BOFIT Discussion Papers
5 • 2018

Veronika Belousova, Alexander Karminsky and Ilya Kozyr

# Bank ownership and profit efficiency of Russian banks


BOFIT
THE BANK OF FINLAND
INSTITUTE FOR ECONOMIES
IN TRANSITION

BOFIT Discussion Papers
Editor-in-Chief Zuzana Fungáčová

BOFIT Discussion Papers 5/2018
21.2.2018

Veronika Belousova, Alexander Karminsky and Ilya Kozyr: Bank ownership and profit efficiency of Russian banks

ISBN 978-952-323-215-0, online
ISSN 1456-5889, online



Suomen Pankki
Helsinki 2018

# Contents

Veronika Belousova, Alexander Karminsky and Ilya Kozyr

# Bank ownership and profit efficiency of Russian banks

## Abstract

The paper examines how the type of ownership affects the profit efficiency of Russian banks. Using bank-quarter data for selected banks in the period 2004–2015, we combine stochastic frontier analysis (SFA) methodology with an intermediary approach to assess profit efficiency. Our key findings show that foreign-owned banks are the most efficient, followed by state-owned banks and private domestic banks. We also find that the profit efficiency of foreign-owned banks was higher than that of other banks during the economically stable periods of 2004Q1 to 2008Q2 and 2014Q1 to 2015Q3, and that state-owned banks were more efficient than others in the period of financial turmoil from 2008Q3 to 2013Q4 due to state support. These results are robust when we consider these banks in terms of branch network diversity, risk preferences, and specialization.

Keywords: profit efficiency; SFA; state ownership; foreign ownership; Russia
JEL codes: G21, P34; P5

**Veronika Belousova**, orcid.org/0000-0002-1436-3190. Corresponding author. Institute for Statistical Studies and Economics of Knowledge, National Research University Higher School of Economics (NRU HSE), 20 Myasnitskaya Str., Moscow, 101000, Russia. Email: vbelousova@hse.ru

**Alexander Karminsky**, orcid.org/0000-0001-8943-4611. School of Finance, Faculty of Economic Sciences, NRU HSE. Email: akarminsky@hse.ru

**Ilya Kozyr**, orcid.org/0000-0001-6750-0331. Analyst of financial investigation group, Central Federal District Department, Federal Financial Monitoring Service, Moscow, Russia. Email: ilya-2@mail.ru

**Acknowledgements**
The paper was prepared within the framework of the Basic Research Program at the National Research University Higher School of Economics and supported within the framework of a subsidy by the Russian Academic Excellence Project "5-100." Veronika Belousova is also grateful to Bank of Finland (BOFIT) for financial support which allows her to participate in BOFIT seminar and conduct research within BOFIT Visiting Researchers Programme.

The authors would like to thank Zuzana Fungáčová (Bank of Finland Institute for Economies in Transition (BOFIT)) and Laurent Weill (Institut d'Etudes Politiques, Université de Strasbourg) for their valuable comments and suggestions.

# 1 Introduction

For countries with bank-based financial systems, the efficiency of the banking sector plays a key role in promoting economic growth (Hasan et al., 2009; Koetter & Wedow, 2010). Koivu (2002), for example, demonstrates that efficient banking sectors have been particularly important in fostering economic growth in transition countries. Taking a finer-grained view, however, we find mixed conclusions on whether the type of bank ownership drives efficiency. Levine (2001) concludes that national economic growth is accelerated by international financial liberalization (i.e. when foreign banks gain access to the domestic market), and La Porta et al. (2002) show that the state ownership of banks is associated with subsequent slow financial development. Andrianova et al. (2012), in contrast, suggest that government ownership of banks boosts long-run economic growth higher.

Assessing efficiency of banking sector and specific banks gained popularity in the early 1990s. Allen Berger, David Humphrey, and Loretta Mester are perhaps the best known for their empirical studies during this period (Berger & Humphrey, 1991; Berger & Humphrey, 1997; Berger & Mester, 1997). As internal factors, scholars often used a CAMELS risk profile description, i.e. a scoring system based on capital adequacy, asset quality, management, earnings, and liquidity. As this work progressed, Berger et al. (2000) noted that the efficiency scores of banks varied significantly depending on the type of owner.

Indeed, ownership type seems to be a crucial determinant of banking efficiency in emerging economies. State-owned banks have dominated as the main players in the banking sector in most CIS countries, while foreign-owned banks have taken the lead in CEE countries (Raiffeisenbank, 2016). Banks in emerging economies operate in different environments than found in advanced economies. State- and foreign-owned banks enjoy serious competitive advantages such as implicit guaranties and access to cheaper funding. The extant studies demonstrate a divergence in the efficiency scores of these banks with the different types of ownership. Most empirical papers conclude that foreign-owned banks have been the most efficient in the banking sectors of emerging economies (e.g. Weill, 2003; Hasan & Marton, 2003; Bonin, 2005a). In addition, cross-country studies suggest that state-owned banks have usually been less efficient than privately-owned banks in Eastern Europe (e.g. Jemric & Vujcic, 2002; Bonin et al., 2005a; Bonin et al., 2005b; Fries & Taci, 2005; Grigorian & Manole, 2006).

While cross-country studies on transition economies (including Russia) often demonstrate that state-owned banks have been the least efficient (Fries & Taci, 2005; Fries et al., 2006; Grigorian & Manole, 2006), Karas et al. (2010) and Mamonov & Vernikov (2017) dispute this finding. They

note that Russian state-owned banks were on par in terms of efficiency – or even more efficient – than privately-owned banks. As a caveat, these empirical studies of Russian banks focus solely on cost efficiency, a measure of how well banks cut costs by offering a range of products and services. Thus, the efficiency scores of banks depend on whether cost or profit efficiency is assessed.

Yildirim & Philippatos (2007) and Mamatzakis et al. (2008) argue that profit efficiency is what matters, because it adds value on the revenue side. Profit efficiency scores also vary. Scoring may be based, for example, on the appropriateness of the output mix for output prices or pricing policy.

The majority of efficiency studies on Russian banks omit the revenue side altogether, even if a broader view of bank efficiency would likely help policymakers in strategic decisions. We believe this gap in research justifies the examination of how the type of ownership might influence the profit efficiency of Russian banks. To do this, we measure profit efficiency as the difference between actual profits of a given bank and its ideal (maximum) value. Using this measure, we evaluate 240 of Russia's largest banks in their roles as financial intermediaries relative to best practices, employing a stochastic frontier approach (SFA) to construct a profit efficient frontier from 2004 Q1 to 2015 Q3.

Russia is ideal for this study. It has the largest market among CIS countries with bank-based economies. Our time horizon also extends over a decade, from 2004 Q1 to 2015 Q3. This is longer than in earlier studies, and covers a period characterized by institutional changes. The share of state-owned banks in total assets of the banking sector increases rapidly from 40% in 2004 to 52% in 2008 and 61.5% in 2015 (Karas & Vernikov, 2016). In contrast, the share of foreign-owned banks, measured by total assets of the banking sector, fluctuates. It starts out at 7.3% in 2004 (CBR, 2005), climbs to 18.7% in 2008 (CBR, 2009), and decreases to 13% in 2015 (CBR, 2016). The share of privately-owned banks also falls significantly. Standing above 50% in 2004, the share of privately-owned banks in the Russian banking sector fall below 30% by 2015 (Karas & Vernikov, 2016).

The paper is structured as follows. Section 2 presents the literature review on banking efficiency. Data are described in section 3. Empirical model is developed in section 4. Section 5 discusses the results. Section 6 concludes.

# 2 Literature review

Berger et al. (2000) shows that the type of ownership is reflected in differences in efficiency scores of banks after assessing cost and profit efficiencies. They formulate two hypotheses to explain these differences.

The *global advantage hypothesis* assumes the higher efficiency of foreign banks due to superior managerial skills, corporate policies and procedures, as well as better investment and risk-management skills. These factors reduce costs, increase profitability, and diversify the risks of foreign banks.

The *home-field advantage hypothesis* predicts higher efficiency of domestic banks, as they avoid certain implicit barriers, management and monitoring challenges, cultural clashes and language differences, as well as troubles in negotiating market, regulatory and supervisory features.

Fries & Taci (2005) and Grigorian & Manole (2006)[1] provide support for the global advantage hypothesis by concentrating on the cost efficiency of banks in transition economies. Styrin (2005) finds that foreign-owned banks in Russia are more cost-efficient than domestic banks.[2]

Karas et al. (2010) conclude that the higher cost efficiency of foreign-owned banks in Russia was driven by advanced banking technology and superior risk-management. They compare these efficiency scores before and after the introduction of the deposit insurance scheme, determining that foreign-owned banks were the most efficient in both cases. However, the efficiency gap between these banks widens after the deposit insurance scheme is introduced.

The cost-efficiency study of Golovan et al. (2008) supports the home-field advantage hypothesis for Russian banks. Their interpretation is that foreign-owned banks often had to create infrastructure and branch networks, recruit staff, attract clients, and build long-term relations. These objectives were expensive and time-consuming, thereby reducing bank efficiency scores.

The cross-country study of Yildirim & Philippatos (2007) demonstrates that foreign-owned banks operated with the highest levels of cost efficiency, but were still much less profit-efficient than domestic banks in the twelve European countries surveyed.

State-owned banks also seem to have played a crucial role in economic development. Two descriptions for the role of state ownership in banks and economic development in transition economies are worth noting. Under the *development* argument, state-owned banks play a prominent role

[1] These authors include revenue as an output of banks in constructing their efficiency indicator for profit generation.
[2] For details, see Belousova (2009) for a literature review of efficiency studies for Russian banks performed before 2009. It includes references published in conference proceedings.

in financial and economic growth (Gerschenkron, 1962). The *political* argument claims that politicians pursue political, not social, goals (Shleifer & Vishny, 1994).

La Porta et al. (2002) show that the state ownership of banks in 92 countries was associated with lower subsequent financial development, lower per capita income, and lower productivity – findings that supports the political argument. Körner & Schnabel (2011) drill down a bit, making the distinction that political argument applies to countries with undeveloped financial institutions, while the development argument holds for rich countries with developed financial institutions. Andrianova et al. (2012) find a positive link between state ownership and economic development for 123 countries.

Several empirical papers that analyze cost-to-income ratios and profitability ratios also compare the cost efficiency scores of state-owned and privately-owned banks. Fries & Taci (2005), for example, show that state-owned banks are more efficient than privately-owned banks. They argue that state-owned banks have trouble creating demand for their services, so they set significantly lower net interest margins compared to other banks.

In contrast, the analysis of the Russian banking sector by Karas et al. (2010) finds a shift in efficiency. State-owned banks are not as cost efficient as private domestic banks before the introduction of Russia's deposit insurance scheme. With the arrival of generalized deposit insurance protections, state-owned banks became more efficient than private domestic banks. Notably, when a set of control variables is included in their efficient frontier and directly in the inefficiency term, the overall results improve for state-owned banks, which are shown to be more efficient than private banks for all specifications both before and after the deposit insurance scheme is introduced.

Government support and implicit guaranties from the state may explain these findings about the efficiency of state-owned banks.

First, state-owned banks succeeded in attracting household deposits (especially those in excess of the insured sum) due to lower costs. Vernikov (2013) points out that the Russian state created three "national champion" banks (Sberbank, VTB, Rosselkhozbank). These three banks received significant government support and enjoyed soft budget constraints. Mamonov (2013) further shows that, while state-owned banks operated at a level of cost efficiency on par with private banks in the period before the 2008 financial crisis, they were *more efficient* during the crisis. Mamonov & Vernikov (2017) conclude that the "national champions" in the pre-crisis period were less efficient than other state-owned banks and private banks, but during the crisis became the most efficient due to government support.

Second, during and after Russia's 2004 banking crisis, customers moved their business to state-owned banks. Moreover, private banks significantly increased their risk-acceptance after they had become participants of the deposit insurance system (Karas et al., 2013). As soon as they were accepted into the deposit insurance scheme, these banks reduced their capital adequacy to levels close to the minimum required and significantly increased their loan portfolios.

The existing empirical studies give a contradictory picture of the cost efficiency for state-, foreign-, and privately-owned banks in Russia. Styrin (2005) and Karas et al. (2010) supported the global advantage hypothesis for Russian banks. Mamonov and Vernikov (2017) give credence to the home-field advantage hypothesis. Moreover, while the inefficiency of state-owned banks relative to privately-owned banks is a theme of numerous cross-country studies, single-country analysis shows that state-owned banks in Russia in our period of interest were at least as cost efficient as private banks (Karas et al., 2010; Mamonov & Vernikov, 2017).

Although a large portion of empirical studies suggest a linkage between the type of ownership and cost efficiency for Russia banks, there is little hard evidence concerning profit efficiency. Thus, we attempt in the following analysis to fill the existing gap in this field of research by examining the profit efficiency of Russian banks to shed light on the revenue side.

# 3 Data

We use banking data taken from the Mobile Information Agency (Banking and Finance database) and the Central Bank of the Russian Federation (CBR). Our data set comprises 240 of Russia's largest banks, which in aggregate represent 91% of total banking sector assets and 89% of total equity. Thus, the sample is representative.

We take data on the types of ownership from Karas & Vernikov (2016). State-owned banks are banks that are majority-owned by the federal or regional government, central bank, state-controlled companies, or municipalities. Foreign-owned banks are defined as banks that are majority-owned by foreign investors. We use the websites of Russian banks and the CBR site to gather information about the location of each bank's headquarters and branch networks.

Our final sample is an unbalanced panel with 8,985 bank-quarter observations extending from the beginning of 2004 to the third quarter of 2015.[3] The sample period includes stable periods and three crisis events (liquidity crisis of 2004, financial crisis of 2008-2010, and the geopolitical

[3] In cleaning the data, we exclude those observations that either have a ratio of equity to assets above 100% or below 2%, or a ratio of loans to assets below 5%.

crisis that began after spring 2014). We collect quarterly data (47 observations) on the official exchange rate from the CBR site. Table 1 provides the descriptive statistics of the variables that we focus on.

Table 1 Descriptive statistics

| Variable | Definition | Unit | Mean | *Standard deviation* |
|---|---|---|---|---|
| Profit | Return on assets | RUB thousand | $5.4*10^5$ | $5.4*10^6$ |
| Loans | Loan portfolio including household and corporate loans, interbank loans | RUB thousand | $9.5*10^7$ | $6.26*10^8$ |
| Securities | Investment in government, non-government and foreign securities | RUB thousand | $1.72*10^7$ | $9.57*10^7$ |
| Price of labor | Personnel expenses to bank assets ratio | | 0.053 | 0.382 |
| Price of deposits | Interest expenses (*paid* out to *depositors*) to deposits ratio | | 0.399 | 8.33 |
| Price of fixed assets | Operating expenses to fixed assets ratio | | 3269.55 | 105239.1 |
| Equity | N*atural logarithm* of equity | RUB thousand | $1.75*10^7$ | $1.07*10^8$ |
| Quality of loan portfolio | Loan loss provision to total loans | | 0.09 | 0.325 |
| State-owned banks | Dummy for state-owned banks | | 0.087 | 0.282 |
| Foreign-owned banks | Dummy for foreign-owned banks | | 0.1 | 0.3 |
| Specialization | | | | |
| Share of corporate loans | Corporate loans to total loans ratio | | 0.633 | 0.256 |
| Share of household loans | Household loans to total loans ratio | | 0.237 | 0.233 |
| Share of corporate deposits | Corporate deposits to total deposits ratio | | 0.366 | 0.287 |
| Share of household deposits | Household deposits to total deposits ratio | | 0.568 | 0.296 |
| Location and branch network | | | | |
| Moscow and St. Petersburg areas | Banks from Moscow or St. Petersburg | | 0.682 | 0.466 |
| Multiregional banks | Banks from Moscow or St. Petersburg with 10 or more branches | | 0.138 | 0.345 |
| Other center located banks | Banks from Moscow or St. Petersburg with fewer than 10 branches | | 0.544 | 0.498 |
| Exchange rate | Official exchange rate average (RUB to USD) | RUB | 31.9 | 8.93 |

# 4 Methodology

Two main methods have been used to assess the efficiency of banks. The first is a set of *non-parametric approaches* that analyze efficiency scores with linear programming techniques. Among these non-parametric methods, data envelopment analysis (DEA) is probably the most popular. The second group consists of *parametric approaches* that estimate the efficient frontier and determine factors influencing the inefficiency term. In this group, stochastic frontier analysis (SFA) is by far the most widely used method.

SFA, originally developed by Aigner et al. (1977) and Meeusen & van de Broeck (1977), has since undergone many modifications. Here, we apply the model proposed by Battese and Coelli (1995), i.e. the "one-stage" procedure that simultaneously estimates the efficiency frontier and the inefficiency term using the maximum likelihood procedure. There is also a "two-stage" procedure in which the efficiency frontier and the inefficiency term are analyzed separately, but it raises a challenge with efficiency distribution. Specifically, the inefficiency term could be identically distributed in the first stage estimation of the efficiency frontier, but the term might not be the same for the second stage when factors influencing the inefficiency term are specified. Moreover, the two-stage procedure can lead to biased estimates due to the omitted variables. Kumbhakar and Lovell (2000) show that the one-stage procedure overcomes this challenge.

Having chosen the one-stage approach, the profit frontier based on panel data is introduced as follows:

$$\Pi_{it} = f(Y_{it}, W_{it}) + U_{i,t} + V_{it}\,, \tag{1}$$

where *i* is a bank number, *t* is a period number. For the variables, *ΠΠ* is profit, *Y* is the bank output, and *W* is the bank input. $V_{it}$ is the error term and $U_{it}$ is the inefficiency term as given in equations (2) and (3).

$$V_{it} \sim iid\ N(0, \sigma v^2), \tag{2}$$

$$U_{it} \sim iid\ N(\mu_{it}, \sigma u^2). \tag{3}$$

The inefficiency term is specified as $\mu_{it} = Z_{it}\delta + \varepsilon_{it}$, where $Z_{it}$ is a set of explanatory variables affecting these inefficiency scores.

To identify banking inputs and outputs, we apply the intermediation approach, which considers all banks as financial intermediaries (Sealey & Lindley, 1977). This approach tends to be appropriate for the banks as a separate financial institution and it takes interest expenses into account (Berger & Humphrey, 1997) We specify three prices for inputs: the price of deposits (interest paid on deposits to total deposits), the price of fixed assets (operating expenses to fixed assets), and the price of labor (personnel expenses to total assets). We also specify two outputs: loans (loans to the economy and interbank loans) and securities (government, corporate and foreign securities). We use the translog profit function, which is widely applied to banks and other financial institutions in developed countries (Berger & Humphrey, 1997; Berger & Mester, 1997) and in Russia in particular (Karas et al., 2010; Mamonov & Vernikov, 2017).

The baseline specification of our function is presented below:

$$\ln\left(\frac{\Pi_{nit}}{w_{3it}} + \theta\right) = \alpha_0 + \alpha_1 \ln\left(\frac{y_{1it}}{w_{3it}}\right) + \alpha_2 \ln\left(\frac{y_{2it}}{w_{3it}}\right) + \alpha_3 \ln\left(\frac{w_{1it}}{w_{3it}}\right) + \alpha_4 \ln\left(\frac{w_{2it}}{w_{3it}}\right) + \frac{1}{2}\sum_{n=1}^{2}\sum_{m=1}^{2}\alpha_5 \ln\left(\frac{y_{nit}}{w_{3it}}\right)\ln\left(\frac{y_{mit}}{w_{3it}}\right)\frac{1}{2}\sum_{n=1}^{2}\sum_{m=1}^{2}\alpha_6 \ln\left(\frac{w_{nit}}{w_{3it}}\right)\ln\left(\frac{w_{mit}}{w_{3it}}\right) + \frac{1}{2}\sum_{n=1}^{2}\sum_{m=1}^{2}\alpha_7 \ln\left(\frac{y_{nit}}{w_{3it}}\right)\ln\left(\frac{w_{mit}}{w_{3it}}\right) + \alpha_8 EQ_{it} + IF_{it} + ER_t + v_{it} - su_{it}\,, \quad (4)$$

where $\Pi_n$ = profitability indicators; $\theta = \left|\frac{\Pi_{nit}}{w_{3it}}\right|^{min} + 1$ is a constant added to each bank's profit in each time period, so the natural log becomes positive according to Berger and Mester (1997); $y_1$ = loans normalized by equity; $y_2$ = securities normalized by equity; $w_1$ = the price of deposits; $w_2$ = the price of fixed assets; $w_3$ = the price of labor; EQ = the *natural logarithm* of equity; ER = the official exchange rate; *IF* = the vector of institutional factors (location or branch network diversity, specialization); $i$ = bank number; $t$ = period number, $v_i$ = error term; and $u_i$ = inefficiency term, which is distributed as:

$$U_{it} \sim iid\ N(\mu_{it}, \sigma u^2), \quad (5)$$

and which is equal to

$$U_{it} = Z_{it}\delta + \varepsilon_{it}, \quad (6)$$

where $Z_{it}$ is a set of explanatory variables affecting the inefficiency term, δ is a *1*p* the vector of parameters to be estimated, $\varepsilon_{it}$ is an error term normally distributed with mean zero, and $\sigma^2 = \sigma u^2 + \sigma v^2$ is the variance.

We normalize profitability, inputs, and outputs by the price of labor. This allows us to achieve linear homogeneity of the model. We proceed with the data in this manner suggested by Berger and Mester (1997).

# 5 Empirical results

Empirical results are divided into three subsections. The first subsection introduces the baseline model by incorporating the input and output mix in the efficiency frontier as in e.g. Karas et al. (2010). The second subsection investigates the determinants of profit inefficiency for Russian banks from 2004 Q1 to 2015 Q3. The final subsection provides results from the first subsection broken down into three time periods.

## 5.1 Determinants of profit inefficiency with control factors in the efficiency frontier

To define factors influencing the inefficiency term for Russian banks, we focus on the type of bank owner. We use dummies for state-owned and foreign-owned banks to explain profit inefficiency.[4] Our baseline model *(a)*, which only incorporates inputs and outputs in the efficiency frontier, is presented in Table 1. The second specification *(b)* includes bank locations (dummy for Moscow and St. Petersburg banks) in the efficiency frontier. Moscow and St. Petersburg are Russia's main financial centers, and there is extensive competition among banks. While Fungáčová and Solanko (2009) find that banks located in Moscow are more stable, Styrin (2005) suggests these banks are also less efficient than "regional" banks. These banks face higher competition and thus have to spend more money on advertisement, development, and customer acquisition than their regional counterparts.

The third specification *(c)* includes both location and equity. We use the log of equity as a proxy for the risk preferences of banks. Equity allows banks to absorb losses, so this indirectly illustrates the insolvency risk (Berger & Mester, 1997; Weill, 2003; Karas, 2010).

[4] A minus sign means that this indicator negatively affects profit *inefficiency*, implying higher bank efficiency.

In addition, we employ models (*d* and *e*) to check whether our baseline results remain the same if the exchange rate is included and bank location is replaced by the indicator for branch network diversity measured by dummies for multiregional and other center-located banks. The indicator for exchange rate describes the volatility of Russian ruble. Caner & Kontorovich (2004) find that the depreciation of the national currency increases foreign investment, the amount of loans denominated in foreign currency, and banking activity on foreign markets. Belousova & Kozyr (2016) show that the exchange rate positively influenced the profitability of Russian banks from 2008 to 2014. Mamonov & Vernikov (2017) conclude that currency revaluation significantly affects banking profitability, so the depreciation of the national currency enhances bank profits.

In constructing another proxy for location, we define multiregional banks as banks located in either Moscow or St. Petersburg with more than 10 branches in other cities. Other center-located banks are identified as banks located in Moscow or St. Petersburg which had fewer than 10 branches. While having more branches may increase the number of potential customers, a large network of branches is expensive and reduces the profit efficiency of banks.

Finally, models (*f* and *g*) account for the specialization of banks in the efficiency frontier. State-owned or foreign-owned banks may have alternative sources of funding or lending strategies that could significantly affect their efficiency, so we seek to identify if the bank's focus is on serving the business community or households.[5] This is motivated by the existing correlation between indicators.[6]

[5] The share of household deposits in total deposits and the share of household loans in a bank's loan portfolio are used in determining the bank as a household focused. The share of corporate deposits in total deposits and the share of corporate loans in loan portfolio indicate whether the bank focused on serving businesses.

[6] The correlation between household loans and corporate loans equals – 0.70 and the correlation between household deposits and corporate deposits is – 0.88. Both results are significant at the 1% level.

Table 2 Baseline model and control variables in the efficiency frontier

| | State-owned banks | Foreign-owned banks | Log likelihood |
|---|---|---|---|
| Baseline *(a)* | -0.461** | -0.696*** | -17794 |
| Location *(b)* | -0.456** | -0.667*** | -17499 |
| Location and equity *(c)* | -0.438** | -0.660*** | -17529 |
| Branch network diversity and exchange rate (*d*) | -0.411** | -0.75*** | -17371 |
| Branch network diversity and equity + exchange rate *(e)* | -0.456** | -0.828*** | -17293 |
| Location and equity + focus on household *(f)* | -0.487** | -0.679*** | -17249 |
| Location and equity + focus on firms *(g)* | -0.487** | -0.693*** | -17250 |

Note: *, **, *** denote the level of significance at 10%, 5%, and 1%, respectively.

The baseline specification *(a)* reveals that foreign-owned banks are more efficient than either state-owned or privately-owned banks. This supports the global advantage hypothesis. This result is also in line with European studies on cost and profit efficiencies such as Hasan & Marton (2003) and Bonin et al. (2005a), who show that foreign-owned banks tend to be the most efficient. Similar results are found in papers referring to cost efficiency for European banks (Fries & Taci, 2005; Weill, 2003) generally and Russian banks in particular (Styrin, 2005; Karas et al., 2010).[7]

Our result might be explained by the fact that foreign-owned banks use advanced technologies, the best corporate practices and methods of risk-management, and they have lower credit risks than others (Karas et al., 2010). In addition, these banks have more complex product lines that include more customized products than offered by other banks. Foreign-owned banks, especially in the period before the 2008 crisis, followed a "cherry- picking" strategy, seeking out the best clients including "blue chip" firms (Bonin et al., 2005a; Karas et al., 2010).

The baseline specification *(a)* shows that state-owned banks are associated with higher profit efficiency than private domestic banks. Mamonov (2013) and Mamonov and Vernikov (2017) find that in the period before the 2008 crisis, private and state-owned banks were on par in terms of

[7] As there is a belief that better-managed banks reflect the ability of managers to control costs rather than profits, we also compare our results with those observed for the cost efficiency of banks (Hefferman, 2005). However, our result for profit maximization might be considered as a more accepted economic goal for managers. According to Berger & Mester (1997), the ability to "raise a marginal dollar of revenue" is as important as the ability to "reduce a marginal dollar of costs (p. 900)." Thus, if a bank is less cost efficient, it can still be more profit efficient due to a different scale and mix of outputs.

efficiency, but during the crisis the efficiency score of state-owned banks substantially increased. Finally, the deposit insurance system increased moral hazard risk for private banks. Public banks, on the other hand, became more profitable and efficient than previously (Karas et al., 2013).

Regarding control variables in the efficiency frontier, our models (*b* and *c*) accounted for location and equity, and the models (*d* and *e*) considered exchange rate and branch network diversity, the rest two specifications (*f* and *g*) associated with the specialization of banks also support our main findings that foreign-owned banks are more efficient than other banks, and state-owned banks are more efficient than private-owned banks.

## 5.2 Determinants of profit inefficiency with specialization and loan quality in the inefficiency term

Next, we use the specialization of banks as explanatory variables for inefficiency terms. Table 3 presents the results. As the previous table shows, our results are robust when we use the share of household loans and household deposits and the share of corporate loans and corporate deposits as a proxy for bank specialization. Thus, we only add the share of household loans and household deposits.

In the inefficiency term, we include the share of bad loans as another explanatory variable. This indicator, measured by the ratio of loan loss provision to total loans, describes the risk preferences of banks. On one hand, the high share of bad loans leads to additional expenses and reduces bank profit. On the other hand, the high share of bad loans could bring in additional income sufficient to cover potential losses and increase bank profit (Trujillo-Ponce, 2013). We find that foreign-owned banks remain more efficient than other banks. State-owned and privately-owned banks remain equally efficient.

This insignificant result for state-owned banks when controlling for bank specialization and quality of loans over the entire time horizon is considered below in a timewise context as the efficiency of banks depends on economic cycles inherent in the economy and banking industries, including credit cycles (Cantor and Mann, 2006). Moreover, the role of Russian state-owned banks has grown significantly after of the 2008 financial crisis and the CBR has performed more active approach to revoking banking licenses of privately-owned banks after 2010.[8]

[8] These structural changes meant that the share of household deposits in state-controlled banks (i.e. controlled by the federal government or the CBR) amounted to 63.1% of total household deposits in the banking sector in 2015 (CBR, 2016), up from 57.0% in 2006 (CBR, 2007). Over this period, these state-controlled banks seemed to be more risk-averse than others. For example, the share of bad loans with state-controlled banks in the total loan portfolio by bank

Table 3 Determinants of profit inefficiency with specialization and the quality of loans in the inefficiency term

| | Baseline (a) | Location (b) | Location and equity (c) |
|---|---|---|---|
| State-owned banks | -0.461 | -0.466 | -0.429 |
| Foreign-owned banks | -1.597*** | -1.192** | -1.186** |
| % Household deposits | Yes | Yes | Yes |
| % Household loans | Yes | Yes | Yes |
| % Loan loss provision | Yes | Yes | Yes |
| Log likelihood | -17359 | -17306 | -17322 |

Note: *, **, *** denote the level of significance at 10%, 5%, and 1%, respectively.

## 5.3 Determinants of profit inefficiency for three time periods

We now separate our time horizon into three shorter periods. The first period runs from 2004 Q1 to 2008 Q2, a relatively stable period economically as Russia enjoyed the benefits of windfall oil earnings. The second period, which runs from 2008 Q3 to 2013 Q4, covers the global financial crisis and post-crisis period. The final period covers the geopolitical crisis in Russia after events in Ukraine and Crimea. We include the official exchange ratio and dummies for branch network diversity (multiregional banks and center-located banks) in the efficiency frontier. Table 4 presents the determinants of profit inefficiency for each time period.

Table 4 Determinants of profit inefficiency in three time periods

| | 2004 Q1–2008 Q2 | 2008 Q3 – 2013 Q4 | 2014 Q1 – 2015 Q3 |
|---|---|---|---|
| State-owned banks | -1.095 | -0.754** | -1.253*** |
| Foreign-owned banks | -1.419* | -0.435 | -1.561*** |
| Log likelihood | -5958 | -8599 | -1844 |

Note: *, **, *** denote the level of significance at 10%, 5%, and 1%, respectively.

group did not exceed 6.4% in 2015 (CBR, 2016). There was *no increase* in the share of bad (non-performing) loans in the loan portfolios of state-controlled banks in 2016 (CBR, 2017).

For the first period, we find that foreign-owned banks are more efficient than others. This supports the global-advantage hypothesis. These banks could operate in the Russian market because the interest margin in Russia (and other developing countries) was significantly higher than in advanced economies. For example, the highest interest margin in the EU was 2.24% during the period from 2004 to 2009 (StlouisFed, 2017a). In Russia, the interest rate margin peaked at 8.02% during the same period (StlouisFed, 2017b). Foreign-owned banks also enjoyed access to advanced technologies, superior investment and risk-management procedures, and could operate more efficiently than domestic banks (Styrin, 2005; Karas et al., 2010). State-owned banks were as efficient as private bank because they were less risky and enjoyed the benefit of implicit guaranties (Karas et al., 2013). Karas et al. (2010) show similar results for the pre-crisis period.

For the second period, our results show that state-owned banks are more efficient than others. Strong government support could explain these results. For example, state-owned banks received the significant share (over 75%) of overall support in 2008 and enjoyed implicit guaranties that helped them attract cheaper funds (Vernikov, 2013). This result is partly in line with Mamonov & Vernikov (2017), who show that state-owned banks are more cost efficient than others in the crisis period.

In the third period, privately-owned banks are least efficient and foreign-owned banks are the most efficient. Foreign-owned and state-owned banks manage to attract cheap funding, either from parent banks in the case of foreign-owned banks or from the government in the case of state-owned banks.[9] The influence of the ownership type on the profit efficiency of Russian banks is the same for the pre-crisis period as in our initial analysis, and supports the findings of Karas et al. (2010).

# 6 Conclusions

This study was designed to determine how the type of ownership affected the profit efficiency of Russian banks between 2004 Q1 and 2015 Q3. The main findings are grouped into four areas.

First, as a general observation, state-owned banks are not consistently the most efficient in Russia, but they are consistently more efficient than domestic private banks. It is important to consider various definitions of efficiency in comprehensively exploring the efficiency of banks, of course. For *cost efficiency*, the recent paper of Mamonov & Vernikov (2017) asserts that state-

[9] State-owned banks received 60% of overall support in year 2015 (RBC, 2015).

owned banks perform best in Russia, and that foreign-owned banks had the weakest performance. However, if we consider *profit efficiency* of Russian banks, we obtain opposite results. Banks that received low cost efficiency scores appear to have been burdened by high costs. Covering such costs requires higher levels of profit for banks deemed cost efficient.

Second, state-owned banks are more efficient than private banks. A possible explanation for this result is that state-owned banks enjoy strong government support and implicit guaranties that allow them to attract cheaper funds and operate with the solvent and responsible clients. The majority of cross-country studies with samples that include Russia (Fries & Taci, 2005; Grigorian & Manole, 2006; and Fries et al., 2006) reach an opposite conclusion, but our results correspond to the papers analyzed the Russian banking sector (Karas et al., 2010; Mamonov & Vernikov, 2017).

Third, we find support the global advantage hypothesis in that foreign-owned banks are more efficient than other banks in Russia. A possible explanation of this finding is that foreign-owned banks possess substantial competitive advantages from high technology and management level, advanced risk-management skills, and other expertise. This result comports with much of the literature on banking in emerging markets (e.g. Weill, 2003; Styrin, 2005; Fries & Taci, 2005; Bonin et al., 2005a; Karas et al., 2010).

Finally, our robustness check using several approaches bolsters these findings. We change specifications in the efficiency frontier and include credit risk profile and bank specialization (corporate or household customer base) in the inefficiency term as explanatory variables. We also run a set of estimations after separating our time horizon into three periods (2004 Q1 to 2008 Q2; 2008 Q3 to 2013 Q4; and 2014 Q1 to 2015 Q3). We find that foreign-owned banks are most efficient in the relatively stable first and third periods. State-owned banks are found to be most efficient during the turbulent second period with included the 2008 financial crisis and its aftermath. State-owned banks are also found to be more efficient than privately-owned banks during the third period.

These results contribute to our understanding of daily banking practices and should be helpful to policymakers in setting medium and long-term strategies, as well as in distinguishing banks among banks in their abilities to manage costs and revenue streams.

Possible avenues of future banking efficiency research include the examination of diversity in bank branch networks. Such diversity could be an important determinant of banking efficiency as it describes the long-term strategy of any platform bank involved in developing remote banking technology for its customers and operating in cooperation with financial technology providers in launching tailored financial services for individual customers.

# References


Aigner, D., C.K. Lovell, and P. Schmidt (1977). "Formulation and estimation of stochastic frontier production function models." *Journal of Econometrics*, 6(1): 21–37.

Andrianova, S., P. Demetriades, and A. Shortland (2012). "Government ownership of banks, institutions and economic growth." *Economica*, 79(315): 449–469.

Battese, G.E., and T.J. Coelli (1995). "A model for technical inefficiency effects in a stochastic frontier production function for panel data." *Empirical Economics*, 20(2): 325–332.

Belousova, V.Y. (2009). "Cost Efficiency of Russian Commercial Banks in Homogeneous Groups." *Higher School of Economics Economic Journal*, 13(4): 489–519 [in Russian].

Belousova V., and I. Kozyr (2016). "How Macroeconomic Indicators Influence Banking Profitability in Russia." [Kak macroeconomicheskie peremennie vliyaut na pribilnost` rossiyskih bankov]. *Journal of the New Economic Association*, 30(2): 72–103 [in Russian].

Berger, A.N., and D.B. Humphrey (1991). "The dominance of inefficiencies over scale and product mix economies in banking." *Journal of Monetary Economics*, 28(1): 117–148.

Berger, A.N., and D.B. Humphrey. (1997). "Efficiency of financial institutions: International survey and directions for future research". *European Journal of Operational Research*, 98(2): 175–212.

Berger, A.N., and L.J. Mester (1997). "Inside the black box: What explains differences in the efficiencies of financial institutions?" *Journal of Banking and Finance*, 21(7): 895–947.

Berger, A.N., R. DeYoung, H. Genay, and G.F. Udell (2000). "Globalization of financial institutions: Evidence from cross-border banking performance." *Brookings-Wharton Papers on Financial Services*, 2000(1): 23–120.

Bonin, J.P., I. Hasan, and P. Wachtel (2005a). "Bank performance, efficiency and ownership in transition countries." *Journal of Banking and Finance*, 29(1): 31–53.

Bonin, J.P., I. Hasan, and P. Wachtel (2005b). "Privatization matters: Bank efficiency in transition countries." *Journal of Banking and Finance*, 29(8): 2155–2178.

Caner, S., Kontorovich, V. (2004). "Efficiency of the banking sector in the Russian Federation with international comparison." *Higher School of Economics Economic Journal*, 8(3): 357–376.

Cantor, R. and Ch. Mann (2006). "Analyzing the tradeoff between ratings accuracy and stability." Special Comment, Moody's Investors Service.

CBR (2005). *Banking Supervision Report 2004*. Moscow: The Central Bank of the Russian Federation.

CBR (2007). *Banking Supervision Report 2006*. Moscow: The Central Bank of the Russian Federation.

CBR (2009). *Banking Supervision Report 2008.* Moscow: The Central Bank of the Russian Federation.

CBR (2016). *Banking Supervision Report 2015.* Moscow: The Central Bank of the Russian Federation.

CBR (2017). *Banking Supervision Report 2016.* Moscow: The Central Bank of the Russian Federation.

Fries, S., D. Neven, P. Seabright, and A. Taci (2006). "Market entry, privatisation and bank performance in transition." *Economics of Transition*, 14:579–610

Fries, S., and A. Taci (2005). "Cost efficiency of banks in transition: Evidence from 289 banks in 15 post-communist countries." *Journal of Banking and Finance*, 29(1): 55–81.

Fungáčová, Z., and L. Solanko (2009). "Risk-taking by Russian banks: Do location, ownership and size matter?" *Higher School of Economics Economic Journal*, 13(1): 101–159.

Gerschenkron, A. (1962). *Economic backwardness in historical perspective: A book of essays*. Cambridge, MA: Belknap Press of Harvard University Press.

Golovan, S., A. Karminsky, and A. Peresetsky (2008). "Cost efficiency of Russian banks, taking into account the risk factors" [Effentivnost` rossiyskih bankov s tochki zreniya minimizatsii izderzek s uchetom factorov riska]. *Economics and Mathematical Methods*, 44(4): 28–38. [in Russian].

Grigorian, D.A., and V. Manole. 2006. "Determinants of commercial bank performance in transition: an application of data envelopment analysis". *Comparative Economic Studies*, 48(3): 497–522.

Hasan, I., M. Koetter, and M. Wedow (2009). "Regional growth and finance in Europe: Is there a quality effect of bank efficiency?" *Journal of Banking and Finance*, 33(8): 1413–1422.

Hasan, I., and K. Marton (2003). "Development and efficiency of the banking sector in a transitional economy: Hungarian experience." *Journal of Banking and Finance*, 27(12): 2249–2271.

Hefferman, S. (2005). *Modern Banking*. John Wiley & Sons, Ltd.

Jemric, I., and B. Vujcic (2002). "Efficiency of banks in Croatia: A DEA approach." *Comparative Economic Studies*, 44(2–3): 169–193.

Karas, A., and A. Vernikov (2016). "Russian Bank Database: Birth and Death, Location, Mergers, Deposit Insurance Participation, State and Foreign Ownership." Utrecht School of Economics Discussion Paper Series No. 16–04.

Karas, A., K. Schoors, and L. Weill (2010). "Are private banks more efficient than public banks?" *Economics of Transition*, 18(1): 209–244.

Karas, A., W. Pyle, and K. Schoors (2013). "Deposit insurance, banking crises, and market discipline: Evidence from a natural experiment on deposit flows and rates." *Journal of Money, Credit and Banking*, 45(1): 179–200.

Koetter, M., and M. Wedow (2010). "Finance and growth in a bank-based economy: Is it quantity or quality that matters?" *Journal of International Money and Finance*, 29: 1529–1545.

Koivu, T. (2002). "Do efficient banking sectors accelerate economic growth in transition countries." Working papers by Bank of Finland Institute for Economies in Transition. Series DP "BOFIT Discussion Papers" No. 14/2002.

Körner, T., and I. Schnabel (2011). "Public ownership of banks and economic growth." *Economics of Transition*, 19(3): 407–441.

Kumbhakar, Subal C., and C.A. Knox Lovell (2000). *Stochastic Frontier Analysis*. Cambridge, Cambridge University Press.

La Porta, R., F. Lopez-de-Silanes, and A. Shleifer (2002). "Government ownership of banks." *Journal of Finance*, 57(1): 265–301.

Levine, R. (2001). "International financial liberalization and economic growth." *Review of International Economics*, 9(4): 688–702.

Mamatzakis, E., C. Staikouras, and A. Koutsomanoli-Filippaki (2008). "Bank efficiency in the new European Union member states: Is there convergence?" *International Review of Financial Analysis*, 17(5): 1156–1172.

Mamonov, M. (2013). "State-owned vs private owned banks: which are more efficient?" [Gosbanki vs chastnyj bankovskij sektor: kto ehffektivnee?] // *Bankovskoe delo*, (5): 22–30. [in Russian].

Mamonov, M., and A. Vernikov (2017). "Bank ownership and cost efficiency: New empirical evidence from Russia." *Economic Systems*, 41(2): 305–319.

Meeusen, W., and J. van Den Broeck (1977). "Efficiency estimation from Cobb-Douglas production functions with composed error." *International Economic Review*, 435–444.

Raiffeisenbank (2016). *CEE Banking Sector Report.* Vienna: Raiffeisen Bank International AG.

Sealey, C.W., and J.T. Lindley (1977). "Inputs, outputs, and a theory of production and cost at depository financial institutions." *Journal of Finance*, 32(4): 1251–1266.

Shleifer, A., and R.W. Vishny (1994). "Politicians and firms." *Quarterly Journal of Economics*, 109(4): 995–1025.

St. Louis Fed (2017a). "Bank's Net Interest Margin for Euro Area." https://fred.stlouisfed.org/series/DDEI01EZA156NWDB.

St. Louis Fed (2017b). "Bank's Net Interest Margin for Russian Federation." https://fred.stlouisfed.org/series/DDEI01RUA156NWDB.

Styrin, K. (2005). "What explains differences in efficiency across Russian banks." *Economics Education and Research Consortium*: 1–29.

Trujillo-Ponce, A. (2013). "What determines the profitability of banks? Evidence from Spain." *Accounting and Finance*, 53(2): 561–586.

Vernikov, A. (2013). "National Champions and the Competitive Structure of the Russian Banking Market." [Natsional`nie chempiony" v structure rossiyskogo rinka bankovskih uslug]. *Voprosy Ekonomiki*, 3: 94–108. [in Russian].

Weill, L. (2003). "Banking efficiency in transition economies." *Economics of Transition*, 11(3): 569–592.

Yildirim, H., and G.C. Philippatos (2007). "Efficiency of banks: recent evidence from the transition economies of Europe, 1993–2000." *European Journal of Finance*, 13(2): 123–143.

# BOFIT Discussion Papers

A series devoted to academic studies by BOFIT economists and guest researchers. The focus is on works relevant for economic policy and economic developments in transition / emerging economies.

2017
- No 1 Koen Schoors, Maria Semenova and Andrey Zubanov: Depositor discipline in Russian regions: Flight to familiarity or trust in local authorities?
- No 2 Edward J. Balistreri, Zoryana Olekseyuk and David G. Tarr: Privatization and the unusual case of Belarusian accession to the WTO
- No 3 Hongyi Chen, Michael Funke, Ivan Lozev and Andrew Tsang: To guide or not to guide? Quantitative monetary policy tools and macroeconomic dynamics in China
- No 4 Soyoung Kim and Aaron Mehrotra: Effects of monetary and macroprudential policies – evidence from inflation targeting economies in the Asia-Pacific region and potential implications for China
- No 5 Denis Davydov, Zuzana Fungáčová and Laurent Weill: Cyclicality of bank liquidity creation
- No 6 Ravi Kanbur, Yue Wang and Xiaobo Zhang: The great Chinese inequality turnaround
- No 7 Yin-Wong Cheung, Cho-Hoi Hui and Andrew Tsang: The Renminbi central parity: An empirical investigation
- No 8 Chunyang Wang: Crony banking and local growth in China
- No 9 Zuzana Fungáčová and Laurent Weill: Trusting banks in China
- No 10 Daniela Marconi: Currency co-movements in Asia-Pacific: The regional role of the Renminbi
- No 11 Felix Noth and Matias Ossandon Busch: Banking globalization, local lending, and labor market effects: Micro-level evidence from Brazil
- No 12 Roman Horvath, Eva Horvatova and Maria Siranova: Financial development, rule of law and wealth inequality: Bayesian model averaging evidence
- No 13 Meng Miao, Guanjie Niu and Thomas Noe: Lending without creditor rights, collateral, or reputation – The "trusted-assistant" loan in 19th century China
- No 14 Qing He, Iikka Korhonen and Zongxin Qian: Monetary policy transmission with two exchange rates and a single currency: The Chinese experience
- No 15 Michael Funke, Julius Loermann and Andrew Tsang: The information content in the offshore Renminbi foreign-exchange option market: Analytics and implied USD/CNH densities
- No 16 Mikko Mäkinen and Laura Solanko: Determinants of bank closures: Do changes of CAMEL variables matter?
- No 17 Koen Schoors and Laurent Weill: Russia's 1999-2000 election cycle and the politics-banking interface
- No 18 Ilya B. Voskoboynikov: Structural change, expanding informality and labour productivity growth in Russia
- No 19 Heiner Mikosch and Laura Solanko: Should one follow movements in the oil price or in money supply? Forecasting quarterly GDP growth in Russia with higher-frequency indicators
- No 20 Mika Nieminen, Kari Heimonen and Timo Tohmo: Current accounts and coordination of wage bargaining
- No 21 Michael Funke, Danilo Leiva-Leon and Andrew Tsang: Mapping China's time-varying house price landscape
- No 22 Jianpo Xue and Chong K. Yip: One-child policy in China: A unified growth analysis

2018
- No 1 Zheng (Michael) Song and Wei Xiong: Risks in China's financial system
- No 2 Jennifer N. Carpenter, Fangzhou Lu and Robert F. Whitelaw: The real value of China's stock market
- No 3 Bing Xu: Permissible collateral and access to finance: Evidence from a quasi-natural experiment
- No 4 Stefan Angrick and Naoyuki Yoshino: From window guidance to Interbank rates. Tracing the transition of monetary policy in Japan and China
- No 5 Veronika Belousova, Alexander Karminsky and Ilya Kozyr: Bank ownership and profit efficiency of Russian banks




ISSN 1456-4564 (print) // ISSN 1456-5889 (online)