ФИНАНСЫ

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VARIATON OF BANKING COST EFFICIENCIES IN CENTRAL ASIA AND MONGOLIA

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ВАРИАЦИЯ ЭФФЕКТИВНОСТИ ПО ИЗДЕРЖКАМ В БАНКОВСКИХ СЕКТОРАХ СТРАН ЦЕНТРАЛЬНОЙ АЗИИ И МОНГОЛИИ

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Abstract

In this paper we seek to investigate differences between banking cost efficiencies among commercial banks in Central Asian countries and Mongolia. In analysis different approaches to liberalization and natural resources exporting characteristics of these countries have been focused as one of the main determinants for cost efficiency variation. Cost efficiency scores estimations are based on transcendental logarithmic stochastic frontier panel data model proposed by Battese & Coelli (1995). Dataset used in the study includes period of 2007-2013. Results indicate that less liberalization policy in the banking systems cause low intensity of competition, which in turn characterized by monopolization of banking sectors by large state owned banks. This tendency results in the low efficiency of commercial banks. Monopolization along with the relative abundance of financial resources accumulated through the export of natural resources and constraints on banking activity may lead to a situation described as “quiet life hypothesis”.

Key words: liberalization, frontier efficiency, banking, Central Asia.

JEL classification: G21, D24, L25

Аннотация

В данной работе исследованы различия показателей эффективности по издержкам в банковских секторах стран Центральной Азии и Монголии. В качестве основного фактора различия эффективности банковской деятельности рассматриваются уровень либерализации экономики и объем экспорта энергоресурсов. При расчете показателя эффективности по издержкам банковских секторов был применен метод стохастического фронтирного анализа на основе трансложарифмической модели, разработанной Battese & Coelli (1995) для панельных данных. В работе использованы панельные данные с охватом периода с 2007 по 2013 г. Результаты исследования показывают, что меньшая либерализация экономики приводит к слабой конкуренции и монополизации банковского сектора крупными государственными банками и к низкому уровню эффективности по издержкам банковских секторов. Изобилие финансовых ресурсов, полученных от экспортирования энергоресурсов и ограничений в банковской деятельности, может привести к ситуации, объясняемой гипотезой, известной в литературе как «quiet life hypothesis».

Ключевые слова: либерализация, фронтирная эффективность, банковское дело, Центральная Азия.
JEL: G21, D24, L25.

1. Introduction

Despite the fact that during the past 25 years transition process to market economy in post-soviet countries has been continuing, banking sector in these countries has not fulfilled their financial intermediation function in the economy yet (IMF, 2014). In this regards, liberalization of the banking system is important part of the economic reforms towards the adoption of the market economy principles. There is a divergent tendency in the liberalization level of banking system of these countries. Banking sectors of some oil and gas exporter Central Asian countries are monopolized mainly by state owned banks (Khalova & Talmy, 1999) and banking activity is constrained (EBRD, 2014:25; OECD, 2011). It may lead to significant cost inefficiencies of banking activity in these countries. However, some other countries have demonstrated significant liberalization activities through privatization of former state-owned banks (Fleming et al., 2001).

Results of the most empirical papers suggest that liberalization promotes cost efficiencies of banking activities (Hasan & Marton, 2003; Di Patti & Hardy, 2005; Fries & Taci, 2005; Bonin et al, 2005; Kraft et al., 2006). Financial resources from exporting energy resources create an enabling environment and opportunities to banking activity and attract foreign capital to banking sector and economy (Uyanik & Segni, 2001). Central Asian countries and Mongolia are interesting case for empirical analysis of this relationship. Among the Central Asian countries Kazakhstan, Uzbekistan and Turkmenistan are mainly considered as the oil and gas exporter countries. Moreover, liberalization trends are also divergent, where Uzbekistan and Turkmenistan are considered as most less liberalized countries. The other half of selected countries is energy importers, but more liberalized. However, two of them have important natural resources such as hydroelectric power stations and gold ore deposits.

In this paper as Central Asian countries considered Kazakhstan, Kyrgyzstan, Uzbekistan, Tajikistan and Turkmenistan. As in Khongorzul (2007), Kazakhstan, Kyrgyzstan and Mongolia are classified as more liberalized countries, while Tajikistan, Turkmenistan and Uzbekistan are classified as less liberalized economies. As proxy for liberalization we used set of EBRD transitional indicators.

Abundance of cheap financial resources in state controlled and/or energy resources export based economies may result quiet life behavior in banking sector of these countries (Coleman et al., 2012: 12). According to quiet life hypothesis (Hicks, 1935) in case of incomplete competition, banks' managers are not worried about the efficient resource allocation. Hence, one can predict higher banking inefficiency in monopolized banking sector (Pruteanu-Podpiera vd., 2007; Al-Jarrah & Gharaibeh, 2009).

Either speed or slow transition process in selected post-soviet countries resulted as difference of banking systems in these countries (Pomfret, 2009). Banking systems in these countries either mainly state owned or liberal banking systems dominated by private and foreign banks (ADBI, 2014). Each type of these banking systems has their advantages and disadvantages (Shagdar, 2007).

Except some, national economies and banking systems of these countries are small and open. In case of occurrence of political, economic or financial distresses in home countries of these foreign banks, risk of capital outflow form financial system of the given country are also increase. Expansion of foreign capital make national banking sector more vulnerable to external shocks emanated from linked/associated big economies. For example to this, Global Financial Crisis of 2007-2009, Russia-Ukraine Problems in 2014-2015 falling oil crude prices

in 2015-2016 negatively influenced banking sectors of Central Asian countries through exchange rates (Coleman et al., 2012; ADBI, 2014; IMF, 2015).

On the other hand foreign banks may increase competition in banking sector through bring along new technologies and banking products, and encourage more effective management and resource allocation in economy (Coleman et al., 2012: 12).

In most selected countries banking sector dependency on mineral and energy sector is high (Hahm & Yenier, 1998). But create good circumstances for extension banking activity in this region (ADBI, 2014: 53). Since financial resources gained from energy and mineral resources may cause shifting up purchasing power of consumers so then allow to extension of supply and production of goods and services (Dowling & Wignaraja, 2006). These all lead to total output increase in economies.

This paper aims to investigate differences between banking cost efficiencies among commercial banks in Central Asian countries and Mongolia taking into account liberalization and natural resources exporting characteristics of countries.

2. Methodology and Model

Measured cost efficiency show how bank's observed total cost closely located to efficient cost frontier (function) which consider a density of possible minimum total costs for a given output amount. We measure cost efficiency using stochastic frontier approach (SFA) proposed by Aigner vd. (1977). Following to Fries & Taci (2005), Djalilov & Piesse, (2014) we adopt panel data SFA model suggested by Battese & Coelli (1995) which is also permits to analysis effects of environmental variables and allow single-step maximum likelihood estimation of cost function parameters. Transcendental logarithmic specification provides local approximation of unknown but true cost functional form. In this study we employ transcendental logarithmic form of cost function, since it more flexible specification than Cobb-Douglass functional form. Adopted in this study transcendental logarithmic stochastic cost frontier model can be written as:

$$\begin{aligned}\ln TC_{it} = \alpha &+ \sum_{m=1}^{3}\beta_m \ln Y_{mit} + \sum_{n=1}^{3}\gamma_n \ln P_{nit} \\ &+ \frac{1}{2}\sum_{m=1}^{3}\sum_{3,3}\beta_{mm}\left(\ln Y_{mit}\right)^2 + \sum_{n=1}^{3}\sum_{3,3}\gamma_{nn}\left(\ln P_{nit}\right)^2 \\ &+ \sum_{m=1}^{3}\sum_{r=1}^{3}\sum_{m\neq r}\beta_{mr}\ln Y_{mit}\ln Y_{rit} + \sum_{n=1}^{3}\sum_{s=1}^{3}\sum_{n\neq s}\gamma_{ns}\ln P_{nit}\ln P_{sit} \\ &+ \sum_{m=1}^{3}\sum_{n=1}^{3}\varphi_{mn}\ln Y_{mit}\ln P_{nit} + u_{it} + v_{it}\end{aligned} \tag{1}$$

where, $\ln TC_{it}$, is natural logarithm of total cost; $\ln Y_{mit}$, is a natural logarithm of m. output; $\ln P_{nit}$, natural logarithm of price of n. input; subscripts *i* and *t* represent the *i.* bank and at *t.* year of observation; $\alpha, \beta, \gamma, \varphi$ are parameters to be estimated. v_{it} is random error term, which capture statistical white noise and have distribution as $N\ 0, \sigma_v^2$, that is identically and independently distributed. u_{it} is non-negative inefficiency term distributed as $N^+(\mu_{it}, \sigma_u^2)$. u_{it} is assumed to be distributed independently, but not identically. And are estimated by truncation at zero of the normal distribution with mean, $\mu_{it}(= \xi_0 + z_{it}'\xi)$. Futher, bank specific inefficiency is considered as function of some explanatory variables. In aim to predict inefficiency effects following auxilary equation is defined and estimated simultanously with equation (1):

$$u_{it} = \xi_0 + \sum_{k=1}^{7} \xi_k z_{kit} + \omega_{it} \qquad (2)$$

where, z_{kit} represents the vector of k variables that determine the inefficiency (μ_{it}) of bank *i* at time *t*. ω_{it} is symmetric random noise distributed as $\omega_{it} \sim N^{+}(-z'_{it}\xi, \sigma^2_{\omega})$.

3. Variables and Data Set

Banking inputs and outputs are defined according to financial intermediation approach pioneered by Sealey and Lindley (1977). While outputs are defined as nominal values of net loans (*y1*); sum of securities, derivatives and other earning assets (*y2*); Other Operating Income (*y3*); as total costs (*TC*) used sum of total interest expenses and total non-interest expenses. All these nominal values are in thousands of US dollars. As inputs considered labor, capital and funds. Price of consequent inputs are following ratios: ratio of personnel expenses to total assets (*p1*), Other Operating Expenses divided to total fixed assets (*p2*) and interest expenses divided to total funds (*p3*). We take natural logarithm of total costs, input prices and output quantity.

In according to duality theory requirements some restrictions are imposed. Following (Fiordelisi et. al., 2011) in order to impose linear homogeneity in input prices *p1* and *p2* were divided to *p3.* Standard symmetry of cross terms implicit when estimation model. Parameters in the translog cost function were estimated using ML estimator which allows getting a consistent and efficient estimator (Barra et al., 2016: 8). Total cost and outputs were normalized through the dividing to equity to control for potential heteroscedasticity stemming from differences between banks' size (Berger & Mester, 1997; Kosak & Zacj, 2006).

Inefficiency effects auxiliary equation in which inefficiency correlates/covariates dependent variable is expected value of inefficiency term. As independent ones used ratio of Reserves for Impaired Loans or NPLs to net loans (*crr*), ratio of liquid assets to sum of deposits and short term funding (*lqr*) and ratio of equity to total assets *(car),* used as proxy for credit risk, liquidity risk, insolvency risk. Additionally to control for banking sector operated in economies based on oil and gas exporting we used dummy variable (*oilexporter*) created as equal 1, if country oil and/or gas exporter. In derivation of some variables from raw data following calculations are imposed:

We used unbalanced annual panel data set provided by BankScope database produced by the Bureau van Dijk for 101 banks from 5 Central Asian countries (Kazakhstan, Kyrgyzstan, Tajikistan, Uzbekistan and Turkmenistan) and Mongolia for period 2007-2013. After excluding points with missing values on total assets 467 observations are used. During estimation due to some missing values observation size decreased down to 375. Observations for central (national) banks are excluded.

Distribution of banks by size can illustrate some characteristics of banking sectors in analyzed countries. As size criteria we have used total assets. Banks divided equally to 5 groups by size of total assets.

Banking sectors of Kyrgyzstan and Tajikistan mainly consist of small and medium-sized banks (Dowling & Wignaraja, 2006). Assets size of most of observed banks in Kazakhstan and Uzbekistan are with large.

It is obvious from Table 1, that banking sector in oil and gas exporter countries consist of bigger size banks than in others. But large sizes of banks in Mongolia can be due to growth gold and other mineral resources mining sector.

Table 1 – The number of banks by size and country

Asset size range	Number of observations by country						
(*of thousands US*	Kyrgyz-	Kazakh-	Mongo-	Tajiki-	Turkmeni-	Uzbe-	Total

dollars)	stan	stan	lia	stan	stan	kistan	
612 - 99117	30	24	9	20	…	10	**93**
99118 - 253536	25	30	11	8	…	19	**93**
253537 - 569910	7	40	7	13	1	26	**94**
569911 - 1920147	…	60	14	…	5	14	**93**
1920148 - …	…	79	6	…	3	6	**94**
Total	**62**	**233**	**47**	**41**	**9**	**75**	**467**

4. Results and Discussion

From the estimation results reported in Table 2, it can be concluded that stochastic frontier models is appropriate and there are inefficiency, referring to statistically significant coefficient of *lambda* (Fiorentino et al., 2006). Null hypothesis assumed deterministic frontier model (OLS) which consider no inefficiency term in the model is rejected at 0.01 significant level (Kumbhakar & Lovell, 2003).

Most of coefficients are statistically significant. Increase in total costs of banks in region is mostly due to growth of loan portfolio and rising of labor price. Coefficient of *y2* (sum of securities, derivatives and other earning assets) have unexpected sign. It is not surprising given that most banks in these countries used securities and other earning assets as alternatives to banking lending. Increase in *y3* instead of *y1* lead to decline in total costs, since lending activity is more costly than holding securities and operate with other earning assets.

Negative relationship between credit risk (*crr*), insolvency (*car*) risk and inefficiency reveal evidence of 'cost skimping' and 'moral hazard' hypotheses among analyzed banks, respectively. Extension of lending activity in banking negatively influenced inefficiency.

Table 2 – Estimation results of Battese & Coelli (1995)'s stochastic cost frontier model

Symbol of variable	Coefficient[a]	t-value	Symbol of variable	Coefficient	t-value
ly1	0.667***	(16.20)	***Inefficiency correlates***		
ly2	-0.108**	(-2.85)			
ly3	0.167***	(4.56)	crr	-0.181***	(-3.40)
lp1	0.483***	(7.97)	lqr	-0.0011*	(-2.11)
lp2	0.197**	(2.91)	car	-0.577*	(-2.30)
ly1sq	0.201***	(12.39)	netmargin	0.015***	(4.02)
ly2sq	-0.0150*	(-2.52)	lassets	0.171***	(19.15)
ly3sq	0.0416***	(3.73)	netloan_ass	-0.037***	(-16.14)
lp1sq	0.134***	(5.27)	oilexporter	-0.136**	(-2.79)
lp2sq	0.00889	(0.35)			
ly1lp1	0.0521*	(2.25)	Usigma	-3.534***	(-9.06)
ly1lp2	-0.0819***	(-4.07)	Vsigma	-3.781***	(-19.26)
ly2lp1	-0.0367**	(-3.28)	sigma_u	0.1708***	(5.13)
ly2lp2	0.0491***	(4.40)	sigma_v	0.1513***	(10.19)
ly3lp1	-0.0269	(-1.65)	***lambda***	***1.1315******	***(24.45)***
ly3lp2	0.0217	(1.31)			
lp2lp1	-0.0237	(-1.09)	Number of groups	= 87	
ly1ly2	-0.0107	(-0.87)	Number of obs	= 375	
ly1ly3	-0.0402**	(-3.13)	Log likelihood[c]	= 98.0274	

ly2ly3	-0.0374***	(-5.18)	Prob > chi2	= 0.0000
_cons	1.694***	(18.54)	Wald chi2(20)	= 7603.54

Coefficient signs of net interest margin (*netmargin*) and size (*lassets*) are positive. High interest rates on banking loans through decrease repayment ability of borrowers. Then worsening of loan quality increasing in problem loans may cause significant impairment expenses related with increased problem loans. Positive sign of size (*lassets*) indicate, that increasing size (*lassets*) of banks making harder the cost saving and control of banking production process. Oil exporting (*oilexport*) is contributor to boost the cost efficiency level of analyzed banks.

We used point estimator of efficiency proposed by Jondrow et al. (1982) to estimate cost efficiency scores for each bank. Referring to the distribution of cost efficiency scores showed that cost efficiency scores of most of banks are nearly the unit. It also indicates to appropriateness of predicted model.

Table 3 summarized some descriptive statistics of estimated cost efficiency scores. Observed decline in average cost efficiency in 2009-2010 most likely due to lagged effects of Global Financial Crisis of 2007-2008. In last years of analyzed period average cost efficiency scores had downward tendency.

However, banks' cost efficiency in some countries not much affected by the Global Financial Crisis, but troubled by internal shocks. In case of Kyrgyzstan, banking sector was distressed by political and social crisis in 2010. Likely it is resulted as decline in cost efficiency scores in following years.

Oil exporting associated with lower average cost efficiency level of banks of the country. Cost efficiency of these banks lesser extent been influenced by Global Financial Crisis (Pomfret, 2009). In recent years cost efficiency of selected Turkmenistan's banks has been significantly declined. This sharp deterioration possibly caused by introduction of IFRS in all banks (EBRD, 2014: 41) under the important reforms were implemented in banking sector of Turkmenistan on the framework of special state program adopted by government.

Table 3 – Cost efficiency scores of banks by country for period of 2007-2013

Country	N	mean	SD	min	max	year						
						2007	2008	2009	2010	2011	2012	2013
						0.80	0.81	0.85	0.82	0.74	0.72	0.75
Kyrgyzstan	45	0.78	0.23	0.30	0.99	0.80	0.81	0.68	0.68	0.76	0.81	0.83
Kazakhstan	179	0.77	0.25	0.10	0.99	0.92	0.95	0.67	0.60	0.75	0.78	0.68
Mongolia	40	0.78	0.17	0.36	0.98	0.94	0.93	0.76	0.68	0.71	0.71	0.96
Tajikistan	35	0.77	0.20	0.27	0.97	0.95	0.95	0.95	0.59	0.56	0.48	0.25
Turkmenistan	9	0.64	0.27	0.25	0.95	0.52	0.75	0.74	0.60	0.65	0.60	0.77
Uzbekistan	67	0.66	0.25	0.05	0.97	**0.82**	**0.87**	**0.77**	**0.66**	**0.69**	**0.69**	**0.71**

Notes: N, mean, SD, min and *max* represent number of observation, mean values, standard deviation, minimum and maximum values, respectively.

Table 4 reported that banks with largest and least assets are more cost efficient compared to those with medium-sized assets. It may be considered, that small banks are accomplished on cost control thanks to small size advantages. On other side large banks by way of employing qualified managers and skilled labor also succeed higher efficiency scores.

Table 4 – Cost efficiency scores of banks by assets size group for period of 2007-2013

Assets size range (*of thousands US dollars*)	No of observation	Expected Value of *CE*	Standard Deviation of *CE*
612 - 99117	93	0.773	0.211
99118 - 253536	93	0.752	0.226
253537 - 569910	94	0.671	0.301
569911 - 1920147	93	0.749	0.242
1920148 - …	94	0.798	0.203
Total	**467**		
CE: cost efficiency			

Additionally efficiency scores of medium-sized banks have largest variation within assets size range group. It indicates that some banks from this group have either further lower or higher cost efficiency scores. This indicates that some of the banks of the group are either even lower or even higher efficient.

Following to Fries & Taci (2005) and Khongorzul (2007) as proxy for liberalization we used average of six EBRD transition indicators (these indicators are (i) large scale privatization; (ii) small scale privatization; (iii) governance and enterprise restructuring; (iv) price liberalization; (v) trade & forex system and (vi) competition policy. Derived from EBRD's Transition Reports) and labeled it as transition index. Further, we calculated average transition index for period 2007-2013 for each country. These indicators summarized in Table 5.

Using indicators from last two columns of Table 5 created Figure 1. The figure clearly shows that banks in liberalized economies are more cost efficient. Two countries with least average cost efficient banks also have least average transition indicators.

Same analogous argument is possible for the two countries with most cost efficient banks. However, this reasoning cannot be done in case of Tajikistan and Kazakhstan.

Table 5 – Transition indicators assessed by EBRD and cost efficiency scores

Country	2007	2008	2009	2010	2011	2012	2013	Mean value of transition index	CE
Kyrgyzstan	3.39	3.39	3.39	3.39	3.39	3.39	3.39	3.39	0.78
Kazakhstan	3.11	3.11	3.11	3.11	3.06	3.06	3.06	3.09	0.77
Mongolia	3.39	3.39	3.39	3.44	3.44	3.44	3.44	3.42	0.78
Tajikistan	2.78	2.78	2.83	2.89	2.89	2.89	2.95	2.86	0.77
Turkmenis-tan	1.45	1.67	1.67	1.67	1.67	1.78	1.78	1.67	0.64
Uzbekistan	2.34	2.34	2.34	2.34	2.28	2.28	2.28	2.31	0.66

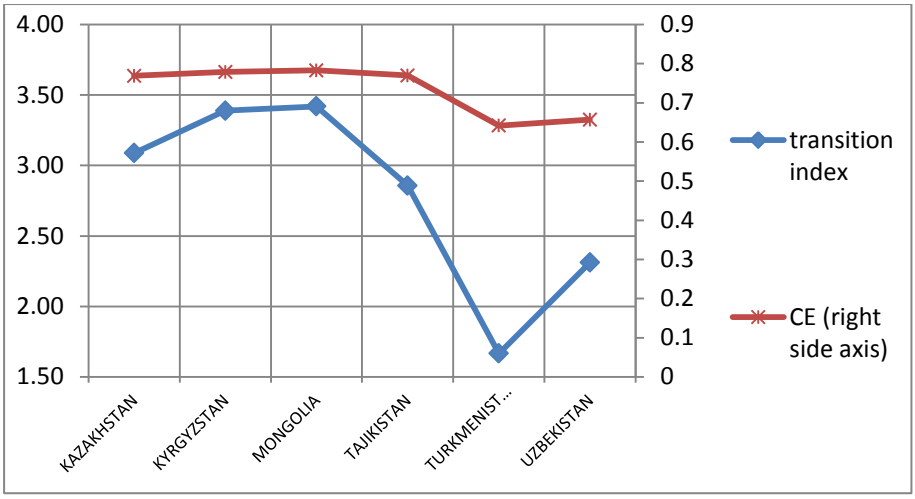

Figure 1. Mean of transition index and banking cost efficiency by country

5. Conclusion

In this paper studied cost efficiency of banks operated in Central Asian countries and Mongolia for period of 2007-2013. Some banks have not been able fulfill their function as financial intermediaries, as well as resources in production process has not been effectively used to the full.

According to results least liberalized banking sectors are less cost efficient. Result in this paper revealed also that inefficiency of less liberalized banking systems may be due to less competition caused by monopolization of banking sectors by large state owned banks.

Monopolization can be a result of the relative abundance of financial resources accumulated by exporting natural resources, and along with constraints on banking activity can lead to a situation considered by 'quiet life' hypothesis.

As explanatory defined oil exporting positively influenced the cost efficiency. Large banks in these countries natural resources provide main financial resources. Overall results indicate that large by assets banks are most cost efficient. Results also show that banks in oil exporter countries have least average cost efficiency scores.

Some banks could manage to control their costs effectively despite the fact of growing size, while others did not. From this one can consider that small banks should be accurate when expanding their assets size. Regulators and supervisors should focus their attention on possible cost skimping and moral hazard behavior of some banks which assumed by hypothesizes introduced in Berger & De Young (1997). Evidence from Central Asian and Mongolian banks showed that liberalization may initiate significantly increase in cost efficiency of banks in these countries.

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References

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

2. Al-Jarrah, I. M., & Gharaibeh, H. (2009). The efficiency cost of market power in banking: a test of the "quiet life" and related hypotheses in the Jordan's banking industry. Jordan: Investment Management and Financial Innovations.

3. Asian Development Bank Institute (ADBI) (2014). Connecting Central Asia with Economic Centers. Kasumigaseki, Japan

4. Barra, C., Bimonte, G., & Zotti, R. (2016). On the relationship among efficiency, capitalization and risk: does management matter in local banking market?. Applied Economics, 1-23.

5. Battese, G. E., & Coelli, T. J. (1995). A model for technical inefficiency effects in a stochastic frontier production function for panel data. Empirical economics, 20(2), 325-332.

6. Berger, A. N., & DeYoung, R. (1997). Problem loans and cost efficiency in commercial banks. Journal of Banking & Finance, 21(6), 849-870.

7. Berger, A. N., & Mester, L. J. (1997). Efficiency and productivity change in the US commercial banking industry: A comparison of the 1980s and 1990s (No. 97-5).

8. Bonin, J. P., Hasan, I., & Wachtel, P. (2005). Privatization matters: Bank efficiency in transition countries. Journal of Banking & Finance, 29(8), 2155-2178.

9. Coleman, B.E., Goffe, V., Perolli, B., Usupova, M., Castillo, L.V., Holzhacker, H., Orlova, N., Sologoub, D., Frewer, G., Hacibedel, B. and Kappeler, A. (2012). Banking in the Eastern neighbours and Central Asia: Challenges and opportunities. Regional Studies and Roundtables, European Investment Bank (EIB).

10. Djalilov, K., & Piesse, J. (2011). Financial development and growth in transition countries: A study of Central Asia. Emerging Markets Finance and Trade, 47(6), 4-23.

11. Djalilov, K., & Piesse, J. (2014). The determinants of bank efficiency in Central Asia. Corporate Ownership and Control, 12(1), 656-670.

12. Dowling, M., & Wignaraja, G. (2006). Mapping Future Prospects to 2015. Central Asia – Caucasus Institute, Silk Road Studies Program, A Joint Transatlantic Research and Policy Center,

13. Di Patti, E. B., & Hardy, D. C. (2005). Financial sector liberalization, bank privatization, and efficiency: Evidence from Pakistan. Journal of Banking & Finance, 29(8), 2381-2406.

14. Fiordelisi, F., Marques-Ibanez, D., & Molyneux, P. (2011). Efficiency and risk in European banking. Journal of Banking & Finance, 35(5), 1315-1326.

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

16. Fiorentino, E., Karmann, A., & Koetter, M. (2006). The cost efficiency of German banks: a comparison of SFA and DEA. Available at SSRN 947340.

17. Fleming, A., Bokros, L., & Votava, C. (Eds.). (2001). Financial transition in Europe and Central Asia: challenges of the new decade. World Bank Publications.

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

19. Hahm, H., & Yenier, D. (1998). Financial Sector Reforms ECONOMIC in Mongolia Development. World Bank, EDI Working Papers 18873

20. Hicks, J. (1935): "The Theory of Monopoly." Econometrica, 3, 1–20.

21. IMF, (2014). The Caucasus and Central Asia: transitioning to emerging markets, Middle East and Central Asia Department, Washington

22. IMF, (2015). Reginal Economic Outlook: Middle East and Central Asia., Washington

23. Khalova, G.O., & Talmy, V. (1999). The Banking System and Monetary Policy in Turkmenistan. Russian & East European Finance and Trade, 35, 5, pp. 45-74

24. Košak, M., & Zajc, P. (2006). Determinants of bank efficiency differences in the new EU member countries. Financial Stability Report, 29.

25. Kraft, E., Hofler, R., & Payne, J. (2006). Privatization, foreign bank entry and bank efficiency in Croatia: a Fourier-flexible function stochastic cost frontier analysis. Applied Economics, 38(17), 2075-2088.

26. Khongorzul, D. (2007). Mongolia and Central Asia in Transition. Ritsemeikan Asia Pacific, 3, pp. 117-149.

27. OECD, (2011). Competitiveness and Private Sector Development Competitiveness and Private Sector Development: Central Asia 2011 Competitiveness Outlook: Competitiveness Outlook, OECD Publishing

28. Pomfret, R. (2009). Central Asia and the Global Economic Crisis. EUCAM policy Brief No. 7, June 2009

29. Pruteanu-Podpiera, A., Weill, L., & Schobert, F. (2007). Market Power and Efficiency in the Czech Banking Sector. CNB.
30. Sealey, C. W., & Lindley, J. T. (1977). Inputs, outputs, and a theory of production and cost at depository financial institutions. The Journal of Finance, 32(4), 1251-1266.
31. Shagdar, E. (2007). Neo-liberal 'shock therapy'policy during the Mongolian economic transition (No. 0703e). ERINA discussion paper.
32. Uyanik, T., & Segni, C. (2001). Evolution of the Banking Sector in Central Asia. Financial Transition in Europe and Central Asia: Challenges of the New Decade, 97.