



UNIVERSITY OF LEEDS

This is a repository copy of *Banking, transition and financial reforms: a long-term analysis of Vietnam*.

White Rose Research Online URL for this paper:
<https://eprints.whiterose.ac.uk/188410/>

Version: Accepted Version

Article:

Ferrari, A and Tran, VHT orcid.org/0000-0003-2629-1590 (2021) Banking, transition and financial reforms: a long-term analysis of Vietnam. *Journal of Banking Regulation*, 22 (1). pp. 1-10. ISSN 1745-6452

<https://doi.org/10.1057/s41261-020-00123-3>

© Springer Nature Limited 2020. This is an author produced version of an article, published in *Journal of Banking Regulation*. Uploaded in accordance with the publisher's self-archiving policy.

Reuse

Items deposited in White Rose Research Online are protected by copyright, with all rights reserved unless indicated otherwise. They may be downloaded and/or printed for private study, or other acts as permitted by national copyright laws. The publisher or other rights holders may allow further reproduction and re-use of the full text version. This is indicated by the licence information on the White Rose Research Online record for the item.

Takedown

If you consider content in White Rose Research Online to be in breach of UK law, please notify us by emailing eprints@whiterose.ac.uk including the URL of the record and the reason for the withdrawal request.



eprints@whiterose.ac.uk
<https://eprints.whiterose.ac.uk/>

Banking, transition and financial reforms: a long term analysis of Vietnam

Alessandra Ferrari^a, Vo Huyen Trang Tran^b

Abstract

We analyse the effectiveness of financial reforms in the transition economy of Vietnam, from the early years until the present day. Our focus is on the changes and the determinants of banks cost efficiency, which was widely criticised and was the focus of the reforms package. We find that regulatory changes impact favourably the development of the sector. Technological and efficiency improvements characterise the period of analysis, helped by better capitalization and increased diversification. Any technological spill-overs from foreign banks are quickly transferred to the domestic market, and larger domestic banks rapidly become the best performing institutions, in support of the more recent liberalization and privatization policies.

Keywords: financial reforms; transition economies; Vietnam banking sector; banks efficiency; stochastic frontier.

JEL Classification: G21; G28; D24; C49.

^a School of Business and Economics, University of Loughborough; Loughborough LE11 3TU. Email a.ferrari@lboro.ac.uk. Corresponding author.

^b School of Business and Economics, University of Loughborough; Loughborough LE11 3TU.

1. Introduction.

This paper analyses the changes in cost efficiency and their determinants for Vietnam commercial banks over the period 1992-2017. The time period is the longest ever analysed for the country and runs from the early years of transition, when Vietnam abandoned the mono-tier system, through two big financial crises and significant financial reforms. Liberalization and re-regulation policies were introduced in response to widening criticisms about the inefficiency and unprofitability of the sector and to meet the requirements related to the country's joining the WTO in 2007. Regulatory changes are still ongoing to increase banks efficiency, stability and competitiveness, as a key to the continued economic growth of the country. Despite all the changes and the growing economic relevance of this ASEAN country very little academic attention has been given to it, which leaves an important gap in the literature. In this paper we analyse if and how banks cost efficiency has indeed increased over the period of analysis and evaluate a series of potential determinants of such changes. This allows us to draw clear policy implications about the effectiveness of the reforms Vietnam embarked upon. We contribute to the literature in several respects. To the best of our knowledge this is the first paper to comprehensively analyse the dynamic changes of Vietnamese banks efficiency as well as its determinants, something which has been largely ignored by extant literature. Our very long time span (the years from 1992 to 2017), previously unexplored, runs from the very early years of economic and financial reforms through to the more recent reforms and two major financial crises. This allows us to formulate more robust conclusions about the long run trends and their determinants in the sector. From a methodological point of view, we estimate a stochastic cost frontier with the simultaneous estimation of efficiency determinants, whilst controlling for various environmental and bank specific factors. This stochastic one-step approach is an improvement on existing work on Vietnam which uses mainly deterministic and/or 2-stage approaches, whose limitations are widely recognised in the efficiency literature (as discussed later). Furthermore, unlike other literature we control for several bank-specific variables and for environmental factors.

Our results show technological improvements and cost efficiency increases throughout the period of observation. Fast improvements are seen at the beginning, possibly helped by foreign banks superior technology, and continue after the introduction of financial reforms. Better diversified and better capitalised banks shift the frontier. Foreign banks are the best performing group at the beginning but they are soon overtaken by domestic banks, who adapt to the new deregulated environment and exploit the benefits of the home advantage. The higher efficiency

of larger banks explains the better performance of State banks. Private domestic banks perform almost as well and eventually converge in levels thus supporting more recent privatization policies. Overall we find supportive evidence of the effectiveness of the regulatory changes introduced by the government.

The rest of the paper is structured as follows. Section 2 provides an overview of Vietnam's banking system. Section 3 offers a brief literature review, and further highlights the contributions of our work. Section 4 discusses the data and the methodology. Section 5 discusses the results and Section 6 concludes.

2. A brief overview of Vietnam banking

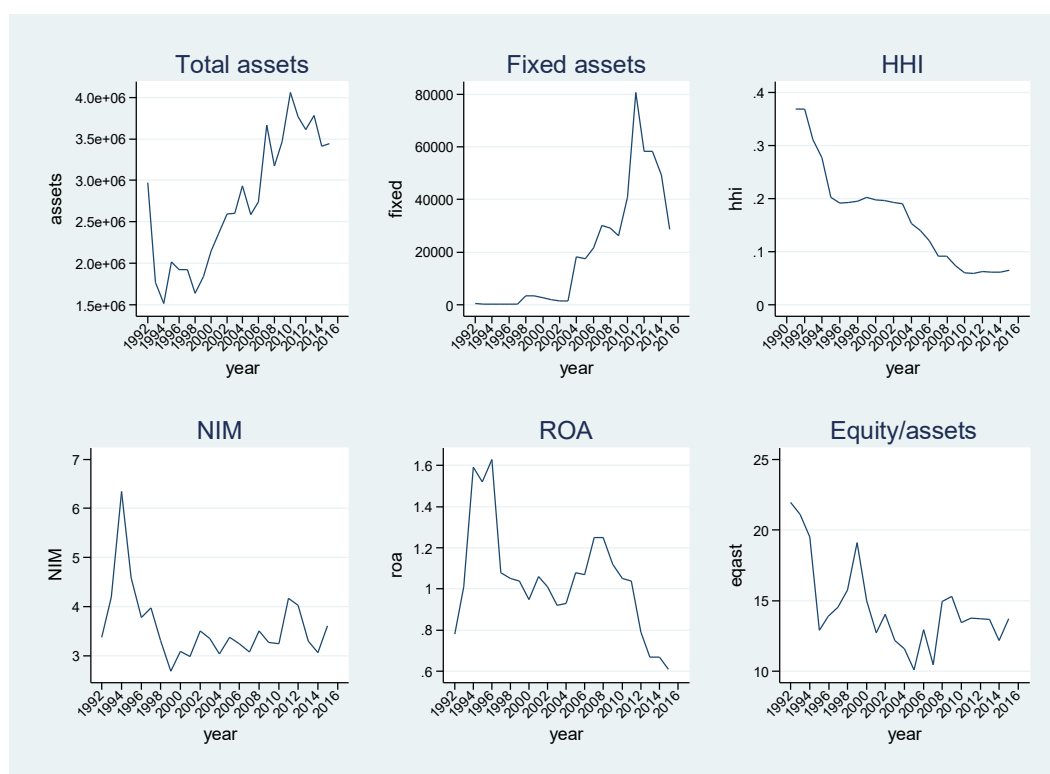
Vietnam is a transition economy. Having unified under a communist regime in 1976, it started its program of reforms in 1986 to move from a centrally planned system to an increasingly market based one. Reforms led to a very fast growth of the economy (the country now qualifies as lower-middle income by World Bank classifications), but also to high levels of inflation. In 1986 the country abandoned the mono-tier banking system and created 4 State owned commercial banks (SOCBs). The banking system remained however centrally planned until the end of the 90s, partly contributing to problems which are typical of (the early stages of) transition: a lasting presence of the State both in the economy and in the banking sector; high levels of non-performing loans (NPLs) inherited from the past and continued by poor lending practices; misallocation of resources, low capitalization and widespread inefficiency; small capital markets and excessive reliance on the banking system for all the funding needs of the economy; and finally weak accounting practices and regulatory systems. All this led to low profitability and efficiency of the banking sector, widespread criticism and proposal for change. A first round of financial reforms started at the end of the 90s, with the development of the legal framework for banks operation, the strengthening of supervisory rules and a law on assets classification and provisioning.¹ Prudential ratios and an increase in minimum capital requirements were also implemented, and the State's protection to SOCBs was gradually reduced. A milestone in the financial liberalisation process was marked by Vietnam officially joining the WTO in 2007. In the implementation of the commitments to the WTO the Government further opened the system to foreign banks, who had since been subjected to very strict operational limits. They were

¹ The Credit Institutions Act and the State Bank Act were introduced in 1997. The Decree 48/1999/QĐ-NHNN5, on assets classification in 1999.

now allowed to open subsidiaries and perform the same activities as domestic banks. Furthermore, overseas investors were allowed to hold shares of Vietnamese joint-stock commercial banks (JSCBs).² A process of privatisation took place in 2010, while 2011 saw the implementation of restructuring policies of the banking system due to the negative effects of the Global Financial Crisis (GFC) and the sharp reduction in real estate prices.

Some of the resulting changes of Vietnam’s banking sector can be seen in Figure 1. As the figure shows, the growth of the sector is quite pronounced (total and fixed assets both increase quite significantly) while the concentration levels decrease (HHI), which could indicate an increased level of competition also supported by the reduction in Net Interest Margins (NIM). Equity levels increase in concomitance with two rounds of reforms (1999 and 2007) but remain low by international standards (by 2010 Vietnam’s capital levels were still far from Basel II requirements), as does profitability, measured by Return on Assets.

Figure 1: Vietnam banking market characteristics, 1992-2017



Data source: Bankscope/Orbis.

² Decrees 22/2006 and 07/2007.

So while as a result of financial liberalisation the banking sector has become more competitive (IMF, 2018) many of its problems remain. Vietnamese banks are still considered inefficient, unprofitable, undercapitalised and with too high levels of NPLs, and call for a deeper restructuring process, improved transparency and increased efficiency, as an efficient financial system is key to stable growth (ADB, 2015; IMF, 2018; WB, 2018). This is what this paper aims to look at.

3. Literature review and paper contributions

The literature on banks efficiency, its dynamics and determinants is remarkably vast with often contradictory results, and a general summary of it goes well beyond the scope of this paper. To stay close to our research questions and contextualize our work we will concentrate on the studies on Asian banking systems and in particular on Vietnam, of which there are few.

The literature on Asian banking systems generally looks at the dynamics of efficiency and the effects of changes in the regulatory environment, given the widespread implementation of liberalization policies of the last 30 years. Particular attention is given to changes in ownership structure and to the entry of foreign banks, whose presence in the region is quite limited by international standards. The results are mixed, due to differences in the regulatory policies, macroeconomic environment and method of analysis. Most studies find that liberalization policies have beneficial effects in terms of growth and efficiency. This is the finding of Gilbert and Wilson (1998) for South Korea; of Leightner and Lovell (1998) for Thailand; of Chen et al. (2005) and Fu and Heffernan (2009) for China; and then again of Zhao et al. (2010) and Casu et al. (2013) for India. Similar conclusions are reached on cross-country comparisons by Chan et al. (2014), Chan et al. (2015), and by Casu et al. (2017). Opposite findings are however found for example by Kumbhakar and Sarkar (2003) for India and by Kumbhakar and Wang (2007) for China. Cautionary tales are found of course in the post Asian Financial Crisis (AFC) literature that looks at the destabilising effects of liberalization. Results are even more mixed when it comes to the differences between ownership structures. Foreign banks are often found to be more efficient and to bring technological advances with them which benefit the host country via spill-over effects (the so-called global advantage theory). This is the case for the cross country analysis of Williams and Nguyen (2005), of the studies on China of Lin and Zhang (2009) and Luo et al. (2016); of Gulati and Kumar (2016) for India, as well as of the more recent cross country work of Casu et al. (2017) and of Goyal and Aggrawal (2018) for India. However opposite conclusions are reached by Chen et al. (2005) for China; and by Sanyal and Shankar (2011) who find evidence

of foreign banks underperformance in India, as do Sathye (2003) and Casu et al. (2013), who find outperformance of State-owned banks.

As of studies on Vietnam banking, these are seriously limited both in scope and number. The majority focuses on technical efficiency, it uses short periods of time and mainly deterministic techniques³, and it pays close to no attention to the root causes of inefficiency. This leaves a big gap in the literature which we aim to fill.

The papers that use the deterministic non parametric technique of Data Envelopment Analysis generally find an improvement over time in efficiency, often helped by a larger size, and have mixed results when it comes to the relative performance of different ownership structures (see for example Nguyen et al (2013); Nguyen et al (2014), Vu and Nahm (2013); and Stewart et al (2016). The first paper to adopt a parametric, stochastic approach is Vu and Turnell (2010) who analyse cost efficiency over the period 2000-2006 estimating a Bayesian stochastic frontier. Their results show a slight decrease in cost efficiency and no significant difference between ownership structures. Although the approach adopted is an improvement over the deterministic methods used by previous literature, their period of analysis is very short and determinants of efficiency are not looked into. Furthermore, only equity capital is used to capture bank-specific characteristics which could lead to specification bias issues. A longer time period (2000-2014) is analysed by Nguyen et al. (2016) using both two-stage SFA and DEA to evaluate cost efficiency. The focus of the paper is on the dynamic efficiency effects of two governance reforms that led to changes in Vietnamese banks ownership structure. They find quite high and increasing efficiency scores (over 90% on average), positively affected by the reforms, and a better performance of state banks over private banks - which contradicts some of their previous results.

In brief, the literature on Vietnam is small and largely contradictory, it is often deterministic in nature, and covers short periods of time. It also devotes little attention to the root causes of efficiency and adopts so called two-stage procedures whose limitations are well established in the literature (Wang and Schmidt 2002)⁴. Our contributions to the literature have been detailed in Section 1. The details on our model specification are offered in the next section.

³ By definition deterministic techniques do not allow for the existence of noise. Among other things this makes them particularly sensitive to the presence of outliers.

⁴ It has been shown that 2-step approaches, that estimate efficiency first and then regress scores on a set of variables, produce biased and inefficient estimators, and biased efficiency estimates.

4. Data and model specification

The core of a cost frontier can be written as

$$TC_i = TC(X; \beta) + \varepsilon_i \quad (1)$$

where total cost TC of bank i depends on a set of independent variables X (output levels, inputs prices and any other control variables) and on a vector of parameters β to estimate. The frontier nature of the model is given by the composite error term $\varepsilon_i = v_i + u_i$. This results from the sum of the two components of noise $v_i \sim N(0, \sigma_v^2)$ and inefficiency u_i with the requirement that $u_i \geq 0$. Positive values of u_i indicate that a bank is above the minimum cost frontier and suffers from inefficiency equal to $1/e^{u_i}$; for perfectly efficient banks $u_i = 0$. Several distributions are possible for u_i , such as the half normal, the truncated normal, the exponential or the gamma, with the final choice based on statistical testing.⁵ In this paper the distribution that best describes the data is the exponential, so that

$$f(u_i) = (1/\eta)\exp(-u_i/\eta) \quad (2)$$

with mean η and var η^2 .

Inefficiency might be expected to vary depending on a set of variables that affect its mean or variance (heteroskedasticity) or both. In our model with an exponential distribution this means that (Wang 2003)

$$\eta_i^2 = \exp(z\delta) \quad (3)$$

where z is a vector of explanatory variables that affect the mean and variance of the inefficiency term u_i . Further details on this will be provided shortly.

To model the production process of the bank we follow the intermediation approach and define two outputs and two inputs (and thus two inputs prices). The two outputs reflect traditional banking activities⁶ and are net loans (q_1 , defined as the difference between gross loans and reserves for impaired loans) and other earning assets (q_2).⁷ The two inputs prices are the unit cost

⁵ Both parametric and non-parametric tests (such as the LR test or the Akaike information criterion) are used depending on whether models are nested within one another or not.

⁶ We are not controlling for non-traditional banking activities such as off-balance sheet items because of lack of data. This is not a problem given the very limited relevance these items have in Vietnamese banking.

⁷ Other earning assets include net loans and advances to banks, reverse repos, securities borrowed and cash collateral, derivative financial instruments, financial assets, and other securities, investments in associated companies, brokerage property, and insurance assets

of funds (w_1 , defined as the ratio of total interest expense to total deposits and funding) and the price of an aggregate input of physical capital, labour, and other administrative costs⁸ (w_2 , calculated as the ratio of total operating expenses to total assets). Bank-specific and environmental variables are also included as will be discussed presently.

The final specification for our panel data set is Greene's true fixed effects model (Greene, 2005) with a translog flexible functional form. Symmetry conditions and linearity in inputs prices are imposed prior to estimation. The significance of efficiency, that supports the choice of a frontier model, is confirmed by a test of the significance of the skewness of the OLS residuals as well as by an LR test.⁹ The model consists in the simultaneous estimation of the following two equations via ML:

$$\begin{aligned}
\ln TC_{it}^* &= \alpha_i + \alpha_w \ln w_{it}^* + \sum_{k=1}^2 \beta_k \ln q_{kit} + \alpha_{ww} (\ln w_{it}^*)^2 + \\
&+ \sum_{k=1}^2 \sum_{j=1}^2 \beta_{kj} \ln q_{kit} \ln q_{jit} + \sum_{k=1}^2 \gamma_{wk} \ln w_{wit} \ln q_{kit} + \sum_{r=1}^2 \zeta_r x_{rit} + \zeta_3 HHI_t + \zeta_4 GDP_t \\
&+ \mathcal{G}_1 t + \mathcal{G}_2 t^2 + \nu_1 D_1 + \nu_2 D_2 + \nu_3 D_1 t + \nu_4 D_2 t + \tau_w \ln w_{it}^* + \sum_{k=1}^2 \tau_k t \ln q_{kit} + u_{it} + v_{it}
\end{aligned}
\tag{4}$$

$$\eta_i^2 = \exp(\delta_0 + \delta_1 S_i + \delta_2 t + \delta_3 HHI_t + \delta_4 FOR_i + \delta_5 ST_i + \delta_7 D_1 + \delta_8 D_2)
\tag{5}$$

In Eq.(4) TC^* is the (normalised)¹⁰ total cost of bank i at time t , w^* is the normalised input price ratio w_2/w_1 and q_1 and q_2 are the two outputs discussed above. To control for differences in output quality and risk between banks we include a diversification variable x_1 and an equity-to-deposits variable x_2 . Diversification is measured as the index (Laeven, 2005)

$$x_1 = 1 - \left| \frac{\text{Net loans} - \text{other earning assets}}{\text{total earning assets}} \right|.$$

The index lies in the interval $[0,1]$, with values closer to 1 indicating higher levels of diversification, and presumably lower levels of risk, and *viceversa*. Its expected effect on TC is unclear a priori. Banks with high-quality and well diversified assets might incur extra expenses for example in management and monitoring; on the other hand, they could also borrow at low interest rates due to their lower probability of default. Similarly, a higher equity to deposits ratio

⁸ The reason for aggregating physical capital, labour, and other administrative costs is due to a combination of economic reasons, degrees of freedom and lack of data on depreciation and number of employees.

⁹ Both the Schmidt & Lin (1984) skewness test and Coelli (1995) LR test have P-values of 0.

¹⁰ This is the ratio of total cost to input price w_2 and it is necessary for linearity in inputs prices.

can lower the cost of funding via the reduction in risk (Berger and Mester, 2003), but it will also increase total cost as the cost of equity is higher than that of debt. Further, to capture the business conditions under which banks operate, we include the Herfindahl-Hirschman Index (HHI) and two time dummy variables. HHI measures market concentration in total assets. The effect of higher concentration on costs and efficiency is unsettled theoretically and it depends on whether it is the result of anticompetitive conduct or the exploitation of scale economies and general better performance. The two dummy variables are defined as follows. D_1 is set = 1 from 1999, capturing the years following the Asian Financial Crisis (AFC) and the first regulatory changes introduced in Vietnam. D_2 is set equal to 1 from 2007, which is when Vietnam joined the WTO, other regulatory reforms were introduced and of course when the Global Financial Crisis (GFC) took place. A (quadratic) time trend captures neutral technological change, which is allowed to change with the two dummies, while its interaction with inputs and outputs variables allows for non-neutral technical change.

Turning our attention to Eq.(5) this models the determinants of inefficiency, which are at the core of our research questions. We allow for differences in size (s , measured by total assets) and ownership, which is captured by two dummy variables FOR (foreign owned banks) and ST (state owned banks), making domestic private banks the base category. HHI, t , D_1 and D_2 are also included and have been defined above.

Equations (4) and (5) are estimated simultaneously via ML. Each bank's cost efficiency level CE_{it} is calculated post estimation as the conditional expectation (Battese and Coelli, 1988):

$$\hat{CE}_{it} = E[\exp(-u_{it} | \hat{\varepsilon}_{it})] \quad (6)$$

Finally the marginal effects on the mean of inefficiency are calculated as

$$\frac{\delta E[u_{it}]}{\delta z} = \frac{1}{2} \delta \exp\left(\frac{1}{2} z \delta\right) \quad (7)$$

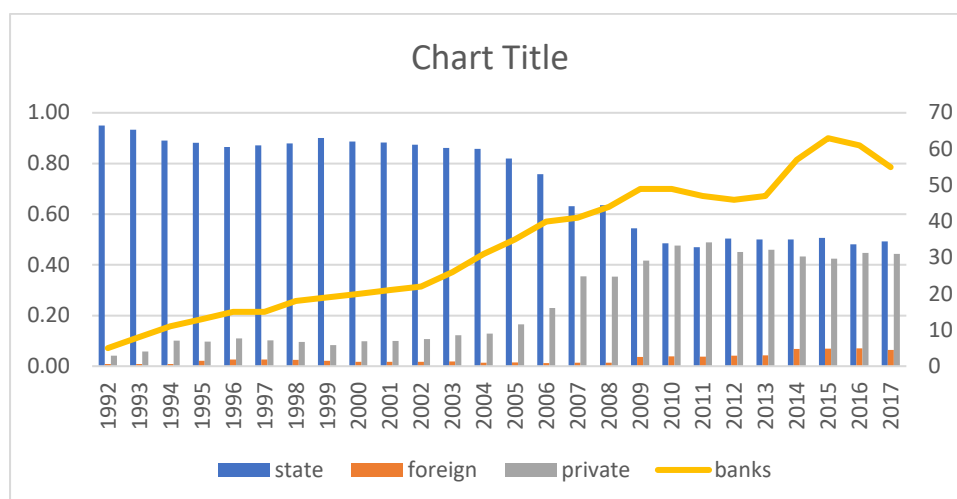
Our dataset is an unbalanced panel comprising of 76 commercial banks operating in Vietnam over the period 1992-2017 giving us a total of 841 observations. Data is obtained from the Bankscope and Orbis databases. Some descriptive statistics of the dataset are offered in Table 1, which reports the average and standard deviation over the sample period along with the average yearly growth rate for each of the variables. Figure 2 shows the changes in ownership structure.

Table 1. Sample descriptive statistics, 1992-2017

Variable	Average		stdev	Yearly growth rate
	1992	2017	1992-2017	1992-2017
<i>Total cost (TC)</i>	247.1	357.0	374.1.0	0.13
<i>Net Loans (q_l)</i>	1334.8	4241.9	3898.0	0.16
<i>OEA (q_s)</i>	1320.5	1836.0	1547.1	0.14
<i>Cost of funds (w_i)</i>	0.293	0.027	0.067	0.02
<i>Cost of aggregate input (w_s)</i>	0.569	0.012	0.034	0.00
<i>Size (assets)</i>	2970.6	6679.9	5624.4	0.14
<i>Div. index</i>	0.569	0.695	0.008	0.02
<i>Equity/deposits</i>	0.221	0.139	0.029	0.09
<i>HHI</i>	0.369	0.073	0.069	-0.05

Notes: Values of total cost and outputs are reported in \$mil.

Figure 2: Bank numbers and shares, 1992-2017



Note: The left axis displays the market shares while the right axis shows the number of banks.

As the table and figure show, the sector is growing over the period of observation, with size, output and cost measures all increasing, along with the number of banks. The increase in the number of banks explains the decrease in HHI which in turn could explain the reduction in net interest margins observed in Figure 1, a signal of increased competitiveness. The very low levels

of concentration support the notion that the Vietnamese banking sector is rather fragmented. Loans are the main output whereas other earning assets account for a smaller proportion. The growth rate in outputs is larger than the growth in input prices and total costs suggesting a possible improvement in efficiency. Banks are getting better capitalised and better diversified, which should mean lower risk. Although state banks remain the largest on the market their share diminishes significantly over time whilst the share of private domestic banks increases. The number and share of foreign banks is also increasing but it remains very small.

5. Estimation results

The main results from the estimation of Equations (4) and (5) are reported in Table 2. The table shows key coefficient estimates and significance levels, inputs and outputs elasticities, returns to scale, the average efficiency level and the (average) marginal effect that inefficiency determinants have on the mean of inefficiency. The cost function meets its theoretical monotonicity requirements; price and output variables are all highly significant translating into positive and significant elasticities as expected. Mildly decreasing returns to scale are experienced on average, especially at the beginning of the time period (not in the table) when fewer larger banks are in the sector (Figure 2). As the number of banks increases economies of scale also improve to reach constant returns towards the end of the time series. Input and output elasticities change significantly over time, with the production of loans becoming relatively cheaper than that of other earning assets. Increases in the diversification degree of the asset portfolio and in equity to deposits ratio are both associated with lower total costs. This suggests that banks should further diversify their activities rather than focusing mainly on lending. It also supports the stricter policies on minimum capital requirements, as higher capital levels are evidently improving the perceived safety of credit institutions thereby lowering their borrowing costs. Costs tend to slowly decline over time, starting at the very beginning of our time series. The two dummies capture the regulatory changes following the Asian Financial crisis (D_1) and the years after 2007 (D_2). This is an important year for Vietnam not only because of the Great Financial Crisis but also because of the country's joining of the WTO and the introduction of further regulatory changes – among which a significant opening to foreign banks. The results indicate that these changes overall affect the sector positively by reducing the costs of production although the pace of technological improvements appears to slow down. We interpret this slower pace in light of the entry of new banks and foreign banks in particular, whose superior technological and management skills can take time to spill-over to the sector. Finally, higher levels of concentration also have a cost

reducing effect, which can be understood in the context of a rather fragmented banking sector with very low levels of concentration especially towards the end.

Table 3. Main results from the estimation of Equations (4) and (5).

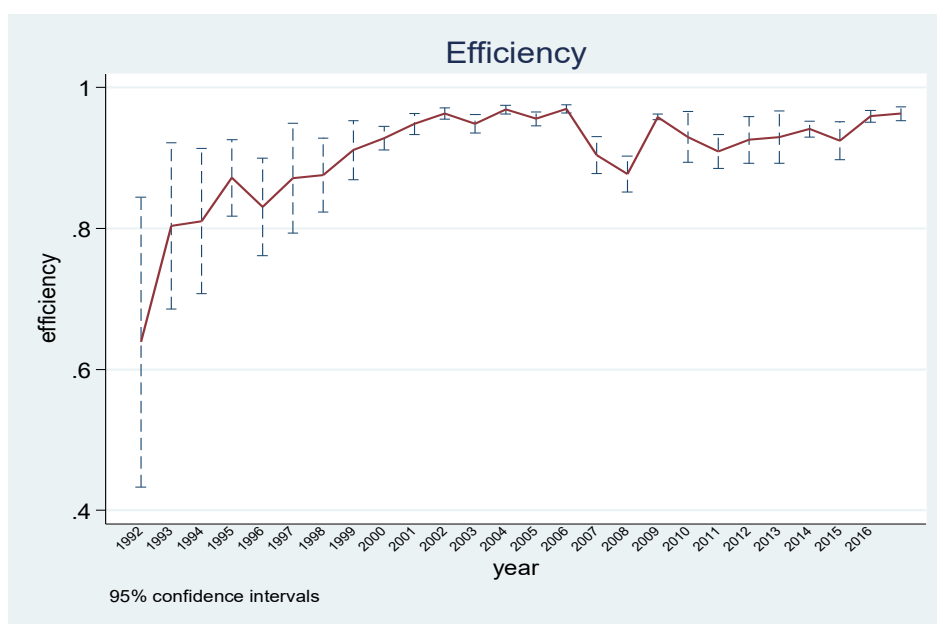
	Coefficient	P-value		Coefficient	P-value
Frontier					
t	0.024	0.214	HHI	-3.993	0.000
tt	-0.004	0.000	t*ln(q1)	-0.003	0.005
D₁	-0.672	0.000	t*ln(q2)	0.003	0.021
D₂	-1.620	0.000	t*ln(w)	-0.005	0.008
tD₁	0.106	0.000	Div.	-0.155	0.000
tD₂	0.099	0.000	Eq/dep	-0.168	0.000
GDP	-0.063	0.000			
Elasticities					
q1	0.597	0.000	w1	0.742	0.000
q2	0.435	0.000	w2	0.258	0.000
Elasticity of scale	0.969	0.000			
Inefficiency determinants (marginal effects) and mean inefficiency					
Size	-0.016	0.023	HHI	0.078	0.732
State	0.015	0.576	D₁	-0.055	0.040
For	0.062	0.000	D₂	0.144	0.000
t	-0.010	0.000	Average efficiency	0.926	

We now turn our attention to the determinants of inefficiency.¹¹ Average efficiency is quite high (92.6%) and it increases slowly but significantly at an average rate of 1% a year, from 63% in 1992 to 96.2% in 2017. More detail is offered in Figure 3, which shows the yearly average efficiency levels and their 95% confidence interval. As we can see, efficiency increases are quite sustained especially at the beginning and continue until the Global Financial Crisis, when they suffer a notable fall, to resume thereafter. These results are in line with those of Vu and Turnell (2010),

¹¹ Recall that a negative sign indicates an increase in efficiency and *viceversa*.

Nguyen et al (2014) and Nguyen et al. (2016). The early sustained growth is reflective of the country first abandoning the mono-tier banking system and beginning proper commercial banking. Further improvements take place after the AFC and the regulatory change introduced at the time. The introduction of the Credit Institution Act and the law on asset classification and provision caused banks to pay more attention to quality asset management. Furthermore, resources allocation became more efficient since the State gradually reduced its intervention in credit allocation. This improvement however turns into a decrease after 2007, probably as a result of various factors. The GFC comes to mind first although Asian banking systems were relatively sheltered from it. More likely culprits are the sharp reduction in real estate prices that took place at the time and the technological improvements discussed above, which make the frontier on average more difficult to reach. The negative effects of the crisis seem to overshadow any potential positive effects of the reforms of the time, but the positive trend restarts subsequently.

Figure 3. Average efficiency scores, 1992 to 2017

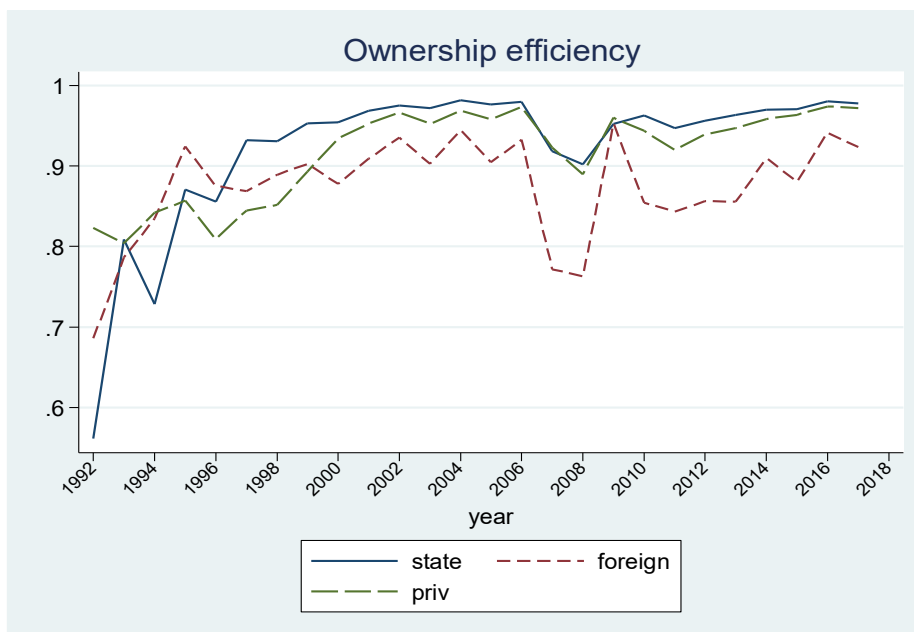


In line with other literature on Vietnamese banks we find that larger banks are more efficient (the average elasticity of size is 1.6%) although higher levels of concentration are not significant. Given the technology results it is possible that larger banks might be benefiting from lower costs and higher efficiency via better output quality and better diversification, rather than via scale

advantages that seem to have been exhausted. The more recent consolidation wave could therefore be beneficial to the sector in that respect.

Finally, the results on ownership structure indicate that on average foreign banks are less efficient than domestic private banks, whereas no significant difference between public and private ownership is found. It is interesting to look into this more carefully, and we report their average efficiency patterns in Fig 4. The figure shows that foreign banks, who have always been subject to strong operational limits in Vietnam, are the most efficient group at the very beginning of our time series. This is a time when the local system is starting to learn commercial banking, having only just abandoned the mono-tier system and still being centrally managed by the State. Despite the limits to their operations foreign banks sought the increased business opportunities (Molyneux et al, 2013) and exploited their superior skills. This advantage is however short lived. The subsequent rounds of reform, including privatizations and stock market listings, have clear beneficial effects for local banks, both public and private. FBs never regain their top position and suffer more from their relative small number, small size and the home advantage effect, while the new products and technologies benefit local banks (Nguyen et al 2016).

Figure 4: efficiency changes over time of different banks



6. Conclusions

This paper analyses the changes in cost efficiency and their determinants for Vietnam commercial banks over the period 1992-2017. The time period is the longest ever analysed for the country and runs from the very beginnings of the transition, when Vietnam abandoned the mono-tier system, through two big financial crises and significant financial reforms. Financial reforms took place in the late 90s and in the late 2000s, in response to widening criticisms about the inefficiency and unprofitability of the sector and to meet the requirements related to joining the WTO. These reforms consisted of increased liberalization and opening to foreign banks and foreign capital; but also of stricter forms of regulation and supervisory control, higher capital requirements and better accounting rules. Regulatory changes and plans are still ongoing to increase the banking system's efficiency and competitiveness, which are crucial to the continued economic growth of the country. In this paper we analyse if and how cost efficiency has in fact increased over the period of analysis and evaluate a series of potential determinants of such changes. This allows us to draw clearer policy implications about the effectiveness of the reform path Vietnam has embarked upon.

Our results show that as the sector grows, technological improvements take place and costs overall decrease, helped by increased diversification in outputs, deregulation and higher capital levels. Cost efficiency increases throughout the period of observation. The steeper increases are observed at the beginning of transition when banks have more scope for improvement. During this time foreign banks are the most efficient group, despite the limits to their number and operational freedom. The end of the 90s and the introduction of the first financial reforms bring a further improvement in efficiency; this continues to grow at a slower pace during the 2000s except in 2007, when the negative effects of the economic crisis possibly overshadow any positive effects of the reforms. Foreign banks are no longer the most efficient group, with domestic banks exploiting the benefits of deregulation and of the home advantage. In other words, the combination of liberalization and re-regulation policies has positive effects on cost efficiency, consistent with other international evidence (Pasiouras et al, 2009). Furthermore, we find that larger banks are more efficient, possibly due to their better diversified portfolios. This suggests that although we do not find increasing returns to

scale,¹² the more recent consolidation wave could still benefit a sector that according to some has become too fragmented (ADB, 2014; IMF 2018).

Overall we can conclude that the transition experience of the banking sector in Vietnam is producing positive results. Financial reforms, with further opening to foreign capital and technologies, better diversification and the progressive adaptation to international accounting and regulatory standards are having the expected beneficial effects and could go some way in helping the system overcome its inherited inefficiency problems.

¹² These results are of course all relative, as this is a single country analysis. It would be interesting for future work to compare the performance of Vietnamese banks with that of other banking systems, especially with regards to the existence of returns to scale.

References

- ADB (2014). *Vietnam Financial Sector Assessment, Strategy and Road Map*. Asian Development Bank.
- ADB (2015). *Financial Soundness Indicators for Financial sector stability in Vietnam*. Asian Development Bank.
- Battese, G.E., & Coelli, T. (1988). "Prediction of Firm-level Technical Efficiencies with a Generalized Frontier Production Function and Panel Data". *Journal of Econometrics*, 38(3), 387-3.
- Berger, A.N., & Mester, L.J. (2003). "Explaining the Dramatic Changes in Performance of US Banks: Technological Change, Deregulation, and Dynamic Changes in Competition". *Journal of Financial Intermediation*, 12(1), 57-95.
- Casu, B., Ferrari, A., Zhao, T., (2013). "Regulatory Reform and Productivity Change in Indian Banking". *Review of Economics and Statistics*, 95 (3), 1066-1077.
- Casu, B., Deng, B., Ferrari, A. (2017). "Post-Crisis Regulatory Reforms and Bank Performance: Lessons from Asia". *European Journal of Finance*, 23 (15), 1544-1571.
- Chan, S., Abd Karim, M., Burton, B., Aktan, B. (2014). "Efficiency and Risk in Commercial Banking: Empirical Evidence from East Asian Countries". *The European Journal of Finance*, 20(12), 1114-1132.
- Chan, S.G., Koh, E.H.Y., Zainir, F., & Yong, C.C. (2015). "Market Structure, Institutional Framework and Bank Efficiency in ASEAN 5". *Journal of Economics and Business*, 82, 84-112.
- Chen, X., Skully, M., & Brown, K. (2005). "Banking Efficiency in China: Application of DEA to Pre- and Post-Deregulations Era: 1993-2000". *China Economic Review*, 16, 229-245.
- Coelli, T. (1995). "Estimators and Hypothesis Tests for a Stochastic Frontier Function: A Monte Carlo Analysis". *Journal of Productivity Analysis*. 6(3), 247-268.
- Fu, X. & Heffernan, S. (2009). "The Effects of Reform on China's Bank Structure and Performance". *Journal of Banking & Finance*, 33, 39-52.
- Gilbert, R.A., Wilson, P.W. (1998). "Effects of Deregulation on the Productivity of Korean Banks". *Journal of Economics & Business* 50: 155-155.
- Goyal, J., & Aggarwal, A. (2018). "Efficiency and Technology Gaps in the Indian Banking Sector: Application of Meta-Frontier Directional Distance Function DEA Approach". *The Journal of Finance and Data Science*. <https://doi.org/10.1016/j.jfds.2018.08.002>.
- Greene, W.H. (2005). "Fixed and Random Effects in Stochastic Frontier Models". *Journal of Productivity Analysis*, 23(1), 7-32.
- Gulati, R., & Kumar, S. (2016). "Assessing the Impact of the Global Financial Crisis on the Profit Efficiency of Indian Banks". *Economic Modelling*, 58, 167-181.

- IMF. (2018). *Vietnam*. IMF Country Report No. 18/215.
- Kumbhakar, S.C., & Sarkar, S. (2003). "Deregulation, Ownership, and Productivity Growth in the Banking Industry: Evidence from India". *Journal of Money, Credit, and Banking*, 35(3), 403-424.
- Kumbhakar, S.C., & Wang, D. (2007). "Economic Reforms, Efficiency and Productivity in Chinese Banking". *Journal of Regulatory Economics*, 32(2), 105-129.
- Laeven, L. (2005). "Banking Sector Performance in East Asian Countries: The Effects of Competition, Diversification and Ownership". *Washington: World Bank*.
- Leightner, J.E., Lovell, C.A.K. (1998), "The Impact of Financial Liberalisation on the Performance of Thai Banks". *Journal of Economics and Business* 50,115-131.
- Lin, X., & Zhang, Y. (2009). "Bank Ownership Reform and Bank Performance in China". *Journal of Banking & Finance*, 33(1), 20-29.
- Luo, Y., Tanna, S., & Vita, G.D. (2016). "Financial Openness, Risk and Bank Efficiency: Cross-Country Evidence". *Journal of Financial Stability*, 24, 132-148.
- Molyneux, P., Nguyen, L.H., Xie, R. (2013). "Foreign Bank Entry in South East Asia". *International Review of Financial Analysis*, 30, 26-35.
- Nguyen, K.M., Giang, T.L., & Nguyen, V.H. (2013). "Efficiency and Super-efficiency of Commercial Banks in Vietnam: Performances and Determinants". *Asia-Pacific Journal of Operational Research*, 30(1), 1-19.
- Nguyen, T.P.T., Roca, E., & Sharma, P. (2014). "How Efficient is the Banking System of Asia's Next Economic Dragon? Evidence from Rolling DEA Windows". *Applied Economics*. 46(22), 2665-2684.
- Nguyen, T.P.T., Nghiem, S.H., Roca, E., & Sharma, P. (2016). "Bank Reforms and Efficiency in Vietnamese Banks: Evidence Based on SFA and DEA". *Applied Economics*. 48(30), 2822-2835.
- Pasiouras, F., Tanna, S., Zopounidis, C. (2009). "The Impact of Banking Regulations on Banks' Cost and Profit Efficiency; Cross-country Evidence", *International Review of Financial Analysis* 18: 294-302.
- Sanyal, P., Shankar, R. (2011). "Ownership, Competition, and Bank Productivity: An Analysis of Indian Banking in the Post-reform Period". *International Review of Economics and Finance*, 20, 225-247.
- Sathye, M. (2003). "Efficiency of Banks in a Developing Economy: The case of India". *European Journal of Operational Research*. 148(3), 662-671.
- Schmidt, P., & Lin, T.F. (1984). "Simple Tests of Alternative Specifications in Stochastic Frontier Models". *Journal of Econometrics*. 24, 349-361.

- Stewart, C., Matousek, R., & Nguyen, T.N. (2016). "Efficiency in the Vietnamese Banking System: A DEA Double Bootstrap approach". *Research in International Business and Finance*, 36, 96-111.
- Vu, H., & Nahm, D. (2013). "The Determinants of Profit Efficiency of Banks in Vietnam". *Journal of the Asia Pacific Economy*, 18(4), 615-631.
- Vu, H.T., & Turnell, S. (2010). "Cost Efficiency of the Banking Sector in Vietnam: A Bayesian Stochastic Frontier Approach with Regularity Constraints". *Asian Economic Journal*, 24(2), 115-139.
- Wang, H.-J., & Schmidt, P. (2002). "One-Step and Two-Step Estimation of the Effects of Exogenous Variables on Technical Efficiency Levels". *Journal of Productivity Analysis*, 18(2), 129-44.
- Wang, H.-J. (2003) "A Stochastic Frontier Analysis on Financing Constraints on Investment: the Case of Financial Liberalization in Taiwan". *Journal of Business & Economic Statistics*, 21, 406-419.
- WB. (2018). *Taking Stock: An update on Vietnam's recent economic developments - Special focus: Facilitating Trade by Streamlining and Improving the Transparency of Non-Tariff Measures*. Vietnam Taking Stock. Washington, D.C: World Bank Group.
- Williams, J. & Nguyen, N. (2005). "Financial Liberalisation, Crisis, and Restructuring: A Comparative Study of Bank Performance and Bank Governance in South East Asia". *Journal of Banking & Finance*, 29(8), 2119-2154.
- Zhao, T., Casu, B. & Ferrari, A. (2010). "The Impact of Regulatory Reforms on Cost Structure, Ownership and Competition in Indian Banking". *Journal of Banking & Finance*, 34, 246-254.