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# The impact of income diversification on liquidity creation and financial performance of Vietnamese Commercial Banks

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**A B S T R A C T**

This research is conducted to investigate the impact of income diversification on bank liquidity creation and the financial performance of Vietnamese commercial banks from 2007 to 2017. Data were collected from 21 Vietnamese commercial banks. Panel OLS with fixed effects and GMM estimations were employed to process data. The results show that diversification had a negative impact on both bank liquidity creation and bank profitability, and thus support the view that Vietnamese commercial banks should remain focusing on their traditional lines of business rather than diversifying towards nontraditional activities since this may lead to both a lower level of liquidity creation and profitability. The findings of this study could draw broad inferences for researchers, policy makers, and bank managers towards more focusing strategies to ensure the health of the banking system.



## 1. Introduction

The modern theory of financial intermediation suggests that a critical function of banks in the economy is to create liquidity and thereby provide funding for investment as well as generate other crucial financial services to customers. Accordingly, banks can create liquidity on the balance sheet by financing relatively illiquid assets with relatively liquid liabilities (Bryant, 1980; Diamond & Dybvig, 1983). Banks may also create liquidity off-balance sheet by providing loan commitments and similar claims to liquid funds (Berger & Bouwman, 2009). Bank liquidity creation play an important role in stimulating the economy; however, it poses default risk (Boyd & Graham, 1986) to banks if some short-term liabilities, which are often financed by long-term, illiquid assets, are claimed at short notice (Distinguin et al., 2013; Wong & Deng, 2016). The extant literature has also dedicated significant attention about bank diversification. Many of these studies (e.g. Stiroh, 2004; Berger et al., 2010; Li & Zhang, 2013; Meslier et al., 2014) have focused on investigating how bank income diversification affect bank risk-taking, bank business model and bank performance and find somehow mixed evidence. Specifically, on the one hand, bank revenue diversification is found to have a positive impact on bank risk by reducing idiosyncratic risk and total risk. It can also increase the risk-return frontier by creating more investment opportunities. Many other studies, on the other hand, have showed that diversification can negatively affect the performance of banks by dispersing managerial resources and increasing earnings volatility (e.g. Berger et al., 1999; Milbourn et al., 1999; Bliss & Rosen, 2001).

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Despite the large number of studies examining the multifaceted aspects of diversification and the measurement of bank liquidity creation, scholars have given much less attention to the relationship between bank diversification and bank liquidity creation. This issue is more noteworthy in an emerging country, such as Vietnam due to the fact that the banking systems here are diverse and are less mature than those in developed countries in terms of business models, paces of development and regulatory and institutional frameworks, which has created opportunities for the trend of diversification. Arguably, banks engaged in more traditional banking activities tend to create more liquidity than banks involved in non-traditional activities since traditional banking is grounded in the relationship-oriented model of associating the highest value-added liabilities (core deposits) to the highest value-added loans (relationship loans) (Song & Thakor, 2007). In contrast, non-traditional activities such as brokerage and securities underwriting, are not associated with the core intermediation function of banks, and thus it is reasonable to expect that the shift into more non-traditional activities may reduce the level of liquidity creation. Alternatively, a bank that can create more liquidity may have management teams with more abundant managerial expertise and a stronger incentive mechanism for managers to meet the diversified demand of financial services for their customers (Hou et al., 2018).

As a result, more liquidity created by a bank may be accompanied by a higher benefit of bank diversification and therefore suggesting a positive relationship between diversification and liquidity creation. Nevertheless, whether more diversified banks can create more liquidity and improve performance or not remains largely unclear. When considering the size and impact of some emerging markets like Vietnam on the world economy, one might be surprised to notice that there is a big gap in the banking literature: there are no empirical study so far that examine the relationship between diversification and liquidity creation in Vietnam. Also, it remains ambiguous about the real impact of diversification on bank performance due to mixed evidence provided to date. Therefore, we aim to fill this gap in the literature by investigating the impact of bank diversification on liquidity creation and then bank performance.

To the best of our knowledge, the only work that is closely related to this research is the study of Hou et al. (2018) in which the interrelationship between bank diversification and liquidity creation of Chinese banking system between 1997 and 2016 is investigated. However, our research is different from this study in a number of ways. *First,* the study of Hou et al. (2018) only focuses on the linkage between bank diversification and liquidity creation, meanwhile, our study will investigate how bank diversification influences bank liquidity creation and ultimately bank performance. *Second*, the study of Hou et al. (2018) does not examine further the channels through which the linkage between bank diversification and liquidity creation is varied**,** while this study will explicitly account for the role of some bank characteristics, such as bank age, in moderating the relationship between diversification and liquidity creation as well as how bank size moderates the linkage between diversification and bank performance. *Third,* the robustness checks are not explicitly accounted for in previous study since the two-step GMM estimator and the inclusion of the market power as well as other exogenous control variables into the baseline models as alternative estimations are only employed. In contrast, our study is more comprehensive than prior studies by taking into account the alternative measures of both diversification and liquidity creation.

We base our research on the country of Vietnam for several reasons. First, a single-country study is needed, as cross-country studies may not be sufficient to deal with the heterogeneity in economic and political factors among nations, especially in the fast-changing economic environment in emerging countries. Second, Vietnam is an emerging country that distinguishes itself from other nations by the fact that despite it has undergone remarkable political and economic reforms to transfer from a centrally planned economy to a more market economy, the country still continues to retain the socialist regime that allow the Communist party has an exclusive role in regulating the economy, especially in the banking and finance sector. Indeed, the Vietnamese banking system is often seen as the bloodstream of Vietnam's economy due to its critical role in providing the primary liquidity for both the macro-economy and the financial system. It is also known that the Vietnamese banking sector is still under strict government supervision and largely regulated by the state in terms of operating activities and market access. As a result, bank revenues are mainly generated from the traditional interest-bearing activities rather than the non-traditional activities. However, in the context of financial technology, the banking systems worldwide have suffered increased competition, consolidation and large structural reforms (Pennathur et al., 2012) and subsequently a considerable decline in banks' interest revenue. In response, Vietnamese banks have employed the diversification strategy and gradually transformed towards a more well-diversified fee-based business model. Nevertheless, whether the trend of diversification is believed to improve bank performance or it will lead to negative perceptions towards banks' operations and even worse deteriorate bank core function of liquidity creation remain unclear. For these reasons, Vietnam would provide an interesting and somewhat unique arena for us to investigate this issue.

The rest of the paper proceeds as follows. Section 2 presents literature review. Section 3 summarizes our data and methodology. Section 4 shows the empirical results. Section 5 provides some robustness checks and then Section 6 concludes.

## 2. Literature review

### *2.1. Bank diversification*

A vast body of literature has investigated multifaceted aspects of bank diversification. For example, some studies (e.g.

Santomero & Eckles, 2000) examined the causes of diversification are to grow and obtain efficiency gains through the economies of scale and scope, while other studies try to investigate the linkage between diversification and bank lending (e.g. Abedifar et al., 2018). It is worth noting that the extent literature has dedicated significant efforts for understanding the relationship between bank diversification and bank performance and find somehow mixed results. On the one hand, the diversification strategy can significantly benefit banks through higher revenue (DeYoung & Roland, 2001; Sissy et al., 2017), economies of scope (Teece, 1982; Meslier et al., 2014), higher franchise value and market betas (Baele et al., 2007), lower risks when banks expand activities across various products and services as well as multiple geographical areas (Berger et al., 1999; Abuzayed et al., 2018), more efficient exploitation of managerial skills and reduced monitoring cost (Drucker & Puri, 2009) and more competitive advantages especially when banks penetrate new markets (Amidu & Wolfe, 2013).

On the other hand, some studies illustrate that many diversification costs may be caused by the agency problems (Laeven & Levine, 2007), the issue of information asymmetries (Harris et al., 1992), the inefficient use of managers by forcing them to operate beyond their expertises (Klein and Saidenberg, 1998) and the inefficient allocation of labor and financial resources (Rajan et al., 2000). Furthermore, many scholars (e.g. Demsetz & Strahan, 1997; DeYoung & Torna, 2013; Williams, 2016) point out that since the non-traditional activities generate more volatile income due to the weaker customer-bank association and higher fixed costs often arise from the expansion into non-traditional activities, banks are more likely to be exposed to higher risks.

Other studies have made an attempt to access this matter in a more dynamic manner by explicitly account for the role of ownership (e.g. Pennathur et al., 2012; Doan et al., 2018), bank market power (e.g. Nguyen et al., 2012) or bank competition (e.g. Amidu & Wolfe, 2013), and the role of abilities (Francis et al., 2018). For example, the study of Doan et al. (2018) find that while diversification is positively associated with bank efficiency, it increases banks' volatile non-interest income. The study also shows that diversification negatively affects earning volatile in state-owned banks and the efficiency of foreign-owned banks. Nguyen et al. (2012) provide evidence that there is a non-linear relationship between bank market power and diversification in a way that banks with low market power tend to employ diversification strategy while banks with high market power are more likely to focus on traditional business activities. In a different way, the study of Francis et al. (2018) explicitly control for the role of banks' abilities (e.g. screening and monitoring) and find that diversification can actually decrease banks' returns. However, this impact of diversification is weaker or even disappeared when the level of banks' monitoring and screening abilities are taken into consideration.

### *2.2. Bank liquidity creation*

There is now an emerging body of literature focusing on bank liquidity creation in terms of its measurement and determinants, particularly after the financial crisis in 2007 (e.g. Berger & Bouwman, 2009, 2015, 2017; Horvath et al., 2014; Meyer et al., 1992; Fungáčová & Weill, 2012). Among them, the study of Berger and Bouwman (2009) provides the first and the most comprehensive measurement of liquidity creation that allows many studies to dig further issues related to liquidity creation in later period. For example, Horvath et al. (2016) examine the impact of bank competition on liquidity creation and find that increased competition decreases liquidity creation since enhanced bank competition affect the financial fragility of banks and consequently reduce banks' core lending and deposit activities. Berger et al. (2016) investigate the impact of regulatory interventions and capital support on liquidity creation on German banks and show that while regulatory interventions trigger decreases in liquidity creation, capital support does not exert a significant effect on liquidity creation. It is worth mentioning that the banking literature to date have spent much attention to understanding the relationship between bank capital and liquidity creation and found that there is a causality between bank capital and liquidity creation based on two different set of theories. First, the "risk absorption" hypothesis suggests that an increase in capital level may positively affect banks' liquidity creation (Berger & Bouwman, 2009). This is because when banks create more liquidity, they face higher default risk and thus, a higher level of bank capital enable banks to absorb more risk, which in turn increase banks' ability to create more liquidity (e.g. Bhattacharya & Thakor, 1993; Allen & Gale, 2004; Repullo, 2004). The capital cushion hypothesis also posits that since higher liquidity creation increases banks' exposure to risk, banks have incentives to hold more capital to improve their solvency, and thus liquidity creation can positively affect bank capital (Matz & Neu, 2007). By contrast, the liquidity substitution hypothesis suggests that liquidity creation has a negative relation with bank capital because banks may expect certain liquid liabilities to be stable funding sources and thus; they may substitute these stable liabilities for capital when facing higher demands of liquidity (Distinguin et al., 2013). Second, the "financial fragility- crowding out" hypothesis proposes a contrasting view that bank capital has a negative association with liquidity creation (Diamond & Rajan, 2001). Specifically, there remains two following relationship: financial fragility referred to as loosen or lower capital may improve liquidity creation and stronger capital can crowd out deposits, which result in reduced liquidity creation. In brief, the financial fragility effect is a result of the following process. First, being functioned as credit intermediation, banks usually collect funds from depositors to generate loans for borrowers. Once loans are issued, banks then need to monitor borrowers and achieve loan payments. By doing this, banks may obtain private information from their borrowers, which helps banks have more advantages in estimating their profitability. Nevertheless, this advantage may cause agency problem due to banks have more incentives to extract rents from their depositors

by demanding a larger proportion of interest income (Horvath et al., 2014). Since depositors recognize that banks may abuse their belief, they are more cautious about their deposits at banks. As a consequence, banks are forced to exhibit their commitment to depositors by employing a fragile financial structure with a greater proportion of liquid deposits. The result of this fragile financial structure is that if banks attempt to refuse depositors, they face the risk of losing sources of funding. As a result, the threat of bank runs would reduce the holdup issue that stems after deposits have been put in banks by depositors. Subsequently, by receiving greater deposits and then financing more loans, the fragile financial structure enables banks to create more liquidity or in other words, lower capital may lead to higher liquidity creation. Conversely, from investors' perspective, Gorton and Winton (2000) contend that as deposits are more effective liquidity hedges than equity investments, stronger capital requirements may crowd out deposits by transferring investor's funds from liquid deposits to illiquid equity and thus decreasing liquidity creation. The relationship between bank capital and liquidity creation has also been documented in several empirical studies. For example, the study of Berger and Bouwman (2009) illustrate that bank capital positively affect liquidity creation in large banks, but negatively affect liquidity creation in small banks in the US. Similarly, Distinguin et al. (2013) also provide evidence that there is a negative association between regulatory capital and liquidity creation in US listed commercial banks. In contrast, Vodova (2013) employ a dataset of Hungarian commercial banks during the period 2001-2010 and show that bank capital has a positive relation with liquidity creation. Finally, the literature to date have also documented that the relation between bank capital and liquidity creation is in fact a two-way linkage, meaning that liquidity creation may have certain impact on bank capital in turn. For example, the study of Horvath et al. (2014), Fu et al. (2016) and Le (2019) find that there is a bi-causal relationship between liquidity creation and bank capital in both developed developing banks.

## 3. Research methodology

### *3.1. Measurement of variables*

*Bank diversification*

In this study, we follow Stiroh and Rumble (2006), Lepetit et al. (2008), Goddard et al. (2008), and Sanya and Wolfe (2011) and capture the degree of bank diversification by considering the structure of income statements. Specifically, bank diversification is calculated as the share of income from traditional interest-bearing activities and income from non-traditional interest bearing activities. The bank diversification indicator is therefore measured by one minus HHI in which HHI is the Herfindahl-Hirschman index and is calculated as subdividing total operating income into its traditional income and non-traditional income components. Consequently, the zero value represents an income structure with absolutely no diversification and the one value would represent the ultimate in diversification. Accordingly, the diversification index for each bank is computed from the revenue flows as below:

$$HHI_{it} = 1 - \left[\left(\frac{NONTRADITIONAL_{it}}{OPERATING\ INCOME_{it}}\right)^2 + \left(\frac{TRADITIONAL_{it}}{OPERATING\ INCOME_{it}}\right)^2\right]$$

*Bank liquidity creation*

In this study, we follow Berger and Bouwman (2009)'s measurement of liquidity creation by using a three-step process to calculate two measures of liquidity creation that are different in terms of whether off-balance sheet (OBS) activities are included in the calculation or not. Particularly, while fat liquidity creation (FLC) examines both on balance sheet activities, nonfat liquidity creation (NFLC) considers on balance sheet activities only. The study of Berger and Bouwman (2009) also points out that the fat method is more favoured than the nonfat calculation since liquidity is functionally created from OBS activities in a similar way to on balance sheet activities. Accordingly, in the first step, we classify all the assets, liabilities, equity and OBS activities as liquid, semi-liquid, or illiquid. While assets and OBS activities are classified depending on how quickly they are to be sold, liabilities are classified based on how quickly they are to be withdrawn. Unlike all of these items, equity is seen as a long-term source of investment and cannot be required from investors, thus it is illiquid. It is worth noting that we classify all these items by category rather maturity due both to the unavailable data on maturity and the advantages of cost, ease and timeliness associate with banks that have liquid funds to meet their obligations, which is more important that the time to self-liquidation. The detailed classification is presented in the Table 3. In the next step, all of the banks' activities are assigned different weights according to the liquidity creation intuition. The magnitudes of the weights are as follows. The transfer one dollar of liquid liabilities into one dollar of illiquid assets or illiquid OBS activities will create one dollar of liquidity. In contrast, the transfer one dollar of illiquid liabilities or equity into one dollar of liquid assets or liquid OBS activities will destroy one dollar of liquidity. According to Berger and Bouwman (2009) illiquid assets, liquid liabilities, and illiquid OBS activities are assigned a weight of 0.5; semi-liquid assets, semi-liquid liabilities, and semi-liquid OBS activities are assigned a weight of 0; liquid assets, illiquid liabilities, and liquid OBS activities are assigned a weight of -0.5. In the final step, the fat and nonfat liquidity creation indicators are estimated by combining the classified and weighted items as in the first two steps as follows:

**FLC =** 1/2 × (illiquid assets + liquid liabilities + illiquid OBS activities) + 0 × (semi-liquid assets + semi-liquid liabilities + semi-liquid OBS activities) - 1/2 × (liquid assets + illiquid liabilities + equity + liquid OBS activities)

**NFLC** = 1/2 × (illiquid assets + liquid liabilities) + 0 × (semi-liquid assets + semi-liquid liabilities) - 1/2 × (liquid assets + illiquid liabilities + equity)

**Table 1**
Liquidity classification of bank activities and construction of two liquidity creation measures

| | | |
|---|---|---|
| **Assets** | | |
| **Illiquid assets (weight = 1/2)** | **Semi-liquid assets (weight = 0)** | **Liquid assets (weight = -1/2)** |
| Corporate and commercial loans | Consumer/retail loans | Cash and due from other credit institutions |
| Other loans | | Trading securities |
| Fixed assets | | Derivatives |
| Other assets | | Investment securities |
| | | At-equity investments in associates |
| | | Other securities |
| **Liabilities plus equity** | | |
| **Liquid liabilities (weight = 1/2)** | **Semi-ilquid liabilities (weight = 0)** | **Illiquid liabilities plus equity (weight = -1/2)** |
| Customer deposits-current | Customer deposits term | Senior debt maturing after 1 year |
| Customer deposits-saving` | Term deposits from banks | Subordinated borrowing |
| Demand deposit from banks and other credit institutions | Other deposits | Other funding |
| Derivatives | Short-term borrowing from banks | Other liabilities |
| Discounts and rediscounts of valuable papers (*)[a] | Certificates of deposit | Total equity |
| **OBS activities** | | |
| **Illiquid OBS activities (weight = 1/2)** | **Semi-liquid OBS activities (weight = 0)** | **Liquid OBS activities (weight = -1/2)** |
| Acceptances and documentary credits reported OBS | Guarantees | |
| Committed credit lines | | |
| Other contingent liabilities | | |

(*): The Vietnamese commercial banks ensure to buy back these items within 91 days so they are categorized as liquid liabilities.

*3.2 Model specification*

To examine the impact of bank diversification towards non-traditional activities on bank liquidity creation, the following baseline specification is employed:

$$LIQUIDITYCREATION_{it} = \alpha_0 + \alpha_1 DIVERSIFICATION_{it} + \alpha_2 SIZE + \alpha_3 CAP + \alpha_4 PROVISION + \alpha_5 NPLs + \alpha_6 ASSETGROWTH + \alpha_7 MARKETPOWER + \varepsilon_{it,} \quad (1)$$

where $LIQUIDITYCREATION_{it}$ represents the level of liquidity creation of bank *i* at time *t* and is calculated as in the study of Berger and Bounman (2009) as discussed in the previous section. Similarly, the degree of income diversification is the main variable of interest and is measured as illustrated in the above section. Following literature (e.g. Baele et al., 2007; Laeven & Levine, 2009; Berger & Bouwman, 2009; Rauch et al., 2011, Horvath et al., 2014; Hou et al., 2018), we also include some bank-specific control variables that may influence bank liquidity creation including bank size (*SIZE,* calculated as the natural logarithm of total assets), bank capital (CAP, measured as total equity to total assets), non-performing loans (*NPLs*, measured as the share of non-performing loans to total loans), loans loss provision (*PROVISION*, measured as the ratio of loan loss provision to total loans), assets growth (*ASSETGROWTH*, measured as the growth rate of total assets), and bank market power (*MARKETPOWER*, measured as $(DI/TD)^2$ where $D_i$ is $bank_i$'s total deposits and TD is total deposits within the banking system. Next, in order to investigate the impact of diversification towards non-traditional activities on bank financial performance, we use the following baseline model:

$$PERFORMANCE_{it} = \alpha_0 + \alpha_1 DIVERSIFICATION_{it} + \alpha_2 SIZE + \alpha_3 CAP + \alpha_4 PROVISION + \alpha_5 NPLs + \alpha_6 ASSETGROWTH + \alpha_7 MARKETPOWER + \varepsilon_{it,} \quad (2)$$

where *i* represents bank *i*, and t indicates the time period. Following DeYoung and Rice (2004), we investigate financial performance of bank in two aspects: risk and profitability. Firstly, accounting for profitability, we use a number of proxies to measure the profitability of a bank, including return on average assets (*ROA*) and return on equity (*ROE*). The degree of income diversification is the main variable of interest and is measured as illustrated in the above section. In addition, a number of bank-specific control variables are also included into the model as suggested in the literature (Kishan & Opiela, 2000; DeYoung & Rice, 2004; Lepetit et al., 2007; and Lepetit et al., 2008). The definitions and measurements of these variables are the same as in the above section. Secondly, to obtain a more comprehensive understanding of the effect of a bank's focus/diversification strategy, we further study its effect on bank risk. This is because if a lower level of diversification could produce an increase in

bank profit and a decrease in bank risk, then we can interpret this result as diversification strategy reduce overall bank performance. However, if a strategy of focusing on traditional activities produces an increase in profitability and an increase in risk, then the overall effects of focus/diversification on banks are ambiguous and cannot be determined without taking a stand on what constitutes an "efficient" risk-return trade-off. Therefore, in the next step, we extend our study by examining the effects of diversification on the risk of the Vietnamese banks. To determine the impact of income diversification on bank risk, we estimate the following regression model:

$$RISK_{it} = \alpha_0 + \alpha_1 DIVERSIFICATION_{it} + \alpha_2 SIZE + \alpha_3 CAP + \alpha_4 PROVISION + \alpha_5 NPLs + \alpha_6 ASSETGROWTH + \alpha_7 MARKETPOWER + \varepsilon_{it}. \quad (3)$$

According to Stiroh and Rumble (2006), Z_SCORE is an indicator of bank stability that is widely used in the literature since it measures the number of standard deviations returns have to fall before a bank becomes insolvent. Following Abuzayed et al. (2018), in this study we use Z_SCORE to measure bank risk and as such the Z-score is calculated as follows:

$$\textbf{Z-score}_{it} = \frac{(\textbf{ROAit} + \frac{TotalEquityit}{TotalAssetit})}{\sigma \textbf{ROAit}} \textbf{ and Z-score}_{it} = \frac{(\textbf{ROEit} + \frac{TotalEquityit}{TotalAssetit})}{\sigma \textbf{ROEit}}$$

For other variables including *DIVERSIFICATION, SIZE, CAP, PROVISION, NPLs, ASSETGROWTH and MARKETPOWER* are defined as in the Eq. (1) and Eq. (2).

### *3.3. Data collection*

Our dataset covers 21 commercial banks in Vietnam over the 11-year period from 2007 to 2017. Income statement and balance sheet data of each banks is retrieved from bank annual reports. We then exclude the bank-year observations that report insufficient information. The final sample comprises of 137 bank-year observations over the entire time period of 2007 to 2017. Descriptive statistics is presented in Table 2, below:

**Table 2**
Descriptive analysis of variables

| Variables | Obs | Mean | SD | Min | Max |
|---|---|---|---|---|---|
| *HHI* | 199 | 0.253 | 0.154 | -0.501 | 0.500 |
| *FLC* | 199 | 12.816 | 1.135 | 10.509 | 15.546 |
| *NFLC* | 199 | 12.785 | 1.139 | 10.489 | 15.530 |
| *ROA* | 178 | 0.010 | 0.007 | -0.004 | 0.044 |
| *ROE* | 178 | 0.103 | 0.070 | -0.140 | 0.296 |
| *SIZE* | 199 | 5.624 | 0.375 | 5.029 | 6.448 |
| *CAP* | 199 | 0.100 | 0.057 | 0.026 | 0.462 |
| *PROVISION* | 169 | 9.669 | 1.517 | 5.721 | 12.844 |
| *NPLs* | 158 | 10.876 | 1.376 | 6.729 | 14.086 |
| *ASSETGROWTH* | 178 | 0.236 | 0.259 | -0.329 | 1.330 |
| *MARKETPOWER* | 199 | 0.055 | 0.068 | 0.002 | 0.320 |

Correlation matrix among all variables is provided in Table 3, below:

**Table 3**
Correlation matrix

| | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 |
|---|---|---|---|---|---|---|---|---|---|---|---|
| *HHI* | 1 | | | | | | | | | | |
| *FLC* | 0.061 | 1 | | | | | | | | | |
| *NFLC* | 0.062 | 1 | 1 | | | | | | | | |
| *ROA* | 0.143 | 0.074 | 0.078 | 1 | | | | | | | |
| *ROE* | 0.061 | 0.466 | 0.465 | 0.699 | 1 | | | | | | |
| *SIZE* | 0.098 | 0.862 | 0.856 | 0.040 | 0.351 | 1 | | | | | |
| *CAP* | 0.198 | -0.478 | -0.472 | 0.457 | -0.205 | -0.365 | 1 | | | | |
| *PROVISION* | -0.041 | 0.686 | 0.668 | -0.136 | 0.279 | 0.748 | -0.483 | 1 | | | |
| *NPLs* | 0.017 | 0.688 | 0.675 | -0.325 | 0.146 | 0.804 | -0.586 | 0.812 | 1 | | |
| *ASSETGROWTH* | 0.110 | -0.005 | 0.002 | 0.563 | 0.384 | -0.135 | 0.143 | -0.263 | -0.343 | 1 | |
| *MARKETPOWER* | 0.061 | 0.776 | 0.770 | -0.030 | 0.382 | 0.831 | -0.503 | 0.732 | 0.798 | -0.045 | 1 |

## 4. Results and discussion

### *4.1. The impact of income diversification on bank liquidity creation*

Table 4 presents the estimation results of specification 1 to estimate the impact of income diversification on bank liquidity creation. Column 1-4 shows the results of FLC as dependent variable while columns 5-8 depicts the results for NFLC.

Overall, Table 4 strongly and consistently show that an increase in the level of income diversification leads to a reduction in bank liquidity creation since the estimated coefficient on *HHI* are negative and significant across all specifications. This finding therefore indicates that the costs of allocating managerial resources from diversification strategy outweigh the benefits from economies of scale and scope, risk absorption, and reduced earnings volatility when banks diversify their income sources. The possible explanation is that the consumption of greater management resources when banks employ diversification strategy has accelerated the switching cost and thus leading to a lower level of banks' capability to meet the liquidity demand of their customers. Our results are in line with the findings of Hou et al. (2018) that diversification has a negative influence on bank liquidity creation in emerging countries. Regarding other variables, the estimated coefficients on *SIZE, PROVISION, ASSETGROWTH* are positive and statistically significant, implying that larger banks, banks having higher loans loss provision, and banks with higher levels of asset growth are more able to create liquidity. In contrast, the coefficients on *CAP* and *NPLs* are negative and statistically significant, indicating that more capitalized banks and banks having higher non-performing loans are negatively associated with liquidity creation. Our results are in line with the findings of Fungacova et al. (2010), Horvath et al. (2014), Fu et al. (2016) and Le (2019) which reveal a negative relationship between bank capital and liquidity creation and thus, lend support for the financial fragility-crowding out hypothesis.

**Table 4**
The impact of income diversification on bank liquidity creation

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **FLC** | | | | **NFLC** | | | |
| *HHI* | -0.486** | -0.486** | -0.322 | -0.322 | -0.472* | -0.472* | -0.294 | -0.294 |
| | (0.221) | (0.221) | (0.360) | (0.360) | (0.226) | (0.226) | (0.371) | (0.371) |
| *SIZE* | 2.030*** | 2.030*** | 3.694*** | 3.694*** | 2.096*** | 2.096*** | 3.842*** | 3.842*** |
| | (0.354) | (0.354) | (0.516) | (0.516) | (0.363) | (0.363) | (0.537) | (0.537) |
| *CAP* | -8.179*** | -8.179*** | -12.386*** | -12.386*** | -8.386*** | -8.386*** | -12.807*** | -12.807*** |
| | (1.304) | (1.304) | (1.610) | (1.610) | (1.356) | (1.356) | (1.730) | (1.730) |
| *PROVISION* | 0.000*** | 0.000*** | -0.000 | -0.000 | 0.000** | 0.000** | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *NPLs* | -0.284** | -0.284** | -0.278*** | -0.278*** | -0.297** | -0.297** | -0.287*** | -0.287*** |
| | (0.122) | (0.122) | (0.076) | (0.076) | (0.121) | (0.121) | (0.074) | (0.074) |
| *ASSETGROWTH* | 0.330** | 0.330** | 0.297** | 0.297** | 0.340** | 0.340** | 0.301* | 0.301* |
| | (0.144) | (0.144) | (0.142) | (0.142) | (0.147) | (0.147) | (0.147) | (0.147) |
| *MARKETPOWER* | 5.591 | 5.591 | 0.015 | 0.015 | 5.814 | 5.814 | -0.209 | -0.209 |
| | (5.331) | (5.331) | (4.194) | (4.194) | (5.580) | (5.580) | (4.382) | (4.382) |
| Constant | 5.001** | 5.001** | -3.178 | -3.178 | 4.760** | 4.760** | -3.860 | -3.860 |
| | (1.815) | (1.815) | (2.341) | (2.341) | (1.861) | (1.861) | (2.419) | (2.419) |
| Year FE | NO | NO | YES | YES | NO | NO | YES | YES |
| Bank FE | NO | YES | NO | YES | NO | YES | NO | YES |
| R-squared | 0.409 | 0.409 | 0.618 | 0.618 | 0.401 | 0.401 | 0.610 | 0.610 |
| Observations | 137 | 137 | 137 | 137 | 137 | 137 | 137 | 137 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

### *4.2. The impact of income diversification on bank financial performance*

Table 5 presents the regression results of equation (2) to examine the influence of income diversification on the profitability of Vietnamese banks. Overall, columns 1-8 in Table 5 reveals that income diversification is negatively and significantly associated with bank profitability, implying that more diversified banks tend to be less profitable than less diversified banks. This result is consistent with the finding of Berger et al., (2010) who finds that focused banks are associated with higher profits and lower costs and thus lend supports for the hypothesis that lending focus is linked with higher profit and cost performance. Another possible explanation for the negative impact of diversification on Vietnamese banks' profit may arise from the fact that bank's managers in Vietnam tend to lack of managerial expertise when entering into new lines of business to generate income and at the same time the requirement of high capital adequacy ratios to ensure a thicker capital buffer have resulted in an inefficient allocation of resources. In addition, most Vietnamese bank managers are appointed by the government based largely on their close relationship with the authority instead of their capabilities. As a consequence, these managers have less incentives to take a firm stand on the diversification strategy to maximize the profit of the bank or the shareholders' wealth.

**Table 5**

The impact of income diversification on bank profitability

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **ROA** | | | | **ROE** | | | |
| *HHI* | -0.005* | -0.005* | -0.004 | -0.004 | -0.087** | -0.087** | -0.081 | -0.081 |
| | (0.003) | (0.003) | (0.004) | (0.004) | (0.035) | (0.035) | (0.060) | (0.060) |
| *SIZE* | 0.001 | 0.001 | 0.014** | 0.014** | -0.038 | -0.038 | 0.137* | 0.137* |
| | (0.003) | (0.003) | (0.005) | (0.005) | (0.041) | (0.041) | (0.069) | (0.069) |
| *CAP* | 0.061*** | 0.061*** | 0.032 | 0.032 | -0.304** | -0.304** | -0.677*** | -0.677*** |
| | (0.017) | (0.017) | (0.021) | (0.021) | (0.135) | (0.135) | (0.178) | (0.178) |
| *PROVISION* | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *NPLs* | -0.004*** | -0.004*** | -0.003*** | -0.003*** | -0.035*** | -0.035*** | -0.024*** | -0.024*** |
| | (0.000) | (0.000) | (0.001) | (0.001) | (0.008) | (0.008) | (0.008) | (0.008) |
| *ASSETGROWTH* | 0.010*** | 0.010*** | 0.009*** | 0.009*** | 0.075*** | 0.075*** | 0.049 | 0.049 |
| | (0.001) | (0.001) | (0.002) | (0.002) | (0.026) | (0.026) | (0.028) | (0.028) |
| *MARKETPOWER* | 0.084* | 0.084* | 0.015 | 0.015 | 1.570*** | 1.570*** | 0.617 | 0.617 |
| | (0.044) | (0.044) | (0.035) | (0.035) | (0.464) | (0.464) | (0.486) | (0.486) |
| Constant | 0.033** | 0.033** | -0.038 | -0.038 | 0.656*** | 0.656*** | -0.300 | -0.300 |
| | (0.013) | (0.013) | (0.025) | (0.025) | (0.203) | (0.203) | (0.328) | (0.328) |
| Year FE | NO | NO | YES | YES | NO | NO | YES | YES |
| Bank FE | NO | YES | NO | YES | NO | YES | NO | YES |
| R-squared | 0.678 | 0.678 | 0.777 | 0.777 | 0.473 | 0.473 | 0.627 | 0.627 |
| Observations | 137 | 137 | 137 | 137 | 137 | 137 | 137 | 137 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

**Table 6**

The impact of income diversification on bank risk

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **Z_score roa** | | | | **Z_score_roe** | | | |
| *HHI* | -0.704* | -0.704* | -0.534 | -0.534 | -1.253** | -1.253** | -1.167 | -1.167 |
| | (0.374) | (0.374) | (0.540) | (0.540) | (0.498) | (0.498) | (0.858) | (0.858) |
| *SIZE* | 0.200 | 0.200 | 1.994** | 1.994** | -0.541 | -0.541 | 1.962* | 1.962* |
| | (0.437) | (0.437) | (0.719) | (0.719) | (0.591) | (0.591) | (0.992) | (0.992) |
| *CAP* | 8.590*** | 8.590*** | 4.513 | 4.513 | -4.365** | -4.365** | -9.702*** | -9.702*** |
| | (2.320) | (2.320) | (2.962) | (2.962) | (1.939) | (1.939) | (2.552) | (2.552) |
| *PROVISION* | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *NPLs* | -0.537*** | -0.537*** | -0.428*** | -0.428*** | -0.498*** | -0.498*** | -0.337*** | -0.337*** |
| | (0.068) | (0.068) | (0.091) | (0.091) | (0.108) | (0.108) | (0.108) | (0.108) |
| *ASSETGROWTH* | 1.401*** | 1.401*** | 1.210*** | 1.210*** | 1.068*** | 1.068*** | 0.699 | 0.699 |
| | (0.153) | (0.153) | (0.226) | (0.226) | (0.366) | (0.366) | (0.406) | (0.406) |
| *MARKETPOWER* | 11.733* | 11.733* | 2.125 | 2.125 | 22.510*** | 22.510*** | 8.852 | 8.852 |
| | (6.140) | (6.140) | (4.854) | (4.854) | (6.652) | (6.652) | (6.961) | (6.961) |
| Constant | 3.257* | 3.257* | -6.592* | -6.592* | 7.932** | 7.932** | -5.771 | -5.771 |
| | (1.750) | (1.750) | (3.493) | (3.493) | (2.910) | (2.910) | (4.708) | (4.708) |
| Year FE | NO | NO | YES | YES | NO | NO | YES | YES |
| Bank FE | NO | YES | NO | YES | NO | YES | NO | YES |
| R-squared | 0.678 | 0.678 | 0.777 | 0.777 | 0.473 | 0.473 | 0.627 | 0.627 |
| Observations | 137 | 137 | 137 | 137 | 137 | 137 | 137 | 137 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Table 6 shows the regression results of Eq. (3) to investigate the impact of income diversification on the risk of Vietnamese banks. Overall, column 1-8 of table VI provides evidence that diversification has reduced bank risk since the coefficients of HHI are statistically significant and negative across all specifications. This finding is consistent with the results of some previous studies (e.g. Pennathur et al., 2012; DeYoung & Torna, 2013; Kohler, 2014; Francis et al., 2018) and lends support for the proposition that banks become significantly more stable if they increase their share of noninterest income. Perhaps the portfolio diversification is more applicable to the case of Vietnamese banks and as such when banks diversify into non-interest revenue, their revenue risk declines (Williams, 2016). Our results are also in favor of the findings suggested by Boot and McLaughlin (2007) that more diversified banks may decrease the costs of bankruptcy or financial distress by reducing risks through diversifying activities across different products and services, business environments or geographical areas. In addition, DeYoung and Torna (2013) suggest that it is not noninterest income but rather the type of noninterest income that is decisive for bank risk. More specifically, they find that a large share of income from nontraditional activities such as investment banking significantly increases the likelihood of bank failure especially during the crisis; meanwhile, a large share of fee income from nontraditional activities is found to significantly reduce the probability of failure, and hence the risk characteristics of these two

types of activities are fundamentally different. In the context of Vietnam, the development of investment banking's model is still immature and infact Vietnamese banks are not allowed to operate as investment banks and to carry out the activities of securities companies without the permission of the State Bank. Therefore, some large commercial banks in Vietnam have currently established their subsidiaries such as securities companies and the operations of some investment banking activities (e.g. M&A advisory services or consultancy on bond issuance) are implemented through these organizations. The fact is that this type of noninterest income has now made up a relatively small proportion of banks' total income due in part to the inferior technological capacity, undeveloped institutional framework and lower level of expertise of Vietnamese commercial banks. Besides, noninterest income in Vietnamese banks are mainly generated from fee-for-service activities (e.g. securities brokerate, insurance sales or other activities that do not require the banks to hold risky assets) and traditional fee banking activities (e.g. depositor services, ATM fee and transaction fees). As a consequence, those small and relatively not risky noninterest income might reduce the revenue risk rather than increase the risk as found in banks in developed countries.

### *4.3. Controlling for endogeneity*

There might also be potential bias that diversification and liquidity creation are likely to be endogenous and thus the estimations of Eq. (1) might be inconsistent. In order to solve this potential endogeneity problem, we use the lagged methods (all variables are lagged by one year). Table 7 reports the regression results to study the impact of diversification on bank liquidity creation after controlling for the endogeneity bias using the lagged method.

**Table 7**
The impact of income diversification on bank liquidity creation

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| **Variables** | **LC3** | | | | **LC4** | | | |
| *L.HHI* | -2.606** | -2.396** | -5.055*** | -5.055*** | -2.456** | -2.456** | -4.183*** | -4.183*** |
| | (1.165) | (1.158) | (1.372) | (1.372) | (1.030) | (1.030) | (1.269) | (1.269) |
| *L.SIZE* | 1.445 | 1.722* | 0.810 | 0.810 | 0.473 | 0.473 | -0.949 | -0.949 |
| | (0.892) | (0.865) | (1.673) | (1.673) | (0.805) | (0.805) | (1.563) | (1.563) |
| *L.CAP* | -1.989 | -3.604 | 0.658 | 0.658 | -0.971 | -0.971 | 4.199 | 4.199 |
| | (3.900) | (3.924) | (5.201) | (5.201) | (3.523) | (3.523) | (4.769) | (4.769) |
| *L.PROVISION* | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *L.NPLs* | 0.660*** | 0.708*** | 0.627*** | 0.627*** | 0.998*** | 0.998*** | 0.825*** | 0.825*** |
| | (0.182) | (0.183) | (0.200) | (0.200) | (0.175) | (0.175) | (0.188) | (0.188) |
| *L.ASSETGROWTH* | 0.140 | 0.331 | 0.614 | 0.614 | 0.422 | 0.422 | 0.835 | 0.835 |
| | (0.528) | (0.505) | (0.561) | (0.561) | (0.452) | (0.452) | (0.513) | (0.513) |
| *L.MARKETPOWER* | -10.776 | -15.222 | -11.697 | -11.697 | -15.747 | -15.747 | -8.218 | -8.218 |
| | (13.403) | (12.200) | (13.259) | (13.259) | (10.865) | (10.865) | (12.046) | (12.046) |
| Constant | -5.476 | -5.969 | 0.254 | 0.254 | -2.261 | -2.261 | 6.883 | 6.883 |
| | (4.358) | (4.299) | (8.738) | (8.738) | (3.879) | (3.879) | (8.052) | (8.052) |
| Year FE | NO | NO | YES | YES | NO | NO | YES | YES |
| Bank FE | NO | YES | NO | YES | NO | YES | NO | YES |
| R-squared | 0.402 | 0.409 | 0.562 | 0.562 | 0.494 | 0.494 | 0.611 | 0.611 |
| Observations | 102 | 102 | 102 | 102 | 100 | 100 | 100 | 100 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

Overall, Table 7 provides consistent empirical evidence that bank diversification is associated with a decrease in bank liquidity creation as the estimated coefficient on l. *HHI* is always negative and significant. This finding therefore suggests that our results remain robust and consistent. As suggested by the previous literature (e.g. Elsas et al., 2010; Miller, 2006), there might also be endogeneity problems towards the relationship between performance and diversification, which could lead to biases in ordinary OLS regressions. The problem of endogeneity can arise, for example, when other factors (e.g. a change in banking legislation) could simultaneously affect diversification and performance (Miller, 2006). Another channel might lead to the endogenous issue is when there is a feedback loop from performance to diversification that make banks have more incentives to diversify to exploit their existing advantages (where bank performance is high) or to overcome intense competition (where bank performance is low) (Miller, 2004; Rumelt, 1982). The endogeneity problem might also be driven by the causality of the diversification-performance relationship in both directions, for example, the current performance can be endogenous to the extent of diversification, and meanwhile the diversification decision might lead to a change in bank performance. Finally, the problem of omitted variables bias may arise because of the failure to include some banks' characteristics (e.g. capabilities, unique resources, or competitive advantages) that determines banks' diversification decision in the diversification-performance model. All of these are the main reasons we could not rely on ordinary OLS models, but have to find a way to relief the potential endogeneity issues. The two-step generalized method of moment (GMM) method is a well-known and effective measure in empirical banking and finance research to deal with the endogeneity issue.

**Table 8**

The impact of income diversification on bank liquidity creation and bank performance GMM and dynamic GMM results

| VARIABLES | (1) Dynamic GMM FLC | (2) Dynamic GMM NFLC | (3) GMM ROA | (4) Dynamic_ GMM ROA | (5) GMM ROE | (6) Dynamic_ GMM ROE | (7) GMM Zscore_ROA | (8) Dynamic_ GMM Z_score_ ROA | (9) GMM Zscore_ROE | (10) Dynamic_ GMM Z_score_ ROE |
|---|---|---|---|---|---|---|---|---|---|---|
| HHI | -0.459*** | -0.439** | -0.004*** | -0.001** | -0.020** | -0.005** | -0.520*** | -0.079** | -0.281** | -0.076*** |
| | (0.177) | (0.197) | (0.005) | (0.002) | (0.068) | (0.031) | (0.718) | (0.256) | (0.973) | (0.441) |
| SIZE | 1.592*** | 1.583*** | 0.009* | 0.008*** | 0.106 | 0.067** | 1.261* | 1.169*** | 1.520 | 0.966** |
| | (0.432) | (0.417) | (0.005) | (0.002) | (0.064) | (0.031) | (0.709) | (0.328) | (0.924) | (0.442) |
| CAP | -5.743*** | -5.732*** | 0.074*** | -0.000 | -0.346** | -0.265** | 10.312*** | -0.040 | -4.967** | -3.793** |
| | (2.180) | (2.139) | (0.018) | (0.023) | (0.142) | (0.119) | (2.514) | (3.165) | (2.030) | (1.712) |
| PROVISION | 0.000 | 0.000 | 0.000 | 0.000 | -0.000 | 0.000 | 0.000 | 0.000 | -0.000 | 0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| NPLs | -0.068 | -0.077 | -0.003*** | -0.002** | -0.027** | -0.023*** | -0.399*** | -0.269** | -0.390** | -0.327*** |
| | (0.099) | (0.097) | (0.001) | (0.001) | (0.011) | (0.007) | (0.101) | (0.117) | (0.154) | (0.102) |
| ASSETGROWTH | 0.912*** | 0.917*** | 0.011*** | 0.002 | 0.095*** | 0.068* | 1.579*** | 0.318 | 1.356*** | 0.977* |
| | (0.172) | (0.178) | (0.002) | (0.003) | (0.037) | (0.037) | (0.335) | (0.467) | (0.526) | (0.529) |
| MARKETPOWER | -2.133 | -2.021 | 0.020 | -0.009 | 0.289 | 0.119 | 2.802 | -1.260 | 4.137 | 1.707 |
| | (1.591) | (1.474) | (0.038) | (0.025) | (0.614) | (0.361) | (5.257) | (3.423) | (8.808) | (5.170) |
| L.NFLC | 0.466*** | | | | | | | | | |
| | (0.169) | | | | | | | | | |
| L.NFLC | | 0.485*** | | | | | | | | |
| | | (0.156) | | | | | | | | |
| L.ROA | | | | 0.574*** | | | | | | |
| | | | | (0.133) | | | | | | |
| L.ROE | | | | | | 0.578*** | | | | |
| | | | | | | (0.156) | | | | |
| L.Zscore_ROA | | | | | | | | 0.574*** | | |
| | | | | | | | | (0.133) | | |
| L.Zscore_ROE | | | | | | | | | | 0.578*** |
| | | | | | | | | | | (0.156) |
| Constant | -0.808 | -0.928 | -0.020 | -0.024 | -0.204 | -0.092 | -4.148 | -3.861* | -4.396 | -1.938 |
| | (1.507) | (1.521) | (0.025) | (0.016) | (0.347) | (0.178) | (3.438) | (2.281) | (4.968) | (2.646) |
| Observations | 137 | 137 | 137 | 125 | 137 | 125 | 137 | 125 | 137 | 125 |
| Specification test (*p-value*) | | | | | | | | | | |
| AR (1) | 0.189 | 0.186 | 0.329 | 0.075 | 0.816 | 0.162 | 0.329 | 0.075 | 0.816 | 0.162 |
| AR (2) | 0.397 | 0.375 | 0.075 | 0.424 | 0.033 | 0.797 | 0.075 | 0.424 | 0.033 | 0.797 |
| Hansen test | 0.549 | 0.578 | 0.398 | 0.747 | 0.410 | 0.535 | 0.398 | 0.747 | 0.410 | 0.535 |
| Difference-Sargan tests | 0.183 | 0.214 | 0.000 | 0.008 | 0.000 | 0.001 | 0.000 | 0.008 | 0.000 | 0.001 |

Robust standard errors in parentheses

*** p<0.01, ** p<0.05, * p<0.1

In addition, compared to the IV-2SLS method, two-step GMM is advanced in tackling the endogenous concern by employing the internal instruments rather than being dependent on external instruments or natural experiments, which are not always accessible. It is worth noting that we also use the dynamic GMM method as an alternative method to deal with endogeneity issue to further confirm the robustness of the diversification-performance relationship, because of its advantages in controlling for the dynamic nature of the diversification- performance relationship by incorporating bank performance in the past year as one of the regressors. Our regression results are provided in Table 8. Specification (1) and (2) shows the results of FLC and NFLC as the dependent variables. Specification (3) and (5) depicts the results for ROA and ROE while the dynamic models with lagged ROA and ROE are included in model (4) and (6) respectively. Similarly, Specification (7) and (9) reports the results for Z_score_ROA and Z_score_ROE while the dynamic models with lagged Z_score_ROA and Z_score_ROE are included in model (8) and (10) respectively.

Overall, Table 8 provides strong and consistent evidence that bank diversification is associated with a decrease in bank liquidity creation, bank profitability and bank risk and thus, reinforcing our results are robust and consistent.

### *4.4. Additional analyses*

So far, we find that income diversification has an overall negative influence on bank liquidity creation and then bank performance. In this section, we further examine the channel through which diversification affect bank liquidity creation and bank performance. Specifically, we investigate whether the diversification-liquidity creation and diversification-performance nexus is conditioned upon on some bank characteristics including bank age and bank size.

#### *The role of bank experience in diversification-liquidity creation nexus*

Bouwman and Malmendier (2015) suggest that the amount of experience that banks can obtain through their business operations may influence their risk-taking behaviors, and ultimately affect the extent to which banks are willing to diversify their activities towards non-traditional lines of business. According to Basuony et al. (2014), banks with more experience tend to possess a larger number of loyal customers and thus, if they employ the diversification strategy, they have more opportunities to create fee-based services that are more appropriate to their customers. In addition, since more experienced banks might be better at dealing with unexpected events and new technologies than their less experienced counterparts due to their superior reputation, competences and skills, their customers are more likely to accept the new fees without leaving their banks. Under this circumstance, we propose that experience in bank's business operations may moderate the relationship between diversification and bank liquidity creation. Previous studies (e.g. Wheelock and Wilson, 2000) suggest that bank age is widely used as an indicator of bank experience and thus following the literature, we include into our baseline model the bank age variable and its interaction term with diversification (*AGE_HHI*) to investigate the moderating impact of bank experience. The regression result is reported in Table 9.

As can be seen from Table 9, the estimated coefficients of the interaction term *AGE_HHI* are always positive and significant across all specifications. The result therefore indicates that diversification in more experienced banks may increase bank liquidity creation, perhaps because their superior capabilities, in terms of financial strength and high skilled labors, have allowed these banks to effectively meet the demand of customers for financial services and simultaneously the demand of depositors for liquidity.

#### *The role of bank size in diversification-performance nexus*

Previous literature (e.g. Goddard et al., 2008) suggests that differences in bank size could lead to differences in banks' operational strategies because of the variances in customer preferences, information quality and production methods. This in turn, may elicit different impacts on the relationship between income diversification and bank performance. Accordingly, larger banks are commonly known as having more advantages than their smaller counterparts, in terms of skilled experts, superior technologies, market power, greater access to capital markets and better information quality. As a result, larger banks would be better in formulating or implementing the diversification strategy for their products and services. In this respect, we posit that bank size could elicit different impacts on the diversification-performance nexus and further examine whether the links between diversification and performance differ between small and large Vietnamese banks. Following Berger and Bouwman (2009), in this study, we define large and small banks as those with total assets above and below than the median, respectively. We also incorporate into our baseline specification (2) and (3) the interaction term between bank size and diversification (*SIZE_HHI).* The regression results are provided in Table 10. Column 1-4 of Table 10 report the regression results for large banks, while column 5-8 depict the results for small banks. As can be seen in Table 10, while the signs of the estimated coefficients of the interaction term *SIZE_HHI* are always positive and significant in profitability models for large banks, they are negative and significant in the same models for small banks, suggesting that diversification may increase the profitability of larger banks but decrease the profitability of smaller banks. With regard to bank risk, our results show that while diversification is negatively associated with the risk of large banks, it turns out positively related to the risk of small banks, implying that diversification can reduce the risk of large banks, but actually increase the risk of small banks.

**Table 9**

The role of bank age in the relationship between diversification & bank liquidity creation

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| **VARIABLES** | **LC1** | | | | **LC2** | | | |
| *HHI* | -2.497*** | -2.497*** | 0.886 | 0.886 | -2.510*** | -2.510*** | 0.982 | 0.982 |
| | (0.727) | (0.727) | (1.113) | (1.113) | (0.743) | (0.743) | (1.171) | (1.171) |
| *SIZE* | 2.370*** | 2.370*** | 3.837*** | 3.837*** | 2.448*** | 2.448*** | 4.000*** | 4.000*** |
| | (0.397) | (0.397) | (0.585) | (0.585) | (0.407) | (0.407) | (0.610) | (0.610) |
| *AGE* | -0.820** | -0.820** | -0.032 | -0.032 | -0.852** | -0.852** | -0.048 | -0.048 |
| | (0.373) | (0.373) | (0.230) | (0.230) | (0.383) | (0.383) | (0.231) | (0.231) |
| *AGE_HHI* | **0.706**** | **0.706**** | -0.423 | -0.423 | **0.716**** | **0.716**** | -0.447 | -0.447 |
| | **(0.298)** | **(0.298)** | (0.388) | (0.388) | **(0.306)** | **(0.306)** | (0.406) | (0.406) |
| *CAP* | -2.840*** | -2.840*** | -1.087*** | -1.087*** | -1.126*** | -1.126*** | -1.588*** | -1.588*** |
| | (1.771) | (1.771) | (1.872) | (1.872) | (1.855) | (1.855) | (2.012) | (2.012) |
| *PROVISION* | 0.000** | 0.000** | -0.000 | -0.000 | 0.000* | 0.000* | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *NPLs* | -0.250 | -0.250 | -0.239** | -0.239** | -0.261* | -0.261* | -0.244** | -0.244** |
| | (0.148) | (0.148) | (0.106) | (0.106) | (0.147) | (0.147) | (0.104) | (0.104) |
| *ASSETGROWTH* | 0.207* | 0.207* | 0.215 | 0.215 | 0.209 | 0.209 | 0.210 | 0.210 |
| | (0.116) | (0.116) | (0.143) | (0.143) | (0.122) | (0.122) | (0.148) | (0.148) |
| *MARKETPOWER* | 5.226 | 5.226 | -0.716 | -0.716 | 5.436 | 5.436 | -1.004 | -1.004 |
| | (5.288) | (5.288) | (4.609) | (4.609) | (5.533) | (5.533) | (4.790) | (4.790) |
| Constant | 5.368** | 5.368** | -4.101 | -4.101 | 5.133** | 5.133** | -4.841 | -4.841 |
| | (1.920) | (1.920) | (2.697) | (2.697) | (1.969) | (1.969) | (2.800) | (2.800) |
| Year FE | NO | NO | YES | YES | NO | NO | YES | YES |
| Bank FE | NO | YES | NO | YES | NO | YES | NO | YES |
| R-squared | 0.437 | 0.437 | 0.623 | 0.623 | 0.431 | 0.431 | 0.615 | 0.615 |
| Observations | 137 | 137 | 137 | 137 | 137 | 137 | 137 | 137 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

These results therefore indicate that the impact of diversification on bank performance is size-dependent in the way that while large banks can benefit from diversification strategy, small banks may not capture these beneficial impacts perhaps due to their limited technological capabilities and lower levels of expertise.

**Table 10**

The impact of diversification on bank performance for large and small banks

| | (1) | (2) | (3) | (4) | (5) | (6) | (7) | (8) |
|---|---|---|---|---|---|---|---|---|
| **VARIABLES** | **Large banks** | | | | **Small banks** | | | |
| | **roa** | **roe** | **zscore_roa** | **zscore_roe** | **roa** | **roe** | **zscore_roa** | **zscore_roe** |
| *HHI* | 0.174* | 0.673 | 25.274* | 9.321 | -0.363* | -3.358** | -50.256* | -64.181** |
| | (0.098) | (1.613) | (14.286) | (22.349) | (0.187) | (1.604) | (25.877) | (30.657) |
| ***SIZE_HHI*** | **0.024***** | **0.096**** | **-4.527**** | **-1.985**** | **-0.068*** | **-0.632**** | **9.413*** | **12.084**** |
| | **(0.006)** | **(0.101)** | **(2.464)** | **(3.855)** | **(0.035)** | **(0.302)** | **(4.873)** | **(5.774)** |
| *SIZE* | -0.031* | -0.143 | 3.483*** | 1.328 | -0.011 | 0.125 | -1.575 | 2.397 |
| | (0.017) | (0.278) | (0.892) | (1.396) | (0.015) | (0.130) | (2.099) | (2.487) |
| *CAP* | 0.013 | -0.449* | 1.951 | -6.216* | 0.108* | -0.260 | 14.939* | -4.974 |
| | (0.014) | (0.230) | (2.039) | (3.191) | (0.056) | (0.482) | (7.771) | (9.207) |
| *PROVISION* | -0.000 | -0.000 | -0.000 | -0.000 | -0.000** | -0.000** | -0.000** | -0.000** |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *NPLs* | -0.002*** | -0.025** | -0.275*** | -0.347** | -0.003* | -0.019 | -0.422* | -0.368 |
| | (0.001) | (0.011) | (0.100) | (0.156) | (0.002) | (0.013) | (0.214) | (0.254) |
| *ASSETGROWTH* | 0.007*** | 0.068** | 0.960*** | 0.940** | 0.003 | -0.009 | 0.373 | -0.170 |
| | (0.002) | (0.029) | (0.256) | (0.400) | (0.004) | (0.035) | (0.567) | (0.672) |
| *MARKETPOWER* | 0.008 | 0.917 | 1.109 | 12.701 | 0.205 | 2.739 | 28.362 | 52.356 |
| | (0.037) | (0.613) | (5.433) | (8.499) | (0.370) | (3.168) | (51.114) | (60.557) |
| Constant | -0.104*** | -0.109 | -16.641*** | -3.220 | 0.094 | -0.285 | 11.916 | -6.816 |
| | (0.036) | (0.588) | (5.205) | (8.143) | (0.078) | (0.668) | (10.784) | (12.777) |
| Year FEs | YES | YES | YES | YES | YES | YES | YES | YES |
| Bank FEs | YES | YES | YES | YES | YES | YES | YES | YES |
| R-squared | 0.824 | 0.699 | 0.824 | 0.699 | 0.877 | 0.764 | 0.877 | 0.764 |
| Observations | 83 | 83 | 83 | 83 | 54 | 54 | 54 | 54 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

## 5. Robustness Check

In this section, we perform several robustness checks for the main findings.

### *5.1. Alternative measure of liquidity creation and subsamples*

In order to provide robust checks for the main findings, we employ two alternative measures of liquidity creation, which are AFLC and ANFLC, calculated in the same way as FLC and NFLC but excluding equity from these measures as a robustness check. This is because according to the liquidity creation theories, banks create liquidity through the transformation of illiquid assets into liquid liabilities but not by illiquid claims such as equity (Fu et al., 2015). The theories also highlight that equity can affect banks' ability to create liquidity. Therefore, it is suggested that equity should be excluded from the measures of liquidity creation to address this concern (Berger and Bouwman, 2009). We further investigate the robustness of our results by splitting our sample into two groups for small and large banks and then re-estimating our baseline model. As can be seen from Table X, bank diversification is negatively and statistically significant associated with bank liquidity creation, and thus reinforces our main findings are robust and consistent.

### *5.2. Alternative measure of diversification*

In order to obtain a more comprehensive understanding of the impact of banks' diversification on bank performance and further investigate the robustness of our results, we consider a more direct measure of income diversification, which is the ratio of non-interest income to bank operating income (NONINTEREST_INCOME). As can be seen from Table 11 that, bank diversification is negatively and statistically significant associated with bank profitability and bank risk, and thus this result reinforces our main findings are robust and consistent.

## 6. Conclusion

The purpose of this paper is to provide more insights into the impact of diversification on bank liquidity creation and bank performance in Vietnam by using a sample of 21 commercial banks during the 2007-2017 period. Our results reveal that diversification has a negative impact on Vietnamese banks' liquidity creation, possibly due to the consumption of greater management resources when banks diversify has accelerated the switching cost and thus decreased banks' ability to create liquidity. Our study also find that income diversification is negatively linked with bank profitability, suggesting that more focused banks tend to have higher returns. Perhaps because Vietnamese bank's managers may have neither sufficient expertise nor enough incentive schemes to maximize the profit of banks. Furthermore, we find that diversification can reduce bank risk, possibly because both the portfolio diversification is more applicable to the case of Vietnamese banks and the nature of the non-traditional activities in Vietnamese banks are not risky enough and as such when banks diversify, their revenue's risk declines. More interestingly, we show that the relationship between diversification and bank liquidity creation is contingent upon the level of bank experience in the sense that diversification in more experienced banks may increase bank liquidity creation. In addition, our study provides evidence that the impact of diversification on bank performance is size-dependent. While diversification can increase the profitability of large banks and reduce their risk, the contradicting results are found for small banks.

Our findings therefore have two broad important policy implications for economic researchers, policy-makers and bank's managers. First, given our findings that diversification has a negative influence on bank liquidity creation and bank profitability, we suggest that Vietnamese banks should focus on their mainstream lines of business rather than more shifting towards nontraditional activities in order to seek for higher returns and to compensate for the drop in interest income because the diversification strategy can adversely deteriorate both bank core function of creating liquidity and bank profitability. Second, our results for different bank size groups recommend that similar diversification strategies should not be utilized for large and small banks. Accordingly, since large banks have superior technologies and sufficient expertise, they are encouraged to further diversify beyond their core expertise in traditional lines of business to gain benefits of higher returns and reduced risk. In contrast, small banks should focus on their traditional activities because their limited capabilities may cause the high costs in terms of both reduced profitability and increased risks when diversifying non-traditional activities.

## Table 11

The impact of income diversification on bank liquidity creation – Alternative measure of bank liquidity creation

| VARIABLES | (1) AFLC | (2) AFLC | (3) ANFL | (4) ANFL | (5) AFLC | (6) AFLC | (7) ANFLC | (8) ANFLC | (1) AFLC | (2) AFLC | (3) ANFL | (4) ANFL | (5) ANFLC | (6) ANFLC | (7) ANFLC | (8) ANFLC |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Large banks | | | | | | | | Small banks | | | | | | | |
| L.HHI | -4.485*** | -4.129*** | -4.191** | -4.191** | -4.119*** | -4.119*** | -4.128** | -4.128** | -3.462** | -3.952** | -6.203*** | -6.203*** | -3.771*** | -3.771*** | -4.207** | -4.207** |
| | (1.516) | (1.490) | (1.973) | (1.973) | (1.491) | (1.491) | (1.983) | (1.983) | (1.641) | (1.400) | (1.576) | (1.576) | (1.017) | (1.017) | (1.552) | (1.552) |
| L.SIZE | -0.325 | 0.101 | -1.637 | -1.637 | -0.036 | -0.036 | -1.843 | -1.843 | 5.869* | 5.967** | 11.067** | 11.067** | -1.348 | -1.348 | -7.238 | -7.238 |
| | (0.928) | (0.881) | (1.849) | (1.849) | (0.882) | (0.882) | (1.858) | (1.858) | (2.877) | (2.391) | (4.299) | (4.299) | (2.677) | (2.677) | (7.691) | (7.691) |
| L.CAP | 5.227 | 2.959 | 6.602 | 6.602 | 3.323 | 3.323 | 7.163 | 7.163 | -3.444*** | -2.567** | -3.779 | -3.779 | -2.847*** | -2.847*** | 3.524 | 3.524 |
| | (4.085) | (4.040) | (5.365) | (5.365) | (4.044) | (4.044) | (5.392) | (5.392) | (9.754) | (8.694) | (17.464) | (17.464) | (6.262) | (6.262) | (17.419) | (17.419) |
| L.PROVISION | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | 0.000 | -0.000 | -0.000 | -0.000 | 0.000 | 0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| L.NPLs | 1.122*** | 1.180*** | 0.966*** | 0.966*** | 1.193*** | 1.193*** | 0.977*** | 0.977*** | -0.271 | -0.317 | 0.172 | 0.172 | 0.261 | 0.261 | 0.377 | 0.377 |
| | (0.199) | (0.198) | (0.233) | (0.233) | (0.198) | (0.198) | (0.234) | (0.234) | (0.340) | (0.268) | (0.366) | (0.366) | (0.275) | (0.275) | (0.348) | (0.348) |
| L.ASSETGROWTH | 0.402 | 0.721 | 1.450** | 1.450** | 0.698 | 0.698 | 1.422** | 1.422** | 1.097 | 1.340 | 1.113 | 1.113 | 1.557** | 1.557** | 0.729 | 0.729 |
| | (0.545) | (0.509) | (0.653) | (0.653) | (0.509) | (0.509) | (0.657) | (0.657) | (1.044) | (0.897) | (1.066) | (1.066) | (0.656) | (0.656) | (0.893) | (0.893) |
| L.MARKETPOWER | | -1.604* | -1.503 | -1.503 | -1.013* | -1.013* | -1.575 | -1.575 | | 1.423** | 5.001 | 5.001 | 1.938*** | 1.938*** | 1.195* | 1.195* |
| | | (11.258) | (13.389) | (13.389) | (11.268) | (11.268) | (13.456) | (13.456) | | (67.001) | (75.618) | (75.618) | (50.430) | (50.430) | (66.396) | (66.396) |
| Constant | -2.636 | -3.073 | 8.007 | 8.007 | -2.526 | -2.526 | 8.884 | 8.884 | -12.429 | -14.970 | -41.283* | -41.283* | 18.809 | 18.809 | 45.919 | 45.919 |
| | (4.433) | (4.326) | (9.935) | (9.935) | (4.330) | (4.330) | (9.984) | (9.984) | (16.250) | (13.593) | (22.135) | (22.135) | (13.499) | (13.499) | (37.128) | (37.128) |
| Year FEs | NO | NO | YES | YES | NO | NO | YES | YES | NO | NO | YES | YES | NO | NO | YES | YES |
| Bank FEs | NO | YES | NO | YES | NO | YES | NO | YES | NO | YES | NO | YES | NO | YES | NO | YES |
| R-squared | 0.571 | 0.586 | 0.670 | 0.670 | 0.582 | 0.582 | 0.664 | 0.664 | 0.573 | 0.688 | 0.869 | 0.869 | 0.736 | 0.736 | 0.868 | 0.868 |
| Observations | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 68 | 35 | 35 | 35 | 35 | 33 | 33 | 33 | 33 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

## Table 12

The impact of income diversification on bank profitability and bank risk – Alternative measure of diversification

| Variables | (1) ROA | (2) ROA | (3) ROA | (4) ROA | (5) ROE | (6) ROE | (7) ROE | (8) ROE | (9) Z_ROA | (10) Z_ROA | (11) Z_ROA | (12) Z_ROA | (13) Z_ROE | (14) Z_ROE | (15) Z_ROE | (16) Z_ROE |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| | Bank Profitability | | | | | | | | Bank Risk | | | | | | | |
| *HHI2* | -0.006* | -0.006* | -0.006 | -0.006 | -0.115*** | -0.115*** | -0.145** | -0.145** | -0.872* | -0.872* | -0.892 | -0.892 | -1.648*** | -1.648*** | -2.073** | -2.073** |
| | (0.003) | (0.003) | (0.005) | (0.005) | (0.032) | (0.032) | (0.068) | (0.068) | (0.443) | (0.443) | (0.644) | (0.644) | (0.457) | (0.457) | (0.973) | (0.973) |
| *SIZE* | 0.001 | 0.001 | 0.015** | 0.015** | -0.046 | -0.046 | 0.141* | 0.141* | 0.148 | 0.148 | 2.028** | 2.028** | -0.657 | -0.657 | 2.028* | 2.028* |
| | (0.003) | (0.003) | (0.005) | (0.005) | (0.042) | (0.042) | (0.073) | (0.073) | (0.448) | (0.448) | (0.740) | (0.740) | (0.597) | (0.597) | (1.041) | (1.041) |
| *CAP* | 0.060*** | 0.060*** | 0.032 | 0.032 | -0.329** | -0.329** | -0.696*** | -0.696*** | 8.350*** | 8.350*** | 4.428 | 4.428 | -4.711** | -4.711** | -9.973*** | -9.973*** |
| | (0.017) | (0.017) | (0.022) | (0.022) | (0.140) | (0.140) | (0.177) | (0.177) | (2.334) | (2.334) | (3.111) | (3.111) | (2.011) | (2.011) | (2.534) | (2.534) |
| *PROVISION* | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 | -0.000 |
| | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) | (0.000) |
| *NPLs* | -0.004*** | -0.004*** | -0.003*** | -0.003*** | -0.036*** | -0.036*** | -0.024*** | -0.024*** | -0.548*** | -0.548*** | -0.434*** | -0.434*** | -0.512*** | -0.512*** | -0.342*** | -0.342*** |
| | (0.000) | (0.000) | (0.001) | (0.001) | (0.008) | (0.008) | (0.007) | (0.007) | (0.065) | (0.065) | (0.090) | (0.090) | (0.111) | (0.111) | (0.107) | (0.107) |
| *ASSETGROWTH* | 0.009*** | 0.009*** | 0.008*** | 0.008*** | 0.066** | 0.066** | 0.041 | 0.041 | 1.324*** | 1.324*** | 1.161*** | 1.161*** | 0.949** | 0.949** | 0.588 | 0.588 |
| | (0.001) | (0.001) | (0.002) | (0.002) | (0.025) | (0.025) | (0.025) | (0.025) | (0.170) | (0.170) | (0.243) | (0.243) | (0.364) | (0.364) | (0.357) | (0.357) |
| *MARKETPOWER* | 0.087* | 0.087* | 0.011 | 0.011 | 1.621*** | 1.621*** | 0.533 | 0.533 | 12.111* | 12.111* | 1.550 | 1.550 | 23.244*** | 23.244*** | 7.634 | 7.634 |
| | (0.043) | (0.043) | (0.037) | (0.037) | (0.452) | (0.452) | (0.555) | (0.555) | (6.014) | (6.014) | (5.106) | (5.106) | (6.476) | (6.476) | (7.957) | (7.957) |
| Constant | 0.036** | 0.036** | -0.037 | -0.037 | 0.714*** | 0.714*** | -0.296 | -0.296 | 3.680* | 3.680* | -6.564* | -6.564* | 8.760*** | 8.760*** | -5.716 | -5.716 |
| | (0.013) | (0.013) | (0.026) | (0.026) | (0.210) | (0.210) | (0.336) | (0.336) | (1.839) | (1.839) | (3.599) | (3.599) | (3.007) | (3.007) | (4.812) | (4.812) |
| Year FEs | NO | NO | YES | YES | NO | NO | YES | YES | NO | NO | YES | YES | NO | NO | YES | YES |
| Bank FEs | NO | YES | NO | YES | NO | YES | NO | YES | NO | YES | NO | YES | NO | YES | NO | YES |
| R-squared | 0.669 | 0.669 | 0.771 | 0.771 | 0.481 | 0.481 | 0.642 | 0.642 | 0.669 | 0.669 | 0.771 | 0.771 | 0.481 | 0.481 | 0.642 | 0.642 |
| Observations | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 134 | 134 |

Robust standard errors in parentheses
*** p<0.01, ** p<0.05, * p<0.1

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