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INVESTIGATION OF IMPACT OF DIVERSIFIED INCOME ON BANK PERFORMANCE: IS IT A SIGN OF FOREIGN BANKS HETEROGENEOUS?

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Abstract

IndianBanks with different ownership types manage differently to changes in economic environments. This topic has been widely studied, all the previous studies fail to control for bank-heterogeneity (Banks effectiveness) in estimating cost structure and efficiency. We propose a model where we control for bank-heterogeneity, and introduce persistent and time-varying inefficiency. Additionally we incorporate determinants of both persistent and time-varying inefficiency as well as production risks. Furthermore, our model allows estimation of different technologies for different ownership types jointly. We use this model to analyze the effect of regulation in Indian banking. We find that private banks have not implicated their economies of scale, foreign banks are operating under diseconomies of scale, especially after the reforms, and scale economies of state owned banks are not affected by regulation. Banks of all ownership types have enjoyed technical progress; however, foreign banks have benefited the most, followed by state owned banks. Only state banks were able to improve their cost efficiency, while private banks, and especially foreign banks, were lagging behind their cost benifits.

Introduction

There is an extensive literature on the effect of different types of regulation on performance of financial institutions. Deregulation of the banking industry is perhaps studied the most. One of the reasons behind banking deregulation all over the world is the belief that deregulation increases competition, and higher competition tends to force banks to use resources efficiently leading to higher productivity. Consequently, this is the subject of study of many papers across many different countries (e.g., Fu & Heffernan, 2009). Part of the reason for the intense scrutiny of the banking sector is that banks (and financial institutions in general) control finances —

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the main driver of economic growth and stability. On the other hand, when there are dangers of 'overheating' and signs of excessive risk taking, authorities increase the 'amount' of regulation with an attempt to achieve greater financial stability (e.g., Doumpos, Gaganis, & Pasiouras, 2015).

With regulations, banks and/or financial institutions may not feel the pressure and incentive to operate efficiently. This is often referred to as the 'quiet life' hypothesis (Hicks, 1935), meaning that firms tend to operate inefficiently when the markets are non-competitive. However, empirical results do not always support this premise (Casu, Girardone, 2009, Berger, Klapper, Turk-Ariss, 2009a, Fu, Heffernan, 2009). According to the 'competition-fragility' hypothesis, greater competition erodes market power, lowers interest margins, reduces the franchise value of banks and increases the loan portfolio as measured by increased non-performing loans. In contrast, the 'competition-stability' hypothesis states that the risk-incentive mechanism operates in the opposite direction, causing banks to become more risky as their markets become more non-competitive (Boyd & De Nicoló, 2005). Additionally, banks operating in the non-competitive market are likely to take more risks if they work under the protection of government regulations. Further, higher risk taking could also be associated with reductions in efficiency (Fiordelisi, Marques-Ibanez, & Molyneux, 2011). Thus it is not clear whether increases in competition will always improve efficiency and productivity. Sometimes it takes time for banks to adjust to deregulatory changes and banks of different ownership types may react differently with different speeds of adjustment. This means efficiency and productivity improvements, if any, may not be instantaneous.

There are many studies that focus on the effects of banking deregulation on efficiency and productivity growth. What is unique about the banking industry in India is that there are three distinct ownership types. That is, state-owned, privately-owned and foreign-owned banks simultaneously operate in the Indian banking industry. Deregulation, whatever form it takes, is likely to affect banks of different ownership type differently.

Different ownerships react with different speeds to the change of regulatory environment (Isik, Hassan, 2002, Leightner, Lovell, 1998) and perform differently (e.g., Berger, Hasan, & Zhou, 2009b). This gives us an opportunity to examine whether one ownership type outperforms another in

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terms of improvement in productivity and efficiency after deregulation. For example, the early efficiency study of Bhattacharyya, Lovell, and Sahay (1997) focused on the relative performance of commercial banks under three different kinds of ownership (private, public, and foreign), but the coverage was limited to only a few years after deregulation. In the post reform period, a number of studies have analyzed the impact of deregulation on the efficiency of Indian banks (Das, Ghosh, 2006, Das, Kumbhakar, 2012, Kumbhakar, Sarkar, 2003, Kumbhakar, Sarkar, 2005, Ray, Das, 2010). The broad finding emanating from these studies was that state-owned banks (SOBs) performed better than private sector banks, and medium sized state-owned are more likely to operate at higher levels of efficiency and have, on an average, less non-performing loans (Casu, Ferrari, Zhao, 2013, Das, Kumbhakar, 2012, Kumbhakar, Sarkar, 2003).

What is missing in all these studies is the failure to control for systematic differences among banks in estimating productivity with or without efficiency. The exceptions are Restrepo-Tobón, Kumbhakar, and Sun (2015) and Malikov, Restrepo-Tobon, and Kumbhakar (2014) who examined TFP of US commercial banks and credit unions. They control for bank-specific effects but did not consider inefficiency. That is, they assumed that all the banks are fully efficient in every year. Bank inefficiency estimates typically reflect on managerial skill, which lead to deviations from the assumed operating behavior. These deviations, however, may arise due to the failure to account for bank-heterogeneity.

Additionally, the inefficiency of banks in a panel study is either assumed to be time-invariant or time-varying. Time-invariant bank inefficiency captures persistent inefficiency attributed to structural rigidities, regulatory constraints where it is reasonable to assume that the these factors remain constant over time especially in a short panel. Time-varying or time-varying inefficiency, in contrast, captures the temporal pattern of inefficiency that is examined to capture catch-up (the rate in which inefficient banks move to the frontier). Banking studies up until now estimated either persistent or time-varying inefficiency but not both. It is likely that, in reality, one part of inefficiency is persistent while another part is time-varying. Further, there might be factors that can explain differences in them across banks and over time.

Recently Colombi, Kumbhakar, Martini, and Vittadini (2014); Kumbhakar, Lien, and Hardaker (2014) and Tsionas and Kumbhakar (2014) introduced a four-component stochastic frontier model which not only allows to control for random bank-specific effects, but also disentangles persistent inefficiency from time-varying inefficiency.[1] In this paper, we propose a model where all the four components are assumed to be heteroscedastic. The heteroscedasticities associated with the persistent and time-varying inefficiency components are viewed as determinants of persistent and time- varying inefficiency. Similarly, heteroscedasticy of the bank-effects and the noise term are interpreted as persistent and long-run production risk. Here we are using the argument advanced by production economists, mainly in agriculture, in interpreting the variance of production shocks as risk which can be explained by some observed phenomena. Furthermore, we allow the technology for each ownership type to be

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different, and devised a procedure to estimate them all together instead of estimating them separately for each ownership type (e.g., Altunbas, Evans, Molyneux, 2001, Casu, Ferrari, Zhao, 2013). This is the most general panel data stochastic frontier model which we label as the heteroscedastic four- component model. Our main focus in this paper is on this new model.

Since our heteroscedastic model can generate many special cases that are widely used in the literature, first we present estimates of returns to scale (RTS), technical change, and persistent and time-varying efficiency from our heteroscedastic four-component model. We also present results from two other misspecified models to show the effect of failure to include one or more of the components, in particular, (i) the widely used model with only time-varying inefficiency (with determinants) and noise; and (ii) the recently developed homoscedastic four-component model. Our goal is to enrich the existing literature by analyzing the effect of banking regulation on the RTS, technical change and efficiency of foreign, private and state Indian banks using our new model.

The rest of the paper is organized as follows. Section 2 presents the heteroscedastic four-component stochastic frontier panel data model followed by the empirical model specification and a brief overview of the Indian banking data in Section 3. The empirical results (viz., the impact of regulatory change on RTS, technical change and efficiency) are discussed in Sections 4 and 5 concludes the paper.

Section snippets

Methodology

In this section, we describe the production technology in general in terms of the dual cost function with input-oriented technical inefficiency. Following the banking literature we use a cost minimizing framework to model the underlying banking technology. In a panel data model which is used in most of the papers, the cost function is specified as logcit=h(yit,wit;θ)+vit+uit,where i=1,…,n denotes the *i*th bank and t=1,…,Ti denotes the time period in which bank *i* is observed, *cit* measures the

Empirical model and data

We follow the intermediation approach, originally proposed by Sealey and Lindley (1977), to specify inputs and outputs in our cost model (see also Casu, Girardone, & Molyneux, 2004). The technology of a bank is described by a translog cost function with three outputs and two inputs (Casu et al., 2013), which is h(yit,wit;θ)=β0+∑k=13βilogykit+0.5∑k=13∑n=13βknlogykitlogynit+∑m=12αmlogwmit+0.5∑m=12∑l=12αmllogwmitlogwlit+∑k=13∑m=12γkmlogykitlogwmit+∑k=13δktlogykit+∑m=12θmtlogwmit+∑k=13λkRlogykit+∑m=

Results

We estimate a variety of models that are special cases of our four- component

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heteroscedastic model. To conserve space, we report results from three models, all of which use (8) along with different specifications of the error components in (9)–(11). This implies that $\boldsymbol{\theta}$ as well as $\boldsymbol{\gamma}_V$, $\boldsymbol{\gamma}_U$, $\boldsymbol{\gamma}_{V0}$, and $\boldsymbol{\gamma}_{U0}$ are ownership-specific.

Model M1: No heterogeneity and persistent inefficiency (i.e.,
both $u0_i$ and $v0_i$ are set to zero for each ownership type in (9)–(11)). Further, v_{it} is homoscedastic for each

Conclusion

In this paper, we propose a panel stochastic cost frontier model to investigate the effects of deregulation and re-regulation of Indian banks of different ownership types on RTS, technical change and efficiency. Our model allows ownership-specific cost frontiers that (i) control for random bank-effects (bank heterogeneity) and (ii) separate persistent inefficiency from time-varying inefficiency. Furthermore, the variances of random bank- effects and the noise component (labeled as production

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