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Impact Analysis of Macroeconomic Condition and Governance on Non-Performing Loans in Asia and Pacific Banking System

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ABSTRACT

The interactive role of governance in the linkage between the macroeconomic environment and credit risk has been conceptually assessed but not empirically tested for the Asia and Pacific region. To that end, this paper investigates the growing influence of governmental institutions on the macroeconomic environment and nonperforming loan nexus in 19 East Asian and Pacific countries between 2009 and 2020. A panel dataset on macroeconomic variables and non-performing loans was obtained from the World Development Indicators database, while governance quality variables were collated from the World Governance Indicators database. The System Generalized Method of Moments (SGMM) technique was employed to estimate the models. The results showed that GDP per capita growth contributed significantly to a reduction in NPLs. Similarly, domestic credit expansion is found to be associated with a decrease in NPLs. Further, without interaction terms, only institutional quality contributed to a significant decline in NPLs, whereas the economic index, political index, and aggregate governance indicator are positively and significantly related to NPLs, meaning that these facets of governance institutions contribute to increasing NPL levels. Moreover, the contingency impact estimation showed that the combined impact of GDP per capita growth, which is the macroeconomic variable of interest, and the four facets of governance on NPLs is significant across all models estimated. This implies that the impact of the macroeconomic environment on the NPL ratio is significantly determined by the quality of the governmental institutions. Specifically, the conditioning influence of institutional quality and the aggregate governance index are found to correlate with 0.2% and 0.4% reductions in NPLs, respectively. On the other hand, economic and political indexes show that a 1% change in the interaction terms correlates with a 0.1% and 0.2% rise in NPLs, respectively. This result has implications for the quality of governance, which has adverse effects on the level of credit risk in the region.

JEL Codes: E10; E50; H10

Introduction

Bank non-performing loan (NPL) problems tend to emerge after credit booms or protracted periods of low growth in structurally weak financial systems. NPLs crowd out new lending, eroding both the profitability and solvency of banks. When high NPL levels affect a sufficiently large number of banks, the financial system stops functioning normally, and banks can no longer provide credit to the economy (Baudino & Yun, 2017). Macroeconomic conditions, in turn, have a non-negligible impact on the severity of the NPL problem (Balgova, Nies & Plekhanov, 2016; Foglia, 2022). Hence, for monetary authorities and other macro-prudential policy institutions, understanding how commercial bank lending and nonperforming loans (NPLs) respond to macroeconomic conditions is critical (Catalan, Hoffmaister & Harun, 2020). Because loans are the riskiest part of a bank's assets, their quality is one of the most critical determinants of business stability and success. Although there is no universally accepted definition of a bad loan, the Basel Committee on Banking Supervision, the International Monetary Fund, and the Institute of International Finance offers the most widely accepted definitions. The Basel Committee on Risk Management defines non-performing loans as including all loans that are not repaid within 90 days of the due date. Therefore, if we consider the fact that one of the primary businesses of banks globally is the granting of loans, then the implications of banks' exposure to credit risk as well as its management become a lot clearer (Žunić, Kozarić & Dželihodžić, 2021).

In the last 2 decades since the 1997/98 Asian financial crisis (AFC), nonperforming loan (NPL) ratios in Asia have generally been trending downward. Annual NPL ratios were less than 5% for most economies during the post-AFC era, a far cry from the peak when the ratio of bad loans to total outstanding loans hit as much as 49 percent for Indonesia, Bangladesh, and Thailand; 29 percent for the People's Republic of China; and more than 10 percent for the Kyrgyz Republic, India, Malaysia, Pakistan, and the Philippines (Lee & Rosenkranz, 2019).

In the particular context of Southeast Asia, governmental authorities throughout the region have continued to pursue reform of their banking systems since the 1997 Asian Financial Crisis. In Southeast Asia, a sound banking system is particularly important because a significant number of companies rely heavily on bank loans for financing. Nonperforming loans (NPLs) in particular can become a major problem for a banking system, as evidenced in recent experiences around the world (Inoguchi, 2012). Since 2010, both the nominal levels of non-performing loans (as a ratio of total gross loans) have appeared to be picking up in many economies in the region. A continuation of these developments could translate into growing concerns over banking sector stability and its systemic implications for the financial sector and the economy in the region (Lee & Rosenkranz, 2019).

The empirical evidence on the determinants of non-performing loans in Asian economies has been limited and, by and large, has relied on country-level analysis. Nevertheless, there is consensus that macroeconomic factors influence the evolution of non-performing loans over time (Baudino & Yun, 2017; Beck, Jakubic & Piloiu, 2013; Bayar, 2019; Nkusu, 2011; Mazreku et al., 2018).

Overall macroeconomic conditions, comprising gross domestic product(GDP) growth rate, domestic credit growth, equity prices, inflation, exchange rate, unemployment rate, and interest rates also tend to affect loan quality, among others, which affect loan quality as well as borrowers' debt servicing capacity, explain credit risk as confirmed by the literature on major economies (Khumalo, Ferreira-Schenk, Rensburg & Mokatsanyane, 2021; Fallanca, Forgione & Otranto, 2020; Al Masud, & Hossain, 2020; Nathan, Ibrahim and Tom, 2020; Jakubik & Kadioglu, 2021). For instance, the European Central Bank(ECB, 2011) points out that real GDP growth has been the leading driver of non-performing loans (NPLs) for decades. To drive this assertion home, Lee and Rosenkranz (2019) argued that income increases when an economy is expanding and the real GDP growth rate is higher, which then improves the borrower's capacity to repay loans.

Hence, default risk is mitigated and non-performing loans tend to decrease. During an economic downturn, unemployment tends to rise, which means that borrowers have less money to repay their debts, which causes NPLs to rise.

Although different macroeconomic factors may produce different multipliers, the question this paper seeks to answer is whether the NPL ratio responds differently to macroeconomic conditions in the context of East Asia and the Pacific when governance and institutional quality are taken into account. As pointed out in Lee & Rosenkranz (2019), there are a limited number of panel studies that explore the macroeconomic determinants of the NPL nexus in Asia as a whole. With regards to East Asia &Pacific, only Ednut, Syuhada, Imsil and Mahmood (2013), to our knowledge, examined the phenomenon over a period spanning from 2000 to 2008.

However, country-level analyses in the region are not rare (, Bhattara, 2018; Zainol, Nor, Ibrahim and Daud, 2018; Amin, Ahsan and Al Muktadir, 2021; Zeng, 2012, and others). Moreover, Nor, Ismail and Rahman (2021) for Southeast Asia, Murshed and Saadat (2018) and Rehman (2017) for South Asia, and Lee and Rosenkranz (2019) for some Asian economies, are among the few studies that examined the phenomenon from a panel data perspective. While panel studies in Asia may differ only in the analytical approaches adopted in regressing the NPL ratio against selected macroeconomic factors, a theoretical model on the contingency (or combined) effect of governance quality and macroeconomic conditions on credit risk is evidently neglected. The vacuum created by ignoring the conditioning influence of governance on NPL levels is not unique to Asian empiricists, but is also common in panel studies conducted in other parts of the world.

The need to fill this gap in literature becomes even more compelling as the debate on the growing influence of governance in Asian economies is on the front burner of recent development policy literature in the region. Moran (1999) and Park (2016) remain a well-known classical study suggesting that the influence of corruption on the political system, developmental trajectory, and forms of external linkages in East Asia cannot be overemphasized. While Haw, Kueh and Ling (2020) contends that corruption is significantly inimical to growth in Asia, Sen (2014) buttresses that the broader governance dimensions affect most development outcomes in Asia, particularly by increasing the mobilisation of domestic resources and increasing the effectiveness with which these resources are utilised. In effect, de

Dios and Lagman-Martin (2010) suggests that strengthening governance quality could well be used as a potential entry point for growth strategies for the Asian region. In a similar perspective, Son, Liem and Khuong (2020) argues that corruption influences the economy through the channels of the banking system. Improved institutional quality has also been linked to less risk in the banking system and better financial development (Canh, Schinckus, Su, & Chong, 2021; Kombo &Koumou, 2021).

In view of the suggestive roles of governance quality in the Asian literature, this paper hypothesizes that good governance acts as an accelerator to growth and thus is expected to bring about a reduction in NPLs. This paper makes makes contributions to the literature by investigating the combined impact of governance quality and macroeconomic conditions on NPLs. This paper therefore reports the result of the contingency effect of governance and interaction terms on NPL levels for East Asia and Pacific countries. Following this, economic stability, institutional quality, and political stability are three broad types of governance indicators we examined based on the World Bank's World Governance Indicators. Also, we looked at the six components of governance indicators—namely, regulatory quality, government effectiveness, rule of law, corruption control, political stability, and absence of violence/terrorism—that make up these broad types of governmental institution variables.

The rest of the paper is organised as follows: In Section 2, we reviewed related literature. Section 3 describes the data and our empirical methodology. Our results and discussion are presented in Section 4, and Section 5 presents our concluding implications.

Review of Empirical Literature
Macroeconomic factors and NPLs literature

Macroeconomic determinants of NPLs, or the quality of bank assets in general, have generated a substantial amount of interest since the outbreak of the financial crisis of 2008/2009. The economic stages determine the probability of loan default and nonperforming loans. Kavkler, Repina, and Festic(2011) contends that it is the fluctuation deriving from the macroeconomic environment that causes these defaults. Numerous empirical studies explore the macroeconomic factors that influence NPLs across countries and regions. In particular, Mazreku et al., (2018), Castro (2013), Ranjan and

Dhal (2003), Liu, Liu and Kim (2019), Hada, Bărbută-Misu, Iuga and Wainberg (2020), Koju, Abbas and Wang (2018), Viswanadham and Nahid (2015), Škarica (2014) and among others, suggested the inclusion of macroeconomic variables into the analysis and contends that the variables exert considerable influence on NPLs. Examining the relationship between credit risk and the macroeconomic environment of South Africa, Khumalo, Ferreira-Schenk, Rensburg & Mokatsanyane (2021) showed a significant long-run relationship between credit risk and macroeconomic variables (interest rate, GDP growth, unemployment rate, & money supply).

Endut, Syuhada, Ismail and Mahmood (2013) examined the implications of macroeconomic indicators using annualised data from 2000 to 2008 for twelve Asian Pacific countries, the results show that economic growth and inflation are associated with a declining level of nonperforming loans.

In a related study, Murshed and Saadat (2018) explored the institutional function, and employed traditional estimation techniques to examine the role of corruption in the macroeconomic factors and NPLs nexus. The results reveal that better control over corruption and   rule of law reduces the volume of nonperforming loans in the panel of the three South Asian countries. In the same vein, Hasan and Ashfaq (2021) found that corruption has a complex relationship with economic growth in a panel of 178 countries and that corruption is beneficial in weak forms of governance. They also found that excessive regulatory pressure tends to contribute to rising NPLs.

Olarewaju (2020) used the generalized method of moment (GMM) estimation for 110 commercial banks from nine sub-Saharan Africa countries for the years 2010–2017. The results reveal that the lag of nonperforming loans, lending rates, and credit growth, among others, significantly influenced nonperforming loans. Similarly, IMF (2021) showed that an increase in lending rates and credit growth was associated with a rise in NPL ratios in the SSA, whereas a slowdown in GDP growth was shown to instantaneously reduces the borrowers' capacity to repay, hence increasing the NPL ratio. This is in line with Mpofu and Nikolaidou (2018), who analysed the macroeconomic determinants of non-performing loans in the banking systems of 22 SSA countries over the period 2000–2016. The findings show that increasing the GDP growth rate

has a statistically significant effect on lowering the sub-regions' NPL ratios. In the same vein, Fofack (2005) suggested a positive and significant association between macroeconomic shocks and the NPL ratio in the SSA. In the same line, Jabbouri and Naili (2020) and Syed and Tripathi (2019) for the MENA countries and BRICS banking sectors, respectively, also highlighted GDP growth, inflation, and unemployment as the main macroeconomic factors affecting NPLs.

While results for the SSA do not differ significantly in both direction and magnitude, conflicting results abound, especially in other emerging economies. Bayar (2019) concludes that economic growth and inflation affected nonperforming loans negatively, while unemployment affected nonperforming loans positively for emerging market economies. In contrast, Masud and Hossain (2021) showed that the GDP growth rate, unemployment rate, and inflation are positively and significantly related to NPLs.

This is in accordance with Klein (2013) for Central, Eastern, and South-Eastern Europe (CESEE). However, findings in Tanasković and Jandrić (2015) for the Central and Eastern European (CEE) and South Eastern Europe (SEE) countries reveal a negative association between GDP growth and the rise of the NPL ratio.

Jakubik and Kadioglu (2021) suggested   that macroeconomic variables (inflation rate, effective tax rate, lending rate, and unemployment rate) have a statistically significant influence on the NPL ratio. On the other hand, poor credit monitoring, exchange rates, and poor credit policies indicate a statistically insignificant impact on NPLs. Within the context of income levels, Koju, Abbas and Wang (2018) explored the macroeconomic determinants of NPLs in low- to high-income economies in Asia using the GMM estimation approach based on a period spanning from 1998 to 2015. The results reveal that NPL responds negatively to inflation in high-income and middle-income countries and positively in low-income countries. The increase in GDP per capita has a negative relationship with the NPL in high-income and low-income countries. Similarly, the direction of influence of the unemployment rate on NPL varies across the income levels; a positive effect in the middle-income and low-income countries and a positive influence in the high-income countries.

Mixed findings have been observed for some country-specific studies. For example, in the Chinese

context, Umar and Sun (2018) showed that GDP has an inverse relationship with NPLs, whereas inflation is positively associated with the NPL ratio. This finding is in accordance with expectations and is supported by Prasanna, Thenmozhi and Rana (2014) for India and Khumalo, Ferreira-Schenk, Rensburg and Mokatsanyane (2021) for South Africa. However, these results are in tandem with Laila (2017) for Indian private sector banks and in part with Goswami (2021) for selected nationalized banks, private sector banks, and foreign banks in India. Pestova and Mamonov (2013) also revealed that macroeconomic factors significantly influence loan quality in Russia. Taking the investigation further to the peer-to-peer lending market, Nigmonov, Shams and Alam (2022) argues that high-interest rates and inflation rates increase the chances of defaults.

Macroeconomic factors, Governance quality and NPLs literature

The combined impact of the macroeconomic environment and governance quality on credit risk has generally remained understudied. The paucity of literature in this area is even more evident in the context of the East Asia & Pacific region. Murshed and Saadat (2018) examined the impact of corruption control on nonperforming loans in three South Asian countries: Bangladesh, India, and Pakistan. The result revealed that stronger anti-corruption measures and the application of the rule of law reduce NPLs. Similarly, Son, Liem, and Khuong (2020) used the three stage least square(3SLS) regression approach based on international evidence to determine the impact of corruption on the banking sector and growth. According to the findings, corruption contributes to higher levels of NPLs in the banking system. Hasan and Ashfaq (2021), on the other hand, used the GMM to examine the relationship between corruption, growth, and NPLs in a panel of 178 economies. The study showed that corruption is positively and significantly related to nonperforming loans (NPLs) in the banking sector. Bayar (2019) revealed in a related study on emerging market economies that economic freedom has a negative impact on NPL levels.

Theoretical Argument and Knowledge Gap

The essentiality of good governance has been a key focus in development policy discussions in recent years. While their intrinsic value as ends of development in their own right is now universally accepted, their instrumental value as a means toward better growth performance is on the front burner of public policy debate. Zhuang, de Dios and Lagman-Martinthe (2010) argues that improving governance, especially in effectiveness, regulatory quality, and rule of law dimensions, could be used as potential entry points into development strategies for many countries in the Asian region. A meta-analysis of studies on the East Asia Pacific regions revealed that while corruption is negatively correlated with growth, government effectiveness and regulation are positively correlated with growth in the region (Yerrabati & Hawkes, 2015).

Further, Gani and Rasul (2020) and Yin (2019) are of the view that good governance promotes the efficient operation of financial markets, facilitates productive cooperation, and encourages other types of commercial activity. Evidence in classical literature also affirms that governance qualities, if improved, can actually mitigate asymmetric information and transaction costs and, therefore, improve resource allocation (Williamson, 1981; Ho & Michaely, 1988), strengthen economic surveillance (Keuschnigg & Weyerstrass 2015), and mitigate the occurrence of banking crises (Gaies et al. 2019). In light of this, and following Duuren, Haana, and Kerkhof (2020) and Canh, Schinckus, Su, and Chong (2020), this paper hypothesizes that good governance quality is positively associated with economic condition, resulting in a reduction in credit risk. Based on this theoretical postulation, wethis paper estimateed the combined impact of macroeconomic conditions and good governance on NPL levels in the East Asia and Pacific region. This is an empirical departure from the existing empirical literature in the region, which leaves a gap in knowledge that this paper attempts to fill.

More so, the few studies that examined the phenomenon selected sub-facets of governance quality, mainly the corruption index, thereby leaving out the core and broader governmental institution indexes like government effectiveness, regulation quality, rule of law, political stability, and voice and accountability, whose improvements are expected to be positively related to the macroeconomic environment, hence lowering credit risk level(source???). In light of this, this paper built the six sub-facets of governance, including corruption perception, into three major governance quality indicators, namely the economic index, institutional quality index, and political index, in accordance with

the World Bank's World Governance Indicators classification(Year???).

Data and Methodology

Data and Methodology

This paper analysed a panel dataset of 19 East Asia and Pacific countries from 2009 to 2020. Data was obtained from the World Development Indicators [WDI] (2021) and the World Governance Indicators [WGI] (2021), both of which are run by the World Bank. The choice of 2009 as the base year was informed by the availability of data for nonperforming loan (NPL) ratios in the region, which became available on the WDI database for most of the countries in 2009. As a result, only countries with significant data on NPL were selected. The estimation approach employed in this study is the generalised method of moments (GMM). Existing empirical studies contended that the dynamic panel model is specifically fashioned for a situation where the time period "T" is small and the number of cross-sections "N" is large (i.e., N > T) so as to control for possible dynamic panel bias (Roodman, 2006; Bond, 2002). One of the key advantages of dynamic estimation over traditional models is that it can resolve potential endogeneity problems produced by time-invariant and country-specific effects by internally generating valid instruments (Hsiao, 2003).

This paper employed the two-step system generalised method of moments (SGMM) introduced by Arellano and Bover (1995) and Blundell and Bond (1998) to address the issue of endogeneity, which is deemed more resilient than the single step-wise method. The SGMM estimator consists of a first-differenced equation that uses acceptable instruments as lagged levels, as well as a level equation that uses relevant instruments as lagged first-differences. The Sargan test can be used to determine the instrument's validity for over-identifying constraints, while the AR(1) and AR(2) tests can be used to determine the presence of serial correlation. The standard errors of the coefficients are not affected by heteroscedasticity (Roodman, 2007).

Table 1 Description of Model Variables

Variable	Description	Measure	Designation	Expected Sign
NPL	Bank nonperforming loans to total gross loan	% of total gross loan	Dependent Variable	-/+
GDPPC	GDP per capita growth rate	Annual %	Explanatory Variable	-
FDI	Foreign direct investment	% of GDP	Explanatory Variable	+
UER	Unemployment	% of total labor force (modeled ILO estimate)	Explanatory Variable	+
INF	Inflation	consumer prices (annual %)	Explanatory Variable	+
REER	Real effective exchange rate	Natural Logarithm	Explanatory Variable	-/+
PSC	Private sector credit	% of GDP	Explanatory Variable	+
IQI	Institutional quality index	0 corresponding to lowest rank, and 100 to highest rank	Moderating Variable	-
ECOI	Economic index	0 corresponding to lowest rank, and 100 to highest rank	Moderating Variable	-
POLI	Political index	0 corresponding to lowest rank, and 100 to highest rank	Moderating Variable	-
GOVI	Aggregate governance indicator	0 corresponding to lowest rank, and 100 to highest rank	Moderating Variable	-

Source: World Bank's *World Development Indicators (WDI) and World Governance Indicators (WGI), 2021.*
GDPPC = GDP per capita growth rate. UER = unemployment rate. INF = inflation rate, PSC = domestic credit to the private sector. FDI = foreign direct investment. REER = real effective exchange rate. IQI = Institutional quality index. ECOI = Economic index. POLI = Political index. GOVI = Aggregate governance indicator

3.1 Model Specification

In analysing the determinants of nonperforming loans in the banking system in the SSA, we follow the extant literature Mpofu & Nikolaidou, 2018; Klein, 2013, Castro, 2013, Koju, Abbas & Wang, 2018 and others) by adopting a dynamic panel approach to account for the influence of possible omitted regressors and the time persistence of NPLs. Therefore, the baseline model is captured by the following general equation:

$$\Delta NPL_{i,t} = \alpha + \delta \Delta NPL_{i,t-1} + \Delta\beta X'_{i,t} + \varphi_i + \Delta\varepsilon_{it} \qquad (1)$$

Where $NPL_{i,t}$ denotes the NPL ratio for country *i* at time *t*; $NPL_{i,t-1}$ represents the NPL ratio of country *i* at time *t−1*; $X_{i,t}$ denotes the matrix of macroeconomic variables used in the nonperforming loan and macroeconomic environment literature, namely GDP per capita growth rate, private sector credit, foreign

direct investment, unemployment rate, exchange rate and inflation rate   de Mendonça & da Silva, 2017; Liu, Liu & Kim, 2019; Hada, Bărbuță-Misu, Iuga & Wainberg, 2020; Koju, Abbas & Wang, 2018). α is the intercept; δ and β are the corresponding coefficient vectors. The parameter estimate of lagged dependent variable is expected to be positive and less than unity. φ_i is unobserved country-specific effect, and ε_{it} is the error term. $\varphi_i + \varepsilon_{it} = \mu_{i,t}$ has the standard error component structure. The innovations are assumed to have the following characteristics:

$$E[\varphi_i] = 0, \ \ E[\varepsilon_{i,t}] = 0, \ \ E[\varepsilon_{i,t}, \varphi_i] = 0, i = 1,2, ..., N, \ \ t = 2, 3, ..., T. \tag{2}$$

In Equation (1), the fixed effects are correlated with the regressors. In order to remove such time in-variant country specific effect, a transformation like first differencing is the option to obtain valid moment conditions. First differencing removes the individual effect and omitted variable bias from the equation. The following expression represents the first difference:

$$\Delta NPL_{i,t} = \alpha + \ \delta \Delta NPL_{i,t-1} + \Delta \beta X_{i,t}^{'} + \varphi_i + \Delta \varepsilon_{it} \tag{3}$$

After the first differencing, $\Delta NPL_{i,t-1}$ gets correlated with the error term ($\Delta \varepsilon_{it}$) in Equation (3) after the first differencing. Anderson and Hsiao's (1981) instrumental variable estimator and Arellano and Bond's (1991) Generalized Method of Moments are two extensively used methods for resolving this issue. Arellano and Bond (1991) is an econometric estimator that uses the lagged value of independent variables as an instrumental variable within the equation if the series of independent variables is preset and there is no contemporaneous connection. The lagged dependent variable in the above specification captures the link between past and present values.

The model used to estimate the impact of governmental institutions on the macroeconomic environment-NPLs relationshipis as follows:

$$\Delta NPL_{i,t} = \alpha + \beta_1 \Delta NPL_{i,t-1} + \beta_2 \Delta X_{i,t} + \beta_3 \Delta GOV_{i,t} + \beta_3 \Delta (X_{i,t} * GOV_{i,t}) + \beta_4 \Delta \gamma_{i,t} + \varphi_i + \Delta \varepsilon_{i,t} \tag{4}$$

β_2 denotes the coefficient of our main independent variable, GDP per capita growth rate denoted as X. The coefficient associated with β_3 captures the effect of governmental institutions on the macroeconomic factor–NPL ratio relationship. Inotherwords,the interaction variable, $X_{i,t} * GOV_{i,t}$, captures the idea that governance factors mayexplainthevariation in themacroeconomic environment–NPLs nexus with GDP per capita growth rate as the main explanatory variable in line with Staehr and Uuskula (2019) and Radivojevic and Jovocic (2017). Thus, GOV is the interacting term (i.e.interaction between GDP per capita growth rate and vector four governmental institution indicators namely, economic index, institutional quality index, political index and aggregate governance index). Y is the vector of control variables comprising private sector credit, unemployment rate, foreign direct investment real effective exchange rate and inflation rate.

Description of Governmental Institution Variables and justifications

- **Economic index:** The average of regulatory quality and government effectiveness is used to calculate the economic index. The view of the government's ability to establish and enforce effective policies and regulations that allow and support private sector development is captured by Regulatory Quality. Government Effectiveness is the second component of the economic index, and it measures public

perceptions of the quality of public services, the civil service's quality and independence from political pressures, the quality of policy formulation and implementation, and the government's commitment to such policies.

▪ **Institutional quality index:** The average of rule of law and corruption control is used to calculate the institutional quality index. The term "rule of law" refers to people's perceptions of how much they trust and follow society's laws, including the quality of contract enforcement, property rights, the police, and the courts, as well as the possibility of crime and violence. Control of Corruption encapsulates popular perceptions of the amount to which public power is used for private gain, encompassing petty and grand corruption, as well as "state takeover" by elites and private interests.

▪ **Political index:** Political stability and absence of violence/terrorism (which measures perceptions of the likelihood of political instability and/or politically motivated violence, including terrorism), and Voice and Accountability (which captures perceptions of the extent to which a country's citizens are able to participate in selecting their government, as well as freedom of expression, freedom of association, and a free media) make up the political index.

▪ **The aggregate governance indicator:**   The average economic index, institutional quality index, and political index is used to calculate the aggregate governance indicator. All of the indicators are ranked in percentiles. The percentile rank of a country is its position among all countries covered by the aggregate indicator, with 0 indicating the lowest rank and 100 indicating its highest rank.

Country-specific ranking in governance quality is further presented in Figure 1 with full representation of the underlying sub-components of governance indicators as well as the corresponding indexes across the East Asia & Pacific countries.
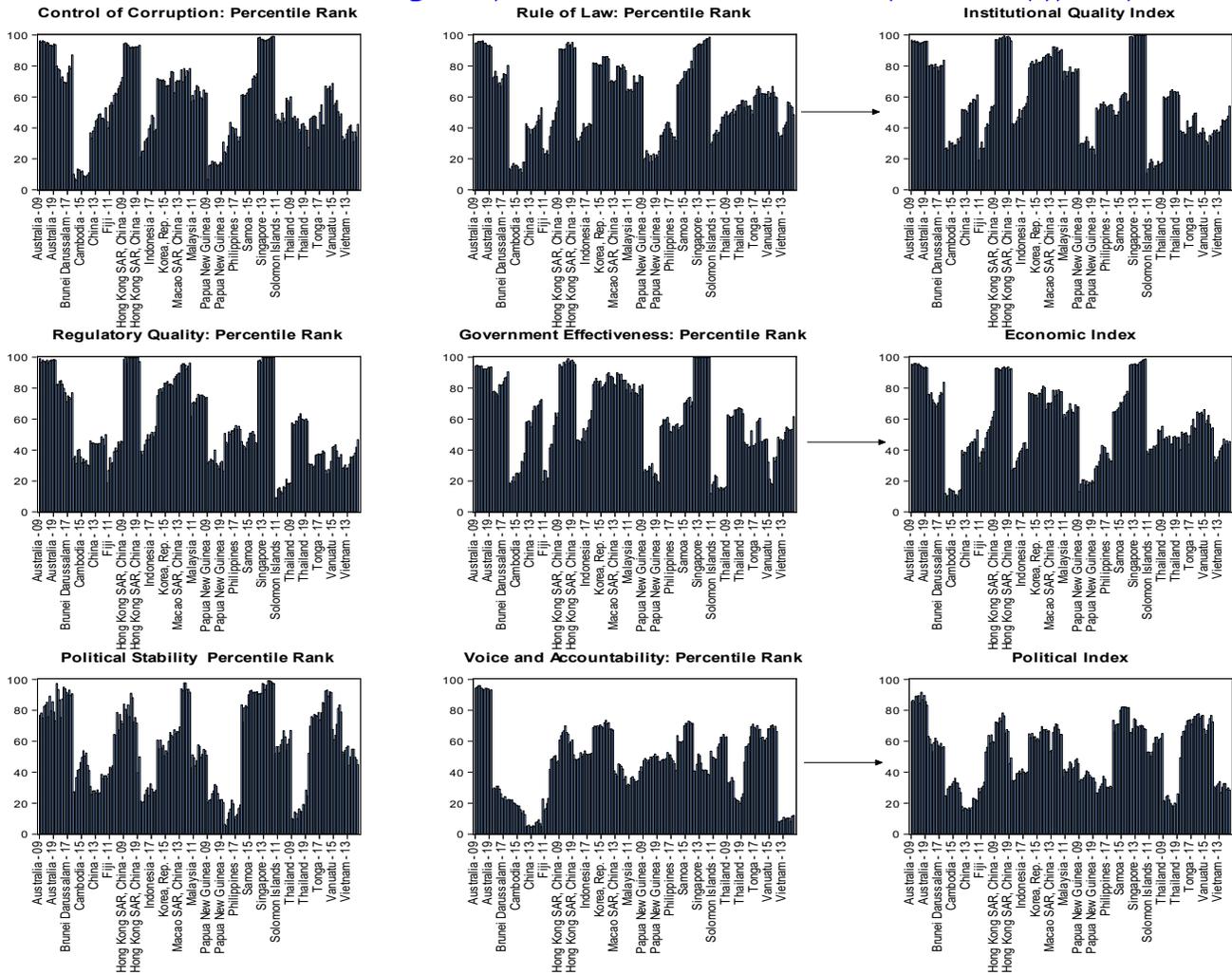
Figure 1: Governance quality country-specific ranking

Source: World Governance Indicators

We choose these indicators because they would possibly affect the role played by macroeconomic indicators on a banking sector credit risk. In addition, they play a role in facilitating the business eco-system, thus enhancing the efficiency or productivity of loan facilities thereby improving the chances of fulfilling bank loan obligations. This possible interaction is graphically represented in Figure 2. The fitted confidence eclipse scatter plot suggests that all the governance indicators are closely associated with nonperforming loan ratio.
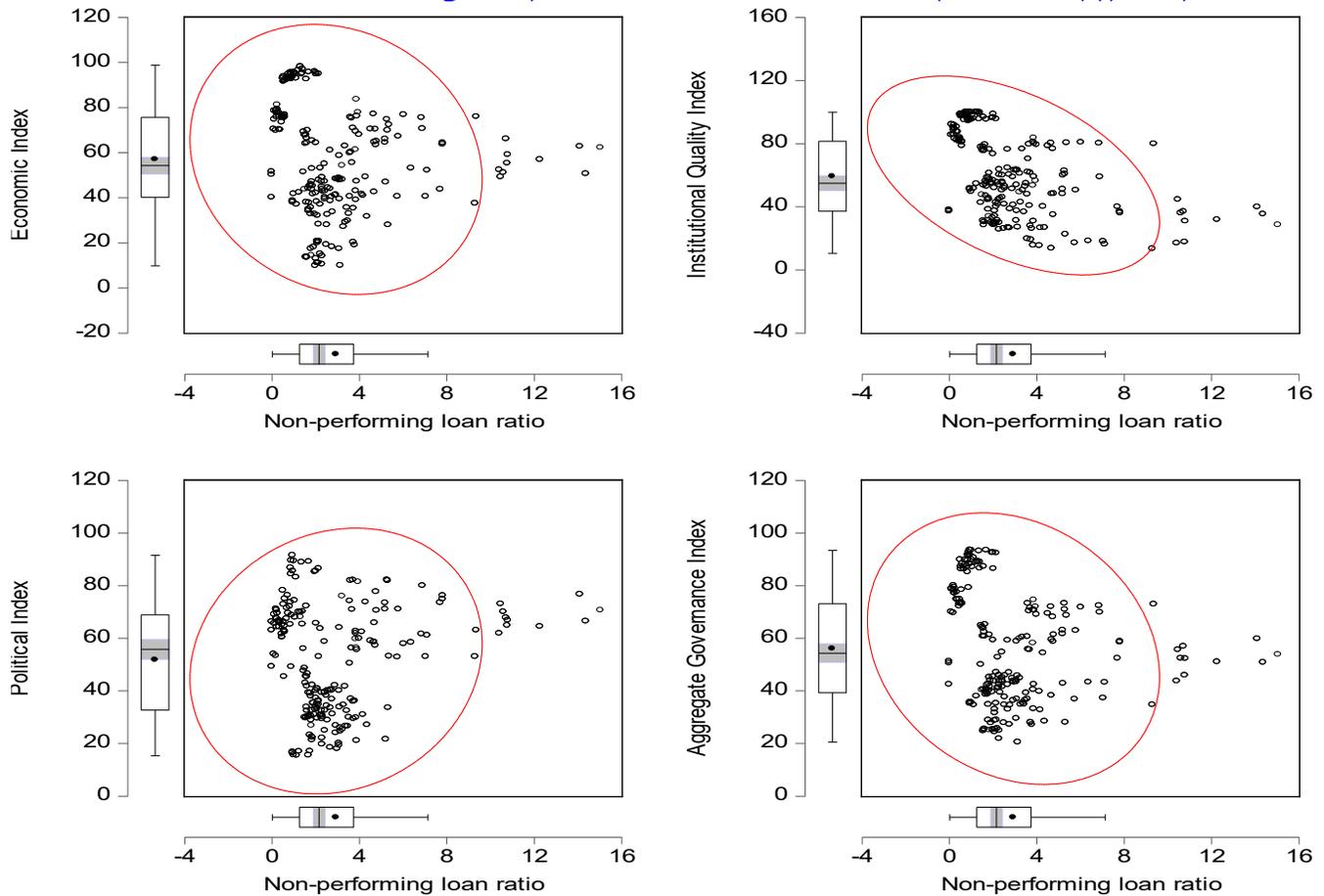
Figure 2: Fitted confidence eclipse scatter plot of governance indicators
Source: Authors' computation based on data from the World Development Indicators

Theoretically, improvement in governance indicators is expected to contribute to reduction in nonperforming loan ratio through a contingent effect on the macroeconomic environment. This conjecture is evident in Figure 3 and seem to hold true for the highest ranked and middle-ranked economies in quality of governmental institutions. However, the evidence for lowest ranked entities in the region is unclear as they tend to react moderately to credit risk exposures. For instance, Figure 3 shows that economies with higher governance percentile rank record lower nonperforming loan ratio (see Australia, Macao, Singapore and Hong Kong) whereas highest level of credit risk is recorded among the middle-ranked countries (see Brunei Darussalam, Vanuatu, Tonga, and Solomon Islands among others). Interestingly, lowest ranked entities also tend to have high but moderate exposure to credit risk compare to the middle-ranked economies (see Cambodia, China, Fiji and Indonesia among others).
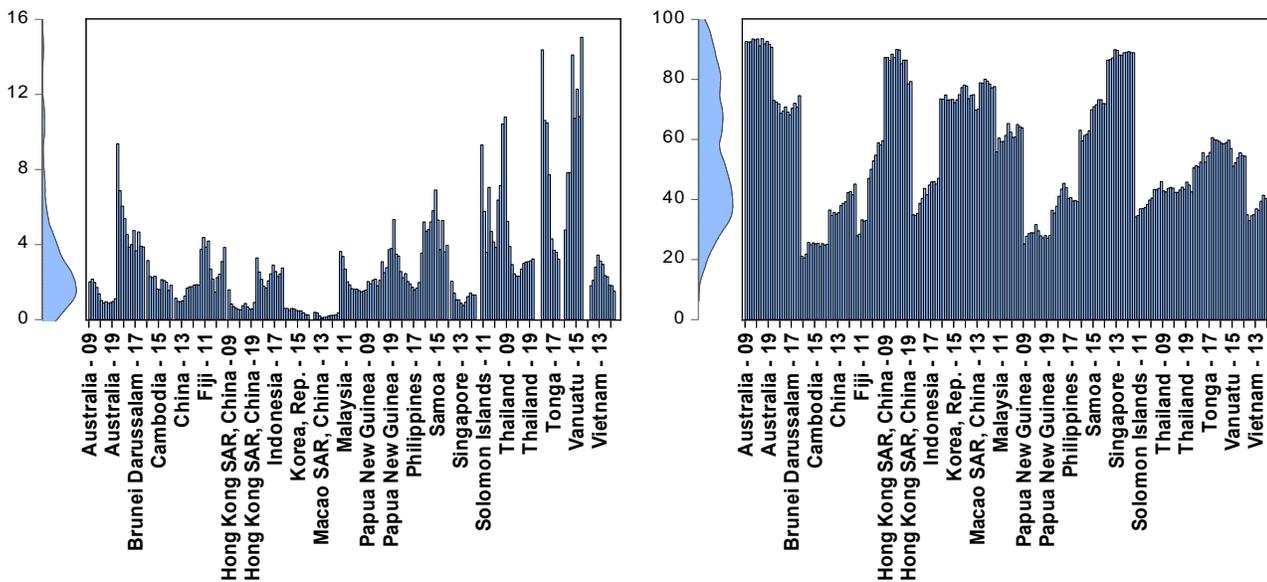
Figure 3: Credit risk and Governance Index ranking
Source: Authors' computation based on data from the World Development Indicators

Results and Discussion

Present the table and then the discussion

Table 2 presents descriptive statistics on the variables over the period of 2009 to 2020 for 19 East Asia & Pacific countries. The information derived from the descriptive statistics provides an overview of a country's position in the sample. The average nonperforming loan ratio is 2.93%, and is within the 0.09% to 15.05% range, with a standard deviation of 2.71%. The average growth rate of GDP per capita is 1.86%, with a standard deviation of 5.86%. Meanwhile, the average unemployment rate and foreign direct investment (relative to GDP) are approximately 3.40% and 6.11%, respectively. The averages of the three institutional quality indicators (Institutional quality index, Economic index, and Political index) are, respectively, 59.33, 57.05, and 51.92, while the aggregate governance indicator averaged 56.10. Because governance indicators are measured in such a way that 0 and 100 denote a low and high level of governance institutions, respectively, this means that governance indicators in East Asia and Pacific countries are

moderate on average. Moreover, Figure 2 displays additional details and demonstrates the country-level percentile ranking across the three facets of governance as well as the aggregate governance indicator. The chart shows that Australia, Hong Kong and Singapore are the best-ranked countries in East Asia &Pacific with an average score of 90+ percentile across all indicators. Moreover, Brunei Darussalam, Burundi, Korea Rep., and Macao maintained an average percentile rank of 70+, whereas Cambodia, China, Fiji, Indonesia, Papua New Guinea, the Philippines, and Thailand are among the worst-ranked countries with an average of less than 50 percentile score across the three governance indicators (See Figure 1).

This result is statistically mis-informing about the characteristics of the variable. We are very much interested not only in the mean but also in the skewness, kurtosis and Jaque-Bera. Report these missing results for the descriptive statistics.

Table 2. Descriptive Statistics

Variable	Mean	Max.	Min.	SD	Obs.	Source of Data
NPL	2.93	15.05	0.09	2.71	214	WDI, World Bank
GDP per capita growth rate	1.86	22.38	-54.64	5.86	228	WDI, World Bank
Unemployment rate	3.40	9.32	0.14	2.09	228	WDI, World Bank
Foreign direct investment	6.11	58.52	-27.76	9.25	228	WDI, World Bank
Private sector credit	84.55	266.61	14.45	54.12	228	WDI, World Bank
Real effective exchange rate	2027.53	23208.37	0.97	5328.41	228	WDI, World Bank
Inflation rate	2.68	18.68	-2.60	2.37	227	WDI, World Bank
Institutional quality index	59.33	100.00	10.53	25.56	228	WGI, World Bank
Economic index	57.05	98.80	9.86	24.05	228	WGI, World Bank
Political index	51.92	91.57	15.40	20.61	228	WGI, World Bank
Aggregate governance index	56.10	93.50	20.55	20.76	228	WGI, World Bank

Source of computation????

Table 3. Durbin-Wu-Hausman Test of Endogeneity: Wald Test

Test Statistic	Value	df	Probability
F-statistic	8.91	(8, 895)	0.00
Chi-square	57.03	8	0.00

Source of computation?????

From the endogeneity test in Table 3, the null hypothesis that the variables are exogenous is rejected. Given that the Chi-square value of 57.03with probability value of 0.00, we cannot reject the alternate hypothesis, meaning that the variables in our study are endogenous. In the absence of endogeneity problems, Panel Least Square would have been a consistent estimator.   However, with the establishment of endogeneity, the GMM estimator will be consistent and efficient approach to estimating endogenous regressions.

Table 4

Results on GMM-System Estimation on Macroeconomic Conditions, Governmental Institutions and Nonperforming Loans Quality

Table 4 shows the relationship between Nonperforming loan ratio, governmental institutions and macroeconomic factors. The baseline results on the effect of macroeconomic environment on nonperforming loan is present in column 2 (model 1(a)). In addition, model 1(b), 1(c) and 1(d) present the results of the baseline model with the inclusion of governmental institution variables namely Institutional quality index, economic index, Political index and aggregate governance index respectively. Notes: ***, ** and * denote significant at 1%, 5%, and 10%. Statistics in parenthesis denote the *t*-statistics.

	Model 1(a) Main Model	Model 1(b) Governance Indicator: Institutional quality Index	Model 1(c) Governance Indicator: Economic Index	Model 1(d) Governance Indicator: Political Index	Model 1(e) Aggregate governance indicator
NPL (-1)	0.631***	0.606***	0.612***	0.609***	0.638***
	(10.58)	(10.19)	(10.70)	(10.81)	(11.16)
GDPPC	-0.058***	-0.051**	-0.058***	-0.057***	-0.065***
	(-2.74)	(-2.35)	(-2.73)	(-2.72)	(-3.00)
FDI	-0.019	-0.026	-0.017	-0.027	-0.015
	(0.74)	(1.06)	(0.72)	(1.14)	(0.60)
PSC	-0.072**	-0.055**	-0.063**	-0.065**	-0.062**
	(-2.42)	(-2.35)	(-2.28)	(-2.29)	(-2.30)
UER	-0.413***	-0.351**	-0.591***	-0.475***	-0.580***
	(-3.03)	(-2.38)	(-3.99)	(-3.48)	(-3.85)
REER	-0.350	-0.467	-0.394	-0.302	-0.229
	(-0.76)	(-1.01)	(-0.85)	(-0.66)	(-0.49)
INF	-0.063	-0.064	-0.051	-0.046	-0.048
	(-1.34)	(-1.39)	(-1.07)	(-0.99)	(-1.00)
GOV		-0.019**	0.060***	0.037***	0.060***
		(-2.28)	(3.21)	(3,05)	(2.64)
Constant	3.732***	4.408***	1.242	1.755	1.148
	(5.11)	(4.82)	(1.16)	(1.81)	(0.93)
AR(2)test(p-value)	0.61	0.65	0.60	0.63	0.59
Sargantest(p-value)	0.86	0.84	0.85	0.88	0.82

GDPPC = GDP per capita growth rate. UER = unemployment rate. INF = inflation rate, PSC = domestic credit to the private sector. FDI = foreign direct investment. REER = real effective exchange rate. GOV denote Institutional quality index, Economic index, Political index, and. Aggregate governance indicator, respectively.
Source: Authors' Computation

The results on the effects of macroeconomic factors and governance on the NPL ratio are shown in Table 4. Our analysis starts by examining the impact of macroeconomic variables on NPL, as shown in column 2 (Model 1(a)). The results reveal that the initial NPL ratio is positively and significantly associated with current NPLs. This is consistent with extant literature (see e.g., Kedira, Iftikhar, Murindec & Kamgnia, 2018; Mpofu & Nikolaidou, 2018; Makri, Tsagkanos & Bellas, 2014; Ćurak, Pepur & Poposki, 2013), which argues that lagged NPL is

expected to positively affect current NPL levels. The results further show that the GDP per capita growth rate (GDPPC) is negatively and significantly related to the NPL ratio. This is in tandem with the *a priori* expectation and implies that an increase in GDP per capita leads to a reduction in the NPL ratio. The parameter estimate suggests that when GDPPC increases by one percentage point, the NPL level declines by 0.06 percentage points. This outcome supports the findings in Endut, Syuhada, Ismail and Mahmood (2013) for the Asian Pacific, and confirms

similar findings in other jurisdictions (see Koju, Abbas & Wang, 2018; Kjosevski, Petkovski & Naumovska, 2019; Bayar, 2019; Abid, Ouertani & Zouari-Ghorbel, 2014, among others). Moreover, in line with theoretical expectation, FDI is shown to have a negative influence on NPL where one percentage point increase in FDI brings about a 0.02 percentage point decrease in NPL. The private sector credit to GDP results indicate a statistically significant and negative sign of nonperforming loans across all models. Based on the coefficients obtained, we can state that a 1% increase in private sector credit correlates with a decrease in nonperforming loans by 0.06% to 0.07% range. The direction of impact of other control variables is in line with theory, except for the unemployment rate.

Considering the other four models (i.e., Models b, c, d, and e), the slope coefficient GDPPC is statistically significant and is in the -0.05 to -0.07 range, suggesting a decline in NPL of at least 0.05% for a percentage change in GDP per capita growth rate. The control variables, with the exception of domestic credit to the private sector, show the correct signs. In addition, the main model could not reject the null hypothesis of no second-order serial correlation at the 5% significance level. Besides that, the p-value of 0.86 generated by the Sargan test suggests that we could not reject the null hypothesis of no over-identifying restriction for the estimation. This shows that the instrument variables are validly exogenous, and in our system GMM estimations are valid.

Table5.

Results on GMM-System Estimation on Macroeconomic Factors, Governmental Institutions and Nonperforming Loans Quality (With Interaction Variable)

Table 5 presents results of the interaction between governmental institution variables and main macroeconomic variable of interest (i.e. GDP per capita growth rate). Notes: ***, ** and * denote significant at 1%, 5%, and 10%. Statistics in parenthesis

Nonperforming loan ratio	Model 2(a) Governance Indicator: Institutional Quality Index	Model 2(b) Governance Indicator: Economic Index	Model 2(c) Governance Indicator: Political Index	Model 2(d) Aggregate governance indicator
NPL (-1)	0.614***	0.625***	0.599***	0.619***
	(10.79)	(10.97)	(10.85)	(10.88)
GDPPC	-0.188***	-0.172***	-0.160**	-0.202***
	(-3.33)	(-2.80)	(-2.28)	(-3.01)
FDI	-0.007	-0.011	-0.018	-0.011
	(0.30)	(0.43)	(0.76)	(0.43)
PSC	-0.002	-0.004	-0.006	-0.003
	(-0.26)	(-0.50)	(-0.77)	(-0.41)
UER	-0.283**	-0.438***	-0.451***	-0.445***
	(-1.99)	(-3.18)	(-3.24)	(-3.31)
InREER	-0.577	-0.447	-0.323	-0.471
	(-1.23)	(-0.96)	(-0.70)	(-1.02)
INF	-0.046	-0.050	-0.052	-0.046
	(-0.98)	(-1.06)	(-1.09)	(-0.97)
GOV	-0.017**	0.053***	0.036***	0.054
	(2.41)	(2.67)	(2.80)	(2.30)
GDPPC*GOV	-0.02***	0.01**	0.02**	-0.04**
	(2.58)	(2.28)	(2.32)	(2.27)
Constant	1.127	1.119	1.469	1.024
	(1.14)	(1.02)	(1.46)	(0.83)
AR(2)test(p-value)	0.54	0.56	0.53	0.57
Sargantest(p-value)	0.66	0.62	0.63	0.65

denote the *t*-statistics.

GDPPC = GDP per capita growth rate. UER = unemployment rate. INF = inflation rate, PSC = domestic credit to the private sector. FDI = foreign direct investment. REER = real effective exchange rate. GOV denote Institutional quality index, Economic index, Political index, and. Aggregate governance indicator, respectively. GDPPC*GOV = interaction between GDPPC and GOV.
Source: Authors' Computation

We analyse the effect of institutions of governance on the NPL ratio and report the results in columns 3 to 6 of Table 4 (i.e., Models 1(b), (c), (d), and (e), respectively). The result indicates that all the governmental institution variables are statistically significant in explaining the NPL level. Moreover, only the institutional quality index appears to contribute to a decrease in the level of NPLs. The evidence suggests that a one percent increase in institutional quality correlates with about a 0.02% reduction in NPLs. On the other hand, the economic index, political index, and aggregate governance indicator are positively associated with the NPL ratio, meaning that these facets of governance institutions have not contributed to the decreasing level of NPLs, contrary to some studies (Bayar, 2019). Moreover, with the inclusion of the governance indicators in the baseline specification, the macroeconomic factor of interest, GDP per capita growth rate, consistently contributed significantly to the reduction in NPL level as shown in Models 1(b), (c), (d) and (e). Based on the *p*-values of 0.59 to 0.65 range across all the models, the AR(2) test could not reject the null of no second-order serial correlation. The Sargan test could not reject the null hypothesis that there is no over-identification restriction, which means that the instruments are very reliable.

We further extended our analysis to consider the combined impact of governmental institutions and the macroeconomic environment on the NPL ratio. Intuitively, since macroeconomic factors also involve equal representation of government policies and private sector active participation in the financial macroeconomic ecosystem, the quality of governmental institutions matters in ensuring the efficient and healthy banking system as well as efficient allocation and distribution of credit to targeted sectors in line with the industry-specific standards and formulated policies.

We follow Gani and Rasul (2020) approach and report our results in Table 5. The results show that the interaction terms between our macroeconomic variable of interest and the four facets of governance institution variables (i.e., Models 2a to 2d) are significant at a 1% to 5% range

of significance level, implying that the effect of the macroeconomic environment on NPL ratio depends on the quality level of the governmental institution. In the light of these interaction terms and augmenting roles of governance, we can observe that only the institutional quality index (in Model 2a) and the aggregate governance indicator (in Model 2d) are negatively related to NPLs, in line with expectations. However, the positive sign of the interaction terms for the economic index and the political stability index would lead to an argument regarding why the macroeconomic environment is positively related to the region's nonperforming loan ratio as the quality of the economic index and political stability improve. For instance, the coefficient of the economic index suggests that a one percent change in the economic index correlates with a 0.01% increase in NPLs, while a change in the political index is associated with a 0.02% increase in NPLs. Generally, these outcomes imply that the augmenting effect of governmental institutions on the level of NPLs in East AsiaandPacific has been significant, irrespective of the facet of the governance indicator. However, the economic index (comprising government effectiveness and regulator quality) and the political index (comprising political stability, voice and accountability) seem to be relatively less effective in reducing NPLs in the region's banking system through their contingency effect on economic growth.

The other explanatory variables show a consistent effect on the NPL ratio at the 5% significance level. The *p*-values for the serial correlation test suggest that we could not reject the null of no second-order serial correlation. The Sargan test also doesn't reject the idea that there isn't an over-identifying restriction, which shows that the instruments are valid.

Diagnostics Test Result

We understand the problem associated with multicolinearity in any regression estimate where it would be problematic to distinguish between the individual effects of the explanatory variables on the dependent variable. While multicolinearity may not

seriously affect the accuracy of the model, it is noteworthy that we might lose reliability in determining the effects of individual features in our model, which could pose the problem of interpretability. To this end,this paper tested for multicolinearity in all the nine models using the Variance Inflation Factor (VIF) presented in Table 6.

By convention, a VIF exceeding 5 or 10 indicates high multicolinearity between the independent variables and the others. The results show that the centred VIF across the models is within the 1.02 and 3.60 range, suggesting that our models do not suffer from any multicolinearity problems.

Table 6. Test for Multicolinearity across all models: Variance Inflation Factor (VIF) Results

Variable	Model 1a VIF	Model 1b VIF	Model 1c VIF	Model 1d VIF	Model 1e VIF
GDPPC	1.182865	1.184629	1.246020	1.205338	1.240240
PSC	1.386904	1.409592	1.031298	1.016704	1.023967
FDI	1.376694	2.276252	1.161222	1.150751	1.159006
UER	1.241929	1.556602	1.453470	1.702229	1.713412
REER	1.297869	1.347206	1.038441	1.029388	1.040974
INF	1.188280	1.203549	1.624815	1.775230	1.878625
Institutional quality index		2.567247			
Economic index			1.246020		
Political index				1.205338	
Aggregate gov. index					1.240240

Variables	Model 2a VIF	Model 2b VIF	Model 2c VIF	Model 2d VIF
GDPPC	1.77312	1.33886	1.55879	1.41426
PSC	1.443182	1.491830	1.562277	1.514407
FDI	2.409078	2.053418	1.461943	1.942369
UER	1.562783	1.581395	1.364262	1.588399
REER	1.376844	1.469938	1.375522	1.429196
INF	1.217651	1.226281	1.219997	1.222979
Institutional quality index	2.864645			
Economic index		3.617350		
Political index			2.010647	
Aggregate gov. index				3.126772
GDPPC*Institutional quality index	2.82687			
GDPPC*Economic index		2.93744		
GDPPC* Political index			2.83546	
GDPPC* Aggregate gov. index				2.09608

Concluding Implications

In this paper, we examined the effects of governmental institutions and macroeconomic conditions on nonperforming loans, while controlling for the traditional determinants of nonperforming loans. An important way our work is different from the literature is that we estimate and model the broad contingency effect of governmental institutions, taking into account all six facets of governance built into three indicators in line with the World Governance Indicator of the World Bank. We examined the way macroeconomic factors and governance quality interact and test how these parameters influence the impact of the macroeconomic environment on nonperforming loans.

Our hypothesis is that, while our main macroeconomic factors, as represented by GDP per capita growth rate, and governance quality are negatively associated with nonperforming loans, their interaction should have a moderating effect on nonperforming loans. Thus, as governance quality improves, the effect of macroeconomic factors on NPLs should be negative (i.e., lead to a decline in NPLs). From a baseline perspective, we find that the GDP per capita growth rate is significantly related to the reduction in the level of NPLs.This is consistent with the findings of Nor, Ismail and Rahman (2012) for Southeast Asia, Karica (2014) for countries in Central and Eastern Europe, and Mazreku et al. (2018) for transition economies.

Furthermore, all the governance quality indicators are statistically significant in explaining credit risk in the East Asia and Pacific countries. Specifically, the results show that as the institutional quality index improves, the negative relationship between the macroeconomic environment and non-performing loans holds true. On the other hand, this conjecture is contradicted by improvements in the political index, economic index, and aggregate governance indicator. Further, the contingency effect (when governance quality indicators interact with GDP per capita growth rate) suggests that interaction terms are statistically significant irrespective of models estimated.

Based on direction of impact, the aggregate governance index improved from the baseline estimation and now has the right sign alongside the institutional quality index, which is found to be consistent in both sign and magnitude. This is in tandem with *a priori* expectations and suggests that the augmenting effect of governmental institutions on GDP per capita growth rate produced the expected outcome of reducing nonperforming loans in the East Asia & Pacific banking system. We estimate that when the interaction terms "institutional index" and "aggregate governance indicator" increased by one percent, the NPL ratio declined by 0.02% and 0.04%, respectively. On the other hand, a one percent change in the economic and political indexes is associated with a 0.01% and 0.02% reduction in the NPL ratio, respectively.

This outcome has implications for the quality of governmental institutions in East Asia and Pacific countries, with government effectiveness and regulatory quality (economic index) and political stability and voice and accountability (political index) coming under scrutiny. Although the overall governance outlook seems to play a significant augmenting role in decreasing NPLs, the economic and political indexes appear to prove weaker links in improving the macroeconomic condition and reducing the level of credit risk. This has ramifications for a concerted awakening towards improving the government's ability to establish and enforce more effective policies and regulations that allow and support private sector development. This extends to the need to ensure political stability and enhance the quality of policy formulation and implementation and the government's commitment to such policies, all of which strengthen the quality of governance, improve

macroeconomic conditions, and potentially lower credit risk levels in the region.

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Appendix 1.

Listof 19 countries

List of the countries represented in this table.

Sample: 2009 2020
Included observations: 228
Number of categories: 19

Value		Count	Percent	Cumulative Count	Cumulative Percent
1.	Australia	12	5.26	12	5.26
2.	Brunei Darussalam	12	5.26	24	10.53
3.	Cambodia	12	5.26	36	15.79
4.	China	12	5.26	48	21.05
5.	Fiji	12	5.26	60	26.32
6.	Hong Kong SAR, China	12	5.26	72	31.58

7.	Indonesia	12	5.26	84	36.84
8.	Korea, Rep.	12	5.26	96	42.11
9.	Macao SAR, China	12	5.26	108	47.37
10.	Malaysia	12	5.26	120	52.63
11.	Papua New Guinea	12	5.26	132	57.89
12.	Philippines	12	5.26	144	63.16
13.	Samoa	12	5.26	156	68.42
14.	Singapore	12	5.26	168	73.68
15.	Solomon Islands	12	5.26	180	78.95
16.	Thailand	12	5.26	192	84.21
17.	Tonga	12	5.26	204	89.47
18.	Vanuatu	12	5.26	216	94.74
19.	Vietnam	12	5.26	228	100.00
	Total	228	100.00	228	100.00