



**Efficiency Gains and Deregulation Policies:
Evidence from Bank Level Data**

Kai Du

School of Economics

THESIS

Submitted to the University of Adelaide in
Partial Fulfilment of the Requirements for the Degree of
Doctor of Philosophy in Economics

October 2013

Declaration

I certify that this thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

I certify that no part of this thesis will, in the future, be used in a submission for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint award of this degree.

I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying, subject to the provisions of the Copyright Act 1968. I also give permission for the digital version of my thesis to be made available on the web, via the University's digital research repository, the Library catalogue and through web search engines, unless permission has been granted by the University to restrict access for a period of time.

Date:

Declaration

I certify that this thesis contains no material which has been accepted for the award of any other degree or diploma in any university or other tertiary institution and, to the best of my knowledge and belief, contains no material previously published or written by another person, except where due reference has been made in the text.

I certify that no part of this thesis will, in the future, be used in a submission for any other degree or diploma in any university or other tertiary institution without the prior approval of the University of Adelaide and where applicable, any partner institution responsible for the joint award of this degree.

I give consent to this copy of my thesis, when deposited in the University Library, being made available for loan and photocopying, subject to the provisions of the Copyright Act 1968. I also give permission for the digital version of my thesis to be made available on the web, via the University's digital research repository, the Library catalogue and through web search engines, unless permission has been granted by the University to restrict access for a period of time.

Date: 30 May 2013

Abstract

This thesis uses bank level data from developing countries and emerging economies and the data envelopment analysis (DEA) approach to provide empirical evidence on the impact of deregulation policies in the banking industry on the banks' efficiency. Since the banking industry in China is the largest and most complex among the developing countries and in transition from a centrally planned to a market economy, its transition process and the development of the banking industry is analysed first in order to provide the background information for the following econometric analyses and the thesis.

To gather the empirical evidence from China's banking industry on the correlation between the World Trade Organization (WTO) accession and efficiency gains by commercial banks, this thesis evaluates the efficiency of Chinese banks over the period 2000–09 (this is referred to as the adapting phase of the WTO accession). During this period of time, the restrictions on the foreign banks were removed gradually. The evolution of banks' efficiency is computed by the DEA approach combined with the bootstrapping technique. All commercial banks are broken down into four groups: (1) all banks in China; (2) domestic banks; (3) private banks; and (4) city banks. Since the categories are mutually exclusive, the empirical results reveal that the efficiency of the banks in China's banking industry increased over this period. In terms of profit maximising, city banks were the least efficient banks and the catch-up effect was highly significant in this group, since their efficiency increased dramatically compared with other banks.

However, the empirical evidence from the Chinese banking industry cannot identify the efficiency effect from removing restrictions on banks in the market. In order to identify the efficiency impacts from different kind of deregulation policies, first, the impact of the deregulation policies to remove the restrictions on foreign banks and domestic banks are explored in six Asian banking industries over the period 1997–2006, namely China (data for mainland China and Taiwan presented separately), India, Indonesia, Malaysia, Pakistan and Thailand.

In the first stage of the two-stage DEA model, the output direction DEA is employed for the selected countries to compute the efficiency of the banks. In the second stage, the estimated DEA score is regressed on the indices of the restrictions in the market. The values of indices are taken from Dinh (2008). The main reason to select her indices is that these indices are used to estimate the restrictions on foreign banks and domestic banks in the given market. The expectation is that the deregulation policies to remove the restrictions on foreign or domestic banks will lead to efficiency gains in the markets.

In order to overcome the reverse causality issue between the dependent variable (the estimated DEA score) and the independent variable (restriction indices), the two-step first-difference regression model is used and bank efficiency in the previous period is included in the model as one of control variables. The main reason to use the first-difference model is to partial out unobservable time and country effects from the data panel. In the sensitivity analysis, a couple of different model specifications are utilised to confirm the baseline results. The regression results show that the deregulation policies related to the operation of foreign banks are positively correlated with efficiency gains of commercial banks, but the other key set of policies to

liberalise the domestic banks has not resulted in significant efficiency gains in the selected banking industries.

As alternative channels for increased competition in the market, the efficiency impacts of mergers and acquisitions (M&As) are explored. Theoretically, banks may be encouraged to enhance their efficiency due to the pressures that arise from the possibility of M&As. Most previous analyses use the case study methodology in this topic rather than the cross-country statistical methodology. In this thesis, the efficiency impacts are examined with a sample of banks from a range of emerging economies (China, India, Malaysia, Russia, Thailand and Vietnam) over the period 2002–09. All banks in the selected countries are divided into three groups, namely target banks, acquiring banks, and the banks not involved in the event (or incumbent banks).

To compare the differences in the impacts on efficiency between the banks involved in the event (target and acquiring banks) and the banks not involved in the event (incumbent banks), the two-stage DEA is employed. In the first stage, the efficiency of the banks is calculated in the DEA model. The results from the DEA show that the efficiency of the banks increased in most of the countries, except India, in which the bank efficiency is neutral over the sample period. In the second stage, two different matching methods was utilised in this thesis: the regression method and propensity score matching. The empirical results are robust across a number of sensitivity analyses and identification methods and reveal that the M&As reduce the efficiency of the acquiring banks and target banks in the selected emerging economies.

Acknowledgments

First of all, I would like to express my heartfelt gratitude to Prof. Christopher Findlay, my principal supervisor. Over the past four years, he has been guiding me, both consciously and unconsciously, how to transform my interests into a good thesis. He has given me sufficient freedom to choose and decide my topic of interest, while providing suggestions and insightful comments on this thesis. I really appreciate all his contributions of time, ideas, and funding on my thesis.

Secondly, I would like to acknowledge my co-supervisors, Prof. Richard Pomfret, and Dr Nicholas Sim. I appreciate their huge time and patience they have shown whenever I want to discuss with them about my research. Prof. Pomfret has given me a lot of good suggestions when I choose the topic of my thesis, and Dr Sim has taught and supervised me to develop the method from an econometric point of view. The numerous conversation and electronic exchanges we had constantly improved and refined this thesis. I also very much appreciate Dr Nicola Chandler's enthusiasm, intensity, and willingness to do the editing work and the proof reading for my thesis.

My appreciation also goes to the other school staff including academic and professional staff for their help in the course work, PhD workshop, seminar and daily life in Adelaide. The names are (among many others), Fabrice Collard, Jacob Wang, Ralph Bayer, Dmitriy Kvasov, Tatyana Chesnokova, Duygu Yengin, Seungmoon Choi, Jiti Gao, Nadya Baryshnikova, Allison Stokes, Sandra Elborough, Sherry Dzonsons, John Snelling and Anne Arnold.

I also acknowledge my PhD colleagues in the same office –Xiaobo He, Chaohua

Dong, Jiang Lin, Yuan Di, Faqin Lin, Hang Wu, Yan Zhang, Kofi Otumawu, Sinad Treewanchai and many others for the time we spent together in Adelaide.

Finally, I thank my parents and my wife Sunny Liu for their unconditional support and sacrifices. This thesis is dedicated to them.

Contents

Abstract	I
Acknowledgments.....	IV
List of Tables	IX
List of Figures	XI
Abbreviation	XII
Chapter 1 Introduction	1
1.1 Background	1
1.2 Research Questions	3
1.3 Outline.....	6
Chapter 2 Financial Reform in China's Banking Industry	8
2.1 Introduction	8
2.2 Replacement of Government Appropriation by Bank Loans.....	10
2.3 Commercialisation in China's Banking Industry	12
2.4 Private Banks.....	16
2.5 Foreign Banks and WTO Accession	18
2.6 Current Banking Industry in China	23
2.7 Summary	30
Chapter 3 Literature on Financial Deregulation and Bank Efficiency	31
3.1 Introduction	31

3.2 Financial Development and Economic Growth	32
3.3 Financial Deregulation and Efficiency Gains	34
3.4 Efficiency Gains from M&As	41
3.5 Methodology of Efficiency Analysis	43
3.6 DEA Frontier Model	48
3.7 Summary	52
Chapter 4 WTO Accession and Efficiency Gains in China's Banking industry	55
4.1. Introduction	55
4.2. Literature on Efficiency Analysis of Chinese Banks	57
4.3. Data	61
4.4. Methodology	71
4.5. Empirical Results	75
4.6. Sensitivity Analyses	82
4.7. Concluding Remarks	88
Chapter 5 Evidence from Asian Banking Industries of Efficiency Gains from Deregulation.....	91
5.1 Introduction	91
5.2 Literature on Efficiency Impact of Financial Deregulation	93
5.3 Data	98
5.4 Methodology	107
5.5 Empirical Results	111
5.6 Sensitivity Analyses	123

5.7 Concluding Remarks	128
Chapter 6 The Impact of M&As on Bank Efficiency	130
6.1 Introduction	130
6.2 Literature on Efficiency Impact of M&As	133
6.3 Data and Sample Selection.....	137
6.4 Methodology	142
6.5 Empirical Results	146
6.6 Sensitivity Analyses	154
6.7 Concluding Remarks	159
Chapter 7 Conclusions	161
References.....	168
Appendix.....	183

List of Tables

Table 2.1. Main business and capital sources of policy banks.....	15
Table 2.2. Establishment dates of JSCBs.....	17
Table 2.3. Removal of geographical restrictions on foreign banks.....	21
Table 2.4. China's banking industry.....	25
Table 2.5. State-owned commercial banks.....	26
Table 2.6. Joint-stock commercial banks.....	28
Table 2.7. City banks.....	29
Table 4.1. Deregulation of foreign banks from 2001 to 2006.....	57
Table 4.2. Number of banks in each group.....	64
Table 4.3. Input and output variables in three specifications.....	65
Table 4.4a. Summary statistics of input variables (US\$ million).....	67
Table 4.4b. Summary statistics of output variables (US\$ million).....	69
Table 4.4c. Summary statistics of total assets (US\$ million).....	71
Table 4.5. DEA scores in profit/revenue specification (2000–09).....	78
Table 4.6. DEA scores in intermediation specification (2000–09).....	84
Table 4.7. DEA scores in product specification (2000–09).....	86
Table 5.1. Summary statistics of input and output variables.....	103
Table 5.2. Summary statistics of regression variables.....	107
Table 5.3. Super inefficient observations in the dataset.....	111
Table 5.4. The average DEA score in each country.....	113
Table 5.5. DEA efficiency of restriction groups of foreign banks (1997–2006).....	114
Table 5.6. DEA efficiency of restriction groups of domestic banks (1997–2006).....	117

Table 5.7. Adapted Li test of restrictions on efficiency distribution (1997–2006).....	119
Table 5.8. Benchmark regression on restrictions on foreign banks.....	121
Table 5.9. Results of basic regression on restrictions on domestic banks.....	123
Table 5.10. Efficiency gains from removing restrictions on foreign banks.....	125
Table 5.11. Efficiency gains from removing restrictions on domestic banks.....	127
Table 6.1. Summary statistics of input and output variables (US\$ million).....	141
Table 6.2. Summary statistics of control variables in the regression.....	142
Table 6.3. Efficiency score of each country in each year.....	146
Table 6.4. Effects of M&As by dummy variables in all banks.....	148
Table 6.5. Effects of M&As by dummy variables and acquiring banks excluded.....	150
Table 6.6. Effects of M&As by dummy variables and target banks excluded.....	152
Table 6.7. Effects of M&As by indicator variables in all banks.....	155
Table 6.8. Effects of M&As by indicator variables and acquiring banks excluded...	156
Table 6.9. Effects of M&As by indicator variables and target banks excluded.....	157
Table 6.10. Effects of M&As in propensity score matching.....	158

List of Figures

Figure 2.1. Structure of China's banking industry.....	23
Figure 3.1. Theoretical frontier with production set (Ψ).....	50
Figure 4.1. Efficiency evolution in profit/revenue specification (2000–09).....	76
Figure 4.2. Efficiency evolution in intermediation specification (2000–09).....	83
Figure 4.3 Evolution of efficiency in product specification (2000–09).....	85
Figure 5.1. Percentage of the observations from each country.....	100
Figure 5.2. Restriction indices of foreign and domestic banks.....	105
Figure 5.3. Illustration of two-stage DEA.....	109
Figure 5.4. Distribution of DEA score with or without outliers.....	112
Figure 5.5. Distribution of restriction groups of foreign banks (1997–2006).....	116
Figure 5.6. Distribution of restriction groups of domestic banks (1997–2006).....	118

Abbreviation

ABC	Agriculture Bank of China
ADBC	Agriculture Development Bank of China
ATT	Average Treatment Effect
Big Five	ABC, ICBC, BOC, CCB and BoCom
BOC	Bank of China
BOCom	Bank of Communications
CBRC	China Banking Regulatory Commission
CCB	China Construction Bank
CDB	China Development Bank
China EXIM	Export-Import Bank of China
CPI	Consumer Price Index
CRS	Constant returns to scale
DEA	Data Envelopment Analysis
EBRD	European Bank of Reconstruction and Development
EU	European Union
EVA	Economic Value Added
GDP	Gross Domestic Product
IAS/IFRS	International accounting or international financial reporting standards
ICBC	Industrial and Commercial Bank of China
IMF	International Monetary Fund
JSCBs	Joint-stock commercial banks

KMD	Kuo Min Dang Party (KMD)
LGAAP	Local generally accepted accounting principles
M&As	Mergers and acquisitions
NIM	Net Interest Margin
NPLs	Non-performing loans
OLS	Ordinary least squares
PBC	People's Bank of China
PCBC	People's Construction Bank of China
ROA	Return on assets
ROE	Return on equity
RMB	Renminbi (The official currency of China)
PRC	People's Republic of China
SOBs	State-owned commercial banks
SEZs	Special Economic Zones
SFA	Stochastic Frontier Analysis
SOEs	State-owned enterprises
WTO	World Trade Organization
VRS	Varied returns to scale
2SLS	Two-step least squares