The Relationship between Market Power and Income Diversity with Ownership Structure as a Moderator – A Study of Vietnamese Commercial Banks

ABSTRACT

The Project on Restructuring the Credit Institution System in the first period from 2011 to 2015 and the second period from 2016 to 2020 emphasize the important role of reducing the relying on traditional activities and increase the share of income from non-credit services. The paper, therefore, was conducted to examine the relationship between market power and income diversity by using a sample of 26 commercial banks during 2007 to 2017. The market power was proxied by Lerner index, the quotient of non-interest income to total operating income represents the income diversity, and ownership structure plays a role as moderator this relationship. Additionally, bank characteristics and country characteristics were considered to be control and dummy variables. Based on panel data analysis with GMM estimator, the results point out that the bank with greater market power can generate more non-interest income. This relationship, moreover, is impactedbyownership structure, which explains the activities managers and owners do in a bank.For more specific, this paper also highlights the positive impact of state ownership on the association between bank market power and its income diversity. The findings are expected to give some useful implications for investors, bank managers and policy makers.

Key words:Market power, ownership structure, income diversity, Vietnamese commercial banks, Lerner index, GMM.

1. INTRODUCTION

In the modern economy, Vietnamese commercial banks act as intermediaries, carrying out mobilizing idle funds through deposits, current accounts or savings and providing these funds for those needing for production and business activities by loans to earn interest income, so-called the traditional activities. After global financial crisis in 2008, Vietnamese banking system, has no exception in facing with many difficulties from increasing bad debts, lacking of information security losing money in customers' bank account, to mass prosecution of senior bankers, etc.Most of irregularities are related to granting loans without satisfying the safety regulations. Though the Vietnamese market has gradually recovered, leading the increase in credit demand, credit growth is expected to slow down from both the credit limit and the control of capital adequacy ratio (CAR) in accordance with the Basel II Accord along with the

35 require reserve ratio, setting by the State Bank of Vietnam (SBV). Moreover, interest rate is more volatile

36 under the changes of monetary policy from time to time. This is the reason why one of the contents in the

37 Project on Restructuring the Credit Institution Systemin the period from 2011 to 2015 (was approved by

38 the Prime Minister through Decision No. 254/QĐ-TTg dated on March 1st 2012)emphasizes: "Shifting the

39 business model of commercial banks in the direction of reducing the dependence on credit activities and

40 increasing income from non-credit services step by step", dragging on the waves of M&A in this sector

41 since 2011. Recently, the remarkable point of the revised Law on Credit Institution, taking effect on

42 January 15th 2018, is that there is no mandatory ofbuying out a credit institution at "0 VND". Instead, the

43 Law authorizing bankruptcy of credit institutions is specifically controlled in Article 152.

44   All of the revised regulations show the increasing importance of diversifying in the banks' income

45 structure in the context of interest income generated by loans is not really stable, highly sensitive to interest-

46 rate movements, and might contain many risks. Income diversity is also considered to be a proactive

47 strategy, in response to market uncertainties as well as broadening their business to compete with other

48 counterparts.Until now, in Vietnam, there is not much noticed enough to clearly understand why non-interest

49 income varies across banks.The paper's objective, therefore, aims to contribute the existing literature by

50 investigating the relationship between market power and income diversity among 31 Vietnamese commercial

51 banks from 2007 to 2017. During this period, there is a fierce competition in the banking industry with the

52 appearance of new both domestic and foreign players, as well as the accretion of existing banks. Banks with

53 greater market power are believed to have greater bargaining capacity with their customers, leading

54 opportunities to earn more non-interest income(Nguyen et al., 2012a). Moreover, different institutional settings

55 create different incentives in both bank market power and bank income structure. Thus, ownership structure

56 should be concerned as moderator in this relationship with the comparison of two groups of Vietnamese

57 commercial banks: state-owned banks (also called Big 4 banks) and privately-owned banks.

58 **2. MATERIAL AND METHODS**

59 **2.1. Relevant concepts and theories**

60   ***Market power.*** In a perfect market, there is the presence of perfect competition, which is defined as

61 the balance between price and marginal cost, or the quantity supplied for products and services equals

62 the quantity demand at the current market price. No firm has ability to affect the market price by its

63 changing in products and services. If the opposite is true, meaning that the firm is able to raise its price

64 over its marginal cost, it can be said that the firm has market power (Kolomaznikova, 2015).Measuring

65 market power, or the degree of competition, has always been confused to use firm performance, but

66 unfortunately the results can be bias due to the effects of bank-specific and country-specific

67 characteristics (Claessens & Laeven, 2004). From previous literatures, as in any other industries, there

68 has been many ways of measuring competition in banking sector, and these methods can be classified

69 into 2 mainly groups: structural approaches (including the number of firms, the concentration ratios and

70 the HHI) and non-structural approaches (including the Lerner index, the Panzar and Rosse, the

71 conjectural variation, and the Boone indicator).

72   *Income diversity.* Banks' revenues come from two primary sources, the one is so called traditional
73   activities, generating interest income, and the other is non-traditional activities, generating non-interest
74   income. Traditional activities of a bank are defined as the financing of loans with deposits, showing the
75   intermediary role of the bank as transferring funds from depositors to borrowers(Gorton & Rosen, 1995;
76   Rogers & Sinkey, 1999). On the other hand, the most common feature of non-traditional activities is
77   producing fee-based, trading-based, and investment-based income. (Clark & Siems, 2002; Hafidiyah &
78   Trinugroho, 2016; Khan et al., 2017; Nguyen et al., 2012a; Rogers & Sinkey, 1999; Stiroh, 2004).Income
79   diversity in banking sector refers to increasing share of non-interest income within net operating income
80   and reducing the dependence on interest income of a bank.

81   *Ownership structure* should be concerned to discuss the impact of market power on income
82   diversity of a firm. It can explain the activities managers and owners do in a firm. Jesen & Meckling (1976)
83   also agree that organizational form influences operating behaviors, as it defines the nature of residual
84   claims, which is also the motivation of the firm's owners. According to the prior theoretical and empirical
85   literature, the agency problems and risk-taking behavior varies across firms due to the nature of
86   shareholders, especially controlling shareholders, who enjoy significant shared control benefits(Barry,
87   Lepetit, & Tarazi, 2011; Lassoued, Sassi, & Attia, 2016).There are several ways to classified ownership
88   types in banking industry, but the most common classification is based on the ownership structure
89   characteristics or types of shareholders as state (or public) ownership, domestic privately ownership and
90   foreign ownership(Mamatzakis, Zhang, & Wang, 2017). For instance, banks were considered to be state-
91   owned if state shareholders controlled more than 50% of the shares; banks, conversely, with foreign
92   shareholders control more than 50% of the stakes will be treated as foreign ownership(Kosak & Cok, 2008).

93 **2.2. Empirical findings**

94 **2.2.1. Bank market power and income diversity**

95   The prior empirical findings show the relationship between market power and income diversity has
96   been explored already, yet it is still ambiguous(Mensi & Widede, 2015).By investigating several emerging
97   markets as ASEAN, Africa, South Asia, some studies state that market power is a crucial factor,
98   stimulating a bank to identify new growth opportunities to shift from traditional activities to non-traditional
99   activities, thus increase the share of non-interest income in total operating income as well as deliver
100   greater bargaining capacity with their customers(Nguyen et al., 2016, 2012a; Ovi, Perera, & Colombage,
101   2014; Robertho & Wibowo, 2018). In short, these results imply that higher market power generates higher
102   income from non-traditional activities and attracts more non-interest income(DeYoung & Roland, 2001;
103   Lepetit, Nys, Rous, & Tarazi, 2008b). The relationship, moreover, also changes over times. Evidence from
104   five ASEAN member countries consisting of 153 commercial banks data collection in the period from 1998
105   to 2008, M. Nguyen et al. (2012a) also figured out that during and after the Asian Financial Crisis (AFC -
106   in 1997), banks tended to diversify their income into non-traditional services in order to compensate for
107   credit losses. Then, when the market began to recover, interest-based income also plays more important
108   role in the banks' income structure.This is also consistent with the *competition-stabilityview*, supporting

109 that market power and income diversity have a positive association when loan market power results in
110 riskier loan portfolios(Berger et al., 2009; Boyd & De Nicolo, 2005). The pilot, however, was different
111 during Global Financial Crisis (GFC – in 2008 and 2009), holding more market power, banks was better
112 able to manage their non-performing loans(Ovi et al., 2014). Simultaneously, SantiagoCarbó Valverde &
113 FranciscoRodríguez Fernández (2007)find that banks can increase their market power if they diversify
114 their income into non-traditional activities.

115 Nevertheless, based on *quite life theory,*some researchers argue that banks with greater market
116 power and earning higher interest margin may be discouraged from diversifying their income, especially
117 when non-interest income might contain many risks; with the price above the marginal cost due to monopoly
118 power, focusing on loans still generates sufficient profits and benefits from economies of scale when the
119 marginal cost of additional loans is limited to interest expenses, and these banks always try to establish long-
120 term lending relationship with their customers(Berger & Hannan, 1989; DeYoung & Roland, 2001; Hidayat,
121 Kakinaka, & Miyamoto, 2012). The results are also consistent with South Asian Banks. The greater market
122 power banks focus more on traditional interest income generating activities (Nguyen et al., 2012b).

123 **2.2.2. Bank market power, income diversity and ownership structure**

124 Many previous studies also took bank ownership into account when investigating the relationship
125 between market power and income diversity. Banks with different ownership forms (foreign banks, state-
126 owned banks, and privately-owned banks) may diversify their income differently for a given level of market
127 power (Meslier et al., 2014; Nguyen et al., 2016). Arguably, state-owned banks, with the relatively bigger
128 size, scope, financial sources, and customer base, can earn more non-interest income than privately-
129 owned banks, they might obtain higher profits from setting lower deposit rates and charging higher interest
130 rate as well as services fees (Nguyen et al., 2016; Robertho & Wibowo, 2018; Sapineza, 2004). However,
131 some researchers argue that state-owned banks are less efficient and incentive to innovate to expand
132 their business lines (Pennathur, Subrahmanyam, & Ishwasrao, 2012).

133 Similarly, foreign ownership also impacts on the association between market power and income
134 diversity in two opposite ways, namely *the global advantage* and the *home field advantage*. The former
135 shows the positive impacts when foreign banks have many advantages from superior managerial skills,
136 advanced technology and well-trained human resources. The latter theory, on the other hand, states that
137 foreign banks are less efficient because domestic banks have better information about their country's
138 economy, language, laws, politics and local customers (Nguyen et al., 2016).

139 The relationship between market power and income diversity with moderating of ownership
140 structure has already investigated, but the results are heterogeneous, which is the rationale and
141 motivations for this paper. Moreover, the empirical findings show the simultaneous relationship between
142 market power and income diversity. Thus, this paper will employ some methods to test the endogeneity in
143 this relationship, presenting in the following section.

144

145

146 **2.3. Data sources**

147   This paper uses both data of bank-level and country-level. Bank-level data is taken from Thomson
148 Reuter database, financial statements (audited and consolidated) and annual reports of recent 31
149 Vietnamese commercial banks[*] in the period from 2007 to 2017, all other types of banks (including 100%
150 foreign-owned banks, branches of foreign commercial banks, joint-venture banks, etc.) are excluded.
151 However, there are 26 Vietnamese commercial banks have enough data at least eleven-year period of
152 time from 2007 to 2017 (*listed in Appendix 1*). This period will help us investigate all events that have
153 happened as before, during, and aftermath the Global Financial Crisis, especially the M&A waves in
154 Vietnam (since 2011).For the country-level data, this paper, additionally, use secondary data from the
155 State Bank of Vietnam, General Statistic Office, Vietstock.vn, etc. in order to meet the study's objectives.

156 **2.4. Methodology**

157 **2.4.1. Selected variables**

158   •*Dependent variable:Non-interest income.* In order to capture the degree of income diversity*(IND)*,
159 we use the ratio of net non-interest income to total operating income(Nguyen et al., 2016; Ovi et al., 2014;
160 Robertho & Wibowo, 2018; Syahyunan, Iskandar, Hasan, Isfenti, & Gerry, 2017). Net non-interest
161 incomeincludes net profit from services, net gain from trading gold and foreign currencies, net gain from
162 investment and trading securities, net profit from other activities and income from capital contribution/equity
163 investments. Meanwhile, total operating income is the sum of net interest income and net non-interest
164 income (Hidayat et al., 2012; Lepetit, Nys, Rous, & Tarazi, 2008a).

165   •*Independent variable: Market power*. The study uses Lerner index to measure banks' market power,
166 which is widely accepted by many researchers, rather than HHI, concentration ratio, and H-statistics due to
167 its advantages compared to the others. According to Blair & Sokol (2014) the standard measure of market
168 power, at least by economists, has come to be the Lerner index. It is more accurate than market
169 concentration method and H-statistic because it takes the pricing power of the banks into account(Brissimis,
170 Delis, & Papanikolaou, 2008). Coccorese (2009) also supports that Lerner index is a true reflection of the
171 banks' degree of market power when representing the behavioral departure from monopoly and perfect
172 competition. Another reason to employ Lerner index is that it measures market power at a bank-year levelso
173 as to easily overcome the small sample bias problem (Jeon, Olivero, & Wu, 2011) suitable for the scope of
174 this study – only 31 commercial banks in the Vietnamese banking system recently as well as the structural
175 panel data used in this study.

176   In this study, we use the calculation of Lerner index proposed by Berger, Klapper, & Turk-Ariss
177 (2009), also called*the conventional Lerner index(CMP),*defined as the difference between the output price
178 and the marginal cost over the output price, hence interpreted as the higher index presents the higher
179 market power. It takes the form as:$Conventional\ Lerner\ index_{it} = \frac{P_{it} - MC_{it}}{P_{it}}$**(1),** where P_{it} is the average price

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[*] <https://www.sbv.gov.vn/>, accessed on 31st Dec. 2018.

180 of bank production measured by the ratio of total income (including interest and non-interest income) to total
181 assets for bank i at time t.

182 Similarly, MC_{it} is the marginal cost of total assets for bank i at time t. However, it cannot compute
183 directly due to unavailable information. A popular approach is to obtain the marginal cost by taking derivative
184 the following translog cost
185 function: $lnTC_{it} =$

186 $$\alpha_0 + \alpha_1 \ln Q_{it} + \frac{1}{2}\alpha_2 (\ln Q_{it})^2 + \sum_{k=1}^{3} \beta_k lnW_{k,it} + \frac{1}{2}\sum_{k=1}^{3} \gamma_k \ln Q_{it}\, lnW_{k,it} + \frac{1}{2}\sum_{k=1}^{3}\sum_{j=1}^{3} \delta_{kj}\, lnW_{k,it} lnW_{j,it} +$$

187 $$\varphi_1 Trend + \frac{1}{2}\varphi_2 Trend^2 + \varphi_3 \text{Trend} \ln Q_{it} + \sum_{k=1}^{3} \mu_k \text{Trend}\, lnW_{k,it} + \varepsilon_{it} \textbf{(2),}$$ where TC is the bank's total cost; Q
188 is a proxy for the bank's output or bank's total assets; W denotes three input prices of labor (W_1), funds (W_2),
189 and fixed capital (W_3); ε is an error term. Their calculations are as follows. Total cost is the sum of interest
190 expenses, personnel expenses, other operating and administrative expenses. W_1, W_2, W_3 is the quotient of
191 personnel expenses (or staff costs) to total assets, interest and similar expenses to deposits from customers,
192 other operating and administrative expense to fixed assets, respectively. Trend (time trend) is to capture the
193 influence of technical change over time, and ε is the error term. In order to estimate the cost function, fixed
194 effects are employed with robust standard errors to capture the influence of possible unobserved variables.
195 The estimation, as usual, is made under the imposition of restrictions of symmetry and of grade one
196 homogeneity in input prices(Berger et al., 2009; Fu, Lin, & Molyneux, 2014; Joaquin Maudos & Nagore,
197 2005). The bank's marginal cost (MC) is then computed as a first derivation of total cost function obtained from
198 the equation **(2)** above: $MC_{TAit} = \frac{\partial TC_{it}}{\partial Q_{it}} = \frac{TC_{it}}{Q_{it}} \times \left[\alpha_1 + \alpha_2 \ln Q_{it} + \frac{1}{2}\sum_{k=1}^{3} \gamma_k lnW_{k,it} + \varphi_3 \text{Trend}\right]$ **(3).**

199 Nevertheless, the conventional Lerner index assumes banks are able to achieve fully efficient;
200 otherwise, the calculation of conventional approach might bias because banks may exploit pricing
201 opportunities resulting from their market power. Therefore, we also estimate the equation (2) using a
202 stochastic cost frontier approach that takes into account possible cost inefficiencies of banks, so called *the*
203 *adjusted Lerner index (AMP),* which uses maximum likelihood (Antonio, Radu, Mohammad, & Thomas,
204 2018; Koetter, Kolari, & Spierdijk, 2012; J. Williams, 2012). The main difference between two methods is
205 mainly in their technical measurement of marginal cost. Based on the above findings in emerging markets
206 like Vietnam and recent regulations of State Bank of Vietnam, market power and income diversity are expected
207 to show a positive relationship.

208 •*Moderating variable:Ownership structure.*In the Vietnamese market, state-owned commercial
209 banks is believed to be the biggest banks with strong financial resources, wide networks, and various
210 customer base, so they might earn more non-interest income. However, they usually apply lower interests
211 in both loans and deposits than the others, so they might mainly focus on traditional activities, being
212 forced to lend to certain sector or industries for supporting their maximizing social welfare objectives, they
213 might also have fewer incentives to innovate banking's services. Thus, the impacts of ownership
214 structureis still ambiguous. In the scope of this study, for the comparison between government-linked
215 banks and non-government-linked banks, we only concern two types of ownership: state-owned banks

216 and privately-owned banks, excluding foreign-owned banks due to lack of data. Particularly, we concern 3
217 out of 4 state-owned commercial banks (Big 4 banks) and other 23 privately-owned commercial
218 banks.*Ownership structure (OWN)* would be treated as a dummy variable.

219 •*Control and dummy variables.* The paper uses some bank specifics and country specifics as
220 control variables, consisting of *bank size (SIZ), net interest margin (NIM), loans (LOA), deposit (DEP),*
221 *cost efficiency (EFF), capital ratio (CAP), liquidity risk (LIQ), credit risk (CRE), bank age (AGE), GDP*
222 *growth rate (GDP).*

223 Firstly, Bank size and cost efficiencyare said to have positive relationship with income diversity with
224 the rationale of bigger banks tend to have more non-traditional activities, and then generates more non-
225 interest income than smaller banks because they have more opportunities to use new technology, hire
226 and train employees well, and then result in cost savings and more efficiency gain (DeYoung & Rice,
227 2004; Lepetit et al., 2008a; Rogers & Sinkey, 1999).

228 Secondly, net interest margin, loans and deposit represent traditional activities, so they are
229 expected to have a negative relationship with income diversity. A bank with high level of non-traditional
230 activities, it may imply that the loans and deposits, the spread between their interest rates, or both are
231 declining. In this scenario, the measure of non-traditional activities would be inversely related to a measure
232 of profits from traditional activities (Rogers & Sinkey, 1999).

233 The model also controls for bank risks, represented by insolvency risk associated with banks' equity
234 capital, liquidity risk and credit risk. Banks with a higher capital ratio may also earn more income from non-
235 traditional activities because the customers will seek the larger capital banks, which implies less risky
236 banks, for consuming non-traditional services. On the other hand, Liquidity ratio can impact on non-
237 interest income in two opposite ways. If a bank needs a higher liquidity ratio to engage in higher levels of
238 non-traditional activities, their relationship will be positive, otherwise, the bank holds less liquid assets for
239 investing on non-traditional activities. The third one, credit risk is proxied by the ratio of loan-loss provision
240 to total assets. The higher provision, the greater protection against loan losses and smoothing earnings. In
241 this case, the provision and non-interest income are expected to have a positive sign(Aslam, Mehmood, &
242 Sharafat, 2015; Lepetit et al., 2008a; Rogers & Sinkey, 1999).

243 The next one is bank age or the number of years of operating, also might impact on income diversity
244 positively. The longer the bank operates, the higher experience, management skill and number of
245 employees, bigger bank networks through opening more branches, transaction offices, so they might have
246 more opportunities for cross-selling in non-traditional activities(Zarutskie, 2013). Lastly, GDP growth rate,
247 is widely used to evaluate the market' overall economic conditions and it is also expected to have a
248 positive relationship with income diversity because during economic boom banks have more opportunities
249 to expand their services to customers.

250 This study also uses *listed (LIS), crisis years (CRI), merger and acquisition (MNA)* as dummy variables.
251 In Vietnam, listed banks are usually considered to be the largest and best performing banks, so it will be
252 expected to have a positive sign with income diversity (Koutsomanoli & Mamatzakis, 2009; Nguyen et al.,
253 2012a). In crisis years, banks tend to grant loans less and increase their non-traditional activities to

254 compensate their credit loss due to non-performing loans, so there is an expectation of positive impact on non-

255 interest income.Additionally, financial distress also negatively impacts on the ability of banks in attracting

256 deposits from customers (Nguyen et al., 2016, 2012a). In recent years, Vietnam has witnessed many M&A

257 deals in the banking sector, banks after the merger usually have larger capital, wider network, more customers

258 as well as more bad debts. This also force the banks to diversify their income and reduce the relying on loans;

259 therefore, a positive will be expected between M&A deals and income diversity.

260 **Table 1. Variable definitions**

No.	Variables	Symbol	Calculations	Expected sign
Panel A: Dependent variable				
1.	Income diversity	IND	NNI/TOI	
Panel B: Independent variable				
2.	Market power	CMP	Conventional Lerner index	+
		AMP	Adjusted Lerner index	+
Panel C: Control variables				
Bank-specific variables				
3.	Bank size	SIZ	ln(total assets)	+
4.	Net interest margin	NIM	Net interest income/Total earning assets	-
5.	Loans	LOA	Loans to customers/Total assets	-
6.	Deposits	DEP	Deposits from customers/Total liabilities	-
7.	Cost efficiency	EFF	Total cost/Total income	-
8.	Capital ratio	CAP	Total equity/Total assets	+
9.	Liquidity risk	LIQ	Liquid assets/Total assets	+/-
10.	Credit risk	CRE	Provision for loan losses to total assets	+
11.	Bank age	AGE	ln(number or years since establishment)	+
Country-specific variable				
12.	GDP growth rate	GDP	Annual GDP growth rate	+
Dummy variables				
13.	Listed	LIS	1: ListedonHoSE or HNX; 0: otherwise	+
14.	Crisis years	CRI	1: in 2008 and 2009; 0: otherwise	+
15.	M&A	MNA	1: Bank merged; 0: otherwise	+
Panel D: Moderating variable				
16.	Ownership structure	OWN	1: State-owned banks 0: Private-owned banks	

261 **2.4.2. The research modelsand econometric methodology**

262 The association between market power and income diversity is investigated using the specific

263 model as below to test hypothesis H_1: *Market power has a positive effect on bank's income diversity.*

264 **Model 1:** $IND_{it} = \alpha_0 + \beta_1 \times IND_{it-1} + \beta_2 \times CMP_{it} + \beta_3 \times SIZE_{it} + \beta_4 \times NIM_{it} + \beta_5 \times LOA_{it} + \beta_6 \times DEP_{it} +$

265 $\beta_7 \times EFF_{it} + \beta_8 \times CAP_{it} + \beta_9 \times LIQ_{it} + \beta_{10} \times CRE_{it} + \beta_{11} \times AGE_{it} + \beta_{12} \times GDP_t + \beta_{13} \times LIS_{it} + \beta_{14} \times CRI_t +$

266 $\beta_{15} \times MNA_{it} + \varepsilon_{it}$

267 **Model 2:** $IND_{it} = \alpha_0 + \beta_{16} \times IND_{it-1} + \beta_{17} \times AMP_{it} + \beta_{18} \times SIZE_{it} + \beta_{19} \times NIM_{it} + \beta_{20} \times LOA_{it} + \beta_{21} \times$

268 $DEP_{it} + \beta_{22} \times EFF_{it} + \beta_{23} \times CAP_{it} + \beta_{24} \times LIQ_{it} + \beta_{25} \times CRE_{it} + \beta_{26} \times AGE_{it} + \beta_{27} \times GDP_t + \beta_{28} \times LIS_{it} +$

269 $\beta_{29} \times CRI_t + \beta_{30} \times MNA_{it} + \varepsilon_{it}$

270 In order to investigate the moderating effects of ownership structure in the relationship between

271 market power and income diversity, we interact market power with bank ownership dummies. The

272   following model is used in order to test the hypothesis *H₂: State ownership strengthens the relationship*

273   *between market power and income diversity.*

274   **Model 3:** $IND_{it} = \alpha_0 + \beta_{31} \times IND_{it-1} + \beta_{32} \times CMP_{it} + \beta_{33} \times CMP_{it} \times OWN_{it} + \beta_{34} \times SIZE_{it} + \beta_{35} \times$

275    $NIM_{it} + \beta_{36} \times LOA_{it} + \beta_{37} \times DEP_{it} + \beta_{38} \times EFF_{it} + \beta_{39} \times CAP_{it} + \beta_{40} \times LIQ_{it} + \beta_{41} \times CRE_{it} + \beta_{42} \times AGE_{it} +$

276    $\beta_{43} \times GDP_t + \beta_{44} \times LIS_{it} + \beta_{45} \times CRI_t + \beta_{46} \times MNA_{it} + \varepsilon_{it}$

277   **Model 4:** $IND_{it} = \alpha_0 + \beta_{47} \times IND_{it-1} + \beta_{48} \times AMP_{it} + \beta_{49} \times AMP_{it} \times OWN_{it} + \beta_{50} \times SIZE_{it} + \beta_{51} \times NIM_{it} +$

278    $\beta_{52} \times LOA_{it} + \beta_{53} \times DEP_{it} + \beta_{54} \times EFF_{it} + \beta_{55} \times CAP_{it} + \beta_{56} \times LIQ_{it} + \beta_{57} \times CRE_{it} + \beta_{58} \times AGE_{it} + \beta_{59} \times$

279    $GDP_t + \beta_{60} \times LIS_{it} + \beta_{61} \times CRI_t + \beta_{62} \times MNA_{it} + \varepsilon_{it}$

280   where the subscript i denotes bank i while t denotes year t and t-1 is lagged variable, representing

281   the previous year, $\alpha, \beta, \varepsilon$ is the intercept, the regression coefficient, and the error term, respectively. All

282   variables are explained in Table 1.

283   First of all,we report the descriptivestatistics of variables to have a deep understanding of the data

284   set. Next, we conduct a wide of diagnostics including the correlation matrix and, of course, along with the

285   Variance Inflation Factorfor testing multi-collinearity among variable. Then, the paper employs a

286   generalized method of moments (GMM), developed for dynamic panel modes by Arellano & Bover (1995)

287   and Blundell & Bond (1998), to address the simultaneous relationship between market power and income

288   diversity with potential endogeneity issues, indicating that independent variables are not strictly

289   exogenous and might correlated with past and possibly current realizations of the error.

290   The GMM estimator combines moment conditions for the model in first differences with moment

291   conditions for the model in levels. TheGMM is really suitable for the study because the panel data has large

292   N (26 banks) and small T (11 years), meaning few time periods and many individuals; moreover, there is a

293   lag of income diversity in the model because it might be influenced by past one – a dynamic panel data, and

294   its presence gives rise to autocorrelation. This also overcomes fixed effects, heteroskedasticityor

295   autocorrelation within individuals (if any), which makes some traditional methods to analysis panel data as

296   fixed effects, random effects and least squares dummy variable become ineffective and unreliable.

297   **3. RESULTS AND DISCUSSION**

298   **3.1. Descriptive statistics**

299   As mentioned above, this study has the sample of 26 Vietnamese commercial banks over the 11-year

300   period from 2007 to 2017, equivalent to 284 observations (TPB and LPB has data since 2008). Income

301   diversity of Vietnamese commercial banks is not relatively high when non-interest income makes up around

302   23.56% (on average) in total operating income. This implies that income composition has not been

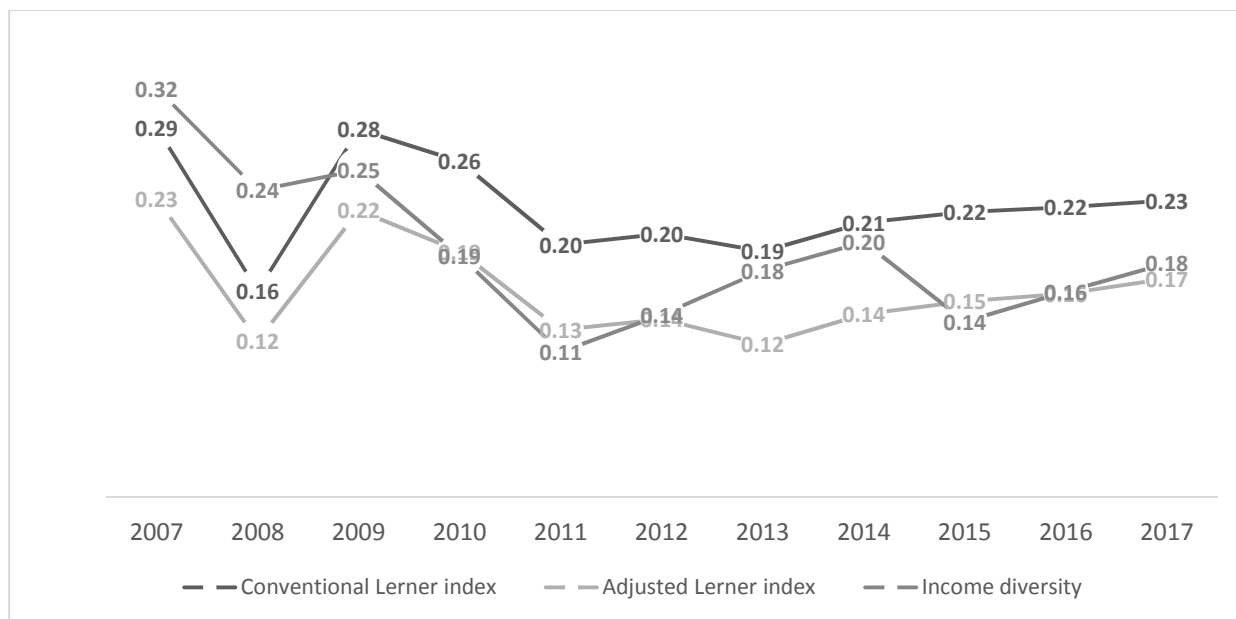303   diversified away from the main contribution of interest income.

Fig. 1. Market power and income diversity of Vietnamese commercial banks

Sources: Authors' collections

The mean of conventional Lerner index in this period is 0.2236 (22.36%) while the adjusted Lerner index is 0.1603 (16.03%), both of them show a fierce competition among Vietnamese commercial banks. Before the M&A waves since 2011, the number of commercial banks in Vietnam increases dramatically, including banks' branches and transaction offices, along with the appearance of 100% foreign-owned banks. The merger of weak banks into big banks since 2011 does not reduce this number, in accordance to World Bank[†], there are over 3 bank branches per 100,000 adults in Vietnam during 2008 to 2015 (of which, the highest value was 3.876 in 2014). The descriptive results for the entire variables are presented in Table 2.

Table 2. Descriptive statistics of variables

Variable	Obs	Mean	Std. Dev.	Min	Max
IND	284	0.2356	0.6990	−0.5516	11.6503
CMP	284	0.2236	0.1831	−0.6297	0.5689
AMP	284	0.1603	0.1354	−0.6241	0.5329
SIZ	284	17.9731	1.2848	14.5267	20.9075
NIM	284	0.0284	0.0119	−0.0075	0.0784
LOA	284	0.5185	0.1326	0.1138	0.8448
DEP	284	0.6757	0.1466	0.2689	0.9668
EFF	284	0.8070	5.0932	0.1619	86.3019
CAP	284	0.1089	0.0622	0.0350	0.4624
LIQ	284	0.3179	0.1315	0.0617	0.8160
CRE	284	0.0051	0.0044	−0.0048	0.0288
AGE	282	2.9028	0.5682	0.0000	4.0943
GDP	284	0.0610	0.0059	0.0525	0.0713
LIS	284	0.2746	0.4471	0.0000	1.0000
CRI	284	0.1831	0.3874	0.0000	1.0000
MNA	284	0.0915	0.2889	0.0000	1.0000

Sources: Authors' calculations

[†]<https://data.worldbank.org/indicator/FB.CBK.BRCH.P5?locations=VN&view=char/>, accessed on 31st Dec. 2018.

3.2. Correlation matrix

The correlation matrix of all variables defined, presented in Table 3, shows that there is a significant multicollinearity between CMP and AMP, but it is not a problem since these two variables will be used separately in order to test the difference of conventional Lerner index and adjusted Lerner index. Additionally, the highest correlations are also found for SIZ with CAP, LIS, and OWN, suggesting that in Vietnam, the bigger the banks are, the less capital ratio the banks have, and they are usually listed and state-owned banks; moreover, LOA is highly correlated with DEP and LIQ, implying that banks could grant more loans if they have sufficient deposits, which might face more liquidity risks. As a result, we should re-estimate 4 models without variable SIZ and LOA in order to avoid multicollinearity issues. After excluding these variables, a VIF test is also conducted to confirm that there is no multicollinearity among variables *(see more in Appendix 2).*

Table 3. The correlation matrix

	IND	CMP	AMP	SIZ	NIM	LOA	DEP	EFF	CAP
IND	1.0000								
CMP	-0.2257	1.0000							
AMP	-0.2954	0.9573	1.0000						
SIZ	-0.0329	0.6808	0.4845	1.0000					
NIM	-0.2829	0.2484	0.3942	-0.0991	1.0000				
LOA	-0.1863	0.2012	0.2419	0.1023	0.3183	1.0000			
DEP	-0.1594	0.1515	0.1321	0.2532	0.1875	0.5723	1.0000		
EFF	0.9705	-0.2946	-0.3680	-0.0455	-0.1908	-0.1723	-0.1583	1.0000	
CAP	-0.0513	-0.3492	-0.1458	-0.7215	0.3486	0.0591	-0.0556	-0.0452	1.0000
LIQ	0.1731	-0.0186	-0.0188	-0.1286	-0.2026	-0.7745	-0.5765	0.1661	-0.0523
CRE	-0.0272	0.3845	0.4285	0.3264	0.4786	0.3355	0.3561	-0.0236	-0.0784
AGE	-0.1698	0.3562	0.2853	0.4932	0.0231	0.3935	0.3222	-0.1889	-0.2479
GDP	0.0287	0.0843	0.1204	0.0536	-0.1347	0.1126	-0.0432	0.0081	-0.1294
LIS	-0.0373	0.4210	0.3256	0.5376	0.0171	0.1966	0.2085	-0.0366	-0.2941
CRI	-0.0001	-0.0140	0.0172	-0.2984	-0.0361	0.0354	-0.0594	-0.0317	0.2291
MNA	0.0201	0.0251	-0.0689	0.3115	-0.2240	0.0802	0.2051	-0.0131	-0.1973

	LIQ	CRE	AGE	GDP	LIS	CRI	MNA
LIQ	1.0000						
CRE	-0.2815	1.0000					
AGE	-0.4677	0.3624	1.0000				
GDP	0.0128	0.0585	0.0714	1.0000			
LIS	-0.2334	0.0230	0.3130	-0.0008	1.0000		
CRI	0.1010	-0.1938	-0.1624	-0.4540	-0.1210	1.0000	
MNA	-0.2228	0.0203	0.1990	0.0861	0.1318	-0.1479	1.0000

Sources: Authors' calculations

3.3. Regression results

3.3.1. The relationship between market power and income diversity

As mentioned above, we apply GMM to address the problem of endogeneity in our research model – between market power and income diversity, so they will be treated as endogenous variables. The difference GMM in two steps is also introduced instead of the system GMM because of the small number of banks collected. Though the system GMM may increase more efficiency, it uses more instruments than the difference GMM, as consequently, the results might break the rule of thumb: *keep number of instruments smaller than number of groups*, which is not appropriate with our dataset. The bank age, the public status of

340 the bank, M&A, or ownership structure as well as macroeconomic variables as GDP and crisis years are not

341 affected by income diversity; therefore, all of them will be treated as exogenous variables.

342 In accordance with Arellano & Bover (1995) and Blundell & Bond (1998), we employ lagged values

343 of both endogenous and exogenous variables as instruments. Finally, our models will be verified again by

344 some diagnostics test as second-order autocorrelation in second differences – AR (2) and Sargan/Hansen

345 test for over-identifying restrictions. The results are presented in Table 4.

346 **Table 4. The relationship between market power and income diversity**

Dynamic panel-data estimation, two step difference GMM Dependent variable: IND				
	Model 1		Model 2	
	Coefficient	t statistics	Coefficient	t statistics
L.IND	0.0298	1.04	0.0172	0.88
CMP	1.1589***	3.21	-	-
AMP	-	-	1.3432***	3.17
NIM	-17.7995***	-4.69	-17.4418***	-5.02
DEP	-0.9926***	-2.87	-0.8717***	-3.17
EFF	0.1260***	7.84	0.1319***	7.91
CAP	4.3675**	2.20	3.9913**	2.20
LIQ	-0.0405	-0.06	-0.1242	-0.20
CRE	16.1699	1.02	11.0006	0.73
AGE	0.3859**	2.18	0.3369*	1.88
GDP	-5.4489*	-1.97	-6.0880**	-2.49
LIS	-0.0452	-0.72	-0.0330	-0.62
CRI	0.0195	0.51	-0.0158	-0.35
MNA	0.0478	0.45	0.0546	0.51
Observations	232		232	
Number of groups	26		26	
No. of instruments	22		22	
p-value:				
AR (1)	0.018		0.032	
AR (2)	0.735		0.740	
Sargan test	0.685		0.753	
Hansen test	0.421		0.612	

347 *Sources: Authors' calculations*

348 *Note: The table also reports number of groups and number of instruments, the test statistics for first*

349 *order (AR (1)) and second order (AR (2)) serial correlation, the Sargan/Hansen test for a validity of*

350 *instruments.*, **, ***indicate significance at 10%, 5%, and 1% level, respectively.*

351 The table presents the positive relationship with market power and income diversity for both

352 conventional and adjusted Lerner index; however, adjusted Lerner index shows a higher significant

353 coefficient, highlighting that Vietnamese commercial banks with greater market power can generate more

354 non-interest incomes, specifically, when market power increases by 1%, resulting in an increase of

355 income diversity by 1.16% (conventional Lerner) or 1.34% (adjusted Lerner). The results are consistent

356 with the literature, which investigates this issue in emerging markets,thus, we strongly support for

357 hypothesis 1 that market power has a positive effect on banks' income diversity.

358

3.3.2. Market power, income diversity and ownership structure

The table below shows the impact of bank ownership structure on the relationship between market power and income diversity. Interestingly, this positive association has been enhanced due to state ownership. This is evident in the positive and statistically significant coefficient for both CMP and CPMxOWNor AMP andAPMxOWN variables, indicating that state-owned banks, with the advantages of the relatively bigger size, scope, financial sources, and customer base, tend to diversify their income into non-traditional activities more than privately-owned ones.

Table 5. Market power, income diversity and ownership structure

Dynamic panel-data estimation, two step difference GMM Dependent variable: IND				
	Model 3		**Model 4**	
	Coefficient	**t statistics**	**Coefficient**	**t statistics**
L.IND	-0.0095	-0.16	0.0009	0.02
CMP	1.3670***	3.72	-	-
CMPxOWN	5.6076**	2.29	-	-
AMP	-	-	1.4418**	2.56
APMxOWN	-	-	5.3883*	1.71
NIM	-17.4808***	-4.09	-14.0100***	-3.75
DEP	-1.0870***	-4.44	-0.6730**	-2.67
EFF	0.1523***	12.21	0.1488***	14.73
CAP	5.9819**	2.61	2.8505	1.29
LIQ	0.4535	0.80	0.0685	0.14
CRE	13.5215	1.52	2.2687	0.46
AGE	1.0044***	4.54	0.5711**	2.41
GDP	-8.3402**	-2.54	-7.0604**	-2.74
LIS	0.1089	1.38	0.1434	0.46
CRI	0.0475	1.35	0.0106	0.23
MNA	0.0838	0.59	0.0128	0.13
Observations	204		204	
Number of groups	26		26	
No. of instruments	26		26	
p-value:				
AR (1)	0.047		0.073	
AR (2)	0.146		0.164	
Sargan test	0.556		0.384	
Hansen test	0.913		0.762	

Sources: Authors' calculations

*Note: The table also reports number of groups and number of instruments, the test statistics for first order (AR (1)) and second order (AR (2)) serial correlation, the Sargan/Hansen test for a validity of instruments. *, **, *** indicate significance at 10%, 5%, and 1% level, respectively.*

Overall, a strong evidence has been found to support the hypothesis 2 that state ownership strengthens the relationship between market power and income diversity. The results are also in the line with (Nguyen et al., 2016, 2012a; Ovi et al., 2014; Robertho & Wibowo, 2018), implying that market power helps banks to exploit growth opportunities in non-traditional businesses, leading to increase the proportion of fee-based incomes in banks' income structure, and fascinatingly, government-linked banks have taken

376 advantages these opportunities and generated more non-interest income than their privately-owned
377 counterparts.

3.3.3. Other results

379   Regarding to bank-specific variables as well as dummy variables, the results are found the same
380 through 4 models. In general, the table 4 and 5 show a negative and significant coefficient for NIM and DEP.
381 As expected, a bank that focuses on non-traditional activities, *ceteris paribus,* the importance of traditional
382 business lines will be reduced, and vice versa. The increase in non-interest income, however, does not fully
383 offset reduction in total income when banks narrow their interest margin in traditional lending and deposit
384 market. This is consistent with most of previous studies(Lepetit et al., 2008a; Nguyen et al., 2016, 2012a;
385 Rogers & Sinkey, 1999). Moreover, we also find out a negative relationship between IND and GDP,
386 indicating the important roles of interest-based income during economic boom. It's understandable because
387 the loan demands are higher when GDP grows faster, leading higher incomes from traditional activities.

388   In addition to these negative relationships, there is evidence of positive relationship between IND and
389 EFF, CAP, and AGE. Except EFF, CAP and AGE are consistent with our prior expectation. Customers
390 prefer less risky banks for consuming non-traditional services because they believe that banks with large
391 capital enough will have a high quality in financial services with advanced technologies employed to ensure
392 safety. Similarly, the older banks have more opportunities for cross-selling, driving customer into using fee-
393 based services with the advantages the higher experience, managerial skill and human capital, and wider
394 bank networks. The expansion intonon-interest income, however, also costs a lot, leading to a positive and
395 significant coefficient of EFF, which is contradictory to the findings of Nguyen et al. (2012a).The other
396 variables as LIQ, CRE, LIS, CRE, MNA, unfortunately, have no significant coefficients.

4. CONCLUSIONS

398   The paper investigates the relationship between market power and income diversity and whether
399 ownership structure moderates this relationship or not in the context of diversifying banks' income structure
400 become a trend worldwide in the past 3 decades, which is also encouraged by the Governor in Vietnam
401 recently. The research problems were explored using the data of26 Vietnamese commercial banks from
402 2007 to 2017. The findings indicate that thanks to greater market power, Vietnamese commercial banks
403 can earn more non-interest income than those with lesser market power due to identifying and executing
404 more opportunities of non-traditional activities.Moreover, this positive association can be impacted by
405 bank ownership structure. Specifically, the state-owned banks have actively diversified their income into
406 non-traditional activities than the privately-owned banks. They areplaying a role as pioneers in
407 implementing the Government Project, launching new products and services to complete and strengthen
408 role of banking industry to support a sustainable economic development as wel as financial system
409 stability. Moreover, they also take the advantages of large capital, wide branch networks along with
410 product scopes, and big customer base to explore the opportunities for cross-selling, contributing the
411 increase in share of non-interest income in the total income.

The findings may be helpful for investors, bank managers and policy makers for their own purposes. Investors should consider with the higher market power and income diversity when buying stocks in banking industry in the context of traditional business lines may contain many risks and unstable. Bank managers should reduce the relying on interest income, change the income structure followed the restructuring projects. To do so, they have to increase their banks' market power first. Moreover, they need control the cost when diversifying their income, especially operating cost, and use their capital effectively in order to invest in depth as developing advanced technology so as to reduce operating cost or develop more non-traditional products and services to serve more customers and earn more non-interest incomes. Bank managers in private ownership must have particular solutions to close the gap with their state-owned counterparts in diversifying the income structure. For policy makers, in the period of market recovering, they should have some encouragement to boost the commercial banks diversify their business linesinstead of focusing on traditional activities, might lead to credit overheating growth with can *"boom"* anytime.

The paper has some limitations. The study just conduct on an industry with small sample is 26 commercial banks in the short period from 2007-2017; therefore, the generality of the study's findings is limited. Further study should increase the sample size by extending to other players in the banking system.

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Appendix 1 – List of Vietnamese commercial banks used in this study

No.	Name	ID	S.E.	No.	Name	ID	S.E.
1	JSC Bank for Investment & Development of Vietnam	BID	HoSE	14	Kien Long JSC Bank	KLB	UPCoM
2	Vietnam JSC Bank for Industry & Trade	CTG	HoSE	15	LienViet Post JSC Bank	LPB	UPCom
3	JSC Bank for Foreign Trade of Vietnam	VCB	HoSE	16	VN International JSC Bank	VIB	UPCom
4	Vietnam JSC Export Import Bank	EIB	HoSE	17	AnBinh JSC Bank	ABBank	OTC
5	Ho Chi Minh Development JSC Bank	HDB	HoSE	18	VN Maritime JSC Bank	MSB	OTC
6	Military JSC Bank	MBB	HoSE	19	Nam A JSC Bank	NamABank	OTC
7	Sai Gon Thuong Tin JSC Bank	STB	HoSE	20	Orient JSC Bank	OCB	OTC
8	VN Technological & Commercial JS Bank	TCB	HoSE	21	Petrolimex Group JSC Bank	PGBank	OTC
9	Tien Phong JSC Bank	TPB	HoSE	22	Saigon JSC Bank	SCB	OTC
10	VN Prosperity JSC Bank	VPB	HoSE	23	Southeast Asia JSC Bank	SeABank	OTC
11	Asia JSC Bank	ACB	HoSE	24	Saigon JSC Bank for Industry & Trade	SGB	OTC
12	National Citizen JSC Bank	NVB	HNX	25	VN Asia JSC Bank	VietABank	OTC
13	Saigon Hanoi JSC Bank	SHB	HNX	26	Viet Capital JSC Bank	VietCapital	OTC

Appendix 2 – VIF test

Variable	VIF	1/VIF
CMP	2.26	0.442212
NIM	2.09	0.479385
CRE	2.06	0.485949
LIQ	2.05	0.486908
AGE	1.75	0.572973
CAP	1.72	0.582432
DEP	1.67	0.600357
LIS	1.56	0.639850
CRI	1.51	0.660862
GDP	1.37	0.731689
EFF	1.27	0.784389
MNA	1.20	0.835218
Mean VIF	1.71	

Variable	VIF	1/VIF
AMP	2.29	0.436196
NIM	2.17	0.461618
CRE	2.13	0.470030
LIQ	2.05	0.488095
AGE	1.72	0.582789
DEP	1.67	0.599912
CAP	1.56	0.639404
CRI	1.54	0.649685
LIS	1.52	0.656765
GDP	1.44	0.696712
EFF	1.36	0.734621
MNA	1.20	0.834704
Mean VIF	1.72	