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Estimating cost efficiency of Turkish commercial banks under unobserved heterogeneity with stochastic frontier models

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ABSTRACT

This study aims to investigate the cost efficiency of Turkish commercial banks over the restructuring period of the Turkish banking system, which coincides with the 2008 financial global crisis and the 2010 European sovereign debt crisis. To this end, within the stochastic frontier framework, we employ true fixed effects model, where the unobserved bank heterogeneity is integrated in the inefficiency distribution at a mean level. To select the cost function with the most appropriate inefficiency correlates, we first adopt a search algorithm and then utilize the model averaging approach to verify that our results are not exposed to model selection bias. Overall, our empirical results reveal that cost efficiencies of Turkish banks have improved over time, with the effects of the 2008 and 2010 crises remaining rather limited. Furthermore, not only the cost efficiency scores but also impacts of the crises on those scores appear to vary with regard to bank size and ownership structure, in accordance with much of the existing literature.

1. Introduction

A stable and efficient banking system is quite important for economic growth and welfare especially for emerging countries like Turkey where the banking sector is the backbone of the economy. The banking system in Turkey has experienced a fundamental change due to the far-reaching reforms implemented in the aftermath of the 2001 local financial crisis. The year of 2001 could well be named as a milestone for the Turkish banking sector. In that year, the banking sector faced with a very deep and devastating crisis and a substantial increase in the non-performing loans due to the skyrocketed interest and exchange rates, inadequate level of funding, maturity mismatch, insufficient risk management practices and bad governance. Subsequent to the 2001 financial crisis, a comprehensive restructuring program was implemented with the aims of strengthening state and private banks, solving the problems of troubled banks, addressing regularity and supervisory deficiencies and improving efficiency. With the gradual implementation of the reform package, the Turkish banking sector experienced a rapid and stable financial deepening process during 2002–2007. More recently, the Turkish economy was severely affected by the 2008 global crisis similar to all other emerging economies. The banking sector however, was relatively less affected compared to the banking sectors in many other emerging countries, which was owed to the reforms adopted successfully after the 2001 crisis to strength the Turkish banking system.

In this context, this study aims to measure the efficiency of

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Table 1
Summary of the literature review on bank efficiency in emerging markets.

Author(s)	Country	Data sample	Functional form	Methodology	Efficiency	Average efficiency
Poghosyan and Kumbhakar (2010)	AL, AM, AZ, BG, BY, CZ, EE, GE, HR, HU, KZ, LT, LV, MD, PL, RO, RU, SI, SK, UA	681 Banks, 1993–2004	Translog	SFA	Cost efficiency	0.69
Du and Girma (2011)	CN	14 Banks, 1995–2001	Translog	SFA	Cost inefficiency	1.30–1.56
Williams (2012)	AR, BR, CL, MX	419 Banks, 1985–2010	Translog	SFA	Cost efficiency	0.77
					Profit efficiency	0.50
Kumbhakar and Wang (2007)	CN	14 Banks, 1993–2002	Translog	SFA	Technical efficiency	0.47–0.90
Manlagnit (2011)	PH	31 Banks, 1990–2006	Translog	SFA	Cost inefficiency	1.25
Kasman and Yildirim (2006)	CZ, EE, HU, LV, LT, PL, SK, SI	190 Banks, 1995–2002	Fourier Flexible	SFA	Cost efficiency	0.20
					Profit efficiency	0.36
Kumbhakar and Peresetsky (2013)	KZ, RU	94 Banks, 2002–2006	Translog	SFA	Cost efficiency	0.82–0.83
Demir et al. (2005)	TR	43 Banks, 1995–1998	Translog	SFA	Cost efficiency	0.70–0.87
Yildirim (2002)	TR	38 to 59 Banks, 1988–1999	–	DEA	Technical efficiency	0.89
Denizer et al. (2007)	TR	29 to 53 Banks, 1970–1994	–	DEA	Technical efficiency	0.50–0.86
Ozkan-Gunay (2012)	TR	29 Banks, 2002–2009	–	DEA	Technical efficiency	0.70
Fukuyama and Matousek (2011)	TR	25 Banks, 1991–2007	–	Two-stage network	Cost efficiency	0.55
					Technical efficiency	0.65
					Allocative efficiency	0.83
Isik and Hassan (2002)	TR	36 Banks 1988–1988, 50 Banks 1992–1992, 53 Banks 1996–1996	–	DEA, SFA	Cost efficiency	0.72–0.89
					Profit efficiency	0.83
Kasman (2002)	TR	48 Banks, 1988–1998	Fourier Flexible	SFA	Cost inefficiency	0.23
Assaf et al. (2013)	TR	45 Banks, 2002–2010	Translog	Bayesian	Technical efficiency	0.78
Zaim (1995)	TR	39 Banks, 1981–1981; 56 Banks, 1990–1990	–	DEA	Technical efficiency	0.82–0.92
El-Gamal and Inanoglu (2005)	TR	53 Banks, 1990–2000	Translog	Estimation - Classification	Cost inefficiency	2.28

Notes: SFA Stochastic Frontier Approach, DEA Data envelopment Analysis, AL Albania, AM Armenia, AR Argentina, AZ Azerbaijan, BG Bulgaria, BY Bosnia and Herzegovina, BR Brazil, CL Chile, CN China, CZ Czech Republic, EE Estonia, GE Georgia, HR Croatia, HU Hungary, ID Indonesia, KZ Kazakhstan, LT Lithuania, LV Latvia, MX Mexico, MD Moldova, MK Macedonia, PH Philippines, PL Poland, RO Romania, RU Russia, SI Slovenia, SK Slovakia, TR Turkey, UA Ukraine.

Turkish commercial banks. Although the efficiency of the banking system has been analysed in numerous studies for developed countries, the literature on the efficiency of the banking sector in emerging countries is relatively thin, as summarized in Table 1.[1] When examining the literature for Turkey, it appears that the studies focus essentially on the evolution of bank efficiencies following the financial liberalization that took place in the late 1980s, the restructuring program adopted in 2001 and the 2008 global financial crisis. The conclusions, however, are not unanimous. For instance, while Zaim (1995) and Ertugrul and Zaim (1999) and Demir et al. (2005) reveal that the financial liberalization led to an increase in the efficiency of Turkish banks, Yildirim (2002), Denizer et al. (2007), Isik and Hassan (2002) and Kasman (2002) observe that the liberalization did not provide the anticipated efficiency gains in Turkish banks. More recently, the studies by Fukuyama and Matousek (2011), Ozkan-Gunay (2012) and Assaf et al. (2013) investigate the effect of the restructuring program adopted in 2001 on the Turkish banking system. Fukuyama and Matousek (2011) find that the restructuring program has a positive effect on bank efficiency over the period 2001–2004, though a gradual decline is observed after 2004 when the restructuring reforms are formally ended. Unlike Fukuyama and Matousek (2011), Ozkan-Gunay (2012) reveal a substantial and more importantly a gradual improvement in the bank efficiency following the restructuring program. The analysis of Assaf et al. (2013), on the other hand, indicates a decline in the efficiency of Turkish banks over the period 2002–2010. Furthermore, it is seen that the annual decline in efficiency becomes more prominent in 2009 and 2010 due to the 2008 global financial crisis.

Our study aims to measure the cost efficiency of 22 Turkish commercial banks over the period of 2003Q1-2015Q3. The use of the longest time period allowed by data availability is important to observe the temporal movement of the efficiency of Turkish banks. More specifically, with our data we will be able to provide a long-term empirical assessment of the effectiveness of the restructuring reforms implemented after the 2001 crisis, which remains controversial in the empirical literature. Moreover, although it is partially investigated by Assaf et al. (2013) over the sample

[1] See Erkoc (2012) for a detailed discussion of the efficiency literature and the existing estimation methodologies.