



ECONOMIC FREEDOM AND BANK EFFICIENCY: EVIDENCE FROM VIETNAMESE COMMERCIAL BANKS

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ABSTRACT

This study applies the overall economic freedom index and its components derived from the Heritage Foundation to examine their effects on the efficiency of Vietnamese commercial banks. We first obtained efficiency scores of 39 banks in Viet Nam using data envelopment analysis (DEA) for the period 2010–2018, with 299 observations. The efficiency scores were then regressed on economic freedom indexes by employing a truncated regression model combined with bootstrapped confidence intervals, at the same time controlling for bank-specific characteristics. We find that economic freedom impacts positively on the efficiency of banks in the Vietnamese banking sector. Other economic freedom counterparts (property rights, business freedom, and freedom from corruption) also have positive correlations with banks' performance, whereas, by regressing all counterparts together, we find a negative effect of financial freedom on bank efficiency. In addition, both credit risk and capitalization are found to have positive effects on bank efficiency.

1. INTRODUCTION

Efficiency is an important aim of most businesses, including banks. And, Bank efficiency is a widely discussed topic because of its vital role in creating a stable and profitable banking sector, which impacts on economic growth in every country. The perspective that an individual's freedom to pursue their own economic goals leads to efficient outcomes is as instinctive as economic theory itself, and thus we see that most countries hold economic freedom as their ultimate goal. However, most recent studies have focused only on the relationship between economic freedom and economic growth.

Fewer studies have been carried out the effects of economic freedom on the banking sector, which is one of the most important financial intermediaries playing a role in providing funding sources for economic growth (Ferreira, 2015). From theoretical viewpoint, though economic freedom helps to motivate the financial environment, leading to the establishment of efficient financial system, the relationship between economic freedom and financial activities still remains vague (Terpilih, 2010).

For example, one of the components of economic freedom is financial freedom, but its effect on emerging markets is not easily

determined, as it relies on reforms and conditions of financial constraint in the markets (Ağca et al., 2007). Lou et al. (2016) find that high levels of openness lead to shrinkage in banks' performance due to lack of up-to-date technologies, skills, and high levels of competition and knowledge. Greater freedom and openness also lead to higher levels of dependence on each other and fragility of the global banking sectors, including credit risk and economic and information shocks (Anginer et al., 2016), which may impact on bank efficiency.

In contrast, Ashraf (2017) finds that greater freedom increases a bank's development levels by reducing costs and bank credit risk. This author also finds that freedom helps to remove barriers to trade and stimulate lending diversification, which creates more demand for bank credit and stimulates banks' opportunities for growth. Banks tend to have greater profitability and efficiency in countries that have high levels of economic freedom (Tennant and Sutherland, 2014). A study by Ahamed (2017) shows that the entry of foreign banks adopting a policy of economic freedom will improve the host country's banking system because of "technology spillover" effects, which positively impact on the performance of financial institutions.

In Viet Nam, particularly recently, the Association of Southeast Asian Nations (ASEAN) banking system has been preparing for multilateral liberalization in advance of 2020. Therefore, we expect the Vietnamese banking system to achieve greater levels of liberalization, freedom, and integration after 2020. This highlights the importance of understanding the impact of economic freedom on banks' efficiency in order to formulate appropriate strategies for maintaining a stable and efficient banking system in the long term. In this spirit, this study examines the impact of

economic freedom on the efficiency of Vietnamese commercial banks over the period 2010–2018 with unbalanced data. To do this, we use a two-step approach:

Step 1: Efficiency scores are estimated using data envelopment analysis (DEA); these efficiency scores are a measure of technical efficiency (TE).

Step 2: Bank efficiency scores are regressed against an array of economic freedom variables and other bank-specific factors in a truncated regression model combined with bootstrapped confidence intervals. This method is suggested by Simar and Wilson (2007). Finally, we carry out a sensitivity analysis using a fractional logit estimator for a robustness check.

The remainder of the study is organized as follows: Section II presents a literature review of economic freedom and bank efficiency; Section III presents the methodology and data; Section IV discusses the results; and Section 5 presents our conclusions.

2. LITERATURE REVIEW

Using the economic freedom indexes, many studies have been carried focusing on the effects of economic freedom on growth (Gwartney, 2009; De Haan and Sturm, 2000) or been used to consider the effects on various aspects of the economy (Roychoudhury and Lawson, 2010). A common thread that economies enjoying a high degree of economic freedom can achieve better economic outcomes. And in banking literature, economic freedom indexes have also been used as control variables in various contexts (Roychoudhury and Lawson, 2010).

Further research has been developed over the last twenty years measuring bank efficiency using econometric and linear programming techniques (Berger et al., 1993; Berger and Humphrey, 1997). Because the changes in the regulatory and operating environment render

banks more concerned about controlling their costs while optimizing revenues, we have seen a surge in bank efficiency studies. Moreover, in the aftermath of the global financial crisis, achieving high levels of efficiency while minimizing the cost has become a critical factor for the survival of banks. Besides, the global financial crisis has put many controversial issues such as regulation, capital requirements, and government interference in the financial industry. People argue that the deregulation of banks and financial institutions is a fundamental reason that led to the crisis, and we need more restrictions on banking activities. However, others think that the seeds of the crisis were sown by a particular set of restrictions rather than deregulation because limited financial freedom may have encouraged banks to create opaque new instruments and miscalculate risk.

Following this path, many studies have analyzed the effects of economic freedom on the efficiency of the banking business. Although there are no existing theoretical models that explicitly analyze the impact of economic freedom on bank efficiency, based on the fundamental tenets of economic theory, as far as we know, the relationship is clearly understood: the greater the degree of freedom, the greater the level of efficiency, as, with fewer constraints on companies controlling their costs, business is therefore more effective. There are numerous studies whose findings support this ideal. For example, Chortareas et al. (2013) investigate the relationship between financial freedom and bank efficiency. This study of economic freedom was drawn from the Heritage Foundation database, with a sample of commercial banks from the 27 European Union (EU) member countries collected between 2001 and 2009. The author uses the DEA method to estimate the efficiency scores of banks in Step 1, then, in Step 2, he uses a truncated regression

model combined with bootstrapped confidence intervals to regress the efficiency scores with the economic freedom variables. This paper finds a positive and significant effect of economic freedom on bank efficiency in terms of cost advantages: the higher the level of freedom of an economy, the greater the benefits that banks enjoy, especially in countries with more open political systems and more enlightened governance. Investigating the effects of risk measures on bank efficiency in countries with few liberal policies, Sun and Chang (2011) use a heteroscedastic and non-monotonic stochastic frontier analysis (SFA) approach. These authors find that if a country is less open, this increases the liquidation or switching costs, which may seriously decrease bank performance and may even result in a bank experiencing a loss. Adopting the SFA approach to estimate the efficiency frontier of banks in sub-Saharan African countries, Chen (2009) concludes that banks can improve their profit efficiency as a result of the liberalization of technology spillover effects. Furthermore, banks in a country with higher levels of freedom tend to have more opportunities to extend their business in order to obtain economies of scale and scope, leading to higher levels of efficiency. Economic freedom brings more opportunities for banks to enter the credit market and make contact with overseas customers, which may improve bank performance and technology, as well as developing strategies and gaining globalization experience, thus enhancing overall bank profitability (Prasad et al., 2003). Baggs and Brander (2006) investigate the effects of liberalization on profitability and financial leverage using Canadian data arising from implementation of the Canada–US Free Trade Agreement. They show a positive relationship between freedom of flow of bank credit to the private sector and bank performance. Moreover, Ashraf (2017) uses a panel dataset of 287 key

banks from 37 emerging countries for the period 2000–2012. He finds that freedom increases banks' development levels by decreasing cost and bank credit risk, because freedom helps to remove barriers to trade and stimulate lending diversification, which creates more demand for bank credit and enhances banks' opportunities for growth. The author identifies that these results for bank efficiency are driven by the benefits deriving from greater openness to trade and reforms that bring greater liberalization of the financial sector.

On the other hand, however, some researchers argue that excessive degrees of freedom might cause banks to take more and greater risks that, in turn, might lead to poor performance or, even worse, cause another global financial crisis. Numerous studies find that economic freedom can direct banks to take more risks, and so have a calamitous effect on bank performance. For example, Sufian and Habibulla (2014) explore the impact of economic freedom on the efficiency of banks in Malaysia. Using the two-stage approach: computing the efficiency score using the DEA method and the bootstrap regression to examine the impact of economic freedom on bank efficiency, the authors find that greater business freedom tends to reduce the efficiency of a bank's operations. This finding suggests that policy-makers and regulators need to act by setting greater limits on the activities that banks might undertake. During the liberalization period, Baggs and Brander (2006) suggest that banks clearly tend to increase the scale of their operations, thus exposing themselves to greater risk. As a result, a failure of operations management is usually the all-too-inevitable result. This is associated with weak governance, which degrades banks' performance. The data of Aebi et al. (2012) shows that, as a result of the introduction of liberalized policies but lacking modern technology and the experience and competitive

advantages of emerging countries, it is easy for banks in these countries to take on evermore risk and experience periods of low returns. Furthermore, Lou et al. (2016) assess the interrelationships between financial openness, bank risk, and bank profit efficiency using a cross-country sample of 2007 commercial banks covering 140 countries for the period 1999–2011. Their paper investigates the potential reverse Granger causality between financial openness and bank profit efficiency using SFA. Their results indicate that financial openness reduces bank profit efficiency directly because the banking systems of emerging economies do not make use of sufficiently up-to-date technologies, transparency, and the power of competitive and financial specialization to compete with overseas banks. Gulamhussen et al. (2014) study of a sample of 384 listed banks from 56 countries between 2001 and 2007 argues that liberalization among emerging countries causes banks depend on each other (co-dependence). Therefore, greater economic freedom and less control by governments are not always ideal. Government intervention is usually mentioned in order to justify avoiding monopolies gaining ever greater power or banks taking excessive risks (Freixas and Santomero, 2004). The evidence suggests that regulation of the economy plays an important role in determining the efficiency of banks' operations in different countries (Barth et al., 2006). Freixas and Jorge (2008) find that monetary policies changes because policies become more liberalized, which can bring uncertainty shocks, and thus negatively impact banks' financial performance.

The evidence for the impact of economic freedom on bank efficiency is therefore conflicting and insufficient, which has thus motivated us to contribute to the literature on this subject.

3. METHODOLOGY AND DATA

3.1 Methodology

3.1.1 Measuring Bank Efficiency

Concepts of Efficiency are varied and diverse, depending on what the efficiency is being related to. However, there are two popular approaches to measuring bank efficiency: Financial ratios and the DEA approach. The use of financial ratios has few drawbacks; for example, financial ratios have to be compared with a standard agreed by consensus, although constructing this standard may be difficult. Therefore, we measure bank efficiency scores by applying the DEA method.

Although Farrell (1957) is seen as a pioneer in developing the piecewise-linear convex hull approach, this method was further developed by Charnes, Cooper and Rhodes, who coined the term DEA (1978). DEA- is a non-parametric linear programming model, which involves the construction of a non-parametric production frontier that relies on real input-output for a given sample of banks. DEA model can be constructed by using either constant returns to scale (CRS) or variable returns to scale (VRS) assumptions. However, for the purpose of our

$$\text{Tec}^{\wedge}_i = \min_{\text{Tec}^{\wedge}_i, \lambda} \{ \text{Tec} > 0 \mid y_i \leq \sum_{i=1}^n y_i \lambda; \text{ and } \text{Tec}^{\wedge}_i x_i \geq \sum_{i=1}^n x_i \lambda; \lambda \geq 0 \}, \quad i=\{1, \dots, n\} \text{banks}$$

where:

variable returns to scale (VRS): constraint $\sum_{i=1}^n \lambda = 1$ (convexity)

input oriented option

y is a vector of bank outputs

x is a vector of bank inputs

λ is a $N \times 1$ vector of constants

Tec^{\wedge}_i is a technical efficiency score for the i th bank. $\text{Tec}^{\wedge}_i = 1$ indicates that the bank is

technically efficient, while $\text{Tec}^{\wedge}_i < 1$ means that a bank is inefficient. In order to discuss the DEA method, let us assume that the data consists of S inputs and M outputs for each bank, and x_i and y_i vectors for the i th bank are as presented below:

study, we employ the input-oriented VRS assumption to measure the efficiency scores because the CRS assumption is only valid when all banks in the sample are scaled at the optimal level (Banker et al., 1984). Moreover, advances in technology and changes in regulations may have different effects on banks of different sizes, but the VRS assumption allows banks to be modeled at the all levels of technology. The reason why this study uses technical efficiency (TE) as total bank efficiency is to eliminate price changes and simply show banks' operating efficiency. With allocate efficiency (AE), it is difficult to obtain full price information, and VRS allows us to count only TE to avoid scale efficiency (SE) effect instead of pure efficiency (PE). In addition, we apply efficiency with the input-oriented approach because input-oriented option is preferred to the output-oriented. Banks can focus on managing the input levels (costs) rather than basing them on the output levels (Dipasha, 2012).

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3.1.2 Bank Efficiency and Economic Freedom

In Step 2, the bank efficiency scores are regressed with the economic freedom factors.

$$EFF_{k,t} = \alpha + \beta_1 H_t + \beta_2 B_{k,t} + \beta_3 YEAR_t + \varepsilon_{k,t} \quad (1)$$

where:

k represent an individual bank and t represents the time period

EFF: bank technical efficiency scores, measured using the DEA method and bounded between 0 and 1

H is a vector of economic freedom indicators derived from the Heritage Foundation

$H_i = (INDEX, FINFREE, GOVERNINDEX, PROPERTY, CORRFREE, BUSINESS)$

INDEX: Economic freedom index; *FINFREE*: Financial freedom index; *GOVERNINDEX*: Government spending index; *PROPERTY*: Property rights index; *CORRFREE*: Freedom from corruption index; *BUSINESS*: Business freedom index

B_k is a vector of bank-specific characteristics for each bank

$B_{k,t} = (EQAS_k, ROAE_k, LNTA_k, CR_k)$

EQAS: level of capitalization; *ROAE*: profitability; *LNTA*: bank size; *CR*: credit risk

YEAR_t is a yearly dummy variable controlling for macroeconomic and technical changes

$\varepsilon_{k,t}$ is the error term.

Because the DEA method generates efficiency scores that significantly depend on each other, employing the DEA scores for the second regression step might violate the basic model assumption required by the regression model. Conventional approaches to inference are invalid due to the complicated and unknown serial correlation among the estimated efficiencies. To solve Equation (1), we apply the method of Simar and Wilson (2007) in Step 2. The idea behind this method is demonstrated below:

$$Tec^{\wedge}_i = E_i \beta + \varepsilon_i$$

where:

Tec^{\wedge}_i are the technical efficiency scores estimated from the DEA method for bank *N* at time *t*

E_i is an environmental variable vector representing the efficiencies among banks

β is a parameter vector

ε_i is the statistical noise.

The procedure has a single and a double bootstrap (Algorithm #1 and Algorithm #2, respectively). In order to carry out this study, we apply Algorithm #1 with the recommended 2000 bootstrap replications.

3.2 Data

Data is collected from the Bankscope database, which was provided by Bureau Van Dijk, and is considered to be the most comprehensive research on banking. In total, there are 39 commercial banks in Viet Nam for the period 2010-2018, with 299 observations. Some financial statements have not provided or published sufficient data. Those years when banks do not publish sufficient data are ignored, which is why there is unbalanced data in this study. In addition, economic freedom indexes are derived from the Heritage Foundation. There are two major data sources to measure economic freedom, namely the Economic Freedom of the World Annual Reports produced by the Fraser Institute and the Index of Economic freedom created by the Heritage Foundation and the Wall Street Journal. Both indexes are highly credible and their results are compatible in general. Although the Economic Freedom of the World has been used frequently in the literature, in this paper we use the Heritage Foundations's index of Economic Freedom for practical purposes because one of its components measures the "financial freedom". While the Index of Economic Freedom focuses explicitly on the components of financial freedom, the corresponding counterpart of the Economic Freedom of the World focuses on the "regulation of credit".

For Step 1, estimating the efficiency scores of banks using the DEA method, we choose input and output variables according to the intermediation approach because this approach

takes account of the cost of interest, which contributes to half of a bank’s operating expenses. Furthermore, adopting this approach is suitable for determining marginal efficiency, as it takes account of the earning possibilities of financial intermediaries. As a basic principle,

minimizing expenses is necessary in order to maximize profits. There are three input variables, *X1*, *X2*, and *X3* and two output variables, *Y1* and *Y2*. The variables are described below.

Table 1. Description of variables for bank efficiency

Variable	Observations	Mean	Std Dev.	Min.	Max.
<i>X1</i>	299	1486.638	2221.365	42.929	14530.02
<i>X2</i>	299	1461.044	4980.227	28.19981	136730
<i>X3</i>	299	8155.195	10612.46	177.9683	5518.15
<i>Y1</i>	299	108377.9	176767.8	2695.293	1006442
<i>Y2</i>	299	2160.073	10485.81	0	125655

Sources: Banks’ annual reports and authors’ own calculations.

Notes: *X1*: Staff costs (including wages, salaries and social security costs, pension costs and other staff costs, and expenses of staff stock options); *X2*: Total fixed assets (total value of property, plant, and equipment); *X3*: Interest expenses (including interest expenses on customer deposits, other interest expenses, and preferred dividends paid and declared); *Y1*: Total loans (including net loans deducted for reserves for impaired loans); *Y2*: Total other earned assets (earned assets not otherwise categorized, including noncurrent assets held for sale that are not for loans). Unit of measurement: Billion VND (Vietnamese đồng)

Economic Freedom Variables

In Step 2, the economic freedom indicator is introduced in regression Model (1) to examine the impact of economic freedom on the performance of the Vietnamese banking sector. In addition, we have selected five other economic freedom components that are closely related to the banking sector. These six indicators are described below.

Economic freedom index (INDEX) is an accumulative measure from 12 different viewpoints for a country’s economic freedom,

obtained by multiplying the 12 economic freedom counterparts. It ranges in value from 0 to 100. The highest value indicates the most conducive economic environment.

Financial freedom (FINFREE) measures the level of freedom of banks in relation to expanding credit, accepting deposits, and conducting financial operations in a country.

Government spending (GOVERNEXP) considers the degree of government expenditure as a percentage of gross domestic products (GDP). Higher levels of government spending indicate enhanced government involvement in the economy. No attempt has been made to identify the optimal level of government expenditure. The ideal level will vary from country to country, depending on factors ranging from culture to geography and the level of development.

Freedom from corruption (CORRFREE) is based on quantitative data that assesses the perception of corruption in index the business environment, including levels of governmental, legal, judicial, and administrative corruption. Freedom from corruption is expected to

promote equitable treatment and greater efficiency.

Business freedom (BUSINESS) is an overall indicator of the efficiency of government regulation on businesses. The quantitative score is derived from an array of measurements of the difficulty of starting, operating, and closing a business. The business freedom score for each country is a number between 0 and 100, with 100 equaling the freest business environment. Business procedures that restrain business entry and reduce competition may affect bank performance through spillover effects.

Property rights (PROPERTY) measures the degree to which a country’s laws protect private property rights and how the government enforces those laws. Property rights protect the rights of borrowers and lenders, and thus facilitate lending. The better these are for collaterals and the protection of banks’ rights for lenders and borrowers, the more efficient they are in enforcing contracts, as well as lowering costs and improving bank efficiency.

Bank-Specific Factors

We include four bank-specific variables that are widely employed by policymakers and practitioners in many regression models.

As equity (*EQAS*) is a cushion against assets malfunction; this ratio measures the amount of protection afforded to a bank by the equity in which it invests. The higher this figure, the more protection it has. Capitalization is one of the common determinants most analyzed in bank efficiency studies.

Return on average equity (*ROAE*) is a measure of the return on shareholder funds. The higher this figure, the better the performance expected. A large number of studies have focused on *ROAE* as an explanatory variable of efficiency. Our expectation in this study is that banks with higher returns are able to provide better services, which improves efficiency.

Bank size (*LNTA*): The natural logarithm of a bank’s total assets is used to capture the size effect. This variable is used in many regression models to analyze bank efficiency.

Credit risk (*CR*) indicates the degree to which a bank’s risk management policies are capable of safeguarding assets. This variable is a common incontestable determinant of efficiency in many studies. Because we have a theoretical trade-off between risk and efficiency, banks need to determine when they should extent credit or create more loans for customers.

Table 2. Overview of explanatory variables to regress in Step 2

Variable	Acronym	Description	Mean	SD	Source
Dependent variable	<i>EFF</i>	Bank’s technical efficiency score	0.826	0.185	Calculated from DEA (Step 1)
Independent variable	<i>INDEX</i>	Index of economic freedom	51.665	1.181	Heritage Foundation
	<i>FINFREE</i>	Financial freedom	33.010	4.595	Heritage Foundation
	<i>GOVERNINDEX</i>	Government spending	73.177	2.918	Heritage Foundation

Variable	Acronym	Description	Mean	SD	Source
Bank-specific control variables	<i>PROPERTY</i>	Property rights	21.632	13.279	Heritage Foundation
	<i>CORRFREE</i>	Freedom from corruption	28.139	2.046	Heritage Foundation
	<i>BUSINESS</i>	Business freedom	64.509	1.442	Heritage Foundation
	<i>EQAS</i>	Shareholders' equity/total assets	0.105	0.084	Bankscope
	<i>ROAE</i>	Return on average equity	0.083	0.079	Bankscope
	<i>LNTA</i>	Natural logarithm of total assets	11.368	1.183	Bankscope
	<i>CR</i>	Total loans/total assets	0.537	0.133	Bankscope

Source: authors' own calculations.

4. RESULTS AND DISCUSSION

4.1 Bank Efficiency and Economic Freedom

In order to examine to what degree economic freedom affects the banking sector in Viet Nam, we regress the TE scores on the economic freedom indexes, along with the specific-bank variables in Equation (1). The equation is estimated by the method of Simar and Wilson (2007), which is a bootstrap truncated

regression model with 2000 replications. Table 3 presents the parameter estimates and their bootstrapped confidence intervals. Each model (from 1 to 6) in the table shows the result derived from alternative economic freedom variables while controlling for the bank-specific control variables. The last model tests that all of the economic freedom variables are significant or not in a group.

Table 3. Results of truncated regression
Truncated regression with bootstrap analysis

Dependent var : eff	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Years: 2010–2018							
Economic freedom variables							
<i>INDEX</i>	0.0489**	–	–	–	–	–	–
<i>FINFREE</i>	–	–0.0039	–	–	–	–	–0.0054***
<i>GOVERNINDEX</i>	–	–	–0.0020	–	–	–	–0.0003
<i>PROPERTY</i>	–	–	–	0.0063**	–	–	0.0064*
<i>CORRFREE</i>	–	–	–	–	0.0278**	–	0.0263**
<i>BUSINESS</i>	–	–	–	–	–	0.0122**	0.0112**
Bank-specific variables							
<i>EQAS</i>	0.6785*	0.7565*	0.7429*	0.6792*	0.6931*	0.7305*	0.6455*
<i>ROAE</i>	0.2883	0.4083	0.3925	0.3769	0.3974	0.3798	0.3924**
<i>LNTA</i>	–0.0098	–0.0050	–0.0067	–0.0068	–0.0027	–0.0124	–0.0064
<i>CR</i>	0.3321*	0.3300*	0.3329*	0.3604*	0.3389*	0.3386*	0.3649*
Constant	–1.7902	0.7196*	0.7478	0.4900**	–0.1954	–0.0794	–0.7025
Year dummies							
2010	0	0	0	0	0	0	0
2011	–0.1220**	–0.0561	–0.0471	–0.0452	–0.0437	–0.0544	–0.0469

2012	-0.0760	-0.0148	-0.0200	-0.0039	-0.0099	-0.0081	-0.0183
2013	-0.2267*	-0.1775*	-0.1704*	-0.1614*	-0.2015*	-0.1681*	-0.2024*
2014	-0.1891*	-0.1548**	-0.1415***	-0.1363**	-0.1340**	-0.1424**	-0.1588**
2015	-0.1255	-0.0524	-0.0251	-0.0405	-0.1410***	-0.0355	-0.1691
2016	-0.2058***	-0.0217	-0.0080	-0.0208	-0.1131	0.1981	-0.0991
2017	-0.1410***	-0.0364	-0.0296	-0.2263**	0.0129	-0.0290	-0.1859***
2018	-0.1838**	-0.0491	-0.0474	-0.2248**	-0.1203***	-0.0648	-0.3152*
Observations	299	299	299	299	299	299	299

Notes: *INDEX* = Economic freedom overall; *FINFREE* = Financial freedom; *GOVERNINDEX* = Government spending; *PROPERTY* = Property rights; *CORRFREE* = Freedom from corruption; *BUSINESS* = Business freedom; *EQAS* = Equity/assets; *ROAE* = Returns on average equity; *LNTA* = Ln of total assets; *CR* = Total loans/total assets; Constant = Constant term; Year dummies: 2010–2018. Estimation of the models is based on Simar and Wilson (2007) with Algorithm #1, using 2000 bootstrap replications for the confidence intervals of the estimated coefficients.

* $p < 0.01$ significance from 0 to 1% level according to bootstrap confidence intervals.

** $p < 0.05$ significance from 0 to 5% level according to bootstrap confidence intervals.

*** $p < 0.1$ significance from 0 to 10% level according to bootstrap confidence intervals.

The economic freedom (*INDEX*) coefficient is positive and statistically significant **at the 5% level** in the first model. The estimation reveals reasonable evidence that higher control and restriction levels in the economy can contribute considerably to decreasing bank efficiency. This result is consistent with recent empirical evidence that considers the impacts of economic liberalization and different types of reforms on the financial sector (e.g., La Porta et al., 1998; Fries and Taci, 2005), and previous studies about the positive link between economic freedom and bank performance (e.g., Chortareas et al., 2013; Sufian and Habibullah, 2010). In fact, a person might expect that they are more likely to engage in competition when working in financial sectors without constraining environments. Sun and Chang's (2011) study of the effects of non-progressive policies on the banking sector suggests that lower levels of openness might increase liquidation and switching costs, seriously decreasing bank efficiency and exposing banks to potentially greater losses. Simultaneously, the empirical findings come as no surprise because economic freedom plays a crucial role in creating a suitable environment for entrepreneurship to thrive and innovate so as to achieve prosperous and stable economic growth and development (Holmes et al., 2008). Hence, a freer economy will lead to economy growth, and a prosperous economy is a condition for bank development, which is demonstrated by many studies, such as that of Daly and Zhang (2014), which shows that the demand for bank loans rises in a period of economic growth, leading to improved efficiency in banks' lending. A study by Aydemir and Ovenc (2016) finds that economic growth is associated with bank credit, especially in the private sector. This means that prosperity and economy growth generate more bank credit, which may enhance bank performance. Therefore, in a prosperous economy, we expect the banking

sector to be more efficient because of the advantages of economies of scales and scope, and thus generate more income. This expectation is consistent with the assumption of *classical economics theory*. Economic freedom has a tendency to promote incentives, productivity efforts, and the effective use of resources. Economists in the past, such as Adam Smith (1776/1937), also argued that the main factors for economic growth are free markets to regulate themselves by means of competition, supply and demand, and self-interest. Heavy regulation limits opportunities, and thus economic freedom.

Turning to the other components of economic freedom, the results also show significant and positive links between bank efficiency and property rights, freedom from corruption, and business freedom, which are dealt with in Models 4, 5, 6, and 7, respectively (5% and 1% significance levels).

If banks work in an environment that is conducive to the protection of property rights, they will achieve greater efficiency in productivity. Higher quality collateral and property rights could efficiently protect the rights of lenders and borrowers, as well as help banks to enforce contracts effectively, which might all contribute to decreasing banks' costs and improving bank efficiency. The quality of the legal framework relates to enforcement of contracts and how protection of property rights is crucial for banks (Chen, 2009). Another theory explaining this relationship between property rights and bank efficiency is the *theory of property rights* by Demsetz (1967). Such protection provides incentives for borrowers and lenders and reduces the costs of protection, ensuring property rights so that each investor devotes fewer resources toward protecting the value of their property. They then have more opportunities to choose which options will deliver the most efficient returns. Property

rights theory is based on the impact of rights assignment of investors' decision-making by allocating resources efficiently.

Vietnamese banks that operate with higher levels of openness (business freedom) tend to have higher efficiency levels. This result implies that entrepreneurs have greater ability to obtain licenses for starting, operating, and closing businesses, which enhances bank performance in Viet Nam. This result is consistent with the observation of Sufian and Habibullah (2010) regarding economic freedom and bank performance in China. This could be explained by the fact that greater freedom for entrepreneurs to start businesses is conducive for job creation. This empirical finding is also consistent with findings of the study by Cannals (1993). Recapping, Cannals points out that new business units influence the performance of the banking sector considerably due to the revenue generated by these businesses contributing to banks' profits. Therefore, the higher the level of business freedom, the fewer the constraints on and procedures for setting up new businesses, leading to evermore new businesses being set up and affecting bank performance.

Less freedom from corruption often leads to inefficiency, possibly through bureaucracy, wastage, and lower productivity, since banks function as an interrelated lending party, which connects firms and individuals. Freedom from corruption in the business environment, governmental administration, and legal and judicial procedures has a significantly positive impact on the efficiency of Vietnamese banks. The key theory, *law and finance*, was pioneered by La Porta et al. (1998), who argue that corruption might be harmful for bank lending. Banks are encouraged to be more willing to grant loans and extend lending under the protection of legal institutions that help to execute the enforcement of contracts. If borrowers default, banks will then try their

utmost to claim repayment or chase collateral and take control from the borrower (if a corporate loan, for example). Then, the legal institutions will take action to exert their power. However, if corruption brings uncertainty for banks regarding how they claim from their defaulting borrowers, banks will lose their willingness to extend their loans. In the end, this will impact on bank efficiency.

Financial freedom is weakly correlated with bank efficiency at the 10% level of significance (a negative sign in the last model). The empirical finding from this study is, to a certain extent, also supported by that of Laeven (2005), who suggests that *diversification costs* are costs that are greater than the advantages gained from economies of scale, as determined from data for banks in East Asian countries. Though banks attempt to generate diversification income instead of focusing on traditional banking business, stepping into new businesses in different segments needs careful management and experience, whereas banks in developing countries have a tendency toward poor management and lack of transparency (Boadi, 2018). Therefore, a weak negative coefficient of the financial freedom variable is reasonable, given the "dark side" of diversification among banks in the Vietnamese banking sector. However, the result should be interpreted with caution, as the coefficient of the variable is only significant at the 10% level and when we control for all economic freedom counterparts.

Turning to the bank-specific control variables, the results show that capitalization (*EQAS*) has a positive sign and is significant at the 1% level in all models. In fact, this finding is not really surprising, given that it is supported by the literature, which argues that better levels of capitalization help to alleviate *agency problems* (Mester, 1996) (a common conflict between managers and shareholders). Furthermore, higher levels of capital may contribute to

reducing financial distress, and even the expected costs of bankruptcy, thus raising earnings and efficiency (Berger, 1995). The effect of profitability (*ROAE*) on bank efficiency is positive and significant in the last model only, which tests all of the economic freedom counterparts. However, in the remaining models, this variable is not significant for bank efficiency. Finally, the ratio of total loans to total assets, or credit risk (*CR*), is also positive and significant for bank efficiency. One suggestion explaining this result is the assumption that banks with greater loan amounts will feel greater risk pressure and will therefore strive to apply more efficient management in order to cope with credit risk, hence promoting bank efficiency.

4.2 Sensitivity Test

For reasons of ensuring robustness, we re-estimate the Step 2 regression results using

another estimation method—the fractional logit estimator (Papke and Wooldridge, 1996). We justify this additional analysis based on the argument by McDonald (2009), who confirms that DEA efficiency scores are impossible truncated outcomes. The fractional logit estimator was developed by Papke and Wooldridge (1996) with quasi-likelihood estimation.

Table 4 summarizes the key findings of the fractional logit estimation, in which we find similar positive and significant effects of the economic freedom index, property rights, freedom from corruption, and business on the efficiency of the banking sector. Moreover, capitalization and credit risk also have significantly positive signs on bank efficiency.

Table 4. Results of the sensitivity test

Fractional logit – Quasi-likelihood estimation method

Sensitive test Eq.							
Dependent var : eff	(1)	(2)	(3)	(4)	(5)	(6)	(7)
Years: 2010–2018							
Economic freedom variables							
<i>INDEX</i>	0.3355*	-	-	-	-	-	-
<i>FINFREE</i>	-	-0.0491	-	-	-	-	-0.0591*
<i>GOVERNINDEX</i>	-	-	-0.8255	-	-	-	-0.2387
<i>PROPERTY</i>	-	-	-	0.0344*	-	-	0.0350*
<i>CORRFREE</i>	-	-	-	-	0.2414*	-	0.1975**
<i>BUSINESS</i>	-	-	-	-	-	0.1599*	0.1502*
Bank-specific variables							
<i>EQAS</i>	0.2358**	0.2389*	3.7681**	0.2278**	0.2614*	0.1732***	2.3670*
<i>ROAE</i>	2.4075***	2.4540**	0.7560	2.486**	2.5680**	2.4642**	1.901
<i>LNTA</i>	1.8156	2.378***	0.3231*	1.7504	1.6977	1.9299	0.1956**
<i>CR</i>	2.6388*	2.6008*	2.4548*	2.8064*	2.5966*	2.5609*	2.7957*
Constant	-19.3034*	-0.8589	-1.2033	-3.0841*	-9.3365*	-11.5970*	-25.1588*
Year dummies							
2010	0	0	0	0	0	0	0

2011	-0.7070**	-0.2829	1.2375	-0.19820	-0.1523	-0.2957	-0.5426***
2012	-0.7818**	-0.4374	-6.1451	-0.3160	-0.3525	-0.3629	0.4748
2013	-1.0554*	-0.8438*	-1.6337**	-0.6894**	-1.0407*	-0.7557**	-1.0636*
2014	-0.9960*	-0.8926*	-2.4531***	-0.6901**	-0.6697**	-0.7739**	-0.7466**
2015	-0.7170	-0.3304	2.8950	-0.1001	-1.0228**	-0.1616	-1.7308*
2016	-1.4923**	-0.3100	1.1283	-0.2225	-1.0907*	0.1342	-1.0441**
2017	-1.1072**	-0.4061	0.5700	-1.4348*	0.0454	-0.3597	-1.3505*
2018	-1.3955*	-0.4517	-1.2033	-1.4247*	-1.1960*	-0.6430**	-2.3310*
Observations	299	299	299	299	299	299	299

Notes: *INDEX* = Economic freedom overall; *FINFREE* = Financial freedom; *GOVERNINDEX* = Government spending; *PROPERTY* = Property rights; *CORRFREE* = Freedom from corruption; *BUSINESS* = Business freedom; *EQAS* = Equity/assets; *ROAE* = Returns on average equity; *LNTA* = Ln of total assets; *CR* = Total loans/total assets; Constant = Constant term; Year dummies: 2010–2018. Estimation of the models is based on the fractional logit estimator of Papke and Wooldridge (1996) – Quasi-likelihood estimation method.

* $p < 0.01$ significance from 0 to 1% level.

** $p < 0.05$ significance from 0 to 5% level.

*** $p < 0.1$ significance from 0 to 10% level.

Though in the truncated regression we find a negative relationship between financial freedom and bank efficiency, with weak evidence at the 10% significance level in the final model (7), in the fractional logit regression this relationship is strongly demonstrated at the 1% level.

5. CONCLUSIONS

5.1 Conclusions and Policy Implications

Economic freedom is a key factor in the development of the banking sector, which is classed as a priority for developing countries, especially in this period of globalization and multi-integrated economies. By using unbalanced data, this study aims to examine the impact of economic freedom on the efficiency of the Vietnamese banking sector. We cover the period between 2010 and 2018, while controlling for a variety of common bank-specific characteristics (size, profitability, capitalization, and credit risk). In order to investigate the effects of economic freedom on banking sector efficiency, we adopt a two-step procedure. In Step 1, the efficiencies of individual banks are evaluated by using data envelopment analysis (DEA), and then, in Step 2, we use a bootstrap truncated regression. The results from the latter suggest that there exists a positive link between economic freedom and bank efficiency in Viet Nam. The evidence also suggests the beneficial effects of different components of economic freedom on bank efficiency, such as property rights, business freedom, and freedom from corruption.

As economic freedom plays an important role in banking performance, the implementation of government policies should not limit economic freedom unduly. Moreover, because of the positive impacts of capitalization on the efficiency of the banking sector in Viet Nam, this study suggests that policy-makers should encourage banks to increase their levels of capital in order to comply with Basel II and with the deadline for banking standards implementation in 2020.

5.2 Limitation

Research on economic freedom is still at an early stage, and therefore much more remains to be investigated. Moreover, many have

criticized the indexes of economic freedom for involving too much ideological bias. As economic freedom does not mean the absence of all government intervention, the economic freedom index includes components that reflect some degree of government importance. A further challenge to research is to consider to what extent is economic freedom good for the banking system.

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