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Non-interest Activities Affect the Bank Risk in the Asia Pacific Region

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Abstract

This paper's main objective is to investigate whether the bank non-interest activities affect the bank risk between developed and developing markets in the Asia Pacific region banking sector over the years 2000-2015. We employ the pooled OLS and panel regression to assess the effect on bank risk through 61 representative banks from Australia, Hong Kong, Korea, Malaysia, Singapore and Thailand. We categorize Australia, Hong Kong and Singapore as developed countries while Malaysia, Korea, and Thailand as developing countries. The empirical findings indicate that the bank non-interest based activities do have overall impact on Asia Pacific banks' risk. Once we further study by segregate into developed and developing countries segment, we only able to find that the impact do significant on developing countries only not on developed countries. We also find that the bank risk also affected by subprime crisis for Asia Pacific countries by factor in bank non-interest activities. The findings from this study are expected to contribute significantly toward decision-making for regulators, policymakers, bank managers, investors, and also to the existing knowledge on performance of the Asia Pacific banking sector.

Keywords: Bank's non-interest activities; Bank Risk; Asia-Pacific Banking sector

1. INTRODUCTION

From last few decades until present, banking system still acts as a predominant source of business finance and stabilizes financial position for various sectors in Asia Pacific due to developing financial system. Banks in the Asia Pacific countries have been moving towards non-traditional sources of income and emphasizing less on interest based activities after the recent global crisis in 1997. Corporate loans and deposits are highly competitive and price sensitive, and banks typically charge a very tight premium over the base lending rate. This results a rapid and sharp decline in net interest margins (Stiroh, 2004a). After 1997, the banking industry is likely to shift its focus to non-interest income to mitigate a revenue decline resulting from a drop in lending rates and due to face increasing repayment defaults and insolvency risks created by companies while in redeeming their loans.

Although the main business of banks is still lending, an increasing number of banks have shifted into investment-banking and other related activities during the last few years. This move towards financial intermediaries' activities like securities underwriting and trading, securitization and derivatives, have blurred the lines among different types of financial institutions. However, with the changing trends and increased competitiveness in the market place, the banking sector has entered into financial intermediaries activities. The importance of these new activities in comparison to traditional banking intermediation has increased over time

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since financial institutions have intensified their diversification efforts (Baele, De Jonghe, & Vander Vennet, 2007; Asli Demirgüç-Kunt & Huizinga, 2010).

The main motive for non-interest activities diversification is to minimize bank overall risk. Generally, there are three major bank risks concerned by regulator which are liquidity risk, credit risk and operational risk to operationalize banking operations and stabilize the financial system. Portfolio asset allocation is by far the most important decision banks make. (Nafula, 2003). If commercial banks choose to invest in loans and advances, they risk default associated with these investments. Such investments potentially have negative consequences for bank earnings because some of the loans and advances to customers may end up as bad or doubtful debts. This risk may or may not be covered by collateral securities or high interest rates (Uzhegova, 2010). Craigwell, Maxwell, Terrelonge, and Moore (2006) stated that one of the central aims of Basel II is to ensure that capital allocation is more risk sensitive and suggested that diversification increases bank returns. However, bank's diversification into non-interest based activities impact on risk is sector and country specific (Kotrozo & Choi, 2006). Banks will have to be done in a way which avoids repetition of the mistakes made during the structured credit boom from 2004 to 2007.

Banks' asset diversity is not sufficient enough to improve bank stability (Hsieh, Chen, Lee, & Yang, 2013). However, bank stability can be enhanced through a strategy of income diversity. Lately, financial institutions heavily diversify into non-interest based activities and yet exposes to a certain level of new areas of risk. However, expansion into non-interest income activities also offer some risk diversification benefits such as trading activities increases the rate of return on assets. Variation in overhead and other operating costs reflect the variation in bank non-interest margins determinants. Diversified banks will always assumed hold a risk efficient portfolio. Any negative effect of over reliance on non-interest income activities should no longer be attributed to the lack of diversification benefits. The development of nontraditional intermediation activities in banking has different implications in terms of profitability and risk in the case of an emerging economy and also across the regional economic structure.

Loan growth leads to an increase in loan loss provisions, to a decrease in relative interest income, and to lower capital ratios. Foos, Norden, and Weber (2010) found that loan growth also has a negative impact on the risk-adjusted interest income and represents an important driver of the riskiness of banks. So it is recommended to have mixed portfolio activities to balance up the bank overall risk. Throughout the world, large banks have significantly grown in size, and become more involved in non-interest based activities since the late 1990s. There is also a substantial empirical literature found that bank diversification into non-interest income areas lead to a certain degree of banking sector instability (Asli Demirgüç-Kunt & Huizinga, 2010; DeYoung & Rice, 2004b; DeYoung & Torna, 2013; Lepetit, Nys, Rous, & Tarazi, 2008a; Stiroh, 2004a, 2006, 2012). They tend to simultaneously have lower capital, less stable funding, more market-based activities, and be most organizationally more complex than small banks.

Kotrozo and Choi (2006) suggested the type of diversification can have varying impacts on both performance and risk. Stiroh (2004b) stated given the recent sub-prime crisis and the role played by fee based income sourced from securitization, increased disclosure of the nature of bank non-interest income is now of global importance. This disclosure is particularly germane within the context of the implementation of Basle II, with its increased emphasis upon market discipline. Increased disclosure in this area is accompanied by improved market pricing for risk.

Diversification reduces the possibility of systemic risk, but caution must be offered with respect to banks pursuing absolute returns rather than monitoring risk-return trade-offs, and so exploiting the benefits of the implied guarantee offered by "too big to fail". However, shareholders should also monitor bank exposure to non-interest income to ensure that they do not become over-exposed to the point where the volatility effect outweighs the diversification benefits stated in the studies by Sanya and Wolfe (2011). Stiroh (2004a) and Fraser, Madura, and Weigand (2002) found that non-interest income is associated with more volatile bank returns and followed by DeYoung and Roland (2001) and argued that fee-based activities are associated with increased revenue and earnings variant. Stiroh (2006) provided evidence that non-interest income has a larger effect on individual bank risk in the post-2000 period. Templeton and Severiens (1992) summarized banks increase their risks through diversification activities. Acharya, Hasan, and Saunders (2006) found that diversification is not guaranteed to produce superior performance and greater safety for banks. Diversification reduces bank return while producing riskier loans for high-risk banks whereas low-risk banks' diversification produces either an inefficient risk-return trade-off or only a marginal improvement. With deterioration in the effectiveness, bank monitoring at high risk-levels and upon lending expansion into newer or competitive industries. Craigwell et al. (2006) also documented an increase in non-interest income is linked to greater bank

profitability and also to higher earnings volatility. Stiroh (2006) found that balance sheet items such as commercial and industrial loans and consumer lending and income statement items such as other non-interest income drive the cross-sectional differences in BHC risk. Newly mandated regulatory data on the components of other noninterest income show that investment banking, servicing, securitization income, gains from loan sales, gains other asset sales, and other noninterest income are particularly volatile activities. In the years after 2000, the locus of risk has shifted off of the balance sheet and onto the income statement as investors identify the new risks associated with evolving and expanding bank activities.

This research will specifically focus on the impact of non-interest based activities of the banks on bank overall income structure. Not much literature has addressed the Asia Pacific countries' economic impact on bank non-traditional activities. The bulk of research in this area focuses on the US banks only as mentioned by (Demsetz and Strahan (1997); Stiroh (2004a), 2006)). As impact of economy level at the banks' non-interest activities have not much been researched in the case of Asia Pacific countries, we attempt to examine bank's non-interest based activities on bank risk.

Due to the important financial roles played by these emerging economies in the global financial markets, the economic growth and volatility in the Asia Pacific countries cannot be overlooked and demand rigorous investigation. In addition, the banking development in these countries cannot be relegated and it deserves extensive exploration. Finally, as most of the existing literature is based on the U.S. or European banks, these issues have to be sufficiently explored in the context of the Asia Pacific member countries. The article is designed the following sections; the second will describe literature review and research framework. The data collection procedure and the methodology discussion will be explained in Section Three. The next part includes the empirical results in addition to the discussion of the finds. Final section will explain the conclusions of the study.

2. METHODOLOGY

The primary source for financial data was obtained from the Bank Scope database produced by the Bureau van Dijk, which provides the banks' balance sheets and income statements. This paper uses each country currency respectively based on annual reports and from database for the selected sample across the periods. The time frame for this study is 16 years which from year 2000 to the year 2015. Australia, Hong Kong, Malaysia, Singapore, Thailand and Korea treated as a benchmark of Asia Pacific regional banks and this region consist of 575 banks. Dataset reported has been narrowed down only with Local GAAP, International Accounting Standards (IAS) and International Financial Reporting Standards (IFRS) in consolidated financial statement which consists only 284 banks. 61 representative banks been filtered from Australia, Hong Kong, Korea, Malaysia and Thailand in Asia Pacific region. This paper segregates the 16-year sampling period into three distinctive period categories which are namely, (i) pre-crisis period, from year 2000 to 2006; (ii) crisis period, in the year 2007 and 2008 and (iii) post-crisis period, from year 2009 to 2015. This segregation is done in order for our study to present a vivid illustration on how the cataclysmic U.S. subprime mortgage crisis in 2008 could affect the bank's non-interest activities.

2.1 Hypothesis

DeYoung (2001) showed that fee-based activities are associated with increased revenue volatility, higher leverage, and increased earnings volatility, while (Stiroh (2004a), 2004b)) found that a greater reliance on non-interest income is associated with more volatile returns and lower risk-adjusted profits. Stiroh and Rumble (2006) revealed that diversification benefits exist for banks that expand into non-interest generating activities, but the gains are typically more than offset by increased exposure to more volatile activities so risk-adjusted performance suffers. In terms of diversification of lending, Acharya et al. (2006) reported that diversification does not typically improve performance or reduce risk. Most generally, DeYoung and Rice (2004a) identified a variety of banking strategies and show clear risk/return trade-offs, e.g., high risk and high return in corporate banking versus low risk and low return in community banking.

On the positive side, (Puri (1996); Santomero and Chung (1992)) found reduced risk, measured as less volatile market returns, for diversified firms, while Kwan (1998) concluded that some diversification benefits do exist for commercial banks because of the low return correlation between securities and bank subsidiaries. Cornett, Ors, and Tehranian (2002) reported that the subsidiaries, which were used to undertake investment banking operations, is associated with increased return on assets, but no change in firm risk. On the negative side of diversification, Kwast (1989) reported limited diversification benefits from expansion of bank securities

activities. Demsetz and Strahan (1997) concluded that size-related diversification benefits exist for US banks, but they are offset by increased exposure to commercial and industrial loans and lower capital ratios.

DeYoung and Rice (2004a), 2004b) also used equity returns and showed that evidence that alternative banking strategies represent different points on the risk and return frontier. Stiroh (2006) used a simple portfolio framework to show that activities that generate non-interest income do not raise average market returns, but do make both unconditional (total) and conditional (idiosyncratic) returns more volatile. The intuition is that a shift into new activities affects the portfolio variance by changing the weights on the components. Contrary to some priors, non-interest activities outweighs the diversification benefits. In order to analyze the non-interest based activities affect bank risk, we suggest that:

H₁: Bank's non-interest based activities have an impact on bank risk between developed and developing markets in the Asia Pacific region.

The risk measurement modified in this research is default risk, Z-score, which measured as the number of standard deviations earnings have to fall before the bank becomes insolvent (Ash Demirgüç-Kunt & Huizinga, 1999; Laeven & Levine, 2009; Stiroh & Rumble, 2006):

$$Z - score = \frac{ROA + E/A}{\sigma ROA}$$

where σROA is the standard deviation of the return on assets and E/A is the average equity to assets ratio over the same period. Z-score is a measure of banking stability. Z-score is a common measure of stability risk at the level of individual banks. It explicitly compares buffers (capitalization and returns) with risk (volatility of returns) to measure a bank's solvency risk. A higher z-score therefore implies a lower probability of insolvency.

In order to capture the risk and non-interest activities impact, we developed the empirical model as follows:

$$Z = \beta_1 NIBA_{it} + \beta_2 LTA_{it} + \beta_3 CF_{it} + \beta_4 LEV_{it} + \beta_5 CAP_Tier1_{it} + \beta_6 CapAdeq_{it} + \beta_7 LLP_{it} + \beta_8 BC_{it} + \beta_9 CI_{it} + \beta_{10} GNI_{it} + \beta_{11} BI_{it} + \beta_{12} BS_{it} + \beta_{13} Crisis_Dummy_{it} + \varepsilon$$

Where,

Variables	Descriptions
Z	Bank risk measured by <i>Z - score</i>
<i>NIBA_{it}</i>	<i>Non_interest_activities_index_{it} measured by HHI_{REV}, DIV and HHI_{NIBA}</i>
<i>LTA_{it}</i>	<i>Loan to asset ratio.</i>
<i>CF_{it}</i>	<i>Bank cash flow.</i>
<i>LEV_{it}</i>	<i>Bank total debt.</i>
<i>CAP_Tier1_{it}</i>	<i>Bank capital tier 1 ratio.</i>
<i>CapAdeq_{it}</i>	<i>Bank capital adequacy ratio.</i>
<i>LLP_{it}</i>	<i>Bank loan loss provision.</i>
<i>BC_{it}</i>	<i>Bank concentration index.</i>
<i>CI_{it}</i>	<i>Contry inflation.</i>
<i>GNI_{it}</i>	<i>Gross national income per capita.</i>
<i>BI_{it}</i>	<i>Country bank interest rate.</i>
<i>BS_{it}</i>	<i>Bank size measured by total asset.</i>
<i>Crisis_Dummy_{it}</i>	<i>Crisis period between 2007 and 2008, value give is 1. Otherwise, value is 0.</i>

Prior research conducted by DeYoung and Rice (2004b) suggested that larger banks, *BS_{it}*, should generate greater non-interest income, while well managed banks, as measured by return on equity, ROE, should generate lower amounts of non-interest income. This study also defines the differences in profitability indexes, and loans to assets ratio, *LTA_{it}*. Nevertheless, this research also predicts a negative sign for the loan to assets ratio (Altamuro & Beatty) if non-interest income is primarily driven by a decrease in traditional interest income sources. While Keeley and Furlong (1990) demonstrated that capital requirements reduce risk taking incentives, Shrieves and Dahl (1992) concluded that higher risk taking may be induced.

Loan loss provision is a proxy for loan quality. As the quality of loans decreases, as evidenced by an increase in loan loss provisions, this study expects banks to diversify into non-interest income sources as a substitute for the interest revenue that is lost due to non-paying loans. Thus, this research also expects a positive relation between

loan loss provision (LLP) and non-interest income. Similarly, banks with larger growth in assets may be more interested in pursuing nontraditional sources of income.

3. RESEARCH FINDINGS

This paper purports to address and identify the impact of bank non-interest activities which could affect bank risk in the Asia Pacific region. By using different Herfindahl–Hirschman Indexes, DIV , HHI_{INI} and HHI_{NIBA} , as non-interest based activities proxies, the results show that the bank risk varies on bank non-interest based activities vary accordingly to developing and developed countries throughout crisis period. To do so, we estimate bank non-interest activities impact on bank risk for overall banks in Asia Pacific region by using panel regression which is presented in model (1), (2) and (3) of Table 1 for overall bank in Asia Pacific region. Panel regression estimated in each developing and developed banks have been presented in model (1) to (6) of Table 2. For all models, the regression model includes two basic bank specific determinant variables namely gross national income per capita, GNI_{it} and country inflation, CI_{it} and four bank specific factors such as degree of bank concentration, BC_{it} , bank Tier 1 ratio, CAP_Tier1_{it} , bank capital adequacy ratio, $CapAdeq_{it}$, and country bank interest rate, BI_{it} . The models also factor in financial crisis 2007-2008 dummy variable.

First and foremost, we found out that all models in Table 1 and Table 2 are significant at the significance level 1% using Breusch-Pagan LM test which indicates the models suitable to be analyzed using panel regression. Fixed effect and random effect were determined by using Hausman Test. Random effect regressions will be used on each models in this paper as the models significant at the significance level 5% on Hausman Test.

3.1 Asia Pacific Region

From *table 1*, bank non-interest activities has significant impact on bank risk in Asia Pacific as indicated by diversification index, $LOGHHI_NIBA$ in Model 3 found to be positively significant at significance level 10%. This consistent with Fraser et al. (2002), Stiroh (2004a), Stiroh (2006), Lepetit et al. (2008a) and Delpachitra and Lester (2013) stated that non-interest income has significant impact on bank risk in the post-2000 period. This may because diversification into non-interest based activities increase the variability of bank earning and increase bank operational cost and increase bank risks, especially in competitive environment (Moshirian (2011). Templeton and Severiens (1992), Baele et al. (2007) and Lepetit et al. (2008a) suggested banks increase their risks through diversification of revenue streams from core financial activities lead to increase the systematic risk and insolvency risk of the bank. Furthermore, Altunbas et al. (2010) and Asli Demirgüç-Kunt and Huizinga (2010) agreed that fee income and expense volatility risk may also cause by the bank does not receive the planned amount of net fee income. Fee income and expense constitute a material part of operating income, and therefore changes in the types of operations or services under which these are generated considerably affect the bank's financial performance and amount of capital. Banking strategies that rely prominently on generating non-interest income or attracting non-deposit funding is very risky. This can increase operational expenses, as banks may need more analysts and a larger fund to cope with defaults. There can also be a risk if the bank focuses on selling services to the exclusion of supporting customers.

For the variables under *bank specific factors*, bank concentration index, $LOGBC$, country bank interest rate, $LOGBI$ and bank capital Tier1, $LOGCAPTIER1$ are found significant at the significance level 1% across the Model 1, 2 and 3. Boyd and De Nicolo (2005), Agoraki, Delis, and Pasiouras (2011) and Jiménez, Lopez, and Saurina (2013) suggested that banks will move to more aggressive strategy when competition among financial intermediaries become stiffer and rules and regulation become more tighten. With $LOGBI$ and $LOGCAPTIER1$ as proxy for bank rules and capital regulation, while $LOGBC$ as proxy for competitive environment, the result shown that these can be essential ingredients motivate banks shift to more risky strategy. Typically, capital requirements set to reduce risk, but the effect on bank risk can be reversed especially for the banks with strong market power. Under *economic factor*, country inflation, $LOGCI$ found to be significant at 5% for Model 1 and 10% significance level for Model 2 and Model 3 respectively. Furthermore, gross national income per capita, $LOGGNI$ significant at 1% significance level across Model 1, 2 and 3. Drake, Hall, and Simper (2006) suggested economic factors do affect in banking operations and bank risk. The significance of country inflation parallel with Demirguc-Kunt, Laeven, and Levine (2003) stated most of commercial banks remained their core growth strategy on competitive pricing in residential mortgages and business lending. It leads to interest based activities under pressure as banks seek to gain competitive edge, market share and offshore funding. Increasing in inflation has prompted government on serviceability and new housing commitments at high loan to valuation ratios (LVRs). Indirectly, country inflation, $LOGCI$, sparks in banks' non-interest based revenue and exerts impact on bank non-interest margins. Lee and Hsieh (2013) stated that gross national income per capita will be

important element in factoring the bank risk especially for banks in lower-middle income countries will have more reserve capital on risk compared to banks in high-income countries have the lowest values.

For *other variables* besides economic and bank specific factors found to have impact on bank risk. Bank total debt, LOGLEV, found to be significant at 1%, 5% and 1% significance level across Model 1, 2 and 3 respectively. Loan to asset ratio, LOGLTA, found to be significant at 10% significance level across Model 1, 2 and 3. Loan loss provision, LOGLLP, also found to be significant at 1% significance level across Model 1, 2 and 3. After controlling for macroeconomic conditions and bank characteristics, Bushman and Williams (2012); Jiménez et al. (2013); Laeven and Majnoni (2003) stated that capital regulatory framework should include the predictive element of bank loan loss provisions. Loan loss provision and loan related ratios need to be integral components of capital regulation. When cyclical downturns closer, banks only realized that delaying provision for doubtful and bad loans is too late, therefore magnifying the impact of the economic cycle on banks' income and capital. The significance of bank total debt, LOGLEV and loan to asset ratio, LOGLTA are due to the economic slowdown, increasing leverage in the household segment, banks face a slight rising asset quality risk intensify banks and non-banks on non-interest based activities. Bank cash flow, LOGCF found to be significant at 10% significance level across Model 1, 2 and 3. This consistent with (Diamond and Rajan (2001); Houston, James, and Marcus (1997) found that bank risk is more sensitive to the bank's cash flow and capital position.

3.2 Developing and Developed Countries Aspect

This section discuss the impact of non-interest income activities on bank risk in each developing and developed countries by using panel and pool OLS regression. For developing countries, it statistically show that diversification into non-interest activities positively affect bank risk at 10% significance level in Model (6). With the changing trends and increased competitiveness in the market place, the banking sector has entered into non-interest based activities. The importance of these new activities in comparison to traditional banking intermediation has increased over time since financial institutions have intensified their diversification efforts (Baele, De Jonghe, & Vander Vennet, 2007; Asli Demirgüç-Kunt & Huizinga, 2010) The development of nontraditional intermediation activities in banking has different implications in terms of risk in the case of an emerging economy and also across the regional economic structure. Lee, Yang, and Chang (2014) found that non-interest activities of banks reduce risk, but do not increase profitability on a broad sample basis. Non-interest activities decrease profitability as well as increases risk for savings banks. The impact can be vary for commercial, cooperative, and investment banks either by increasing profitability or reducing risk.

Under *bank specific factors*, for developed countries, we found out that country bank interest rate, LOGBI and bank capital tier 1, LOGCAPTIER1 are significant at 10% and 1% respectively across Model 1 to 3. Bank capital adequacy ratio, LOGCAPADEQ, found to be significant at 10% in Model 3. Bank concentration index, LOGBC, also significant at the level 5% and 1% for diversification indexes in Model 1 and 2 respectively. For developing countries, variables such as bank concentration index, LOGBC, bank capital tier 1, LOGCAPTIER1, and country bank interest rate, LOGBI found to be significant across the Model 4 to 6. The result parallel and supported by previous studies conducted by Lepetit et al. (2008b) and Demirguc-Kunt et al. (2003). For developing countries, under bank specific factors, LOGBC and LOGBI found to be significant at least 10% supported by Claessens and Laeven (2004), Berger, Demirguc-Kunt, Levine, and Haubrich (2004); Berger, Demirgüç-Kunt, Levine, and Haubrich (2004); Casu and Girardone (2006)) and stated that banking system concentrated with greater financial player entry and activity restrictions will lead to bank environment become more tighten and more competitive and place more pressure on bank activities. Under *economic factors*, for developed countries, gross national income per capita, LOGGNI found to be significant at 1% significance level across Model 4 to 6. This also parallel with the study conducted by Doliente (2005) stated that bank interest margin found to decline after 1997 thus reflecting the profit squeeze experienced by the region's banks due to extensive loan defaults and increment in bank borrowing rate in the aftermath of the Asian currency and banking crises. The borrowers unable to pay off their existing loan.

Last, for *developed and developing country*, other variables such as loan loss provision, LOGLLP, and loan to asset ratio, LOGLTA, found to be significant across Model 1 to 6. While, bank size, BS and bank cash flow, CF are found to be significant at 5% and 1% significance level respectively in developing countries which across Model 4 to 6. Lepetit et al. (2008b) analyzed bank size effects and splitting non-interest activities into both trading activities and commission and fee activities strongly link with risk. Bank non-interest activities will be varied across regional countries and corporate structure. Hidayat et al. (2012) showed that degree of product diversification on bank risk depends highly on the bank's asset size. Afzal and Mirza (2012) also noticed that there is a significant relation between bank size and diversification index. This is understandable because of their outreach, coupled with a strong capacity to mobilize funds. Consistent with our result that bank size and

bank cash flow do significant affect the banks' non-interest based activities. For crisis variable, we found that it significant across Model 1 to 4 for developing and developed countries. The impact of crisis 2007-08 is inescapable element when research on banks' non-interest based activities. Last, as Acharya et al. (2006) and Meslier, Tacneng, and Tarazi (2014) agree that diversification is able to produce superior performance and greater safety for banks in developing countries but not for developed countries.

Table 1. Summary of the impact of non-interest income on bank risk on overall Asia Pacific countries by using pooled OLS regression and panel regression.

	Developing and developed countries		
	Model 1	Model 2	Model 3
Dependent variables	DIV	HHI_INII	HHI_NIBA
Constant	-12.9016	-14.7554	-14.8451
SE	6.281	6.1953	6.1814
Bank Diversification Indexes			
LOGDIV	0.1008		
SE	0.1498		
LOGHHI_INII		0.1188	
SE		0.2597	
LOGHHI_NIBA			0.1825*
SE			0.1079
Bank Specific Factor			
LOGBC	-2.6599***	-2.5364***	-2.5716***
SE	0.8352	0.8311	0.8288
LOGBI	-1.0282***	-0.8959**	-0.8779***
SE	0.395	0.3901	0.3894
LOGCAPADEQ	0.1898	0.3124	0.3385
SE	0.5394	0.5341	0.5325
LOGCAPTIER1	2.0564***	2.0280***	2.0215***
SE	0.4455	0.4419	0.4409
Economy Factor			
LOGCI	-0.1936**	-0.1768*	-0.1732*
SE	0.0976	0.0969	0.0967
LOGGNI	3.0111***	3.0806***	3.1277***
SE	0.5678	0.5669	0.5660
Other factors			
LOGLEV	-0.4743***	-0.4596**	-0.4630***
SE	0.1818	0.1795	0.1779
LOGLLP	-0.4951***	-0.5131***	-0.5247***
SE	0.1313	0.1302	0.1301
LOGLTA	0.7147*	0.7303*	0.771779*
SE	0.3899	0.3891	0.3891
LOGBS	0.1704	0.1345	0.1157
SE	0.2064	0.1995	0.1980
LOGCF	-0.2809***	-0.2495***	-0.2425***
SE	0.0947	0.0906	0.0904
Dummy Variable			
Crisis_Dummy	0.0503	0.0306	0.0250
SE	0.1410	0.1395	0.1390
R-squared	0.5850	0.5828	0.5846
Adjusted R-square	0.5373	0.5354	0.5374
F-statistic	12.2720	12.2900	12.3825
Prob (F-statistic)	0.0000	0.0000	0
No. of Obs	661	677	677
Breusch Pagan LM Test			
Corss	563.3329***	562.4848***	564.7066***
	0.0000	0.0000	0.0000

Time	225.3527***	281.3090***	283.0241***
	0.0000	0.0000	0.0000
Both	788.6856***	843.7938***	847.7307***
	0.0000	0.0000	0.0000
HausmanTest			
Chi-Square	48.2001***	52.2185***	54.4216***
Prob (Chi-Square)	0.0000	0.0000	0.0000

Note: ***, **, * indicates significance at the 1 %, 5 % and 10 % levels respectively. SE indicates standard error.

Table 2. Summary of the impact of non-interest income activities on bank risk between developing and developed countries by using pooled OLS regression and panel regression.

	Developed Countries			Developing Countries		
	Model 1	Model 2	Model 3	Model 4	Model 5	Model 6
Dependent variables	DIV	HHI_INII	HHI_NIBA	DIV	HHI_INII	HHI_NIBA
Constant	45.2386**	42.4664**	42.0128**	-17.5995**	-20.1058***	-19.8492***
SE	19.1335	18.8229	18.8432	7.8247	7.7987	7.7370
Bank Diversification Indexes						
LOGDIV	0.1572			0.1199		
SE	0.2286			0.2010		
LOGHHI_INII		-0.3604			0.1568	
SE		0.4110			0.3429	
LOGHHI_NIBA			-4.6664			0.4003**
SE			15.5759			0.1766
Bank Specific Factor						
LOGBC	-4.3957**	-4.3388***	0.2341	-2.3746**	-2.2399**	-2.1154**
SE	1.735069	1.7003	15.5799	1.0323	1.0400	1.0298
LOGBI	-1.0441*	-0.9522*	-0.9843*	-1.8963*	-1.5554**	-1.6017**
SE	0.5761	0.5619	0.5618	0.6882	0.6850	0.6787
LOGCAPADEQ	1.1843	1.1577	1.2480*	0.3562	0.4549	0.5840
SE	0.7620	0.7319	0.7340	0.7913	0.8000	0.7955
LOGCAPTIER1	2.1420***	2.0805***	2.0171***	0.6956***	1.8797***	1.7689**
SE	0.5287	0.5092	0.5111	2.6378	0.7046	0.6997
Economy Factor						
LOGCI	0.0639	0.0561	0.0510	0.0415	0.0679	0.1102
SE	0.1281	0.1259	0.1260	0.1697	0.1694	0.1682
LOGGNI	-1.7447	-1.5922	-1.4822	2.3170***	2.4430***	2.4387***
SE	1.7622	1.7316	1.7289	0.7314	0.7400	0.7330
Other factors						
LOGLEV	0.1389	0.1352	0.1220	-0.3904	-0.3708	-0.3581
SE	0.2949	0.2849	0.2848	0.2570	0.2567	0.2530
LOGLLP	-0.4656***	-0.4465***	-0.4573***	-0.4922**	-0.5218**	-0.5021**
SE	0.1439	0.1404	0.1402	0.2226	0.2239	0.2222
LOGLTA	-1.5230*	-1.4228*	-1.3616*	1.0626**	1.0891**	1.1922**
SE	0.8076	0.7667	0.7669	0.4796	0.4856	0.4840
LOGBS	-0.1753	-0.1784	-0.1880	0.7618**	0.7030**	0.6814**
SE	0.2930	0.2748	0.2751	0.3021	0.3013	0.2961
LOGCF	-0.0719	-0.0577	-0.0576	-0.5123***	-0.4708***	-0.4866***
SE	0.1159	0.1072	0.1074	0.1437	0.1394	0.1383
Dummy Variable						
Crisis_Dummy	0.3318*	0.3266*	0.3133*	-0.2628**	-0.3400	-0.3632
SE	0.1660	0.1622	0.1622	0.2331	0.2306	0.2279
R-squared	0.4239	0.4275	0.4261	0.6175	0.6069	0.6129
Adjusted R-square	0.3450	0.3507	0.3491	0.5642	0.5525	0.5593
F-statistic	5.3711	5.5704	5.5384	11.6014	11.1588	11.4437
Prob(F-statistic)	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
No. of Obs	308	314	314	353	363	363

Breusch Pagan LM Test						
Corss	0.6304	1.0717	3.5612**	83.5639***	101.6011***	98.9040***
	0.4272	0.3006	0.0591	0.0000	0.0000	0.0000
Time	347.3384***	331.9669***	336.5451***	228.7351***	303.1024***	299.0604***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
Both	347.9688***	333.0386***	340.1063***	312.2990***	404.7035***	397.9644***
	0.0000	0.0000	0.0000	0.0000	0.0000	0.0000
HausmanTest						
Chi-Square	32.4249***	35.8373***	27.7844***	62.3583***	70.8097***	77.2986***
Prob (Chi-square)	0.0021	0.0006	0.0097	0.0000	0.0000	0.0000

Note: ***, **, * indicates significance at the 1 %, 5 % and 10 % levels respectively. SE indicates standard error.

5. CONCLUSION

There are numerous banking researches on interest based activities nowadays but rarely on non-interest based activities. Most banking researches focus on Western countries and less emphasize on Asia Pacific region. This paper attempts to fill in the demanding gap and provides new empirical evidence on the impact of on bank risk on during the years 2000–2015 which consists of crisis years 2007/08. We employ the pooled OLS and panel regression to measure the impact of banks' non-interest based activities in the Asia Pacific banking sector. The empirical findings from this study indicate that overall bank risk in Asia Pacific banking sector has affected by bank non-interest income activities. From this paper, we found that developing countries banks' risk do affected by non-interest based activities economic factors during the years. We also found that all banks non-interest based activities affected during the crisis period. The empirical findings from this study clearly call for regulators and investors to review the banks' non-interest based activities in Asia Pacific banking sector from specific banking and economic perspectives. This review is vital because banks' non-interest based activities does not only contribute to individual and regional banks' risk and also affect country and regional fundamental ground and stand. Banking sector always be the financial supporting root for all others industries. Banks have to well manage the non-interest based activities which have close relationship with economic. Banks operating in Asia Pacific banking sector need to consider all potential technologies that could improve their degree of non-interest based activities since the main motive of banks is to maximize shareholders' value or wealth through profit maximization. Furthermore, the results from this study have implications for investors whose key motive is to diversify their risk and profit from their investments. Investors may consider planning and strategizing their investment portfolios based on asset allocation theory. Finally, the findings of this study are expected to contribute significantly to new chapter of bank non-interest based activities of the Asia Pacific banking sector.

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