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The interrelationship between net interest margin and non-interest income: evidence from Vietnam

Net interest
margin and
non-interest
income

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Abstract

Purpose – The purpose of this paper is to investigate the interrelationship between non-interest income (NII) and net interest margin (NIM) in the Vietnamese banking system between 2006 and 2015. Thereafter, the impact of NII on risk-adjusted returns is also examined.

Design/methodology/approach – Various analysis techniques are used to achieve the research objectives.

Findings – The findings show a negative two-way link between NII and NIM, thus supporting the subsidisation hypothesis. Furthermore, NII is found to have a negative impact on risk-adjusted returns. When observing this relationship in sub-samples, the findings indicate that the negative impact of NII on risk-adjusted returns still holds in the first subsample (2006-2011). The coefficient of NII becomes positive but not significant for the subsequent period (2012-2015). In addition, the Spearman rank-order correlations of returns on assets and NII for both sub-samples are negative. Together, the author concludes that there are no diversification benefits in the Vietnamese banking system.

Practical implications – The evidence suggests a trade-off between non-interest activities and traditional lending ones. In addition, the findings demonstrate that the Vietnamese banks may use NIIs to expand leverage and herd by coordinating NII strategy during the economic downturns. Thus, the banking system may be exposed to a greater risk. The research has implications for bank supervisors, policy-makers and bank managers.

Originality/value – This study is the first attempt to investigate the interrelationships between net NII and NIM in the Vietnamese banking system.

Keywords Vietnam, Diversification, Bank risk, Non-interest income, Bank margins, Three-stage least squares

Paper type Research paper

1. Introduction

Trends such as globalisation, disintermediation and re-regulation have impacted not only the competitive viability of banks but also the nature of the intermediation business. Changes in the nature of financial intermediation have been accompanied by a change in the nature of bank income (Allen and Santomero, 2001). The reduction in net interest margin (NIM) reflects increasing competition on the returns on earning assets and the cost of bank funds. The growth in core deposits at banks has reduced since customers have more options that offer them similar services and pay higher interest rates such as cash management accounts and mutual funds. Loan yields have declined because of the increasing competition from non-bank creditors such as finance and leasing companies. Accordingly, banks have offset the impact of reduced traditional income sourced from margin income via increases in fee income. Non-interest income (NII) have accounted for an approximately half of total operating income of US banks and contributed a significant amount to the total income of banks in many developed countries (Nguyen, 2012). NII generated by off-balance sheet (OBS) activities includes trading gains and fees, investment banking and brokerage fees, net servicing fees, insurance commissions, net gains on assets sales, fiduciary income, net securitisation, service charges on deposit accounts, other foreign transactions and other NII (Clark and Siems, 2002). Such a shift has a number of important implications from the perspectives of bank management and regulatory policy.



Prior studies show mixed findings. A cross-country study by Davis (2002) finds that the shift towards non-traditional activities is beneficial for banks in most countries since it enhances an improvement in NIM. The removal of geographic restrictions that allows banks to engage in new OBS activities in new markets is likely to generate desirable outcomes. However, others indicate that NII has increased at the expense of NIM (Heffernan and Fu, 2010; Lepetit *et al.*, 2008a; Rogers and Sinkey, 1999). Accordingly, this shift rather offsets a reduction in margin income. Also, non-traditional activities may generate higher NIM via interest and fee income banks charge to compensate (line of credit or options) (Angbazo, 1997). Whereas, Carbó Valverde and Rodríguez Fernández (2007) find that the negative relationship between NII and NIM exists under certain assumptions. In fact, the shift towards non-traditional activities does not mean that banks are abandoning their traditional activities. Rather, there has been “at most” a slight reduction in commercial banks’ share of financial intermediation[1] (Boyd and Gertler, 1994). In short, most of prior studies examine the impact of NII on NIM while the opposite link is relative weak (Nguyen, 2012 may be one of the few exceptions). Accordingly, this study revisits this issue by investigating the interrelationship between NII and NIM with the unique data set and recent empirical methodologies.

The empirical evidence documenting the interrelationship between NII and NIM is primarily based on the developed markets, with much less insight and discussion on the banking industry in emerging economies. 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 studies that examine the interrelationship between NIM and NII in Vietnam.

Vietnam boasts one of the fastest-growing emerging economies in the world[2], with an average of approximately 6 per cent gross domestic product (GDP) growth per year in real terms. Because of relatively underdeveloped capital markets[3], the Vietnamese banking system is a backbone of the economy as it contributes 16-18 per cent towards annual GDP (Stewart *et al.*, 2016). Before 2007, the traditional lending and deposit markets were intensively competitive among the state-owned commercial banks and privately owned commercial banks (Asian Development Bank, 2015). Since Vietnam’s entry into the World Trade Organisation in 2007, an increasing number of foreign banks were allowed to operate in Vietnam. This resulted in fierce competition for deposits and loans, thereby reducing interest margins for domestic banks[4]. In response, domestic banks have diversified away from their traditional business activities into new fee-based sources of revenue (OBS activities) (Le, 2015; Nguyen and Simioni, 2015). As such, Vietnam offers a particularly interesting environment in which to investigate this critical issue.

Our study contributes to the literature in several ways. Most studies examine the relationship between NII and NIM separately. In particular, the investigation of the determinants of NIMs must explicitly take into account of the potential impact of NII. By contrast, we examine the two-way relationship between NII and NIM using a simultaneous equations model. In addition, we use a different measure of non-traditional activities. The ratio of NII to total net income is our main proxy for non-traditional activities whereas the ratio of other earning assets to total assets is employed in Nguyen’s (2012) study. In addition, the results obtained by the Granger causality framework as used in Nguyen (2012) for cross-country analysis are sensitive to model specification and the number of lags. In our study, a three-stage least squares (3SLS) estimation is used to assess whether similar findings can be obtained. Furthermore, this study is the first attempt to examine the interrelationship between NIM and NII in the Vietnamese banking system between 2006 and 2015 where there is a significant change in the banks’ income structure. Finally, we further investigate whether NII improves risk-adjusted returns of Vietnamese commercial banks.

Our main findings indicate that the negative two-way relationship between NII and NIM between 2006 and 2015, thus lends to support the subsidisation hypothesis. Our findings

also demonstrate that banks' increasing involvements in non-traditional activities in general is negatively related to the risk-adjusted profitability measures. When observing this relationship in sub-samples, we find that the negative impact of NII on risk-adjusted returns still holds in first subsample (2006-2011) and the coefficient of NII becomes positive but not significant for the subsequent period (2012-2015) for one equation. In addition, the Spearman rank-order correlations of returns on assets and NII for both sub-samples are negative. Together, we conclude that there are no diversification benefits in the Vietnamese banking system. This suggests that Vietnamese banks may use NII to expand leverage and herd by coordinating NII strategy during the economic downturns. Consequently, the banking system may be exposed to greater risk.

The remainder of our study is organised as follows. Section 2 presents a literature review on the relationship between NIM and NII and the impact of NII on bank risk and profitability. Section 3 introduces the methodology. Section 4 describes the data used in the tests. Section 5 discusses the empirical findings and Section 6 concludes the paper.

2. Literature review

As per the conventional view, a decline in NIM precedes an increase in NII, which indicates that an increase in NII is a reaction to the falling revenue. Consequently, increased NII is acting to supplement declines in NII rather than replacing margin income (DeYoung and Rice, 2004). However, an increase in NII precedes a reduction in NIM, suggesting a trade-off between NII and NIM. This reflects the increased competition and the process of disintermediation that reduced the comparative advantage of banks in obtaining funds and advancing loans. In response, banks has shifted towards non-traditional activities because these activities may generate higher net margins via interest and fee income banks charge to compensate, for example, for providing the line of credit options included OBS contracts (Angbazo, 1997). Prior studies find mixed findings. Several studies indicate that NII have increased at the expense of NIMs (Lepetit *et al.*, 2008a; Rogers and Sinkey, 1999; Williams and Rajaguru, 2012). Accordingly, banks have offset the impact of decreased traditional income by improving NIIs. However, others demonstrate a positive relationship between interest income and NII (Ozili, 2017). Accordingly, high-performing banks have greater levels of NII and NIM (Carbó Valverde and Rodríguez Fernández, 2007; Stiroh, 2004). This is mainly due to the cross-selling strategies and increased loan commitments. Whereas, Nguyen (2012) finds the negative two-way relationship between NII and NIM in the particular period.

Conventionally, the negative relationship between NII and NIM implies that NII is used to augment a shortfall in interest income. This would suggest increased diversification benefits to banks, thereby lowering the bank's systematic risk. Accordingly, several studies further investigate the impact of NII on bank risk and profitability. The literature is dominated by the studies from developed markets where larger markets and number of banks have facilitated economic modelling. Earlier studies indicate that diversification potentially reduces risk, thus improving ultimately the stability of banking system (Gallo *et al.*, 1996; Kwast, 1989). Similarly, Froot and Stein (1998) suggest that diversification is a hedge against insolvency risk and reduces the effect of costly financial distress. However, recent studies in the US banking system show no clear diversification benefits. Stiroh (2004) finds that increased fee-based income is associated with a reduction in the risk-adjusted returns. Rather, this increase in NII is accompanied by higher market risks as measured by market β s and return volatility. These findings are consistent with the findings of Calmès and Liu (2009) who found that OBS activities do not generate diversification benefits for Canadian banks due to greater banking income volatility. Indeed, change in income mix towards fees increases earnings volatility that account for leverage effects (DeYoung and Roland 2001) and worsens the bank's risk-return trade-off (DeYoung and Rice, 2004;

Stiroh and Rumble, 2006). Non-traditional income is more volatile than margin income, which can be explained as follows. First, because of a substantial relationship component in bank lending, the switching costs between loan providers are higher than when changing providers of fee-based transactions, which have a lower relationship component. Second, fee income is significantly reliant on employee costs to offer the services, which incurs a high fixed-cost component whereas margins are more dependent on interest expenditure as a main cost input. Therefore, fees have a higher level of operating leverage. Third, fees have higher financial leverage due to lower levels of required fixed assets and thus, having higher financial risk (DeYoung and Roland, 2001).

Regarding other markets, Baele *et al.* (2007) find that European banks that engage in more non-interest activities have higher expected returns but also have greater β risk. Their findings are in line with findings of Lepetit *et al.* (2008b) and Schmid and Walter (2009) who found that diversification benefits from raised fees and commissions are offset by increased bank risk. Similarly, Williams and Prather (2010) document that NII is riskier than margin income but provides diversification benefits to bank shareholders in Australia. Furthermore, a study of international data indicates that financial conglomerates have a lower market value than focussed counterparts and thus there exists a diversification discount in multiple activities financial firms, due to the effect of agency problems (Laeven and Levine, 2007). Another across-country study by Nguyen (2012) also indicates similar results.

In the context of Vietnam, the mixed findings have also been found. Batten and Vo (2016) and Le (2016a) indicate the negative impact of NII on bank risk, suggesting that Vietnamese banks should concentrate on traditional lending activities. This somewhat conflicts with the findings of Nguyen *et al.* (2015), indicating that more diversified banks are generally associated with lower bank risk than less diversified counterparts. In contrast, we first investigate the interrelationship between NII and NIM by using 3SLS. Thereafter, if the trade-off between NII and NIM exists we further examine the impact of diversification towards NII on risk-adjusted returns (RAR_{ROA} , RAR_{ROE}) in the Vietnamese banking system. The Spearman rank-order correlation of ROA and NII is also used to confirm our main findings.

3. Methodology

Nguyen and Nghiem (2015) demonstrate that results obtained from Granger causality are sensitive to model specification and the number of lags. In addition, Belsley (1988) suggests that 3SLS can be more efficient than 2SLS, a relative advantage that increases with the strength of the interrelations among the error terms. Therefore, the 3SLS estimator which combines 2SLS and SUR is used in our study.

Following prior studies such as Nguyen (2012) and Angbazo (1997), four different measures of NIM are used in our study. These include NIM1 (the ratio of net interest income to total interest bearing assets[5]), NIM2 (the ratio of net interest income to average interest bearing assets), NIM3 (the ratio of net interest income to total assets) and NIM4 (the ratio of net interest income to average total assets). Therefore, NII and NIM represent the two endogenous variables in the following simultaneous equation system, with two right-hand-side endogenous variables in each of the two equations. The model is completed by adding exogenous variables that have explanatory power for each of the above endogenous variables as follows:

$$\begin{aligned} \text{NIM}_{i,t} = & \alpha_0 + \alpha_1 \text{NII}_{i,t} + \alpha_2 \text{SHARE}_{i,t} + \alpha_3 \text{NIE}_{i,t} + \alpha_4 \text{EQUITY}_{i,t} + \alpha_5 \text{LLP}_{i,t} \\ & + \alpha_6 \text{LIQUITY}_{i,t} + \alpha_7 \text{COV}_{i,t} + \alpha_8 \text{SIZE}_{i,t} + \alpha_9 \text{LNTL}_{i,t} + \varepsilon_{i,t} \end{aligned} \quad (1)$$

$$\begin{aligned} \text{NII}_{i,t} = & \beta_0 + \beta_1 \text{NIM}_{i,t} + \beta_2 \text{SIZE}_{i,t} + \beta_3 \text{TDTL}_{i,t} + \beta_4 \text{LIQUIDITY}_{i,t} + \beta_5 \text{TLTA}_{i,t} \\ & + \beta_6 \text{OH}_{i,t} + \beta_7 \text{ROA}_{i,t-1} + \theta_{i,t} \end{aligned} \quad (2)$$

where NIM, a measure of NIM of i th bank in year t ; NII, the ratio of NII to the total net income; SHARE, the ratio of bank's deposits to the total deposits in the industry; NIE, the ratio of non-interest expenses to the total assets; EQUITY, the ratio of equity to total assets; LLP, the ratio of loan loss provisions to the total assets; LIQUIDITY, the ratio of liquid assets to short-term funding; COV, the product of the values of LIQUIDITY and LLP; SIZE, the natural logarithm of the total assets; LNTL, the natural logarithm of total loans; TDTL, the ratio of total deposits to the total loans; TLTA, the ratio of total loans to the total assets; OH, the ratio of overhead costs to the total net income; ROA, the ratio of profit before tax to the total assets.

3.1 NIM

NII. A conventional view suggests a negative relationship between NII and NIM. Several studies found that NIIs have increased at the expense of NIMs (Heffernan and Fu, 2010; Lepetit *et al.*, 2008a; Rogers and Sinkey, 1999). This could be explained by the fact that banks have offset the impact of reduced traditional income sourced from margin income by increasing NII. In addition, the banks that engage in non-traditional activities generate higher net margins via interest and fee income banks charged to compensate, such as providing the line of credit options (i.e. OBS contracts) (Angbazo, 1997). In contrast, the positive relationship between NII and NIM suggests the shift towards non-traditional activities is beneficial for banks. This means that high-performing banks have high levels of NII and NIM. Stiroh (2004) suggests that an improvement in NII is associated with a growth of NIM. This is due to an increased focus on cross-selling strategies and increased loan commitments.

Following prior studies (Angbazo, 1997; Carbó Valverde and Rodríguez Fernández, 2007; Maudos and Fernández de Guevara, 2004; Nguyen, 2012; Saunders and Schumacher, 2000), we use market structure (SHARE), management quality (NIE), risk aversion (EQUITY), credit risk (LLP), liquidity risk (LIQUIDITY), the interaction between credit risk and interest rate risk (COV), bank size (SIZE), the size of banks' loan portfolio (LNTL) as control variables for NIM. SHARE as measured by the ratio of bank's deposits to total deposits in the industry is used to control for market power. As per traditional structure-conduct performance hypothesis, banks in concentrated markets tend to collude in setting their interest margins and so improve the margin (Naceur, 2003). Accordingly, larger banks are able to exercise their market power in pricing and pay lower rates for depositors, thus earn higher margins. A cross-country study by Demirgüç-Kunt and Huizinga (1999) found that banks with larger market share impacts interest margin positively. NIE as measured by the ratio of non-interest expenses[6] to total assets is used to control for management quality. A variation in non-interest expenses of banks is reflected in fluctuation in bank interest margins since they pass on their costs to their deposits and lenders. Banks with poor management quality may charge higher margins to offset their increased costs (Claeys and Vander Vennet, 2008; Maudos and Fernández de Guevara, 2004; Peria and Mody, 2004). EQUITY as measured by the ratio of total equity to total assets is used to control for the degree of risk aversion. EQUITY is expected to have a positive impact on NIM since those banks that are most risk-averse require a higher margin in order to cover the higher costs of equity financing compared to external financing (Maudos and Fernández de Guevara, 2004)[7]. LLP as measured by the ratio of loan loss provisions to total assets is used as a proxy for credit risk[8]. A high level of credit risk may cause banks to increase their interest margins with risk premium to compensate for possible default risk (Carbó Valverde and Rodríguez Fernández, 2007; Drakos, 2002; Maudos and Fernández de Guevara, 2004; Nguyen, 2012). LIQUIDITY as measured by the ratio of liquid assets[9] to short-term funding[10] is used to control for liquidity risk. Similar to credit risk, LIQUIDITY is expected to have a positive impact on NIM (Angbazo, 1997). COV as measured by the product of the values of LLP and LIQUIDITY is used to control for the impact of interaction between credit risk

and interest rate risk. Interest rate risk exposure is inversely associated with the average maturity of assets. Consequently, the higher the level of short-term assets, the smaller the sensitivity to near-term interest rate changes which may lower interest rate premium (Maudos and Fernández de Guevara, 2004). We use the ratio of liquidity assets to customer and short-term funding (LIQUIDITY) as a proxy for inverse interest rate risk (Nguyen, 2012). Liebeg and Schwaiger (2006) argue that higher interest rate risks increase the likelihood of default, thus increasing margins to compensate higher risk default. Similarly, adequate provisioning of loan losses may also increase the margins (Nguyen, 2012).

SIZE as measured by the natural logarithm of total assets is used to control for bank size. Theoretical model suggests a positive relationship between the SIZE and NIM. Accordingly, the larger the average size of the operations, the higher the risks concentrated in single customers, thus demanding higher the NIMs (Liebeg and Schwaiger, 2006; Maudos and Fernández de Guevara, 2004). However, due to economies of scale, banks that provide more credit should benefit from their size and have lower margins (Fungáčová and Poghosyan, 2011). LNTL as measured by the natural logarithm of the volume of total loans is used to control for the size of banks' loan portfolio (Nguyen, 2012). Lending specialisation offers informative advantages which may lower intermediation costs, thus leading to reduced margins (Berlin and Mester, 1999; Boot, 2000; Carbó Valverde and Rodríguez Fernández, 2007; Petersen and Rajan, 1995). However, banks with higher share of loans in their portfolio are exposed to greater risk, thus, demanding higher margins.

3.2 NII

NIM. Since a bank makes relatively higher profits from its margin returns, this would reduce engagements in other activities that prevent banks from possible exposure to excessive risk. The negative relationship between NIM and NII is anticipated.

Following prior studies (Nguyen, 2012), we use bank size (SIZE), bank intermediation (TDTL), liquidity risk (LIQUIDITY), lending specialisation (TLTA), bank operating efficiency (OH), bank profitability (ROA) as control variables for NII. SIZE as measured by the natural logarithm of total assets is used to control for bank size. Engaging in certain non-traditional activities may require some degree of specialisation for the bank which may be achieved by recruiting more expertise and using modern technology (Rogers and Sinkey, 1999). TDTL as measured by the ratio of total deposits to total loans is used to control for bank intermediation. Because the bank is able to mobilise more deposits, there is a higher propensity of making more loans. However, if a bank is constrained on attracting core deposits, it may induce the bank to produce a larger quantity of non-traditional activities concurrently with searching for other sources of funds. Reasonably, banks that face prevailing (low) interest rates and higher credit risk may have shifted other source of revenue such as derivatives. LIQUIDITY as measured by the ratio of liquid assets to short-term funding is used to control for liquidity risk. The shift to non-traditional businesses varies greatly across banks due to differences in risk and other characteristics (Rogers, 1998). A bank with relatively more liquid assets is better placed to satisfy the unforeseen contingencies (Rogers and Sinkey, 1999). This liquidity serves as a cushion against losses arising from the fire sale of assets to meet liquidity. A bank that holds a relatively high proportion of liquid assets unlikely generates high profits, but is also less exposed to risk (Goddard *et al.*, 2004). If banks need more liquidity to engage in higher levels of non-traditional activities, the positive link between them is anticipated. However, Rogers and Sinkey (1999) argue that less liquid banks may have more non-traditional activities, thus a moral hazard behaviour exists. TLTA as measured by the ratio of total loans to total assets is used to control for lending specialisation (Maudos and Fernández de Guevara, 2004). As per conventional view, specialisation in lending could enable banks to avoid technological and learning costs associated with diversification (Rogers and Sinkey, 1999).

Consequently, as to be economically efficient, banks have less incentive to move away traditional lending function. However, the safety perspective hypothesis predicts that banks specialising in the advancing loans may be exposed to greater risk. Therefore, banks involved in more non-traditional activities may be able to protect themselves from risk and are able to tolerate greater risk. OH as measured by the ratio of overhead costs to the total net income is used to control for bank efficiency. Banks with lower efficiency level are likely to charge higher fee and commissions (if they enjoy market power). ROA as measured by the ratio of profits before tax to the total asset is used to control for bank profitability. As banks become more profitable they will have incentives to find new profitable opportunities in other non-interest segments of the market as those opportunities emerge.

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4. Data

We use annual data extracted from the balance sheets of individual Vietnamese banks over the period 2006-2015 where there is a significant change in the income structure of banks. Since 2006, Vietnamese banks have been required to publish their annual reports to improve the transparency in the banking system. Data are also collected from Vietstock database for cross-checking and missing data. Only domestic commercial banks are selected as they are main active players in the banking system while foreign banks and joint-venture banks[11] are somewhat limited to operate in the Vietnamese markets. Initially, we obtain 334 observations from unbalanced panel data of 40 banks including five state-owned commercial banks[12] and 35 joint-stock commercial banks[13]. However, in order to examine whether the negative/positive relationship between NIM and NII still holds using four different measures of NIM, we have 322 observations after eliminating missing data. The summary statistics of the posited variables are indicated in Table I.

	Mean	SD	Minimum	Maximum
NIM1 _{<i>t</i>}	3.0066	1.4752	-0.7573	10.3034
NIM2 _{<i>t</i>}	3.4118	1.5995	-0.8641	9.3380
NIM3 _{<i>t</i>}	2.6261	1.3439	-0.6412	9.6073
NIM4 _{<i>t</i>}	2.9792	1.4447	-0.6972	8.9380
NII _{<i>t</i>}	24.9154	66.8433	-58.4901	1,165.0270
SHARE _{<i>t</i>}	2.8575	4.2395	0.0276	25.7013
NIE _{<i>t</i>}	1.7751	0.9517	0.0510	7.9704
EQUITY _{<i>t</i>}	12.6844	8.9915	2.4480	66.0754
LLP _{<i>t</i>}	0.6984	1.2640	0.0076	22.0620
LIQUIDITY _{<i>t</i>}	46.5997	18.9722	7.9581	109.2788
COV _{<i>t</i>}	29.3956	44.0745	0.2663	743.4421
SIZE _{<i>t</i>}	17.4711	1.6832	1.4043	20.5615
LNTL _{<i>t</i>}	16.7721	1.6899	1.4373	20.2098
TDTL _{<i>t</i>}	64.7164	15.9169	19.2558	98.2945
TLTA _{<i>t</i>}	51.5961	14.0548	14.7255	94.4218
OH _{<i>t</i>}	75.1821	478.5092	1.0952	8,630.1942
ROA _{<i>t-1</i>}	1.4527	1.0742	-5.5117	5.9518

Notes: NIM1, the ratio of net interest income to total interest bearing assets; NIM2, the ratio of net interest income to average interest bearing assets; NIM3, the ratio of net interest income to total assets; NIM4, the ratio of net interest income to average total assets; NII, the ratio of non-interest income to total net income; SHARE, the ratio of bank's deposits to total deposits in the industry; NIE, the ratio of non-interest expenses to total assets; EQUITY, the ratio of total equity to total assets; LLP, the ratio of loan loss provisions to total assets; LIQUIDITY, the ratio of liquid assets to short-term funding; COV, the product of LIQUIDITY and LLP; SIZE, the natural logarithm of total assets; LNTL, the natural logarithm of total loans; TDTL, the ratio of total deposits to total loans; TLTA, the ratio of total loans to total assets; OH, the ratio of overhead costs to total net income; ROA, the ratio of profits before tax to total assets

Table I.
Descriptive statistics
of variables

5. Empirical results

Table II presents the correlation matrix of the various variables used in our study. For the convenience, we concentrate on the interpretation of correlation between NII and all measures of NIM. At the first glance, NII is negatively correlated with all four measures of NIM. Along with this, the correlations of other control variables in both equations are also reported [14]. However, whether NIM has an impact on NII can be only addressed by using 3SLS estimation in a simultaneous equations model as presented in the following section.

5.1 Regression results

5.1.1 The impact of NII on NIM. For the ease of exposition, we attempt to provide general interpretations of the significant coefficients as presented in the following tables. The results for the impact of NII on NIM are indicated in Table III.

The coefficient of NII is significant and negative in all versions, suggesting that NII has increased at the expense of NIM. This may reflect a strategy of cross-subsidisation hypothesis (Carbó Valverde and Rodríguez Fernández, 2007; Lepetit *et al.*, 2008a; Maudos and Solís, 2009; Nguyen, 2012). Since banks engage in different non-lending businesses, these other activities may influence the pricing of loan products due to cross-subsidisation of bank products. For instance, banks may reduce lending rates to borrowers who also use bank services which generate fee and commission income, such as underwriting of securities.

The coefficient of SHARE is statistically not significant. NIE is significantly and positively associated with NIM, suggesting that banks with poor management quality may charge higher margins to offset their increased costs (Maudos and Fernández de Guevara, 2004; Peria and Mody, 2004). EQUITY is significantly and positively related to NIM, indicating that the more risk-averse banks, the higher margins they charge to compensate for the higher costs of equity financing (Berger, 1995). This is in line with earlier findings of Fungáčová and Poghosyan (2011); Kasman *et al.* (2010); and Saunders and Schumacher (2000). In other words, safer banks may pay less deposit rates to depositors, thus lowering funding costs and obtaining higher margins. LLP and COV are found to have no significant impacts on NIM, respectively. This is in line with earlier findings of Nguyen (2012) in 28 financially liberalised countries. The coefficient of LIQUIDITY is generally positive and significant in two models, thus supporting the opportunity costs hypothesis (Poghosyan 2013). A higher fraction of liquid assets improves bank margins, as banks compensate extra costs related to holding liquid assets by charging higher margins. The coefficient of SIZE is significant and negative, suggesting that larger banks tend to have lower margins (Poghosyan, 2013). This supports the importance of scale effects for financial intermediation costs. Accordingly, the banks that provide more credit should benefit from their size and have lower margins (Fungáčová and Poghosyan, 2011). LNTL is found to have a positive impact on NIM, suggesting that the banks with larger size of loan portfolio are exposed to greater risk, thus, demanding higher margins.

5.1.2 The impact of NIM on NII. The results for the impact of NIM on NII are indicated in the Table IV.

As can be seen in the table, NIM is found to have a negative effect on NII in all versions, suggesting that Vietnamese banks face the trade-off between NII and NIM. This is in line with the findings of Nguyen (2012). This provides complements to earlier studies by Claessens *et al.* (2001) and Demirgüç-Kunt and Huizinga (1999). The findings indicate that since a bank makes relatively higher profits from its margin returns, this would reduce engagements in other activities that prevent banks from possible exposure to excessive risk. The coefficient of SIZE is significant and negative, suggesting no economies of scale in providing non-traditional services to customers [15]. This is in line with the findings of Nguyen (2012) in 28 financially liberalised countries. The coefficient of TDTL is statistically

	NIM1 _t	NIM2 _t	NIM3 _t	NIM4 _t	NIL _t	SHARE _t	NIE _t	EQUITY _t	LLP _t	LIQUIDITY _t	COV _t	LNTL _t	SIZE _t	TDTL _t	TLTA _t	OH _t	ROA _{t-1}
NIL _t	-0.30*** (-5.69)	-0.30*** (-5.55)	-0.29*** (-5.47)	-0.29*** (-5.36)	1												
SHARE _t	-0.09 (-1.55)	-0.13*** (-2.33)	-0.04 (-0.75)	-0.09 (-1.54)	-0.02 (-0.30)	1											
NIE _t	0.51*** (10.68)	0.38*** (7.37)	0.52*** (10.93)	0.39*** (7.57)	0.18 (3.28)	-0.04 (-0.71)	1										
EQUITY _t	0.59*** (12.98)	0.62*** (14.07)	0.57*** (12.46)	0.60*** (13.55)	-0.07 (-1.33)	-0.38 (-7.38)	0.34 (6.47)	1									
LLP _t	0.03 (0.56)	0.02 (0.31)	0.04 (0.63)	0.02 (0.35)	-0.02 (-0.37)	0.18 (3.28)	0.00 (-0.03)	-0.09 (-1.62)	1								
LIQUIDITY _t	-0.04 (-0.66)	0.00 (-0.03)	0.01 (0.12)	0.03 (0.47)	0.12 (2.11)	-0.15 (-2.67)	0.01 (0.22)	0.16 (2.87)	-0.13 (-2.38)	1							
COV _t	0.04 (0.67)	0.02 (0.31)	0.05 (0.98)	0.03 (0.57)	-0.02 (-0.32)	0.18 (3.32)	0.02 (0.28)	-0.07 (-1.20)	0.96 (63.53)	0.09 (1.61)	1						
LNTL _t	-0.19*** (-3.4)	-0.31*** (-5.78)	-0.16*** (-2.86)	-0.28*** (-5.19)	-0.06 (-1.14)	0.75 (20.23)	-0.05 (-0.89)	-0.66 (-15.83)	0.18 (3.2)	-0.22 (-4.05)	0.16 (2.99)	1					
SIZE _t	-0.25*** (-4.65)	-0.37*** (-7.04)	-0.25*** (-4.26)	-0.35*** (-6.64)	-0.01 (-0.26)	0.71 (18.09)	-0.08 (-1.48)	-0.69 (-17.25)	0.15 (2.74)	-0.07 (-1.21)	0.17 (3.07)	0.98 (83.83)	1				
TDTL _t	0.11 (2.02)	0.03 (0.54)	0.11 (1.99)	0.04 (0.64)	-0.12*** (-2.23)	0.25 (4.59)	0.17 (3.00)	-0.03 (-0.53)	0.12 (2.17)	-0.51 (-10.73)	0.03 (0.50)	0.31 (5.75)	0.22 (3.99)	1			
TLTA _t	0.30 (5.58)	0.26 (4.81)	0.35 (6.66)	0.32 (6.03)	0.32 (-3.03)	0.27 (5.07)	0.17 (3.03)	0.09 (3.03)	0.13 (2.35)	-0.76 (-20.60)	-0.02 (-0.36)	0.19 (3.44)	-0.02 (-0.28)	0.43 (8.57)	1		
OH _t	-0.15 (-2.66)	-0.16 (-2.87)	-0.14 (-2.55)	-0.15 (-2.75)	0.95*** (55.37)	-0.04 (-0.65)	0.26 (4.79)	-0.04 (-0.73)	-0.02 (-0.38)	0.13 (2.25)	-0.01 (-0.2)	-0.06 (-1.08)	-0.01 (-0.24)	-0.12 (-2.25)	-0.15 (-2.66)	1	
ROA _{t-1}	0.41 (7.93)	0.51 (10.47)	0.41 (8.03)	0.52 (10.78)	-0.06 (-1.00)	-0.14 (-2.57)	0.04 (0.73)	0.46 (9.27)	-0.02 (-0.33)	0.08 (1.53)	-0.03 (-0.46)	-0.38 (-7.43)	-0.40 (-7.78)	-0.12 (-2.16)	0.08 (1.42)	-0.04 (-0.63)	1

Notes: NIM1, the ratio of net interest income to total interest bearing assets; NIM2, the ratio of net interest income to average interest bearing assets; NIM3, the ratio of net interest income to total assets; NIM4, the ratio of net interest income to average total assets; NIL, the ratio of net interest income to total net income; SHARE, the ratio of bank's deposits to the total deposits in the industry; NIE, the ratio of non-interest expenses to total assets; EQUITY, the ratio of total equity to total assets; LLP, the ratio of loan loss provisions to total assets; LIQUIDITY, the ratio of liquid assets to short-term funding; COV, the product of LIQUIDITY and LLP; SIZE, the natural logarithm of total assets; LNTL, the natural logarithm of total loans; TDTL, the ratio of total deposits to total loans; TLTA, the ratio of total loans to total assets; OH, the ratio of overhead costs to total net income; ROA, the ratio of profits before tax to total assets. The table reports the correlation matrix of key considerable variables. Accordingly, the correlation matrix among NIM variables is not reported due to the space constraint. *t*-statistics are shown in parentheses, **, ***Significant at 5 and 1 per cent levels, respectively

Table II.
Correlation matrix
of key variables

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IJMF

	NIM1 _t	NIM2 _t	NIM3 _t	NIM4 _t
NII _t	-0.0044*** (-4.7389)	-0.0046*** (-4.2094)	-0.0035*** (-4.3427)	-0.0036*** (-3.7194)
SHARE _t	-0.0039 (-0.1972)	0.0360 (1.5289)	-0.0018 (-0.1039)	0.0316 (1.5129)
NIE _t	0.5407*** (8.4553)	0.3708*** (4.8565)	0.49*** (8.6068)	0.3279*** (4.844)
EQUITY _t	0.0911*** (9.5776)	0.0898*** (7.8926)	0.071*** (8.4065)	0.0697*** (6.9193)
LLP _t	0.0440 (0.1621)	0.4178 (1.2792)	0.0816 (0.3371)	0.31 (1.069)
LIQUIDITY _t	0.0024 (0.3662)	0.0111 (1.3938)	0.0178*** (2.9989)	0.0232*** (3.2974)
COV _t	0.0096 (0.0123)	-1.0553 (-1.1212)	-0.1172 (-0.1681)	-0.7735 (-0.9256)
SIZE _t	-0.0065** (-2.0531)	-0.0089** (-2.3901)	-0.0157*** (-5.6317)	-0.018*** (-5.5022)
LNTL _t	0.0082** (2.5608)	0.0082** (2.1676)	0.017*** (6.0159)	0.0172*** (5.1636)
Constant	-0.0156 (-1.1775)	0.0291* (1.8537)	-0.0102 (-0.8733)	0.0308** (2.2147)
Adjusted R ²	0.5731	0.4990	0.5987	0.5223
No. of observations	322	322	322	322

Notes: NIM1, the ratio of net interest income to total interest bearing assets; NIM2, the ratio of net interest income to average interest bearing assets; NIM3, the ratio of net interest income to total assets; NIM4, the ratio of net interest income to average total assets; NII, the ratio of net interest income to total net income; SHARE, the ratio of bank's deposits to the total deposits in the industry; NIE, the ratio of non-interest expenses to total assets; EQUITY, the ratio of total equity to the total assets; LLP, the ratio of loan loss provisions to the total assets; LIQUIDITY, the ratio of liquid assets to short-term funding; COV, the product of LIQUIDITY and LLP; SIZE, the natural logarithm of total assets; LNTL, the natural logarithm of total loans. The table contains the results estimated using a simultaneous equations model with 3SLS estimator. *t*-statistics are shown in parentheses. *, **, ***Significant at 10, 5 and 1 per cent levels, respectively

Table III.
The determinants
of NIM

	NIM1 _t	NIM2 _t	NIM3 _t	NIM4 _t
NIM _t	-6.1175*** (-5.0653)	-6.6472*** (-4.3391)	-7.8117*** (-5.3652)	-9.2308*** (-4.8848)
SIZE _t	-0.01 (-1.2865)	-0.0194** (-2.2812)	-0.0099 (-1.286)	-0.0221*** (-2.6319)
TDTL _t	0.0437 (0.6052)	0.0321 (0.4328)	0.0751 (1.0286)	0.0657 (0.8803)
LIQUIDITY _t	-0.0114 (-0.1272)	0.0012 (0.0132)	0.143 (1.4045)	0.185* (1.6634)
TLTA _t	0.0077 (0.0627)	0.0184 (0.1408)	0.2228 (1.5545)	0.2909* (1.8036)
OH _t	0.1307*** (63.3125)	0.1299*** (60.7277)	0.1307*** (63.7902)	0.1296*** (61.1596)
ROA _{t-1}	2.6974** (2.4915)	3.2687** (2.5340)	2.7997** (2.5615)	3.701*** (2.7425)
Constant	0.4433*** (2.7005)	0.6397*** (3.7469)	0.2578 (1.5482)	0.4819*** (2.9216)
Adjusted R ²	0.9317	0.9306	0.9327	0.932
No. of observations	322	322	322	322

Notes: NIM1, the ratio of net interest income to the total interest bearing assets; NIM2, the ratio of net interest income to average interest bearing assets; NIM3, the ratio of net interest income to the total assets; NIM4, the ratio of net interest income to the average total assets; SIZE, the natural logarithm of total assets; TDTL, the ratio of total deposits to the total loans; LIQUIDITY, the ratio of liquid assets to short-term funding; TLTA, the ratio of total loans to total assets; OH, the ratio of overhead costs to total net income; ROA, the one-year lagged ROA where ROA is the ratio of profits before tax to total assets; NII, the ratio of non-interest income to the total net income. The table contains the results estimated using a simultaneous equations model with 3SLS estimator. *t*-statistics are shown in parentheses. *, **, ***Significant at 10, 5 and 1 per cent levels, respectively

Table IV.
Determinants of NII

not significant though positive. LIQUIDITY is significantly and positively related to NII. This suggests that a bank that holds a relatively high proportion of liquid assets unlikely generate high profits, but is also less exposed to risk. Consequently, the bank is able to engage in higher levels of non-traditional activities (Goddard *et al.*, 2004). The coefficient of TLTA is significant and positive, supporting the safety perspective hypothesis. Accordingly, banks specialising in the advancing loans may be exposed to greater risk[16].

Therefore, banks engaging more in non-traditional activities may be able to protect themselves from risk so that they are able to tolerate higher risk levels. OH is significantly and positively related to NII, suggesting that banks with lower efficiency level may charge higher fee and commissions to compensate their costs (if they enjoy market power). Lastly, ROA is found to have a positive impact on NII. This suggests that since banks become more profitable they will have incentives to find new profitable opportunities in other non-interest segments of the market as those opportunities emerge[17].

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income

5.2 Robustness

In order to provide robustness checks for our main findings, we first investigate the interrelationship between NII and NIM in sub-samples. Thereafter, we evaluate whether diversification towards non-traditional activities would result in higher risk-adjusted returns.

5.2.1 Subsample. Based on evolution of two endogenous variables examined in our study, we attempt to evaluate this relationship in two sub-samples: 2006-2011 and 2012-2015 as presented in Figure 1.

When analysing the trend of NIM, it appears that NIM (all four measures) was slightly fluctuated during the period 2006-2010 before reaching a peak in 2011. Thereafter, NIM declined in the subsequent period.

When observing NII, this appears the same phenomenon. The Chow test shows the structure break near the end of 2011[18]. This structure break occurs in the same year that the restructuring credit institutions programme was officially introduced by the Vietnamese government in 2011. Accordingly, along with the minimum charter capital requirement, tighter supervisions were imposed by the State Bank of Vietnamese in terms of management, governance, financial conditions and operations. These measures would squeeze the operations of domestic banks, especially privately owned commercial banks towards non-traditional activities[19] (Dinh, 2011). Consequently, the share of NII to total net income of banks was rapidly reduced in 2012.

The same set of control variables as indicated in Equations (1) and (2) is used. Tables V and VI show the results of the interrelationship between NIM and NII in two sub-samples. In general, NII is found to have significantly negative effect on NIM in both sub-periods, thus strongly confirms our main findings. More specifically, the negative relationship between NIM and NII is only found in the first subsample. The coefficient of NIM is not

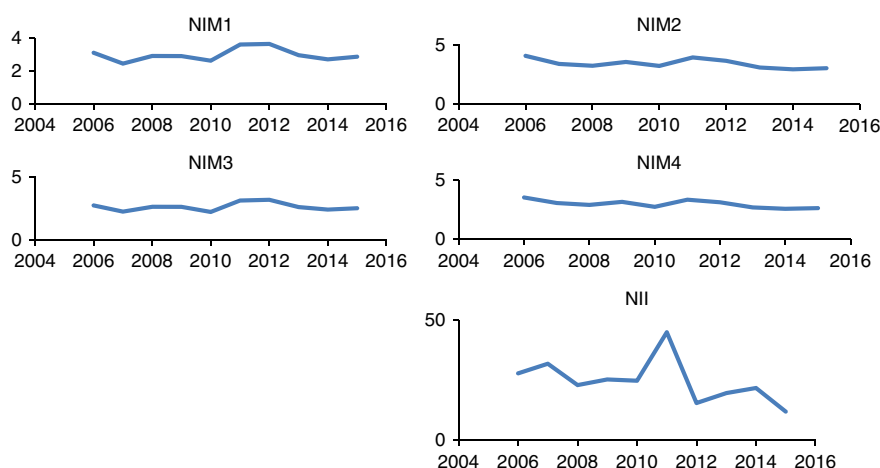


Figure 1.
Evolution of NIM
and NII between
2006 and 2015

Table V.
Determinants of
NIM in sub-samples

	NIM1		NIM2		NIM3		NIM4	
	2006-2011	2012-2015	2006-2011	2012-2015	2006-2011	2012-2015	2006-2011	2012-2015
NII	-0.0046*** (-4.8296)	-0.0635*** (-4.3289)	-0.0049*** (-4.1515)	-0.0551*** (-4.1298)	-0.0037*** (-4.2354)	-0.0594*** (-5.2157)	-0.0038*** (-3.4941)	-0.0648*** (-5.3515)
Constant	-0.0336** (-2.1566)	-0.0889** (-2.2557)	0.0036 (0.1862)	-0.0506 (-1.192)	-0.019 (-1.3265)	-0.0966*** (-2.6241)	0.0167 (0.9437)	-0.0664* (-1.6884)
Adjusted R ²	0.5283	0.6773	0.4823	0.5794	0.5249	0.546	0.4714	0.3792
No. of observations	200	122	200	122	200	122	200	122

Notes: NIM1, the ratio of net interest income to the total interest bearing assets; NIM2, the ratio of net interest income to the total assets; NIM3, the ratio of net interest income to average interest bearing assets; NIM4, the ratio of net interest income to the average total assets. The coefficients of the control variables are not presented in this table due to space constraints. The table contains the results estimated using a simultaneous equations model with 3SLS estimator. /statistics are shown in parentheses; *, **, ***Significant at 10, 5 and 1 per cent levels, respectively

	NIM1		NIM2		NIM3		NIM4	
	2006-2011	2012-2015	2006-2011	2012-2015	2006-2011	2012-2015	2006-2011	2012-2015
NIM	-4.9265*** (-2.8751)	-1.313 (-0.4901)	-4.6566*** (-2.6232)	-3.3903 (-1.1822)	-6.6137*** (-3.091)	-2.4818 (-0.7755)	-6.6851** (-2.8540)	-5.2365 (-1.5072)
Constant	0.4065** (2.0594)	0.0357 (0.073)	0.5418*** (2.5895)	0.1396 (0.2874)	0.2353 (1.2025)	-0.1574 (-0.3417)	0.423** (2.1644)	-0.0979 (-0.2203)
Adjusted R^2	0.9591	0.1328	0.9585	0.1963	0.9607	0.1207	0.9606	0.1693
No. of observations	200	122	200	122	200	122	200	122
Notes: NIM1, the ratio of net interest income to the total interest bearing assets; NIM2, the ratio of net interest income to average interest bearing assets; NIM3, the ratio of net interest income to the total assets; NIM4, the ratio of net interest income to the average total assets; NII, the ratio of non-interest income to total net income. The table contains the results estimated using a simultaneous equations model with 3SLS estimator. The coefficients of other control variables are not presented in this table due to space constraints. <i>t</i> -statistics are shown in parentheses. *, **, ***: Significant at 10, 5 and 1 per cent levels, respectively								

Table VI.

Determinants of NII
in sub-samples

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income

significant though negative in the second subsample. Nonetheless, these findings confirm the negative two-way link between NIM and NII.

5.2.2 The effect of NII on risk-adjusted returns. The early findings indicate the trade-off between net interest margin and NII. Accordingly, a conventional view argues the negative relationship between NII and NIM that would suggest increased diversification benefits for banks, thereby lowering banks' systematic risk. Therefore, we further investigate whether diversification towards non-traditional activities leads to higher risk-adjusted performance. Two performance measures based on accounting ratios include risk-adjusted returns on equity (RAR_{ROE}) and risk-adjusted returns on asset (RAR_{ROA}). As in Stiroh (2004), these measures are defined as $RAR_{ROE_{i,t}} = ROE_{i,t} / \sigma_{ROE_i}$; $RAR_{ROA_{i,t}} = ROA_{i,t} / \sigma_{ROA_i}$, where ROE is the returns (profits before tax) on equity, σ_{ROE} is standard deviation of returns on equity over the examined period. ROA is the returns (profits before tax) on total assets, σ_{ROA} is the standard deviation of returns on assets over the examine period (Fu *et al.*, 2015; Laeven and Levine, 2009).

Consequently, we use the following empirical specification:

$$y_{i,t} = \delta_0 + \delta_1 NII_{i,t} + \delta_2 X_{i,t} + \omega_{i,t} \quad (3)$$

where y = a measure of risk-adjusted returns (RAR_{ROE} , RAR_{ROA}), NII = the ratio of NII to total net income, X = a vector of control variables.

Table VII shows the relationship between NII and risk-adjusted returns by using two-way fixed effects model (time and period effects) specification which permits firm-specific and time-specific heterogeneity as typically used in prior studies such as Nguyen (2012). For the ease of exposition, we focus on the interpretation of the main considerable variables.

This appears that NII has a significantly negative impact on RAR_{ROA} and RAR_{ROE} , suggesting that diversification benefits are not effective in overall and especially in the first subsample. This is in line with prior studies in Vietnamese banking system (Batten and Vo, 2016; Le, 2016b). The coefficient of NII in the second subsample is unclear and statistically not significant.

We furthermore estimate the Spearman rank-order correlations of ROA and NII. The correlations between ROA and NII are negative in both sub-samples (-0.0293 in 2006-2011 and -0.0836 in 2012 and 2015, respectively)[20], thus confirms our main findings. Vietnamese banks have reduced their reliance on traditional lending functions and engaged in more non-traditional activities as they evolve over time. Our findings suggest that banks may use NII to expand leverage and herd by coordinating their NII strategies during economic downturns. Accordingly, the herding behaviour may result in the risk-return trade deterioration. Consequently, the banking system may be exposed to greater risk (Calmès and Théoret, 2010; Quagliariello, 2009).

6. Conclusion

Our study investigates the interrelationship between NII and NIM in the Vietnamese banking system between 2006 and 2015. The findings show the negative two-way links between NII and NIM, thus lends to support the subsidisation hypothesis. The measure of robustness checks is used and indicates the consistent results. This implies that Vietnamese banks face a trade-off between NII and interest income.

Furthermore, we further investigate the relationship between non-traditional activities and banks' risk-adjusted returns. Our findings indicate that NII in general is negatively related to the risk-adjusted profitability measures. When observing this relationship in sub-samples, we find that the negative impact of NII on risk-adjusted returns still holds in the first subsample (2006-2011) and the coefficient of NII becomes positive but not

	RAR_{ROA}		RAR_{ROE}		
	2006-2015	2006-2011	2012-2015	2006-2015	2006-2011
NII	-0.2272*** (-3.3190)	-0.1603* (-2.0091)	-0.0417 (-0.0717)	-0.2994 (-4.1506)***	-0.2803** (-3.3289)
LLP	-4.5615 (-1.2848)	-5.5633 (-1.4)	-19.5748 (-0.5042)	-5.9525 (-1.591)	-6.7173 (-1.6017)
SIZE	0.1330 (0.8983)	0.1433 (0.6785)	0.8487 (1.4601)	0.3188** (2.0425)	0.0983 (0.4411)
EQUITY	3.7479*** (4.1488)	5.3889*** (4.4649)	10.0171* (2.3553)	-1.8434* (-1.9363)	-2.5909** (-2.0339)
Constant	-0.2746 (-0.1033)	-0.0975 (-0.0263)	-14.9347 (-1.3672)	-2.7438 (-0.9793)	1.8598 (0.4760)
Adjusted R^2	0.9600	0.9680	0.8599	0.9705	0.9774
F -statistic	151.9657	133.1385	18.8357	207.5651	190.3615
Sum squared residuals	153.7744	100.8720	28.0669	170.7813	112.3626
Observations	334	211	123	334	211
Cross-section effect	Included	Included	Included	Included	Included
Period effect	Included	Included	Included	Included	Included
Notes: RAR_{ROE} : risk-adjusted return on equity as measured by the ratio of the return on equity (ROE) to the standard deviation of ROE; RAR_{ROA} : risk-adjusted return on assets as measured by the ratio of the return on asset (ROA) to the standard deviation of ROA; NII, the ratio of non-interest income to total net income; LLP, the ratio of loan loss provisions to total assets; SIZE, the natural logarithm of total assets; EQUITY, the ratio of equity to the total assets. This table contains results for the impact of NII on risk-adjusted returns using two-way fixed effects model (time and period effects). t -statistics are shown in parentheses. *, **, ***Significant at 10, 5 and 1 per cent levels, respectively					

Table VII.
The relationship
between NII and risk-
adjusted returns

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significant for the subsequent period (2012-2015) in one equation. In addition, the Spearman rank-order correlations of ROA and NII for both sub-samples (2006-2011 and 2012-2015) are negative. Together, we conclude that there are no diversification benefits in the Vietnamese banking system. Consequently, our findings cast some doubt on the view that banks tend to engage in more non-traditional activities when their intermediation-based profits are low to compensate for the potential revenue loss. Additionally, this suggests that Vietnamese banks may use NII to expand leverage and herd by coordinating NII strategy during the economic downturns. Consequently, the banking system may be exposed to greater risk. Therefore, policy-makers should put more attention on the bank herd behaviour[21].

Regarding bank management perspective, along with others (Batten and Vo, 2016; Le, 2016b) our findings suggest that Vietnamese banks should focus on traditional lending function rather than more shifting towards non-traditional activities in order to seek for higher profitability. Nonetheless, as banks evolve over time, risks must be recognised when entering new lines of business to generate additional revenues.

Given the recent bank-centric financial crisis that affect both developed and developing markets, fee-based income sources (i.e. securitisation) have played an important role. While this study examines only one emerging market and a limited period of study, it suggests the need for future research in other emerging nations that have similar banking structure for the robustness of our main findings. Perhaps, alternative measure of non-traditional income (the ratio of other earning assets to total assets) may be used in the future research to confirm the findings (Carbó Valverde and Rodríguez Fernández, 2007; Nguyen, 2012).

Notes

1. Market share intermediation figures are unable to capture the relative increase in financial intermediation.
2. Just behind China within Asia (with an average of approximately 9 per cent GDP growth per year over the same period).
3. The stock market has been only serving limited number of companies which are favoured by the government.
4. Several wholly foreign-owned banks were establish in 2009 and became strong competitors for local banks since they are able to fund local assets using internationally sourced funds at lower costs than their domestic counterparts. In addition, this is also due to the growing number of non-bank institutions in the financial sector.
5. Interest bearing assets include cash and reserves, balance with the State Bank, due from financial institutions, trading and available for sale securities and total loans.
6. Non-interest expenses include fee and commission expenses, other expenses and operating expenses.
7. The capitalisation may not be an adequate measure of risk aversion. Maudos and Fernández de Guevara (2004) suggest that capital adequacy ratio is a more accurate measure because this ratio cannot be calculated by looking at the balance sheet of a bank.
8. Ideally, credit risk can be measured by the ratio of non-performing loans to total assets. Unfortunately, there are substantial missing data on non-performing loans of Vietnamese banks. The ratio of loan loss provisions to total assets is used as a proxy for credit risk, instead.
9. Liquid assets include cash and reserves, balances with State Bank, due from banks, trading and available for sale securities.
10. Short-term funding includes interbank liabilities and customers' deposits.
11. There is substantial missing data on financial information of foreign banks and joint-venture banks.

12. State-owned commercial banks: Bank for Investment and Development, Foreign Trade Bank, Bank of Industry and Trade, Housing Bank of Mekong Delta, Agriculture and Rural Development Bank.
13. Joint-stock commercial banks: An Binh Bank, Asia Bank, Bao Viet Bank, Construction Bank, Dong A Bank, First Bank, Global Petrolimex Bank, Great Asia Bank, Hanoi Building Bank, HCM Development Bank, Kienlong Bank, Lien Viet Post Bank, Mekong Development Bank, Military Bank, Nam A Bank, National Citizen Bank, Ocean Bank, Orient Bank, Petrolimex Group Bank, Saigon-Hanoi Bank, Saigon Bank for Industry and Trade, Saigon Commercial Bank, Saigon Thuong Tin Bank, South-East Asia Bank, Southern Bank, TienPhong Bank, Viet A Bank, Technological Bank, Bank for Private Enterprise, Export-Import Bank, Vietnam International Bank, Maritime Bank, Tin Nghia Bank, Western Bank.
14. It is important to note that the correlations matrix among other control variables as reported in Table II may be altered when running the 3SLS estimation. For example, the highest correlation was in fact between LNTL and SIZE as can be seen in the table. However, SIZE variable does not necessarily distort the sign of LNTL when both variables are considered in Equation (1) when running 3SLS estimation as can be seen in Table III.
15. Smaller Vietnamese banks are engaged in more non-traditional activities since they are less advantageous in the traditional lending market.
16. Ideally, better proxies for credit risk could be either non-performing loans or provisions for insolvencies. Unfortunately, data on NPL are not available for many banks. We also used the ratio of loan loss provisions to the total assets as a proxy for credit risk but the results show statistically insignificant in all models.
17. We thank an anonymous referee for the their suggestion of this variable.
18. The Chow test is not reported here due to space restrictions. However, it is available upon request.
19. For example, security income has a significant contribution to total non-interest income. Due to the impact of global financial crisis 2008-2009, the Vietnamese stock market index was declined by some 60 per cent. Consequently, this resulted in the sharp decline in the security income.
20. Others use the Kendall's τ rank-order, a non-parametric approach to investigate the correlation between ROA and NII because this method is able to provide level of significance. Nonetheless, Spearman and Kendall's τ methods yield similar signs (Nguyen, 2012).
21. For detailed discussions of bank herding, see Quagliariello (2009) and Calmès and Théoret (2010).

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