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Economic Freedom on Bank Efficiency: Evidence from Vietnamese Commercial Banks

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Abstract: *This study employs the overall economic freedom index and the index's components which are derived from Heritage Foundation to examine their effects on Vietnamese commercial bank's efficiency. In first step, we obtain efficiency scores of 39 banks in Viet Nam using Data Envelopment Analysis (DEA), over the period 2010-2018 with 299 observations. Then second step, the efficiency scores estimated from DEA method will be regressed on economic freedom indexes, applying truncated regression model combined with bootstrapped confidence intervals while controlling for bank specific characteristics.*
We find that far greater economic freedom positively impacts on the efficiency of banks in Vietnamese banking sector. The other economic freedom counterparts such as the higher the degree of property rights, business freedom and freedom from corruption, the better bank's performance while regress all counterparts together we find a negative effect of financial freedom on bank efficiency. Besides, this study also shows the positive relationship between capitalization and bank efficiency as well as credit risk and bank efficiency

Keywords*: Banks, economic freedom, bank efficiency, DEA, truncated regression bootstrap, Viet Nam*

I. INTRODUCTION

Efficiency is the most important aim of most business including banks, and bank efficiency is a widely discussed topic because of its vital roles in creating a stable and profitable banking sector then impact on economic growth in each country. As a perspective that individual's liberty to pursue its own economic goals will lead to efficient outcomes is as instinctive as the economics theory itself, we have seen that most countries are trying to close to economic freedom. However, most of studies recently just focus on the relationship between economic freedom and economic growth but fewer studies have been carried about effect of economic freedom on banking sector, which is one of the most important financial intermediaries playing an important role in providing funding sources for economic growth (Ferreira, 2015). Theoretically argued, economic freedom helps to motivate the environment leading to efficiency financial system's establishment but the relationship between economic freedom and financial activities still remains vague (Terpilih, 2010).

For example, one of component in economic freedom is financial freedom, and the effect of financial freedom in emerging markets is not easily determined as it relies on kind of reform and conditions of financial constrains in the market (Ağca et al., 2007). Lou et al., (2016) find that the openness with high level leads to shrink of bank performance due to the lack of technologies, skills, the high level of competition and knowledge. Higher freedom and openness also lead to the higher dependence on each other and fragility of banking sectors in the world such as credit risk, economic and information shock (Anginer and Demirguc-Kunt, 2016), which may impact on bank efficiency.

In contrast, Asharf (2017) finds that freedom increases the bank's development levels by decreasing cost and bank credit risk. The author also finds that freedom helps to remove barriers of trading and stimulate lending diversification which creates more bank credit demand and banks' chances to growth. Banks tend to have higher profitability, efficiency in countries that have high economic and freedom (Tennant and Sutherland 2014). A study from Ahamed (2017) also shows that foreign bank entry following freedom policies will improve the host country's banking system because of the "technology spillover" effects which positively impact on the financial institution's performance.

In Viet Nam, particularly this time, the Association of Southeast Asian Nations (ASEAN) banking system has been preparation for the multilateral- liberalization before of the year 2020. Therefore, we expect Vietnamese banking system to achieve higher liberalization, freedom and integration level in 2020. This keys on that the importance to understand the impact of economic freedom on bank efficiency to have appropriate actions for the aim of maintaining stable and efficient banking system for economic development in the long term. This study follows this spirit by examining the impact of economic freedom on the efficiency of Vietnamese commercial banks during the period of 2010 to 2018 with unbalanced data. To do this, we use a two-step approach:

- First step: Estimation of efficiency scores by using DEA (Data envelopment analysis), these efficiency scores are measured by technical efficiency (TE)

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

The rest part of study is organized as follows: section 2 Literature reviews on economic freedom and bank efficiency. Section 3 presents methodology and data, while section 4 discusses results, and section 5 is conclusion.

II. LITERATURE REVIEW

In fact, there are no models exist about economic freedom and bank efficiency. However, with the basic tenets of economic theory, the relationship between them is clearly understand: higher degree of freedom, higher level of efficiency as the less constraints to manage their company in controlling cost, thus business will be more effective. Therefore, we also have many studies supporting for this ideal. For example, Chortareas (2013) investigates the relationship between financial freedom and bank efficiency. This economic freedom had been drawn from the Heritage Foundation database and the sample of commercial banks with 27 European Union member countries collected from 2001 to 2009. The author uses the DEA method to estimate efficiency scores of banks in the first stage, then second stage using truncated regression model combined with bootstrapped to regress the efficiency scores with economic freedom variables. This paper finds a positive significantly effects of economic freedom on bank efficiency in term of cost advantages: higher the level of an economy's freedom, higher the benefits for banks. Especially, it tends to be clearer in which countries with more freedom political systems and governments with higher quality governance. Investigating the effects of low-liberalized policies on banks, Sun and Chang (2011) find that if the openness is lower degree, it can go up the liquidation costs or switching costs which may seriously decrease bank performance and get case of bank's loss. Bank can improve the profit efficiency as a result of the liberalization of Technology spill-over effect (Chen, 2009). Further argument, banks in a country with higher freedom's level tend to have more chances to extent their business to obtain economies of scale and scope leading to be higher bank efficiency. Economic freedom brings more chances for banks to approach credit market and customers from oversea which may improve bank performance, technology, and develop strategies and globalization experience, thus enhancing overall bank profitability (Prasad et al., 2003). Baggs and Brander (2006) also show a proof that an association from higher level of freedom with bank credit to private sectors and higher performance.

On the other hand, definitely others can argue that freedom with excessive degree might make banks to take greater and more risks then in turn might have a bad performance and even worse, causing to the recent global crisis. There are lots of studies find that economic freedom can direct banks to take more risks and destroy bank performance. For example, Sufian (2014) explores the impact of economic freedom on the efficiency of banks in Malaysia. With the two stage approach, computing efficiency score from DEA method then bootstrap regression to examine the impact of economic on bank efficiency, the author finds that the greater business freedom tends to reduce the efficiency of bank's operation. The finding suggests the policy makers and regulators taking action by setting more limits on activities which banks might take. Baggs and Brander (2006) suggest that liberalization period time, obviously banks tend to increase their operation scale then make them take more risk exposures causing of failure of managing their operations. This is associated with the weak governance's corporation impeding bank performance. A data with higher frequency of Aebi et al., (2012) shows that after the introduction of liberalized policies but lack of technology, experiencing and competition advantages in emerging countries, normally banks in these countries are easy to take more risk and have a low-return period. Furthermore, Lou et al. (2016) documents that emerging economy's banking systems do not have enough technology, transparency, power of competitive and financial specialty to compete with oversea banks, therefore association with lower efficiency. In addition to this, Gulamhussen et al., (2014) argue that banks depend on each other (co-dependence) happening with liberalization among emerging countries with exposure more systemic risk as well as insolvency risk. Government intervention is usually mentioned in justification to avoid the monopoly power's development or bank's taking risk excessively (Freixas and Santomero, 2004). Evidences suggest that regulation in economy plays an especial role in the efficiency of bank operation among banking sectors in different countries (Barth et al., 2006). Freixas and Jorge (2008) find that the monetary policy's changes because of policies becoming liberalized and more freedom can bring some uncertainty shocks, and negatively impact on bank financial performance.

III. METHODOLOGY AND DATA

3.1 Methodology

Measure bank efficiency

In first step, we measure bank efficiency scores by DEA method (Data envelopment analysis) with assumption input orientation and variable return to scale.

In order to discuss the DEA method, let assume that the data consists of S inputs and M outputs for each bank, and xi and yi vectors for the *i*th bank will be presented as below:

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

Where:

- Variable Returns to Scale (VRS): constraint $\sum_{i=1}^{n} \lambda = 1$ (convexity)
- Input Orientation option
- y is a vector of bank outputs
- x is a vector of bank inputs
- λ is a Nx1 vector of constant
- $\text{Tec}\hat{}_i$ is a technical efficiency score for the ith bank. $\text{Tec}\hat{}_i$ =1 indicates that the bank is technical efficient, while $\text{Tec}\hat{}_i$<1 mean that a bank is inefficient

The programming of linear has to be solved by *n* times, one by one for every bank in the whole sample.

Bank efficiency and economic freedom

In second step, bank efficiency scores are regressed with economic freedom factors.

$$\mathbf{EFF_{k,t} = \alpha + \beta 1 H_t + \beta 2 B_{k,t} + \beta 3 YEAR_t + \varepsilon_{k,t}} \quad \mathbf{(1)}$$

Where:

"k" is individual bank, and "t" represents for time period

EFF: bank technical efficiency scores, used DEA method to measure and bounded between 0 and 1.

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

H_t = (INDEX, FINFREE, GOVERNINDEX, PROPERTY, CORRFREE, BUSINESS)

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

B_k is a vector of bank specific characteristics for every single 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 DEA method generates efficiency scores which significantly depend on each other. Then, employing the DEA scores for the second step regression might violate the basic model assumption required by regression models. Conventional approaches to inference are invalid due to complicated and unknown serial correlation among estimated efficiencies. To solve the equation (1) we apply a method from Simar and Wilson (2007) in second step. The idea of this method is demonstrated below:

$$\text{Tec}\hat{}_i = E_i\,\beta + \varepsilon_i$$

Where:

- $\text{Tec}\hat{}_i$ is technical efficiency scores estimated from DEA method of bank *N* at the time *t*
- E_i is an environmental variable vector explaining for efficiencies among banks
- β is a parameter's vector
- ε_i is statistical noise

The procedure has a single and double bootstrap (respectively with algorithm#1 and algorithm #2), in order to carry this purpose study, we apply an algorithm #1 with 2000 bootstrap replication as recommendation. The process of algorithm #1 can be summarized below:

(1) Calculating TE scores $\text{Tec}\hat{}_i$ for each bank applying the linear programming DEA with input- oriented
(2) Using the method of maximum likelihood in order to estimate the truncated regression of $\text{Tec}\hat{}_i$ on E_i so that estimate $\beta\hat{}$ of β as well as estimating $\sigma\hat{}_\varepsilon$ of σ_ε

(3) For every bank $i = \{1,\ldots n\}$ keep repeating the further steps from 1 to 3 below with 2000 times to set a bootstrap estimating of $Tec^{\wedge *}_{i,b} = 1,..,2000$

3.1 From the $N(0; \sigma^{\wedge 2}_{\varepsilon})$ distribution and right truncation $(1- \beta^{\wedge} E_i)$ for drawing ε_i

3.2 Computing $Tec^{\wedge *}_{i,} = \beta^{\wedge} E_i + \varepsilon_i$

3.3 Use Maximum likelihood again to estimate the truncated regression of $Tec^{\wedge *}_{i,}$ on $E_{i,}$ yielding estimate $(\beta^{\wedge *}; \sigma^{\wedge *}_{\varepsilon})$

(4) Use bootstrap values $(\beta^{\wedge *}; \sigma^{\wedge *}_{\varepsilon})$ and original values $(\beta^{\wedge}; \sigma^{\wedge}_{\varepsilon})$ to construct estimated confidence interval.

3.2 Data

Data were collected from the Bankscope database which provided by Burau Van Dijk. This one has been considered the most comprehensive research on banking. Totally we have 39 commercial banks in Viet Nam in the period 2010-2018 whereas only 299 observations. Some financial statements have not provided and not published sufficient data. For the year that bank does not publish sufficiently or lack of data will be ignored. That why the data is unbalanced in this study. Besides, economic freedom indexes are derived from Heritage Foundation. For the first step, estimating efficiency scores of banks by DEA method, we choose input and output variables accordingly the Intermediation approach. There are three inputs (X1; X2; X3) and three outputs (Y1; Y2). The variables are described below:

Table 3.1 Description variables for bank efficiency

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

Source: Banks annual reports and authors own calculations.

Note: *X1: staff cost(Including wages, salaries and social security costs, pension costs and other staff costs and expenses of staff stock options) ; X2: Total fixed assets(Total properties, plants and equipment); X3: Interest expenses(Including interest expense on customer deposit, other interest expense and preferred dividends paid and declared); Y1: Total loans(Including Net loans deducted for reserves for impaired loans); Y2: Total other earning assets(Earning assets not otherwise categorized, including non-current assets held for sale which are not for loans). Unit of measurement: billion vnd*

Economic freedom variables:

In the second step, 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. We have selected five other indicators excluding economic freedom index, which are closely related to the banking sector.

Economic freedom index: The Economic freedom index variable (INDEX) is an accumulative measure from 12 different viewpoints for a country's economic freedom by multiplying 12 economic freedom counterparts. It takes value in a scale from 0 to 100, with highest value indicating an economic environment is the most conductive to economic freedom.

Financial freedom: financial freedom index (FINFREE) to measure the bank efficiency as well as a measure of how is independent of financial sector on government controls and interventions. How freedom banks on expanding credit, accepting deposits and conducting operations in a country. To measure how openness of banking industry, this variable is mostly used. The scale of this variable is also in range from 0 to 100.

Government spending: (GOVERNEXP) This index considers the degree of government expenditures as a percentage of GDP. The scale of this variable is also in range from 0 to 100. Higher level of government spending indicates enhanced government involvement in the economy. No attempt has been made to identify an optimal level of government expenditures. The ideal level will vary from country to country, depending on factors ranging from culture to geography to level of development.

Freedom from corruption: Freedom from corruption (CORRFREE) is defined as the failure of integrity in the system, a distortion by which individuals are able to gain at the expense of the whole. This index is based

on quantitative data that assess the perception of corruption (CPI) in the business environment, including levels of governmental legal, judicial and administrative corruption. The scale of this variable is also in range from 0 to 100. Freedom from corruption is expected to promote equitable treatment and greater efficiency.

Business freedom: The business freedom (BUSINESS) is an overall indicator of the efficiency of government regulation of business. 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 also affect bank performance through spillover effects.

Property rights (PROPERTY): It measures the degree to which a country's laws protect private property rights and the degree to which its government enforces those laws. The scale of this variable is also in range from 0 to 100. The property right that reflects to which collateral and bankruptcy law then protects the rights of borrowers and lenders, and thus facilitate lending. Better quality for collaterals and the protection of bank's rights for lenders, those of borrowers or investors, it will be efficient in enforcing contracts resulting in lower costs and improve bank efficiency.

Bank specific factors

We include four bank-specific variables which are widely followed by policymakers and practitioners in the regression models.

As equity (EQAS) is a cushion against assets malfunction, this ratio measures the amount of protection afforded to the bank by the equity they invested in. The higher this figure the more protection it is. Capitalization is one of common determinant mostly carried on studies of bank efficiency.

The return on average equity (ROAE) is a measure of the return on shareholder funds. The higher this figure, expected the better performance. A large number of studies have focused on ROAE as efficiency's explanatory variable. Our expectation on this study realistically is that bank with higher returns are able to gain better services which improve efficiency.

Bank size (LNTA): proxy by the logarithm of the bank's total assets to capture the size effect like advantages for controlling of scale bias. This variable was in the regression models of many studies in bank efficiency.

Credit risk indicates how sufficient of the bank's risk management policies on safeguarding assets. This variable is a common incontestable efficiency's determinant in many studies. Because we have trade-off theory between risk and efficiency, banks need to consider taking this account whenever extent credits or create more loans for customers.

Table 3.2: The overview of explanatory variables to regress in second stage

Variable		Acronym	Description	Mean	SD	Source
Dependent variable		EFF	Bank's technical efficient score	0.826	0.185	Calculated from DEA (first step)
Independent variable	Economic freedom variables	INDEX	index of economic freedom	51.665	1.181	Heritage Foundation
		FINFREE	financial freedom	33.010	4.595	Heritage Foundation
		GOVERNINDEX	government spending	73.177	2.918	Heritage Foundation
		PROPERTY	property rights	21.632	13.279	Heritage Foundation
		CORRFREE	freedom from corruption	28.139	2.046	Heritage Foundation
		BUSINESS	business freedom	64.509	1.442	Heritage Foundation
	Bank-specific control variables	EQAS	shareholder's equity/total assets	0.105	0.084	Bankscope
		ROAE	return on average equity	0.083	0.079	Bankscope
		LNTA	logarithm of total assets	11.368	1.183	Bankscope
		CR	total loans/total assets	0.537	0.133	Bankscope

IV. RESULTS AND DISCUSSION

4.1 Bank efficiency and economic freedom

In order to examine to what degree of economic freedom affects on banking sector in Vietnam, we regress the estimated efficiency scores (TE) from first step on economic freedom indexes along with specific-bank variables in equation (1). The equation is estimated using Simar and Wilson (2007) method – bootstrap truncated regression model with 2000 replications. Table 4.1 below reports the parameter estimates and their bootstrapped confidence intervals. Every model (from 1 to 6) in the table shows the result derived from alternative economic freedom variables while controlling for specific- bank control variables. The last model is to test all the economic freedom variables are significant or not in a group.

Table 4.1: Truncated regression result

Truncated regression with bootstrap analysis

Dependent var : eff	**(1)**	**(2)**	**(3)**	**(4)**	**(5)**	**(6)**	**(7)**
Years: 2010-2018							
Economic freedom variables							
Index	0.0489**	-	-	-	-	-	-
Finfree	-	-0.0039	-	-		-	-0.0054***
Governindex	-	-	-0.0020	-	-	-	-0.0003
Property	-	-	-	0.0063*	-	-	0.0064*
Corrfree	-	-	-	-	0.0278**	-	0.0263**
Business	-	-	-	-	-	0.0122**	0.0112**
Bank specific variables							
eqas	0.6785*	0.7565*	0.7429*	0.6792*	0.6931*	0.7305*	0.6455*
roae	0.2883	0.4083	0.3925	0.3769	0.3974	0.3798	0.3924**
lnta	-0.0098	-0.0050	-0.0067	-0.0068	-0.0027	-0.0124	-0.0064
cr	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

Note: 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 at the 5% level is positive statistically significance in the first model tested. The estimation reveals reasonable evidence that a higher control and restriction's levels in the economy can contribute considerably in decreasing bank efficiency. This result is consistent with an empirical evidence recently which considers the impacts of economic liberalization and type of reforms on the financial sector e.g. La porta et al., (1998); Fries and Taci, (2005) or the previous studies about the positive link between economic freedom and bank performance such Chortareas, (2013); and Sufian, (2010). Actually, a person might expect that when financial sectors working in a less or without constraint environment they would be more likely to engage in competition. A study carried on the effects policies with low-liberalized on the banking sector, Sun and Chang (2011) suggest that lower openness level might increase liquidation's costs and switching costs, turning to seriously decreasing bank efficiency and exposing bank's losses. Simultaneously, the empirical findings come as no surprise since economic freedom is a crucial role to the environment's creation allowing for entrepreneurship to have vital cycle, innovation and keep stability for economic growth as well as prosperous development (Holmes et al., 2008). Hence, more freedom in economy will lead to economy growth, and a prosperous economy is a condition for bank development. The reasons for bank development in this situation are shown in many studies such as Daly and Zhang (2014) show that the bank loan's demand will be raised in an economic growth, leading to improve banking lending efficiency. A study of Aydemir and Ovenc (2016) find that economic growth is associated with bank credit, especially with private sectors. This means that the prosperity and growth of economy will generate more bank credit which may enhance bank performance. Therefore, in a prosperous economy we are no suspect to expect that banking sector would be more efficient because of be able for them to take advantages from economies of scales and scope and generate more incomes. This expectation is consistent assumption with **classical economics theory and economic theory**. Economic freedom has tendency to promote incentives, efforts of productivity, and effective using resources. Economists in the past since the time such Adam smith gives an argument that the main components for economic growth and progress are freedom choosing and supplies. The degree of heavy regulation decreases opportunities and economic freedom, the marketplace should be primary source of protection by performing the role as independent auditors and information services in a banking environment.

Turning to other economic freedom components, the results also document significant and positive links among bank efficiency and property right, freedom from corruption and business freedom. Evidences are in model 4, 5, 6 and 7 at the 5% and 10% significant levels. Firstly, banks in Viet Nam in which the overall environment is conductive to the protection of property right, it will have higher productivity efficiency. This result can be understood as the property right that reflects to collateral and bankruptcy laws will protect the rights of borrowers and lenders, and thus facilitate lending. Higher quality of collateral and property right could efficiently protect the bank's rights for lenders and borrowers and help banks in enforcing effectively contracts, which all might decrease bank's costs, hence can improve bank efficiency. Another theory explaining this relationship between property right and bank efficiency is **The theory of property rights**, such protection provides incentives for borrowers and lenders and decrease protection costs, ensuring property right so as to each investor devotes fewer resources for protecting his or her properties then they have more chances to grab the choice which gains most efficiency and return.

Secondly, banks operating with higher level of openness (business freedom) tend to have higher efficiency level. The result implies that an entrepreneur with more ability to get licenses for starting, operating and closing business will enhance bank performance in Viet Nam. This result is consensus with Sufian (2010) conducting about economic freedom and bank performance in China. This could be explained by the fact that higher freedom for entrepreneurs to start business is conductive a job creations. This empirical finding is also consonance with the previous study of Cannals (1993). Recapping, Cannals (1993) points out those new business units will considerably influence on performance of banking sector due to the revenue generated from

these businesses contributing to banks. Therefore, when the level of business freedom is higher, it is less constraints and procedures for setting up new business, leading to more and more new businesses in country and affecting to bank performance.

Thirdly, less freedom from corruption often leads to inefficiency, possibly through the channels of bureaucracy, wasted and lower productivity. As banks are aware as inter related lending parties which connect firms and individuals. Freedom from corruption such as less corruption in the business environment, governmental administration, legal and judicial procedures, has a significantly positive impact on the efficiency of Vietnamese banks. The key theory pioneered by La Porta et al., (1998) which can argue that corruption maybe harmful for bank lending, is ***the law and finance theory***. Banks are encouraged to take more willingness to grant loans and extent greater lending by legal institutions which protect banks and help to execute contracts enforcement. If borrowers are default, obviously banks will try their best to get the repayment or chase collateral and take control from borrower (if this is corporate loan). Then, the institutions above will take action to exert their power. However, if corruption accompanies with uncertainty for banks to claim their defaulting borrowers, banks will lose willingness to extent their grant loans as obviously. At the end this is no suspect their effects on bank efficiency.

However, the financial freedom is weakly correlated with bank efficiency at 10% level of significance and exhibits a negative sign in the last model. Thus, we should not understand and explain the limited financial freedom as bank regulatory restrictiveness because of inappropriate means. In this study, the more government controlling banks less free to engage in other activities (diversification income) which do not focus on traditional purely banking business, the more efficient banks are. The empirical finding from this study, to a certain extent, can be also supported from Laeven (2005) who suggests that ***diversification costs*** is higher costs than advantages taking from economies of scopes carrying on a data of banks in the East Asian countries. Though banks with an attempt on diversification incomes and instead of focusing on traditional banking business, stepping in a new business with different segments needs well-managing and experiences, whereas banks in developing countries have a tendency as poor management as well as transparency (Boadi, 2018). Therefore, a weak negative coefficient of financial freedom variable is reasonable with the dark side of diversification among banks in Viet Nam banking sector.

Turning to the bank-specific control variables, the result shows that the capitalization (EQAS) has a positive sign and significant at 1% level in all models. In fact, the findings not really surprising as this is supported by literature which argues that better level of capitalization will help to alleviate ***agency problems*** (Mester, 1996) which a common conflict between managers and shareholders. Furthermore, higher level of capital may contribute to reduce financial distress and even bankruptcy expected costs, thus raise earnings and efficiency (Berger, 1995). The effect of profitability (ROAE) on bank efficiency is positive and significant in the last model only in which tests all economic freedom counterparts; however the rest of seven models this variable is not significant with bank efficiency. Finally, the ratio of total loans to total assets or credit risk also carries a positive and significant sign to bank efficiency. A suggestion explaining for this result is assumption that banks with greater amounts of loans will feel more risk pressure and stress on efficient management to cope with credit risk, hence promoting bank efficiency as consequently.

4.2. Sensitive Test

For robustness purpose, we re-estimate the second stage regression model (1) by using another estimation method that is fractional logit estimator (Papke and Wooldridge's 1996). We justify an additional analysis due to argument from Mc Donald (2009). He confirms that DEA efficiency scores are impossible truncated outcomes; it seems that fractional logit process's outcomes because their values are bounded between zero and one and typically not latent variables. Fractional logit estimator is developed by Papke and Wooldridge's (1996) with quasi-likelihood estimation allowing us to have another test for our results if the efficiency estimates are not constructed by Simar and Wilson assumption of data-generation process (DGP)

The table 4.2 below is overall key findings which are same as the truncated regression in second step. Specifically, we find a positive and significantly high effect of economic freedom index; property rights, freedom from corruption and business on efficiency of banking sector. Besides, capitalization and credit risk also have positive and significant signs to bank efficiency.

Table 4.2: Sensitive 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 variable							
Index	0.3355*	-	-	-	-	-	-
Finfree	-	-0.0491*	-	-	-	-	-0.0591*
Governindex	-	-	-0.8255	-	-	-	-0.2387
Property	-	-	-	0.0344*	-	-	0.0350*
Corrfree	-	-	-	-	0.2414*	-	0.1975**
Business	-	-	-	-	-	0.1599*	0.1502*
Bank specific variables							
eqas	0.2358**	0.2389*	3.7681**	0.2278**	0.2614*	0.1732***	2.3670*
roae	2.4075***	2.4540**	0.7560	2.486**	2.5680**	2.4642**	1.901
lnta	1.8156	2.378***	0.3231*	1.7504	1.6977	1.9299	0.1956**
cr	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

Note: 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 Fractional logit 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 10% significant level at the last model (7), in fractional logit regression this relationship is strongly demonstrated at 1% level (model 2 and 7). Beside diversification costs hypothesis above, ***helping hand theory*** of Pigou (1938) can interpret for this case. As banking sector perspective, this view considers that if governments control banks with proper policies, the governments will play as a hand to alleviate failures and flaws in markets. In consequence, enhancing and allocating the resources in markets. This could ensure banks providing efficient financial intermediation between household and firm or between investor

and entrepreneur by setting the limits on non- traditional income activities which banks could undertake and focusing on banking business. Some studies pointing out same result, such Kose et al., (2003) support that bank efficiency in developing countries can be reduce when applying liberalization because of their government effectiveness is weak and institutions are poor.

V. Conclusion

5.1. Conclusion and policy implication

Economic freedom is a key for the development of banking sector which classify as priority of developing countries in improving efficient banking system in the period of globalization and multi- integration economy. By using unbalanced data, this study is aim 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 effects of economic freedom on banking sector efficiency, we approach two-step procedure. First step, the efficiency estimate of individual banks are evaluated by using DEA method (Data Envelopment analysis), then use a bootstrap truncated regression analysis in second stage. The results from the truncated regression bootstrap suggest that a positive link between economic freedom and bank efficiency in Vietnam. The evidence also suggests positive beneficial effects of different components of economic freedom such as property rights, business freedom and free from corruption on bank efficiency.

Because of the positive impacts of capitalization on efficiency of banking sector in Viet Nam, this study suggests that policy makers should encourage banks to increase the bank capital to meet with Basel II and for deadline banking standard implementation in 2020. In hope that the contributions of this study will help the policy makers in formulating banking policies to be harmonious with globalization and liberalization trend of economy. Because of the important role of economic freedom in banking performance, implementation policies from government should not limit economic freedom severely. In spite of that, official regulation and policy makers still should keep eyes on activities which bank could undertake and ensure that banks focus on traditional banking business providing efficient financial intermediation between households and firms.

5.2. Limitation

Research on economic freedom is still at an early stage and therefore much more remains to be further researched. Besides, many criticizes that the indexes of economic freedom constructed is over or too much ideological bias. A further challenge of research is to consider whether excessive economic freedom may contribute to finance crisis or how enough economic freedom for banking system is.

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