans" or "old debts" for government bonds known as consolidation bonds, with a coupon equal to 90-day treasury bills. In total, 14 banks participated in the scheme and contributed HUF105 billion face value of bad debt for exchange (NBH, 1996). It helped to remove the nonperforming loans from the balance sheet but did not provide new capital in the banking sector. In its next initiative, a year later, the government recapitalized nine state-owned banks and helped attain the minimum 8% requirement. It cost the authority more than US $2billion—almost 7% of the country's GDP. This high cost to the government created an urgency to cease accumulation of new nonperforming loans and accelerated the importance and need of privatization.

2.2. Entry of new banks

In the two-tier banking system of 1987, the five large state-owned commercial banks accounted for more than 90% of corporate and household loans, deposits, and foreign exchange trading. There was almost no competition among these banks as most of the newly created commercial banks were specialized by industrial sectors. In the new era, liberal bank licensing policies allowed specialized banks to operate in all segments of business and encouraged new bank entry in the market. By 1991, the number of banks rose to 37, a substantial increase from 15 in 1987. Most of these new banks were either subsidiaries or branches of multinational banks or were affiliated with the large state-owned banks.

The initial impact of new entrants on the banking sector was uneven. The newly formed subsidiaries of foreign banks focused their activities initially on foreign trade and foreign exchange transactions and rapidly gained a major share of the market. By 1991, these banks accounted for almost 44% of market share in the letter of credits issued and 27% of the corporate loan sector from around 6% market shares in these categories in 1989 (NBH, 1992). As the newly formed foreign or joint-venture

banks increased their position, the large state-owned banks registered a relative decline.

2.3. Privatization

Despite many early ambiguity and uncertainty regarding methods of privatization, a consensus developed among administrators that all new investors ("strategic investors") must be committed to improving the governance of the bank, its technological modernization and infusion of capital. There were concerns and debates regarding the dominance of foreign ownership of state-owned institutions. It was the Banking Act of 1991 that allowed foreign banks to have more than 10% of equity share in domestic banks. The preference of retaining government control and ownership was evident in the privatization of the NSB, the largest and most valued Hungarian public bank. The authority restricted foreign involvement by allocating certain blocks of shares to domestically owned institutional funds, retail investors, as well as to the management and employees of the company during the public flotation of shares. Only 20% of the equity was offered to foreign institutional investors.

By the mid-1990s there was a broader acceptance of majority foreign ownership of banks, but the preference for the government keeping a "golden share" of the venture continued. This government policy discouraged foreign banks from participation in the privatization, especially during the early years (Abel and Bonin, 1994). In 1996, the government further liberalized the banking laws and encouraged active foreign participation and did not impose share limitation. In its negotiations with foreign banks, the government was flexible and took new approaches on the terms and conditions of bank privatization.

Two key features characterized privatization of large Hungarian banks. First, the large banks were privatized in tranches, i.e., blocks of shares were offered to different foreign investors at different times. For the strategic foreign investor, this reduced the initial cost and risk of investments. In the case of two of the largest banks, for example, the government negotiated with the European Bank of Reconstruction and Development (EBRD), the international financing institution, to be involved with 20% and 32% equity participation in the deals. In the early stages, foreign investors got involved with the 20–40% range of equity shares with the government retaining 20–25% ownership. The government, however, granted full management control to the foreign partners and gave call options to these investors to subsequently increase their ownership either by acquiring the share of partners like EBRD or of the government.

Second, at least in the case of two large banks, the contract provided for subsequent price adjustments in the purchase price, depending on the future profit of the bank. Regarding the privatization of Budapest Bank with the involvement of General Electric Capital, for example, the terms of the sale provided a few call options for GE Capital to sell back assets to the government in case of nonperformance of assets. And it also allowed for acquisitions of additional shares from the government and other nonprivate partners (EBRD). Interestingly, subsequent to the

completion of privatization, the management of Budapest Bank did exercise its option and sold back its unprofitable subsidiary, Polgari Bank, to the government.

Politically, the terms of this type of negotiated liberal privatization were subject to substantial criticism and the government subsequently limited or reversed some of the provisions. Others, on the contrary, argued that while the government may not have received maximum revenue for its assets in some of the foreign-investor-involved privatization, it did lay the foundation of a strong efficient banking sector in Hungary (Schnatterly and Kormendi, 1998). Irrespective of the involvement of foreign or domestic investors in the privatization deals, it freed banks from the government influence in credit allocation. Privatization was also followed by large lay-offs of personnel, which were politically unpopular but provided significant cost efficiency to these formerly state-owned banks notoriously overstaffed by any standard.

3. Relevant literature

The literature on the restructuring and development of the financial sector in transition economies is abundant. Gorton and Winton (1998) describe various issues and problems associated with the transformation of the financial sector while the relative merits of bank- versus securities-based systems and corporate governance issues are analyzed in Litwack (1995) and Gros and Steinherr (1997). [3] Catte and Mastropasqua (1993) and McNulty (1999) investigated the investment projects and financial intermediation issues in Central and Eastern Europe countries reporting, in general, a relatively stable system in Eastern Europe relative to the former Soviet Union republics. Recently, Scholtens (2000) reported the quick progress of Central European banking systems relative to the stock markets in sample countries while Hermes and Lensink (2000) focused on the role played by independent central banks, deposit insurance systems, and capital market in stabilizing the banking system in transition economies.

Early studies on transitional banking issues focused on problems related to loan performance and recapitalization (McKinnon, 1991; Csaki, 1993; EBRD, 1995). Subsequently, privatization of state-owned banks with its multiple dimensions took a center stage (Perotti, 1993; Bonin and Leven, 1996) reporting conflicting views and findings about the merits of the pace of privatization. The privation and efficiency issues got its first attention from Kraft and Tirtiroglu (1998) who highlighted the increased efficiency of newly privatized banks in Croatia. [4]

Thorne (1993) reported that countries with higher number of new private banks, new regulation and supervision, and enhanced bank competition have experienced an improvement in credit allocation and loss minimization. In a multicountry study, Demirguc-Kunt and Detragiache (1998) concluded that success of liberalization at-

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[3] For a more detailed review of corporate governance and impact of debt and equity investors on management, see EBRD (1993).

[4] In the post-deregulatory period—since 1990—the Croatian banking industry experienced the entry of over 30 new banks within the first 6 years. Only one of these banks was a foreign banking institution.

tempt is dependent on legal behavior, contract enforcement, and effective prudential regulation and supervision.

A number of papers emphasizing conceptual issues of financial sector developments and the impact of foreign-owned banks on local market competition are available in the management, finance, and international business literature (Gray and Gray, 1981; Grosse and Goldberg, 1991; DeYoung and Nolle, 1998; Molyneux and Thornton, 1992; Meyendorff and Snyder, 1997; Hasan and Hunter, 1996; Haslem et al., 1992). Most of these papers are based on experiences in the United States. In an 80 country bank performance study, Claessens et al. (2001) found that foreign banks have higher profits than domestic banks in developing countries but the situation is opposite in the case of developed countries.

Dijkstra (1996), Barlett (1996), Jelic and Mallin (1997), Sabi (1996) and Bonin and Istvan (2000) investigated the banking practices, performance and privatization experience in Hungary. Most of these studies, however, were limited to descriptive analyses and, in most cases, based on industry-level data and are primarily focused on the financial reform or overall operational performance of different groups. Comparing financial ratios, Sabi (1996) reported a significantly superior performance by the foreign-owned banks over domestic institutions during the 1992–1994 period mainly due to their risk-adverse behavior. However, Sabi's research covered the period when most of the large local institutions were still owned by the state and had various levels of government intervention in their management. This paper attempts to contribute further on this topic by using post-liberalization era sample and rigorous empirical analyses to further understand the experience, performance, and efficiency of Hungarian banks.

In evaluating performance, we have emphasized more on the dynamics of bank efficiency rather than focusing on traditional measures such as return on assets and return on equity. Given the newly privatized transitional environment, continuous restructuring of nonperforming assets by local banks, and entry of foreign banks in the market, we were more interested in finding how banks have approached or adjusted to their highest operational capability or relative efficiency. Efficiency estimates reflect extent of efficient use of output and input choices by banks thus reflecting the magnitude of superior management of resources. The paper also focuses on a time period when a predominantly private-owned banking sector was established and almost all previously state-owned commercial banks were privatized. Importantly, the paper highlights the role of foreign banks in the local transitional banking market.

4. Data

The data comprises financial statements of all commercial banks that published in the Hungarian Financial and Stock Exchange Almanac (HFSEA) during the 1993–1998 period. As new banks entered the market and a number of mergers and acquisitions took place between foreign and local banks, our sample had an uneven number of banks each year. Although HFSEA is our primary source of data, however we

have taken some information and related details from publications of the NBH and the Hungarian Ministry of Finance. We were forced to delete some of the institutions due to the lack of consistent and unstained data.[5] Our final sample was comprised of 193 bank observations.

The sample period encompasses three fairly distinct economic and sectoral conditions. First, the initial years, 1993–1994, were characterized by a large concentration of nonperforming loans by the state-owned banks, which became manifest partly due to the newly adopted reporting standards and partly because of the deterioration of economic conditions. Second, the year 1995 marked completion of debt consolidation and recapitalization of banks and the adoption of restrictive monetary policies to stabilize the economy. Third, the 1996–1998 period witnessed completion of privatization of all the major banks, with well-developed bank regulatory and supervisory institutions in place under relative economic stability and positive GDP growth rates.

Table 1 displays descriptive statistics for all the variables used in our efficiency model estimates on sample Hungarian banks. The first column provides combined estimates of key asset, liability, income, and expenditure ratios in respect to total assets, and other related variables for the pooled sample 1993–1998. The other columns present yearly averages. Overall, the liquid assets to total assets ratio declined (25.66–19.03) while short-term loan to asset ratio (46.65–48.02) and total loan to asset ratio (62.07–67.93) increased during the sample period. Once adjusted for inflation, the average growth of assets did not show any significant changes, although in a few cases there was evidence of declining size. On average, the banks moved away from retail lending—lending to customers—and also relied less on retail deposits as a financing source over the sample years. Sample banks reported strong capital to asset ratio as reflected by the 10–13% ratios over the years.

The total cost showed a substantial decline over the years. Most of the decline came from lowering noninterest operating expenses. New consolidation efforts, layoffs of excess employees, and closing down of some of the branch activities helped in lowering the noninterest expenses. The return on assets increased from a negative ratio of −0.24 in 1993 to a high 0.56 in 1995 and then declined substantially to 0.26 and 0.30 in 1997 and 1998 respectively. A similar trend is also observed in the other performance proxy ratio—return on equity. The availability of bank services as reflected in the number of hours per week banks are open for business activities has increased substantially from an average of 29.8–37.3 hours. In respect to foreign bank involvement in the local banking market, the percentage of asset share increased from 51.4% in 1993 to almost 79% in 1998. Among the banks operating in Hungary, almost 68% were had some form of foreign capital involvement in their ownership structure. By 1998, almost every bank had at least some such foreign involvement.

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[5] For example, our sample excluded a few commercial banks—e.g. Hanwa Bank, Agro Deposit Bank and Ibusz Bank—who conducted regular business but did not report or provide complete and consistent information. Also excluded are some medium and long-term credit institutions that did not have a commercial bank charter.

Table 1
Descriptive statistics

	Combined	1993	1994	1995	1996	1997	1998
Key balance sheet items							
Liquid assets ratio	21.26 (14.82)	25.66	20.37	20.57	21.74	19.27	19.03
Short-term loans ratio	46.06 (15.79)	46.65	48.93	48.71	48.43	49.47	48.02
Financial investments ratio	8.43 (9.82)	7.48	8.19	9.54	9.82	9.06	10.63
Retail loans ratio	34.75 (14.82)	39.22	36.51	37.25	27.99	27.71	27.17
Retail deposits ratio	46.79 (19.03)	52.68	46.28	45.99	47.15	46.80	44.08
Institutional deposits ratio	30.01 (18.24)	24.23	30.60	28.57	29.92	29.08	30.16
Equity ratio	11.01 (6.93)	13.28	11.68	10.62	10.16	10.91	9.84
Logarithm of assets	16.03 (4.81)	13.76	14.95	16.57	17.61	18.26	18.04
Key income expenditure items							
Noninterest costs ratios	6.06 (7.54)	8.86	8.01	8.27	4.87	4.41	4.13
Total cost ratio	16.82 (12.18)	19.64	18.92	22.48	15.69	14.83	12.63
Return on assets	0.56 (1.93)	−0.24	0.28	0.56	0.36	0.26	0.30
Return on equity	5.88 (20.63)	5.93	3.59	8.26	3.80	2.76	2.92
Outputs, inputs and other ratios							
Total loans ratio	64.38 (17.85)	61.58	62.07	63.69	64.58	69.21	67.93
Total investment ratio	10.73 (10.14)	10.86	10.16	12.25	12.04	11.90	12.11
Total borrowing ratio	85.16 (7.38)	84.50	85.22	86.55	87.21	86.98	85.47
Price of fund	11.42 (4.73)	8.78	10.92	13.63	12.89	11.95	11.29
Price of labor	64.02 (23.11)	74.20	59.36	62.14	58.60	60.51	59.36
Number of years in business	11.92 (13.83)	7.95	8.95	10.41	11.76	13.39	14.07
Weekly banking hours	33.88 (8.14)	29.89	31.26	33.17	33.80	36.75	37.30
Percentage of asset share by the foreign banks	64.20 (42.11)	51.43	58.29	61.81	68.64	74.30	78.86
Percentage of banks with foreign involvement	75.31 (18.42)	59.32	64.81	67.95	72.84	80.56	100
Number of banks	193	34	33	30	29	34	33

(*continued on next page*)

Table 1 (*continued*)
Mean statistics of key ratios and variables of sample banks. Liquid assets include cash and treasury bills; short-term loans are usually loans with 1–5 years maturity; financial investments are asset concentration in financial assets of other businesses; retail loans are mostly consumer related noncommercial loans; retail deposits are walk-in customer deposits where as institutional deposits are from the other banking and corporate related institutions; equity is the bank capital; logarithm of total assets reflects institutional size; noninterest cost includes office and labor expenses; total cost includes both interest and noninterest expenses; return on assets and equity are net income relative to assets and equity respectively. Output measures are broader asset and liability measure where loan includes both short- and long-term loans; investments are asset concentration in nonlending activities of speculative nature; all types of deposits and financing tools are combined as borrowing ratio; price of borrowed funds equals total interest expense divided by total borrowed funds; the price of labor equals noninterest expenses divided by the number of employees; number of years in business represents the age of the firm, weekly banking hours are the typical average hours when institution is open for banking business; and finally foreign bank share is the average equity involvement of foreign institutions in the domestic banking institutions. All ratios are in respect to total assets.

5. Estimating inefficiency

We used the stochastic frontier approach (SFA) to estimate profit and cost inefficiency. [6] In SFA models, a cost or profit frontier is estimated using a statistical procedure that decomposes the error term into two parts. One part of the error term captures random disturbances and is assumed to follow a symmetric normal distribution around the frontier that captures a phenomenon beyond the control of management (bad luck, natural or economic disaster, labor unrest, etc.). The other part of the error term is assumed to capture inefficiency that is assumed to follow a positive half-normal distribution below (above) the profit (cost) frontier and represent individual firm profit (cost) deviations or errors due to factors under management control (technical and allocative inefficiency). This represents poor managerial performance (e.g., incompetent asset–liability management, expense preference behavior, agency problems, etc.). [7,8]

Along with our key focus on profit inefficiency, [9] we also estimate cost inefficiency and eventually investigate the relative importance of cost inefficiency in determining profit inefficiency. We use a translog functional form to estimate cost and profit

[6] The econometric, or ''stochastic,'' frontier approach was introduced by Aigner et al. (1977), and was made tractable by Jondrow et al. (1982). Bauer (1990) offers an overview of these methods. For an extensive review of the banking literature on efficiency, see Berger et al. (1993b), Berger and Humphrey (1997) and Kumbhakar and Lovell (2000).

[7] See Mester (1996), Cebenoyan et al. (1993), Berger et al. (1993a,b) and Berger and Mester (1997).

[8] Bank efficiency literature primarily used SFA as well as data envelopment analysis and avoided other approaches such as Bayesian approach. Both SFA and DEA have their advantages and disadvantages. While our preferred SFA method is in conformity with production theory and offers flexibility however it requires the imposition of a certain distributional assumption firm-specific technical efficiency related variables. See Kalirajan and Shand (1999), Kumbhakar and Lovell (2000) and Kumbhakar et al. (2001) for all developments and extensive details in this field of research.

[9] Berger et al. (1995) and Berger and Mester (1997) provide arguments in favor of using a profit function to examine banking inefficiency.

("alternative", or "nonstandard" profit function) frontiers for banks during the sample period. [10,11]

We estimate the following standard translog function: [12]

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\ln \mathrm{TC}_{\mathrm{st}}(\mathrm{TP} + \theta) = \alpha_0 + \sum_{i=1}^{4} \alpha_i \ln Y_{i\,\mathrm{st}} + \sum_{k=1}^{2} \beta_k \ln W_{k\,\mathrm{st}} + \sum_{h=1}^{2} \mu_h \ln E_{h\,\mathrm{st}}
$$
$$
+ \frac{1}{2} \sum_{i=1}^{4} \sum_{j=1}^{4} \delta_{ij} \ln Y_{i\,\mathrm{st}} \ln Y_{j\,\mathrm{st}} + \frac{1}{2} \sum_{k=1}^{2} \sum_{m=1}^{2} \gamma_{km} \ln W_{k\,\mathrm{st}} \ln W_{m\,\mathrm{st}}
$$
$$
+ \sum_{i=1}^{4} \sum_{k=1}^{2} \rho_{ik} \ln Y_{i\,\mathrm{st}} \ln W_{k\,\mathrm{st}} + \sum_{i=1}^{4} \sum_{h=1}^{2} \varepsilon_{ih} \ln Y_{i\,\mathrm{st}} \ln E_{h\,\mathrm{st}}
$$
$$
+ \sum_{k=1}^{2} \sum_{h=1}^{2} \lambda_{kh} \ln W_{k\,\mathrm{st}} \ln E_{h\,\mathrm{st}} + \frac{1}{2} \sum_{h=1}^{2} \sum_{n=1}^{2} \psi_{hn} \ln E_{h\,\mathrm{st}} \ln E_{n\,\mathrm{st}}
$$
$$
+ v_{\mathrm{st}} + u_{\mathrm{st}}.
$$

Here, logTC (TP) is the natural logarithm of total cost (total profit) of the banking institution in a given year. [13] Y is the vector of quantities of output, W is the vector of inputs, and E represents a vector of netputs. Standard homogeneity and symmetry restrictions are imposed and duality of cost and production function is preserved in estimating the parameters in the translog equation above. In order to impose linear homogeneity, costs, profits, and one input price are scaled by the other input price, price of labor (arbitrarily chosen). At the same time, costs (profits), output variables,

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[10] Some papers (Mitchell and Onruval, 1996; Berger et al., 1997a; DeYoung and Hasan, 1998) have found that the Fourier-flexible form, that combines a standard translog functional form with the nonparametric Fourier functional form, provide a better fit. Berger and Mester (1997) however report that mean efficiency estimates between the two procedures was very small. Moreover, Fourier application requires additional truncations of data and given the limitation of our sample, we estimate a translog function.

[11] The alternative or nonstandard approach has been applied to banking data by Berger et al. (1996), Humphrey (1994), Pulley and Humphrey (1993), Humphrey and Pulley (1997) and DeYoung and Hasan (1998). In the "standard" approach to estimating a bank revenue function, output markets are assumed to be perfectly competitive, so revenues are specified as a function of output prices and input quantities, with the bank choosing its output quantities based on these prices. In contrast, a "nonstandard" profit function assumes that banks have some market power in output markets, so revenues are specified as a function of input prices and output quantities, with the bank choosing input quantities and output prices. In reality, market power can vary greatly across both geographic and product markets, so it is difficult to know whether individual banks choose output prices, output quantities, or both. We make the assumption that output quantities are exogenous (i.e., banks choose output prices), which allows us to use the nonstandard function. This choice is made for practical reasons—using the nonstandard approach avoids having to use output price data, which is not very reliable, and many times is not even available for banks.

[12] We estimated the cost (profit) equation using maximum likelihood techniques, and imposed the standard symmetry and homogeneity restrictions. Factor share equations were omitted because application of the usual cross-equation restrictions would impose the assumption that the given input proportions were the allocatively efficient ones (see Berger, 1993, p. 266).

[13] In the profit model, we have added a constant θ that is equal to one plus the absolute value of minimum profits in respective sample years. Incorporating such constant, we avoid taking log of a negative number.

and one of the netput variables are scaled by the other netput, loan loss provision to loans (arbitrarily chosen) to adjust for scale bias and control for heteroscadasticity. [14] The error term U captures profit (cost) inefficiency and is distributed as a truncated normal variable; V captures random error and is distributed as a normal variable. [15]

After-tax profit and total cost represent TP and TC respectively. Output Y includes total loans, total investments (other earning assets), noninterest or fee-related income and total interest bearing borrowed funds. W consists of price of borrowed funds and price of labor and related expenses. The price of borrowed funds equals total interest expense divided by total interest bearing borrowed funds. The price of labor equals noninterest expenses divided by the number of full-time equivalent workers. Given that our data did not have firm-specific consistent information on the salaries and benefits, we substitute it with the best available alternative—total noninterest expenditure (labor plus office expenses) incurred by each of the institutions. [16,17] Netput variables, represented by equity capital and loan loss provision to total loan ratio, are included to control for risk preferences, loan quality, and ability to absorb losses. [18]

6. Results

Descriptive statistics for estimated inefficiency are shown in Table 2. The first two columns display cost inefficiency followed by profit inefficiency in the following two

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[14] See Stiroh (2000) and also Altunbas et al. (2000) for detailed perspectives on the estimation techniques.

[15] Stevenson (1980) has shown that the assumption of a truncated normal inefficiency distribution is more general and more flexible than the assumption of a half-normal distribution. Berger and DeYoung (1997) show that the truncated normal distribution results in lower estimates of average inefficiency for banks than does the half normal, but that the rank efficiency order of banks remains virtually identical across distributions.

[16] Noninterest expense includes labor expenses and office expenses. One can assume that money spent on office related expenses is, in some way, an indirect benefit to employees, and therefore, the whole noninterest expense can be a good substitute of employee benefits. Alternatively, we also estimate the functions using one input—the price of borrowed funds. In these additional estimates, we do not follow the homogenity assumption that followed in the two input estimates. Interestingly, our inefficiency estimates based on one input was not significantly different from the two reported input estimates. Moreover, in subsequent regression analyses, we substituted the inefficiency scores with our one input-based inefficiency and it did not change the overall significance of the reported results and conclusions of the paper. Therefore, we did not report additional results; however, they are available upon request.

[17] Data constraints limit us to use more appropriate alternative output and input measures. However it should be pointed out that even after using most preferable output and input choices, the debate on the choices still exist. See Berger and Mester (1997), Mountain and Thomas (1999), and McAllister and McManus (1993) for details on the preferred choices and associated limitations. Our choice of input and output measures are still consistent and compatible with a number of important studies in the literature.

[18] Mester (1996) and Berger and Mester (1997) provide convincing arguments on the importance and appropriateness of incorporating some measures of bank activities that are likely to provide some insight on product quality and risk.

Table 2
Inefficiency score

Groups and years	Cost inefficiency		Profit inefficiency	
	Mean	Standard deviation	Mean	Standard deviation
1993	37.92	9.20	42.31	10.66
1994	34.05	10.58	40.02	7.27
1995	30.49	6.35	35.13	11.20
1996	26.81	7.01	31.17	9.86
1997	24.53	6.52	28.42	8.75
1998	22.39	7.04	26.06	9.89
Combined 1993–1998	28.76	10.68	34.50	11.24
All domestic	33.84	8.59	38.02	9.36
Foreign banks or foreign involvement (FFI)[a]	26.07[b]	8.00	31.84[b]	8.15
FFI 75.01–100%	24.73[b]	6.81	30.03[b]	7.85
FFI 50.01–75%	25.84[b]	8.13	30.73[b]	7.28
FFI 25.01–50%	26.79[b]	5.37	33.72[b]	8.16
FFI 0.01–25%	28.30[b]	7.65	35.13[b]	8.53

Inefficiency scores are calculated by using a stochastic econometric frontier where reported scores represent firm's observed cost (profit) deviation from the frontier. Estimations assume a common frontier with pooled sample data. Yearly estimates are simply average for the year from the pooled estimate. Foreign involvement numbers are also averages for respective groups taken from the pooled sample.

[a] Overall, the sample had 51 observations with some sort of foreign ownership involvement at a range of 75.1–100%, 40 had 50.1–75%, 38 had 25.1–50%, and 24 observations had a foreign ownership at the 0.1–25% range. In this sample 40 observations had no foreign involvement.

[b] Significantly different from domestic mean scores at 5% significance level.

columns. Overall, the pooled average estimate indicates a cost inefficiency of 28.76 and profit inefficiency of 34.50. Hence, an average bank could improve its cost and profit categories by 28.76% and 34.50% respectively, thus matching its performances with the best-practiced bank. Hungarian-owned banks, i.e., institutions with no foreign involvement, reported higher inefficiency (33.84 and 38.02) than their foreign counterparts in both cost and profit (26.07 and 31.84) categories.

We investigate the performance of the foreign institutions based on the extent of foreign involvement in banks operating in Hungary into four categories (quartiles). The results indicate that the higher the foreign involvement in bank ownership the lower is the inefficiency. Banks with at least 75% foreign involvement were the most efficient group, with a cost-inefficiency score of 24.73 and a profit-inefficiency score of 30.03. These banks, as well as banks with 50–75% owned by foreign institutions (inefficiency score of 30.73), displayed significantly lower inefficiency than the domestic bank scores, at least at the 5% significance level. Interestingly, the inefficiency scores of these two groups were quite similar indicating that some of the foreign banks that have some local involvement performed as well as the banks with total and mostly foreign ownership. Banks with less than 50% foreign

ownership fared substantially lower relative to the groups with over 50% foreign ownership. The group with banks up to 25% foreign involvement was relatively less efficient among the foreign-based groups, with inefficiency scores of 28.30 and 35.13 in the cost and profit categories, respectively. These scores were still significantly lower than the inefficiency scores of the Hungarian-owned domestic bank group.

Observing the inefficiency trend over the sample years, we notice a significant improvement in both categories. In the profit category, the average profit-inefficiency score was 42.31 in 1993; this score declined significantly over the years, with the lowest score of 26.06 reported in 1998. The same trend was observed in the cost category, where the inefficiency score declined from a high of 37.92 in 1993 to 22.39 in 1998. The overall evidence reveals that different regulatory initiatives, privatization of state-owned banks, and increase in foreign-ownership in the banking markets were associated with improved profitability and profit efficiency of banks. However, we do recognize that the overall improvement of the country's stability and its economic condition relative to the initial transition years may have contributed to the environment of better banking and thus the trend of improvements in the banking sector.

6.1. Correlates of profit-inefficiency scores

Once we have attained the profit-inefficiency scores, we employ a series of estimates to investigate possible correlation between such inefficiency and other relevant organization-specific and other related variables reflecting portfolio positions and management practices. Among other issues, we are interested in seeing whether the influence of foreign-owned banks or foreign-involved joint-venture initiatives are significantly correlated with the profit-inefficiency scores. Simple correlation as an alternative to regression analysis attempts to make a point that causation may run in both directions (Berger and Mester, 1997). [19]

$$
\begin{aligned}
\text{Pineff}_i = {} & a_0 + b_1 \text{LQASSET}_i + b_2 \text{STLOAN}_i + b_3 \text{FINVEST}_i + b_4 \text{RLOAN}_i \\
& + b_5 \text{RDEPOSIT}_i + b_6 \text{EQUITY}_i + b_7 \text{CINEFF}_i + b_8 \text{LASSET}_i \\
& + b_9 \text{YRBUS}_i + b_{10} \text{HOURS}_i + b_{11} \text{FSHARE}_i + b_{12} \text{ACQDUM}_i \\
& + \sum b_{13-17} \text{FSHAREDUM}_i + \sum b_{18-22} \text{YEARDUM}_i + e_i,
\end{aligned}
$$

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[19] Berger and Mester (1997) correctly pointed out the limitation of such two-step procedure. While such analyses are suggestive but not necessarily conclusive as the dependent variable 'inefficiency' in the regressions is an estimate and the standard error of this estimate is not accounted for in the subsequent regression or correlation analysis. One should interpret the results as providing information on correlation only instead of causality as the variables used in the estimation also suffer from endogeneity problem and thus bias the coefficient estimates.

where Pineff$_i$ is the profit-inefficiency score, our dependent variable; LQASSET is the liquid asset (cash and securities) to total assets; STLOAN is the short-term loan to total assets; FINVEST is the financial investment to total assets; RLOAN is the retail loans (loans given to customers) to total assets; RDEPOSIT is the retail deposit (short-term liabilities to clients) to total assets; EQUITY is the equity to total assets; CINEFF is the cost-inefficiency score; LASSET is the logarithm of assets; YRBUS is the logarithm of number of years in business; HOURS is the logarithm of number of hours bank service available; FSHARE is the percentage of asset owned by foreign banks; ACQDUM is the acquisition dummy variable. If the bank has acquired or merged with another bank during the post-1991 period then ACQDUM = 1 or ACQDUM = 0; $\sum$ FSHAREDUM is the four foreign share dummy variables under different categories of foreign bank involvement (0.01–25%, 25.01–50%, 50.01–75%, and 75.01–100%). For example, if the bank has 0.01–25% foreign involvement in bank's asset then FSHARE$_{0.01–25\%}$ = 1 otherwise FSHARE$_{0.01–25\%}$ = 0 and so on; $\sum$ YEARDUM is the year dummy variables for all sample years, for example, if year is 1993 then YEARDUM$_{1993}$ = 1 otherwise YEARDUM$_{1993}$ = 0; e_i is the error term.

All the independent variables are proxy for some sort of management practice, business experience, foreign involvement, and the current portfolio commitments of individual banks. We estimate three sets of OLS regressions: (a) a profit efficiency test that uses profit inefficiency as a dependent variable without cost inefficiency considered as an independent variable; (b) a profit efficiency test that uses profit inefficiency as a dependent variable with cost inefficiency included as one of the independent variable in the regression; and (c) a cost-efficiency test that employs cost inefficiency as the dependent variable.

Results are shown in Table 3. Estimates display the pooled estimates of the combined sample banks and incorporate bivariate year variables "YEARDUM" for all sample years except for the year 1993. In these estimates, the 1993 binary variable is reflected in the intercept. The first three regressions focus, among other issues, on the relationship between the level of foreign bank's ownership share and bank's inefficiency scores. The last three estimates replace the foreign bank ownership share variable with specific extents of foreign bank involvement incorporating sample bank groups with different levels of foreign ownership involvement. All six estimates provided relatively high model statistics. [20]

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[20] We did not report the yearly estimates because the overall magnitude and significance of the relationship between profit inefficiency and other variables were strikingly similar to the reported combined results. Also, we estimated a pooled sample, adding an economic environment variable for each year represented by the GDP growth taken from International Financial Statistics. The GDP growth variable did not show any significant correlation while other results portrayed a similar relationship. Moreover, we estimated additional regressions adding an asset growth variable as an independent variable. It lowered the sample size to 118. Although in each of the six combined regressions, the variable reported a positive relationship with inefficiency however the coefficients were not statistically significant in most estimates. All of these results are available upon request.

Table 3
Correlates of profit-inefficiency scores OLS estimates (*t*-statistics in parenthesis)

Independent variables	Profit-inefficiency regression		Cost-inefficiency regression	Profit-inefficiency regression		Cost-inefficiency regression
	1	2	3	1	2	3
Intercept	0.010	0.028	0.105	0.036	0.034	0.109
	(1.44)	(1.15)	(1.80)	(1.42)	(1.62)	(1.92)
Liquid asset ratio	0.024	0.045	−0.030	0.034	0.042	−0.045
	(2.72)[a]	(3.17)[b]	(2.60)[a]	(2.94)[b]	(3.41)[b]	(2.98)[b]
Short-term loan ratio	0.115	0.073	0.248	0.098	0.082	0.221
	(1.29)	(0.84)	(1.22)	(1.49)	(1.54)	(1.50)
Financial investment ratio	−0.049	−0.052	0.156	−0.044	−0.052	0.093
	(2.08)[a]	(1.86)	(1.99)[a]	(2.31)[a]	(2.07)[a]	(2.30)[a]
Retail loan ratio	−0.017	−0.008	−0.099	−0.018	−0.007	−0.081
	(1.66)	(1.32)	(1.51)	(1.80)	(1.73)	(1.34)
Retail deposit ratio	−0.021	−0.008	0.062	−0.024	−0.011	0.073
	(1.43)	(1.52)	(1.30)	(1.77)	(1.68)	(1.39)
Equity ratio	0.034	0.041	0.045	0.040	0.041	0.051
	(1.85)	(1.86)	(2.19)[a]	(2.05)[a]	(1.91)	(1.82)
Cost inefficiency	–	0.027	–	–	0.039	–
		(2.76)[a]			(2.81)[a]	
Log of assets	−0.001	−0.010	−0.010	−0.004	−0.009	−0.007
	(2.16)[a]	(1.88)	(1.85)	(2.18)[a]	(2.04)[a]	(1.96)[a]
Log of years in business	0.001	0.001	0.001	0.001	0.001	0.001
	(0.50)	(0.52)	(1.63)	(0.51)	(0.48)	(1.69)
Log of hours service available	−0.001	−0.001	−0.001	−0.002	−0.002	−0.002
	(1.84)	(1.73)	(1.70)	(1.97)[a]	(1.78)	(1.75)
Acquisition dummy	−0.030	−0.025	−0.024	−0.035	−0.028	−0.027
	(2.42)[a]	(2.05)[a]	(1.94)	(2.07)[a]	(2.11)[a]	(1.88)
Foreign ownership share (FS)	−0.034	−0.037	−0.031	–	–	–
	(2.02)[a]	(2.29)[a]	(2.25)[a]			
FS 0.1–25%	–	–	–	0.005	0.005	0.016
				(0.13)	(0.14)	(0.08)
FS 25.1–50%	–	–	–	−0.014	−0.015	−0.024
				(0.85)	(1.02)	(1.08)
FS 50.1–75%	–	–	–	−0.016	−0.014	−0.013
				(3.18)[b]	(3.06)[b]	(3.12)[b]
FS 75.1–100%	–	–	–	−0.018	−0.014	−0.017
				(2.98)[a]	(3.06)[b]	(3.11)[b]
Year 1994	−0.002	−0.002	−0.003	−0.002	−0.001	−0.001
	(1.04)	(1.05)	(1.60)	(1.29)	(1.25)	(1.26)
Year 1995	−0.025	−0.023	0.026	−0.023	−0.028	−0.018
	(2.31)[a]	(2.20)[a]	(2.52)[a]	(2.30)[a]	(2.46)[a]	(2.35)[a]
Year 1996	−0.001	−0.001	−0.002	−0.003	−0.002	−0.003
	(2.26)[a]	(1.77)	(2.30)[a]	(1.94)	(1.90)	(1.95)
Year 1997	−0.001	−0.001	−0.002	−0.002	−0.002	−0.001
	(1.43)	(1.40)	(1.47)	(1.59)	(1.38)	(1.49)
Year 1998	−0.001	−0.001	−0.001	−0.002	−0.002	−0.002
	(1.60)	(1.60)	(1.52)	(1.63)	(1.64)	(1.67)
Adjusted R^2	0.2501	0.2677	0.3032	0.3081	0.3179	0.3386

Table 3 (*continued*)

Independent variables	Profit-inefficiency regression		Cost-inefficiency regression	Profit-inefficiency regression		Cost-inefficiency regression
	1	2	3	1	2	3
F-statistics	3.47[b]	4.85[b]	5.81[b]	5.43[b]	6.02[b]	6.46[b]
No of observation				193		

Correlates of independent variables with profit and cost-inefficiency scores estimated assuming a common frontier from the pooled combined sample. Liquid assets include cash and treasury bills; short-term loans are usually loans with 1–5 years maturity; financial investments are asset concentration in financial assets of other businesses; retail loans are mostly consumer related noncommercial loans; retail deposits are walk-in customer deposits where as institutional deposits are from the other banking and corporate related institutions; equity is the bank capital; cost-inefficiency scores are systematic deviation of individual bank's cost from the efficient cost frontier, i.e. the cost experience of the most cost effective institution; logarithm of total assets reflects institutional size; Number of years in business is simply the difference between sample year and the year the bank was established, number of business hours the bank is open to customers in a given week, acquisition dummy variable in case the merged with another bank during the post-1991 period then the variable is considered 1, otherwise it is considered 0, foreign bank share is the average equity involvement of foreign institutions in the domestic banking institutions followed by foreign share dummy variables for each of the four quartiles taking a value of 1 if the bank's foreign share is in a particular category and otherwise is considered 0. Finally, year dummy variables represent sample years giving a value of 1 for the given sample year and assigning a value of zero for others. All ratios are in respect to total assets.

[a] 5% Significance level.
[b] 1% Significance level.

Concentration in liquid assets lowered profit inefficiency as portrayed by positive correlation between liquid assets parameters and profit-inefficiency variables. But in relation to cost inefficiency, liquid asset was found to be reducing inefficiency. On the contrary, asset concentration in financial investment activities was associated with increased cost inefficiency but influencing an inverse relationship with profit inefficiency. Retail lending to customers revealed an inverse association with profit-inefficiency scores however without any acceptable strong statistical significance. Overall, the results above suggest that Hungarian banks incurred higher cost in shifting into new nontraditional financial investment activities but maintaining a diverse asset portfolio consisting of retail lending and investment in financial instruments helped them to achieve more efficiency in the profit side. Equity ratio showed consistent positive correlation with inefficiency suggesting that risk-averse banks with relatively lower earning assets outstanding were less likely to be associated with increased efficiency.

Logarithm of asset variable, a proxy for firm size, showed inverse relationship with the dependent variable in all estimates. It reflects that bigger institutions were relatively more efficient. As discussed earlier, relaxation of asset restrictions in the banking system encouraged many specialized institutions to venture into different areas of the banking business and may have experienced some economies of scale and scope from growth and joint production resulting in lower inefficiency. DeYoung and Nolle (1998) explained that such relationship, in the US context, is due to the ability of large banks to attract and retain better managers.

The length of the banking experience, i.e., the number of years in business variable, did not yield any significant relationship. The variable representing the availability and access to bank services—number of hours a bank is open to public—was found to be inversely associated with inefficiency. The acquisition dummy variable—which reflects only those institutions that have acquired or merged with another banking institution—revealed a negative and significant association with inefficiency variable in most estimates. It suggests that banks involved in acquisition in the new banking environment benefited from such experience and are associated with lower inefficiency. Consistent with previous results, the extent of the foreign involvement variable was found to be significantly associated with lower inefficiency. We also found that banks performed relatively better during the 1995 and 1996 sample years and cost inefficiency significantly correlates with profit inefficiency.

The last three estimates—that incorporate the extent of foreign banks' involvement into four groups based on different levels of their foreign ownership in the local bank—reveal a slightly better model statistics compared to the first three estimates. The independent variables, common with the first three regressions, show the same magnitude and in a few cases, stronger statistical significance in their association with respective inefficiency dependent variables.

Among the disaggregated foreign share variables, the group with more than 75% ownership by foreign banks, revealed a strong and significant inverse association with the dependent variables. Given over 80% of the banks in this category were 100% foreign-owned, this simply confirms significant higher efficiency associated with foreign banking institutions in Hungary. Interestingly, the group that had an average foreign involvement between 50.1–75% provided a similar magnitude and in some cases marginally higher statistically significant impact on dependent variables in all three estimates. This strengthens previous findings that foreign banks taking a substantial ownership from local partners performed better or at least as well as the foreign banks without any local involvement or relatively less local involvement. The groups with minority foreign ownership (25.1–50% and 0.01–25%) however did not reveal any statistically significant correlation with improved efficiency. The lack of significant improvement in efficiency by these two groups especially the group with less than 25% foreign involvement may not be totally associated with their foreign ownership percentage. It simply could be the fact that institutions in these groups recently went through a significant reorganization, privatization, and joint partnership process and that the new management was yet to make adjustments to the new association and lacked immediately effective and efficient portfolio management. Such explanations seemed plausible as a comparison of mean statistics (not reported in the text) of this group with the group with the highest foreign involvement reveals that the banks in the former group were significantly smaller in asset size and held significantly lower financial investment. Incidentally, both size and financial investment variables were significantly and inversely associated with lower inefficiency in most of our regression estimates.

It can be summarized from evidence that foreign-owned banks in Hungary outperformed their domestic counterparts and their active involvement with local banks

in many cases improved the efficiency of those banks as well as the others institutions in the Hungarian banking sector. However one should be cautious to make such generalized statements, as some banks, despite their new partnership with foreign banks (low level of foreign involvement), are yet to achieve a total recovery from costly transition and reorganization.

7. Conclusions

The paper introduces the Hungarian banking sector and its experiences and developments during the transitional process from a centralized economy to a market-oriented system. The paper identifies that among other factors, early reorganization initiatives, flexible approaches to privatization, and liberal policies towards foreign banks' involvement with the domestic institutions paved the way for a stronger banking sector in a short period of time. [21] Using data following the initial changes subsequent to 1992, the paper captures the recent experiences and status of the banking sector finding steady improvement in both the cost and profit-inefficiency categories. Indeed, a liberal privatization policy and easy terms and conditions may have caused some immediate loss of maximum possible benefits; however, the competition and associations from more skilled and experienced foreign banking institutions have resulted in a positive influence on the banking sector. On average, banks today have extended hours of customer services and are involved in cutting costs and developing new lines of businesses. In recent years, the Hungarian banking sector has been one of the most popular and sought-after banking markets by foreign banking institutions in the region; this is well reflected by the involvement of foreign banks.

Banks with foreign involvement were found to be significantly less inefficient than their domestic counterparts. Among the foreign-involved institutions, a higher share of foreign ownership was associated with lower inefficiency. Also, institutions that took advantage of acquisition of local banks were associated with lower inefficiency. The experience of foreign banks in Hungary has been different from foreign banks studied in other countries where foreign banks usually experience excessive costs associated with transferring their own comparative advantages or due to the idiosyncratic features of local customers and service delivery systems. [22] In Hungary, on the contrary, the local market conditions presented opportunities for foreign banks to exploit their comparative advantages into lower costs, causing lower inefficiency. [23]

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[21] These results are consistent with Thorne (1993) initial perspectives in the Central and Eastern European region.

[22] These results are consistent with Bonin and Istvan (2000) who concluded that Hungary has managed to avoid ''being cut by either blade of the two-edged sword of foreign entry''.

[23] The comparative advantage of foreign banks however was also related to the fact that foreign banks started from a stronger position relative to the local banks with of inherited nonperforming loans.

Despite the rapid privatization and much improved banking sector, predominantly through foreign banks, the banking industry in Hungary, similar to that of other countries in the ECE region, remains under-developed in terms of the provision of credit to enterprises (EBRD, 1999). Ultimately, the merits of the evolving Hungarian banking sector will become more evident over time as the rate of financial sector deepening become manifest and comparable to alternative models of banking sector restructuring.

Acknowledgements

References

Abarbanell, J., Bonin, J., 1997. Bank privatization in Poland: The case of Bank Slaski. Journal of Comparative Economics 25 (1), 34–51.

Abarbanell, J., Meyendorff, A., Bonin, J., 1997. Bank privatization in post-communist Russia. Journal of Comparative Economics 25 (1), 52–68.

Abel, I., Bonin, J., 1994. Financial sector reform in the economies of transition: On the way to privatizing commercial banks. In: Bonin, J.P., Szekely, I. (Eds.), The Development and Reform of Financial Systems in Central and Eastern Europe. Edward Elgar, Cheltenham.

Aigner, D.J., Lovell, C.A., Schmidt, P., 1977. Formulation and estimation of stochastic frontier production function models. Journal of Econometrics 6, 21–37.

Altunbas, Y., Ming-Hua, L., Molyneux, P., Seth, R., 2000. Efficiency and risk in Japanese banking. Journal of Banking and Finance 24, 1605–1628.

Barlett, D., 1996. Commercial banks and corporate governance in the Czech Republic and Hungary. Post Soviet Geography and Economics 37 (8), 503–510.

Bauer, P.W., 1990. Recent developments in the econometric estimation of frontiers. Journal of Econometrics 46, 39–56.

Berger, A.N., 1993. Distribution-free estimates of efficiency in the US banking industry and tests of the standard distributional assumptions. Journal of Productivity Analysis 4, 261–292.

Berger, A., DeYoung, R., 1997. Problem loans and cost efficiency in commercial banks. Journal of Banking and Finance 21, 919–944.

Berger, A.N., Humphrey, D.B., 1997. Efficiency of financial institutions: International survey and directions of future research. European Journal of Operational Research 98, 175–212.

Berger, A.N., Hancock, D., Humphrey, D.B., 1993a. Bank efficiency derived from the profit function. Journal of Banking and Finance 17 (2–3), 317–345.

Berger, A.N., Hunter, W.C., Timme, S.G., 1993b. The efficiency of financial institutions: A review and preview of research past, present, and future. Journal of Banking Finance 17 (2–3), 221–250.

Berger, A.N., Kashyip, A., Scalise, J., 1995. The transformation of US banking industry: What a long strange trip it's been. Brookings Papers on Economic Activity (2), 55–201.

Berger, A.N., Humphrey, D.B., Pulley, L.B., 1996. Do consumers pay for one-stop banking? Evidence from an alternative revenue function. Journal of Banking and Finance 20, 1601–1625.

Berger, A.N., Cummins, D.J., Weiss, M.A., 1997a. The coexistence of multiple distribution systems for financial services: The case of property–liability insurance. Journal of Business 70, 515–546.

Berger, A.N., Mester, L.J., 1997. Inside the black box: What explains differences in the efficiencies of financial institutions? Journal of Banking and Finance 21, 895–947.

Bonin, J.P., Istvan, A., 2000. Retail banking in Hungary: A foreign affair? Working Paper, Budapest University and Wesleyan University.

Bonin, J., Leven, B., 1996. Polish bank consolidation and foreign competition: Creating a market-oriented banking system. Journal of Comparative Economics 23 (1), 52–72.

Catte, P., Mastropasqua, C., 1993. Financial structure and reform in Central and Eastern Europe in the 1980s. Journal of Banking and Finance 17, 785–817.

Cebenoyan, A.S., Cooperman, E.S., Register, C.A., Hudgins, S.C., 1993. The relative efficiency of stock versus mutual S&Ls: A stochastic cost frontier approach. Journal of Financial Services and Research 7, 151–170.

Claessens, S., Demirguc-Kunt, A., Huizinga, H., 2001. How does foreign entry affect domestic banking markets? Journal of Banking and Finance 25, 891–911.

Csaki, A., 1993. The Hungarian financial sector. World Economics Institute, Budapest, Mimeo. (in Hungarian).

Demirguc-Kunt, A., Detragiache, E., 1998. Financial liberalization and financial fragility. In: Stiglitz, J., Pleskovic, B. (Eds.), Annual World Bank Conference on Development Economics, Washington, DC, April 20–21, pp. 1–48.

DeYoung, R., Hasan, I., 1998. The performance of Denovo commercial banks: A profit efficiency approach. Journal of Banking and Finance 22, 565–587.

DeYoung, R., Nolle, D.E., 1998. Foreign-owned banks in the US: Earning market share or buying it? Journal of Money, Credit, and Banking 28, 622–636.

Dijkstra, A.G., 1996. Financial reform and the efficiency of intermediation: Banking performance in Hungary. Working Papers, Institute of Social Studies, The Hague, The Netherlands.

Dornbusch, R., Reynoso, A., 1989. Financial factors in economic development. American Economic Review 79, 204–209.

EBRD—European Bank for Reconstruction and Development, Transition Report, London, various issues.

Gorton, G., Winton, A., 1998. Banking in transition economies: Does efficiency require instability? Journal of Money, Credit, and Banking 30, 621–650.

Gray, P., Gray, J., 1981. The multinational bank: A financial MNC? Journal of Banking and Finance 5 (1), 33–63.

Gros, Steinherr, A., 1997. Winds of Change. Economic Transition in Central and Eastern Europe. Longman, London.

Grosse, R., Goldberg, L., 1991. Foreign bank activity in the United States: An analysis by country of origin. Journal of Banking and Finance 15 (6), 1093–1120.

Hasan, I., Hunter, W.C., 1996. Efficiency of Japanese multinational banks in the United States. Research in Finance 14, 157–173.

Haslem, J.A., Scheraga, C.A., Bedingfield, J.A., 1992. An analysis of the foreign and domestic balance sheet strategies US of banks and their association to profitability performance. Management International Review 32, 55–75.

Helmenstein, C., 1999. Capital Markets in Central and Eastern Europe, Cheltenham UK and Northampton. Edward Elgar Publishing Ltd., MA, USA.

Hermes, N., Lensink, R., 2000. Financial system development in transition economies. Journal of Banking and Finance 24 (4), 507–524.

Hetzel, R.L., 1990. Free enterprise and central banking in formerly communist countries. Economic Review, Federal Reserve Bank of Richmond 76 (May–June), 1–19.

Humphrey, D., 1994. Delivering deposit services: ATMs versus branches. Federal Reserve Bank of Richmond Economic Quarterly (January/February), 50–81.

Humphrey, D., Pulley, L., 1997. Bank's responses to deregulation: Profits, technology, and efficiency. Journal of Money, Credit, and Banking 29, 73–93.

Hungarian Financial and Stock Exchange Almanac, various years.

Hunter, W.C., 1993. Banking reform and the transition to a market economy in Bulgaria: Problems and prospects. Economic Review, Federal Reserve Bank of Atlanta 78, 15–22.

Jelic, R., Mallin, C., 1997. Banking in transition—The case of Poland, Hungary, and the Czech Republic. Working Paper, University of Hull, UK.

Jondrow, J., Lovell, C.A., Materov, I.S., Schmidt, P., 1982. On the estimation of technical inefficiency in the stochastic frontier production function model. Journal of Econometrics 19 (2–3), 233–238.

Kalirajan, K.P., Shand, R.T., 1999. Frontier production functions and technical efficiency measures. Journal of Economic Surveys 13, 149–172.

Kraft, E., Tirtiroglu, D., 1998. Bank efficiency in Croatia: A stochastic-frontier analysis. Journal of Comparative Economics 26, 282–300.

Kumbhakar, S., Lovell, C.A.K., 2000. Stochastic Frontier Analysis. Cambridge University Press, Cambridge.

Kumbhakar, S., Lozano-Vivas, Lovell, C.A.K., Hasan, I., 2001. Deregulation and productivity of savings banks. Journal of Money Credit and Banking 33 (February), 101–121.

Litwack, D., 1995. Corporate governance, banks, and fiscal reform in Russia. In: Ito, T., Krueger, A. (Eds.), Financial Deregulation and Integration in East Asia. University of Chicago Press, Chicago and London, pp. 266–301.

McAllister, P.H., McManus, D., 1993. Resolving the scale efficiency puzzle in banking. Journal of Banking and Finance 17, 389–405.

McKinnon, R.I., 1991. Financial control in the transition from classical socialism to a market economy. Journal of Economic Perspective 5, 107–122.

McNulty, J.E., 1999. Financial intermediation in the transitional economies of Central and Eastern Europe. Working Paper, Florida Atlantic University.

Mester, L.J., 1996. A study of bank efficiency taking into account risk-preferences. Journal of Banking and Finance 20, 1025–1045.

Meyendorff, A., Snyder, E., 1997. Transactional structure of bank privatizations in Central Europe and Russia. Journal of Comparative Economics 25, 5–30.

Mitchell, K., Onruval, N.M., 1996. Economies of scale and scope at large commercial banks: Evidence from the Fourier flexible functional form. Journal of Money, Credit, and Banking 28, 178–199.

Molyneux, P., Thornton, J., 1992. Determinants of European bank profitability. Journal of Banking and Finance 16, 1173–1178.

Mountain, D.C., Thomas, H., 1999. Factor price misspecification in bank cost function estimation. Journal of International Financial Markets, Institutions and Money 9, 163–182.

National Bank of Hungary, Annual Report, Budapest, various issues.

Perotti, E., 1993. Bank lending in transition economies. Journal of Banking and Finance 17, 1021–1032.

Popov, V., 1999. The financial system in Russia compared to other transition economies: The Anglo–American versus the German–Japanese model. Comparative Economic Studies XXXXI (Spring), 1–42.

Pulley, B.L., Humphrey, D.B., 1993. The role of fixed costs and cost complementarities in determining scope economies and the cost of narrow banking proposals. Journal of Business 66, 437–461.

Sabi, M., 1996. Comparative analysis of foreign and domestic bank operations in Hungary. Journal of Comparative Economics 22, 179–188.

Sachs, J., 1997. An overview of stabilization issues facing economies in transition. In: Woo, W., Parker, S., Sachs, S.D. (Eds.), Economies in Transition: Comparing Asia and Eastern Europe. The MIT Press, Cambridge, MA.

Saunders, A., Sommariva, A., 1993. Banking sector and restructuring in Eastern Europe. Journal of Banking and Finance 17, 931–957.

Schnatterly, R., Kormendi, E., 1998. Bank privatization in transitional economies: A general framework with application to Hungary's Magyar Kulkereskedelmi bank transaction. Financier (Summer), 1–28.

Scholtens, B., 2000. Financial regulations and financial system architecture in Central Europe. Journal of Banking and Finance 24 (4), 525–553.

Stevenson, R.E., 1980. Likelihood functions for generalized stochastic frontier estimation. Journal of Econometrics 13, 58–66.

Stiroh, K.J., 2000. How did bank holding companies prosper in the 1990s? Journal of Banking and Finance 24, 1703–1745.

Sundarajan, V., 1992. Central banking reforms in formerly planned economies. Finance and Development 29 (3), 21–38.

Szego, G.P., 1993. Introduction on banks and capital markets in former planned countries: Their role in establishing a market economy. Journal of Banking and Finance 17, 773–783.

Thorne, A., 1993. Eastern Europes's experience with banking reform: Is there a role for banks in the transition. Journal of Banking and Finance 17, 959–1000.

World Bank, 1996. From Plan to the Market, Washington, DC.