“The moderating role of country-specific uncertainty in the cross-border banking–financial stability relationship”

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THE MODERATING ROLE OF COUNTRY-SPECIFIC UNCERTAINTY IN THE CROSS-BORDER BANKING–FINANCIAL STABILITY RELATIONSHIP

Abstract

The purpose of this study is to examine whether country-specific uncertainty modifies the relationship between cross-border banking exposure and financial stability. The analysis uses an annual panel covering 53 countries over 2005–2024, with 788 country-year observations in the baseline estimation sample. Financial stability is measured by the ratio of bank non-performing loans to total gross loans, cross-border banking exposure by BIS consolidated cross-border claims relative to GDP, and uncertainty by the country-specific World Uncertainty Index. The empirical strategy employs country and year fixed effects with standard errors clustered at the country level and includes an interaction between cross-border banking exposure and uncertainty. Formal triple-interaction tests are used to assess heterogeneity across exchange-rate regimes, levels of economic development, and financial depth. Robustness checks include lagged explanatory variables, placebo leads, country-specific linear trends, bias-corrected dynamic estimation, alternative transformations of cross-border exposure, and sample checks. The results show that higher uncertainty makes the relationship between cross-border banking exposure and non-performing loans more positive, indicating a less favorable association with financial stability as uncertainty rises. This moderating relationship is significantly stronger under pegged exchange-rate regimes, in developing economies, and in countries with greater financial depth. The main finding remains robust across the alternative specifications and sample checks. However, because the study is based on observational cross-country panel data, the results should be interpreted as conditional associations rather than definitive causal effects.

Keywords banking, uncertainty, stability, exposure, integration, non-performing loans

JEL Classification G21, F36, C23

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INTRODUCTION

Cross-border banking remains a major component of international financial integration and an important channel through which financial conditions are transmitted across economies. At the end of 2024, global cross-border bank claims reached approximately USD 40.1 trillion, while cross-border bank credit – comprising loans and holdings of debt securities – stood at USD 32.6 trillion (BIS, 2025a). Cross-border bank credit to emerging market and developing economies increased by 3.8% year on year during the same period (BIS, 2025a). These figures illustrate the scale of international banking linkages and the potential importance of changes in cross-border exposures for domestic financial systems.

The relevance of these linkages becomes more apparent when international financial conditions change rapidly. In the first quarter of 2024 alone, global cross-border bank claims increased by USD 1.1 trillion, bringing their outstanding stock to USD 39.6 trillion (BIS, 2024). By

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the third quarter, claims increased by a further USD 629 billion and reached USD 41 trillion, while cross-border credit to emerging market and developing economies was 3.8% higher than a year earlier (BIS, 2025b). Such sizeable fluctuations demonstrate that international banking exposures can adjust considerably over relatively short periods. Previous evidence also shows that international bank lending can loosen domestic financial conditions and stimulate credit and economic activity, while simultaneously creating vulnerabilities to reversals in external financing (Aldasoro et al., 2023).

These vulnerabilities may become particularly relevant when uncertainty rises. Greater uncertainty can weaken expectations about future income and economic activity, postpone investment and consumption, increase risk aversion, and impair borrowers' repayment capacity. At the same time, international banks may reassess foreign exposures and external funding conditions may tighten.

The scientific problem, therefore, extends beyond determining whether cross-border banking exposure is associated with stronger or weaker financial stability on average. A more relevant question is whether this relationship systematically changes with the uncertainty faced by the recipient economy. This distinction matters because uncertainty is not uniform across countries: domestic economic, political, and institutional conditions can generate substantially different uncertainty environments even when economies are exposed to common international financial developments. Evaluating uncertainty only as a common global shock may therefore overlook an important source of cross-country variation in the way international banking linkages relate to domestic bank asset quality.

The issue may also differ according to structural characteristics that shape countries' capacity to absorb external financial pressures. Exchange-rate flexibility affects the mechanisms through which external shocks are accommodated; developing economies may face more constrained access to external financing and more limited policy buffers; and deeper financial systems can simultaneously enhance intermediation and broaden the channels through which financial disturbances propagate. These structural differences suggest that the relationship between international banking exposure and financial vulnerability may vary systematically across countries.

1. LITERATURE REVIEW AND HYPOTHESIS

Existing evidence shows that cross-border banking can transmit international financial conditions to domestic banking systems (Shirota, 2015; Dinger & te Kaat, 2020), while uncertainty is associated with weaker bank asset quality and stability (Karadima & Louri, 2021; Shabir et al., 2021). The literature below examines these two strands and the limited evidence on their interaction.

1.1. The effect of cross-border banking exposure on financial stability

Cross-border banking exposure can affect financial stability through both stabilizing and destabilizing channels. International banking integration can broaden funding sources, improve liquidity allocation, and facilitate risk sharing. Institutional arrangements may also reduce disruptions during periods of stress; Hasan et al. (2022), for example, show that deposit insurance can mitigate contractions in cross-border bank lending.

At the same time, international banking linkages can transmit external financial disturbances. Cross-border banking activity responds to global and regional financial conditions (Shirota, 2015), while international banking relationships remain concentrated across major bilateral links (Aldasoro & Ehlers, 2019), increasing the potential for external disturbances to propagate across countries. Dinger and te Kaat (2020) find that cross-border capital inflows are associated with credit expansion but weaker average loan quality. Yin (2019) reports that foreign bank presence may increase portfolio and failure risks in host economies, while Li et al. (2024) find that capital-inflow liberalization is associated with higher bank credit risk in emerging and developing econ-

omies. Foreign-bank lending may also vary with crisis conditions, regulatory environments, and home-country characteristics (Hsieh & Lee, 2020; Jackowicz et al., 2022).

These risks may be more pronounced where shock-absorption capacity is limited. Essers (2013) shows that developing-country vulnerability depends on both exposure to shocks and domestic resilience. Chikhaoui (2025) further shows that the determinants of bank liquidity vary across major crisis episodes, with the adverse relationship between credit risk and liquidity becoming stronger during periods of stress.

1.2. The effect of country-specific uncertainty on financial stability

Higher uncertainty can weaken financial stability by reducing economic activity, impairing borrowers' repayment capacity, and inducing banks to tighten lending standards or increase risk premia. Empirical evidence broadly supports this relationship. Karadima and Louri (2021) find that greater economic policy uncertainty is associated with higher non-performing loans, while Zeqiraj et al. (2024) document similar deterioration in loan quality. Shabir et al. (2021) show that economic policy uncertainty weakens bank stability, with the relationship varying according to institutional quality and competition, and Shabir et al. (2023) link economic and geopolitical uncertainty to greater banking risk.

Ari et al. (2021) document substantial increases in non-performing loans around banking crises and show that high unresolved NPLs deepen post-crisis recessions. Pancotto et al. (2024) likewise find that NPL dynamics reflect both bank-specific and macroeconomic conditions. Cross-country evidence from Trinh and Tran (2024) further shows that geopolitical risk is associated with weaker banking stability, including higher non-performing loans.

Nguyen and Dang (2024) find that banking uncertainty reduces loan growth in Vietnam, with diversification mitigating this relationship. Zuhroh and Rofik (2024) show that the effects of global economic policy uncertainty on Islamic bank performance differ across countries and horizons. Nguyen and Ha (2026) document a relationship between world uncertainty and bank credit risk that varies with bank concentration and size, while Suripto et al. (2026) find that geopolitical risk affects credit, liquidity, and operational dimensions of banking stability across ASEAN economies.

1.3. The moderating role of country-specific uncertainty in the relationship between cross-border banking exposure and financial stability

Country-specific uncertainty may alter this relationship through external funding and domestic balance-sheet channels. When uncertainty rises, international banks may reassess country risk, reduce foreign exposures, shorten maturities, or increase the cost of external finance. Choi and Furceri (2019) show that uncertainty affects cross-border banking flows, indicating that international banking positions respond to changes in the uncertainty environment.

At the domestic level, higher uncertainty can weaken borrower repayment capacity while external financing conditions deteriorate. Duan et al. (2022) associate economic policy uncertainty with greater systemic banking risk through bank leverage and asset-risk channels.

Structural characteristics may also shape this moderating relationship. More rigid exchange-rate regimes provide less scope for adjustment through currency movements (Edwards & Levy Yeyati, 2005; Sangaré, 2016). Developing economies may be more vulnerable to external financing disturbances because of narrower policy space and smaller financial buffers (Barrot et al., 2018; Essers, 2013). Financial depth may facilitate intermediation but also broaden the channels through which financial disturbances propagate (Mathonnat & Minea, 2018; CGFS, 2022).

Previous research indicates that cross-border banking can transmit external financial risk and that uncertainty can weaken banking stability; however, there is limited cross-country evidence examining whether country-specific uncertainty changes the relationship between the two.

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The purpose of this study is to examine whether country-specific uncertainty modifies the relationship between cross-border banking exposure and financial stability.

H1: Higher country-specific uncertainty makes the relationship between cross-border banking exposure and non-performing loans more positive.

2. METHODS

The empirical analysis combines annual country-level banking, macro-financial, and uncertainty data for 2005–2024 and applies country and year fixed-effects specifications.

2.1. Data and variables

The study uses annual country-level data covering 2005–2024. Complete information for all variables included in the baseline specification is available for 789 observations across 54 countries. One country contributes only a single complete observation and is therefore removed as a singleton by the fixed-effects estimator, leaving a final baseline estimation sample of 788 country-year observations from 53 countries. Missing observations are concentrated mainly in the non-performing loan ratio, domestic credit, and exchange-rate series. Additional diagnostics provide little evidence of systematic sample selection: baseline-sample inclusion is not significantly related, either individually or jointly, to the fully observed variables cross-border banking exposure, country-specific uncertainty, and GDP growth. Country-level comparisons between economies with lower and higher estimation-sample coverage lead to the same conclusion. These diagnostics do not establish random missingness, but they reduce concerns that sample inclusion is systematically associated with the observable characteristics available for the full panel.

Financial stability is measured by the ratio of bank non-performing loans to total gross loans (NPL), obtained from the IMF Financial Soundness Indicators database. A higher ratio indicates poorer bank asset quality and therefore weaker financial stability.

Cross-border banking exposure is measured by cross-border claims on counterparties in each country relative to GDP (*CBL_gdp*). Claims data are obtained from the BIS Consolidated Banking Statistics (CBS) and represent outstanding cross-border claims of domestic banking groups in BIS reporting countries, excluding domestic positions, on counterparties in country *i*. The series is reported on a guarantor basis, so claims are allocated according to the country of the ultimate obligor. It covers all counterparty sectors, instruments, maturities, and currencies. Because the BIS series is quarterly and reported as amounts outstanding, the fourth-quarter observation is used as the annual value. Claims, reported in millions of US dollars, are divided by current GDP in US dollars and multiplied by 100 to obtain *CBL_gdp* as a percentage of GDP.

Country-specific uncertainty is measured using the World Uncertainty Index (WUI) developed by Ahir et al. (2022). The index is constructed separately for individual countries from the frequency of the term "uncertainty" and its variants in Economist Intelligence Unit country reports. Accordingly, although the indicator is termed the

Table 1. Descriptive statistics

Variable	Obs.	Mean	Std. dev.	Min	Max
NPL	788	4.578	5.356	0.227	45.967
CBL_gdp	788	20.052	23.116	0.094	226.237
WUI	788	0.225	0.175	0.000	1.343
CA_gdp	788	0.898	6.793	–21.797	45.460
GDPgr	788	2.543	3.641	–10.940	24.624
Inflation	788	4.207	10.818	–4.448	219.884
Reserves_IM	788	5.740	5.506	0.033	37.374
Credit_gdp	788	87.517	47.671	12.565	264.442
ln*ER*	788	2.089	2.652	–1.298	10.070

World Uncertainty Index, the measure used in this study varies across countries and years and does not represent a single global uncertainty series.

The baseline specification also includes a set of macroeconomic and external-sector controls. *CA_gdp* denotes the current account balance as a percentage of *GDP*, *GDPgr* measures real *GDP growth*, Inflation captures changes in the general price level, *Reserves_IM* measures international reserves in months of imports, *Credit_gdp* denotes domestic credit to the private sector as a percentage of *GDP*, and ln*ER* is the natural logarithm of the end-of-year exchange rate expressed in local currency units per US dollar. The definitions and sources of all variables are reported in Table A1, Appendix A, while the countries included in the baseline estimation sample are listed in Table A2, Appendix A. Table 1 presents the descriptive statistics.

2.2. Empirical strategy

The baseline model examines whether country-specific uncertainty modifies the relationship between cross-border banking exposure and financial stability:

$$NPL_{it} = \alpha + \beta_1 CBL_gdp_{it} + \beta_2 WUI_{it} + \beta_3 CBLxWUI_{it} + \gamma X_{it} + \mu_i + \lambda_t + \varepsilon_{it}, \quad (1)$$

where i denotes countries and t denotes years. $X_{i,t}$ is the vector of control variables. μ_i denotes country fixed effects; λ_t denotes year fixed effects; and ε_{it} is the error term. Country fixed effects absorb time-invariant country characteristics, while year fixed effects capture shocks common to all countries. Standard errors are clustered at the country level.

The coefficient of primary interest is β_3, which indicates whether the relationship between cross-border banking exposure and non-performing loans varies with country-specific uncertainty. A positive coefficient implies that this relationship becomes more positive as uncertainty increases. Because the specification includes an interaction term, β_1 represents the conditional association between cross-border banking exposure and non-performing loans when uncertainty equals zero rather than an unconditional average relationship.

To examine heterogeneity, the baseline interaction is further interacted with indicators for exchange-rate regime, level of economic development, and financial depth. These triple-interaction specifications allow formal tests of whether the relationship between cross-border banking exposure, uncertainty, and financial stability differs significantly across groups. Financial depth is classified relative to the median value of domestic credit to the private sector in the baseline sample.

A series of additional specifications is used to assess robustness. All explanatory variables are first lagged by one year to strengthen temporal ordering. A placebo specification then includes both contemporaneous and one-year-ahead values of cross-border banking exposure, uncertainty, and their interaction. Country-specific linear trends are added to account for heterogeneous underlying trends across countries. Dynamic persistence in non-performing loans is addressed using the bias-corrected least-squares dummy-variable estimator (LSDVC), initialized with the Arellano–Bond estimator and based on 500 bootstrap replications.

Further sensitivity checks include winsorizing cross-border banking exposure at the 1st and 99th percentiles, using its logarithmic transformation, excluding major internationally active financial economies, imposing minimum country-coverage requirements, and re-estimating the baseline model after removing one country at a time.

3. RESULTS

The empirical results indicate that the cross-border banking-NPL relationship becomes more positive as uncertainty rises; subsequent analyses assess heterogeneity and the robustness of this pattern.

3.1. Baseline results

Table 2 reports the baseline fixed-effects estimates. The coefficient on *CBL_gdp* is negative but statistically insignificant, while *WUI* is also insignificant. By contrast, the coefficient on *CBL_gdp* × *WUI* is positive and statistically significant, indicating that the relationship between cross-border banking exposure and non-performing loans becomes more positive as country-specific uncertainty increases.

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Table 2. Baseline fixed-effects results

Variables	NPL
CBL_gdp	−0.0603
	(0.0361)
WUI	−0.255
	(1.279)
CBL_gdp × WUI	0.101***
	(0.0295)
CA_gdp	0.312***
	(0.0995)
GDPgr	−0.0329
	(0.113)
Inflation	−0.0656**
	(0.0253)
Reserves_IM	−0.229**
	(0.0886)
Credit_gdp	0.0663**
	(0.0305)
ln*ER*	2.235**
	(0.947)
Observations	788
No. of countries	53
Within R-squared	0.170
Country FE	Yes
Year FE	Yes
Clustered SE	Yes

Notes: Cluster-robust standard errors in parentheses. *** p < 0.01, ** p < 0.05, * p < 0.10.

Because the model includes an interaction term, the association between *CBL_gdp* and *NPL* varies with the level of *WUI*. Based on the estimated coefficients, the point estimate changes from negative to positive at approximately *WUI* = 0.598. This value should not be interpreted as a statistical threshold, however. The marginal effect of *CBL_gdp* is not statistically distinguishable from zero at the evaluated levels of *WUI*. The result therefore indicates a significant change in the slope of the cross-border banking-NPL relationship as uncertainty rises, rather than evidence that cross-border banking exposure becomes significantly detrimental above a particular level of uncertainty.

Among the control variables, *CA_gdp*, *Credit_gdp*, and ln*ER* are positively and significantly associated with *NPL*, whereas Inflation and *Reserves_IM* are negatively and significantly associated with *NPL*. *GDPgr* is statistically insignificant. These coefficients are interpreted as conditional associations within the fixed-effects specification rather than as separate causal effects.

Overall, the baseline results support *H1:* higher country-specific uncertainty is associated with a more positive relationship between cross-border banking exposure and non-performing loans. In substantive terms, the financial-stability implications of cross-border banking exposure become less favorable as uncertainty rises, although the estimates do not establish a statistically significant adverse marginal effect of cross-border exposure at any specific level of uncertainty.

3.2. Heterogeneity analysis

Table 3 reports formal heterogeneity tests based on triple-interaction specifications. The relevant evidence is the estimated difference in the *CBL_gdp* × *WUI* relationship across groups rather than differences in statistical significance from separate subgroup regressions.

The formal between-group differences are significant across all three dimensions. The uncertainty-related change in the cross-border banking-NPL relationship is stronger under pegged than non-pegged regimes, stronger in developing than de-

Table 3. Formal tests of heterogeneity in the CBL-WUI interaction

Dimension	Reference group		Comparison group		Difference
Exchange-rate regime	Non-peg	−0.054	Peg	0.109***	0.163***
		(0.061)		(0.036)	(0.061)
Economic development	Developed	0.055	Developing	0.399***	0.344**
		(0.056)		(0.141)	(0.146)
Financial depth	Low	−0.033	High	0.205***	0.238***
		(0.033)		(0.070)	(0.075)

Notes: The table reports the estimated CBL_gdp × WUI coefficient for the reference group, the implied coefficient for the comparison group, and the between-group difference obtained from triple-interaction specifications. All models include the baseline control variables, country fixed effects, and year fixed effects. Standard errors are clustered at the country level. Financial depth is classified using the median value of Credit_gdp in the baseline sample. *** p < 0.01, ** p < 0.05, * p < 0.10.

veloped economies, and stronger in financially deeper than shallower systems. These results indicate that the moderating relationship is systematically heterogeneous across country characteristics rather than being driven by differences in significance across separate subgroup regressions.

3.3. Robustness and additional checks

Table 4 presents a series of robustness checks addressing timing, dynamic persistence, functional form, influential observations, and sample composition. The main interaction remains positive and statistically significant when all explanatory variables are lagged by one year. In the placebo specification, the contemporaneous interaction remains significant, whereas the one-year-ahead interaction is insignificant and the future cross-border banking terms are jointly insignificant. The result also persists after allowing for country-specific linear trends and when dynamic persistence in non-performing loans is addressed using the bias-corrected least-squares dummy-variable estimator.

The finding is also robust to alternative treatment of cross-border banking exposure. Winsorizing the exposure measure at the 1st and 99th percentiles leaves the interaction positive and significant, while the logarithmic transformation yields the same qualitative conclusion. The coefficient from

Table 4. Robustness and additional checks

Panel A. Timing, trends, and dynamic adjustment		
Specification	**Interaction term**	**Coefficient**
Baseline FE	CBL_gdp × WUI	0.101***
		(0.029)
All explanatory variables lagged one year	L.CBL_gdp × L.WUI	0.105***
		(0.038)
Baseline + one-year lead	CBL_gdp × WUI	0.077**
		(0.036)
Placebo lead	F.CBL_gdp × F.WUI	0.018
		(0.029)
Country-specific linear trends	CBL_gdp × WUI	0.140***
		(0.041)
Bias-corrected dynamic panel (LSDVC)	CBL_gdp × WUI	0.054***
		(0.017)
Panel B. Alternative transformations and sample checks		
Specification	**Interaction term/test**	**Estimate**
Winsorized CBL_gdp (1st–99th percentiles)	CBL_w × WUI	0.103**
		(0.045)
Log-transformed CBL_gdp	ln*CBL × WUI*	2.627**
		(1.050)
Excluding major internationally active financial economies	CBL_gdp × WUI	0.127***
		(0.037)
Minimum 5 usable observations per country	CBL_gdp × WUI	0.100***
		(0.030)
Minimum 10 usable observations per country	CBL_gdp × WUI	0.104***
		(0.030)
Sample-selection logit: joint test	CBL_gdp, WUI, GDPgr	p = 0.637

Notes: Standard errors are reported in parentheses. All fixed-effects specifications include the baseline control variables, country fixed effects, and year fixed effects, with standard errors clustered at the country level. In the all-lagged specification, all explanatory variables are lagged by one year. The placebo specification includes contemporaneous and one-year-ahead values of cross-border banking exposure, uncertainty, and their interaction; the future cross-border banking terms are jointly insignificant. The LSDVC specification includes lagged non-performing loans, is initialized with the Arellano–Bond estimator, and uses 500 bootstrap replications. The coefficient in the log-transformed specification is not directly comparable in magnitude with the baseline estimate. The exclusion specification removes Hong Kong, Singapore, Switzerland, the United Kingdom, and the United States. The sample-selection logit models baseline-sample inclusion using CBL_gdp, WUI, GDPgr, and year indicators; the reported p-value is from the joint significance test of CBL_gdp, WUI, and GDPgr. In leave-one-country-out estimations, the interaction remains positive in all 53 re-estimations, ranging from 0.085 to 0.114; 52 of 53 estimates are significant at the 1% level. *** p < 0.01, ** p < 0.05, * p < 0.10.

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the logarithmic specification is not directly comparable in magnitude with the baseline estimate because the underlying scale differs.

Sample-based checks lead to similar results. Excluding major internationally active financial economies does not alter the sign or significance of the interaction, and imposing minimum requirements of five or ten usable observations per country produces estimates close to the baseline result. In leave-one-country-out re-estimations, the interaction remains positive in all 53 cases and statistically significant at the 1% level in 52 of them. Although excluding Ireland reduces statistical precision, the coefficient remains positive and of similar magnitude, indicating that the baseline result is not driven by a single country.

Additional diagnostics provide little evidence of systematic sample selection. Using the full 1,120-observation panel, baseline-sample inclusion is not significantly related, either individually or jointly, to the fully observed variables cross-border banking exposure, country-specific uncertainty, and GDP growth. Country-level comparisons between economies with lower and higher estimation-sample coverage yield the same conclusion. These checks do not establish random missingness, but they reduce concerns that the baseline findings are driven by systematic selection on observable characteristics.

Overall, the robustness results support *H1* across alternative timing assumptions, dynamic specifications, variable transformations, and sample definitions. They strengthen confidence in the estimated conditional relationship while remaining consistent with an observational interpretation rather than causal identification.

4. DISCUSSION

The findings indicate that country-specific uncertainty changes the way cross-border banking exposure relates to bank asset quality. This helps explain why previous studies have produced mixed conclusions on the financial-stability implications of international banking integration. Rather than indicating a uniformly favorable or adverse relationship, the results show that the association between cross-border banking exposure and asset quality becomes less favorable as uncertainty increases. This interpretation is consistent with evidence that international banking positions respond to changes in uncertainty and financial conditions (Choi & Furceri, 2019) and that cross-border capital inflows can coincide with weaker loan quality (Dinger & te Kaat, 2020). It also complements studies showing that foreign-bank activity can transmit disturbances originating outside the host economy (Yin, 2019; Hsieh & Lee, 2020; Jackowicz et al., 2022).

The results also extend the uncertainty–banking literature by showing that uncertainty operates not only as a direct source of banking risk but also as a conditioning factor. Previous studies link uncertainty to higher non-performing loans and weaker bank stability (Karadima & Louri, 2021; Shabir et al., 2021; Zeqiraj et al., 2024), while more recent evidence shows that these responses vary across banks and institutional settings (Nguyen & Ha, 2026). The present study adds a cross-country dimension by showing that the financial stability relevance of external banking exposure itself varies with the domestic uncertainty environment.

The heterogeneity results further suggest that this conditional relationship depends on structural characteristics. The stronger interaction under pegged exchange-rate regimes is consistent with the idea that limited exchange-rate flexibility narrows one channel of adjustment to external disturbances, potentially shifting more pressure toward reserves, liquidity, output, and domestic balance sheets. This interpretation accords with Edwards and Levy Yeyati (2005) and Sangaré (2016), who emphasize the shock-absorbing role of exchange-rate flexibility. The result should not be interpreted as implying that pegged regimes are inherently less stable, but rather that cross-border banking exposure may become more sensitive to uncertainty when exchange-rate adjustment is constrained.

The stronger relationship in developing economies is also consistent with differences in shock-absorption capacity. More limited policy space, smaller financial buffers, and greater sensitivity to international funding conditions can make developing economies more vulnerable to external disturbances (Barrot et al., 2018; Essers, 2013). By contrast, the stronger interaction in financially deeper systems points to a different mechanism. Financial development can improve intermediation and diversification, but larger

credit markets and denser balance-sheet linkages may also increase the channels through which external and uncertainty-related pressures propagate (Mathonnat & Minea, 2018; CGFS, 2022). Financial depth may therefore enhance resilience in some dimensions while simultaneously increasing exposure to the transmission of financial disturbances.

The robustness checks support the stability of these interpretations across alternative timing assumptions, dynamic specifications, transformations, and sample definitions. At the same time, the observational design remains important for interpretation. The findings establish a robust conditional association rather than a causal effect. The main contribution is therefore to show that the financial-stability implications of cross-border banking exposure are state-contingent and depend on both the uncertainty environment and structural characteristics of the recipient economy.

CONCLUSION

The purpose of this study is to examine whether country-specific uncertainty modifies the relationship between cross-border banking exposure and financial stability.

The results show that the relationship between cross-border banking exposure and non-performing loans becomes more positive as country-specific uncertainty increases. This moderating relationship is stronger under pegged exchange-rate regimes, in developing economies, and in countries with greater financial depth. The main finding remains robust across alternative timing assumptions, dynamic specifications, variable transformations, and sample definitions.

These findings suggest that the financial-stability implications of cross-border banking exposure are conditional rather than uniform. Cross-border banking exposure should therefore be assessed together with the uncertainty environment and structural characteristics that shape the transmission of external financial pressures. From a policy perspective, macroprudential monitoring may warrant greater attention during periods of elevated uncertainty, particularly in economies with limited exchange-rate flexibility or greater sensitivity to external financing conditions.

Several limitations remain. The World Uncertainty Index is a text-based country-level proxy and may not capture all dimensions of uncertainty relevant to banking decisions. The estimation sample is also unbalanced because of differences in data availability across countries. Most importantly, the observational design does not establish causal effects. The findings should therefore be interpreted as evidence of a robust conditional association between cross-border banking exposure, country-specific uncertainty, and bank asset quality rather than a causal relationship.

DATA AVAILABILITY STATEMENT

The processed dataset used in this study is publicly available through Zenodo at 10.5281/zenodo.21882650. The deposited dataset contains a balanced annual panel of 56 countries over 2005–2024, corresponding to 1,120 potential country-year observations, and was compiled from publicly available data provided by the Bank for International Settlements, the International Monetary Fund, the World Bank, and the World Uncertainty Index database. Although the deposited panel is balanced in country-year coverage, some variables contain unavailable values for particular observations. Complete information for all variables included in the baseline specification is available for 789 observations across 54 countries. One of these countries contributes only a single complete observation and is therefore removed as a singleton by the fixed-effects estimator. The final baseline estimation sample consequently consists of 788 observations from 53 countries. Missingness is concentrated primarily in the non-performing loan ratio, domestic credit, and exchange-rate series.

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AUTHOR CONTRIBUTIONS

Conceptualization: Trang Ha Le.
Data curation: Trang Ha Le.
Formal analysis: Trang Ha Le.
Investigation: Trang Ha Le.
Methodology: Trang Ha Le.
Project administration: Trang Ha Le.
Visualization: Trang Ha Le.
Writing – original draft: Trang Ha Le.
Writing – reviewing & editing: Trang Ha Le.

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APPENDIX A

Table A1. Variable description

Variable	Meaning	Measure	Source
NPL	Financial stability	Bank nonperforming loans to total gross loans (%). A higher NPL indicates poorer bank asset quality and a lower level of financial stability	IMF FSI
CBL_gdp	Cross-border banking exposure	Cross-border claims on counterparties in country *i*, on a guarantor basis, relative to GDP (%); Q4 outstanding claims are used as the annual value	BIS CBS + WDI
WUI	World Uncertainty Index	It is constructed from the frequency of the word "uncertainty" and its variants in country reports published by the Economist Intelligence Unit. A higher number means higher uncertainty	WUI
CBL_gdp × WUI	Interaction variable	CBL_gdp × WUI	BIS CBS + WUI
GDPgr	Economic growth	Real *GD*P growth (%)	WDI
Inflation	Inflation	CPI growth (%)	WDI
Credit_gdp	Financial depth	Domestic credit to private sector/GDP (%)	WDI
CA_gdp	External balance	Current account balance/GDP (%)	WDI
Reserves_IM	External buffer	Total reserves in months of imports	WDI
ln*ER*	Exchange rate level	Natural log of the exchange rate at the end of the year (LCU per USD)	IMF

Table A2. Countries included in the baseline estimation sample

No.	Country	No.	Country	No.	Country
1	DZA	19	GRC	37	PHL
2	ARG	20	HKG	38	POL
3	AUS	21	HUN	39	PRT
4	AUT	22	IND	40	ROU
5	BEL	23	IDN	41	SAU
6	BIH	24	IRL	42	SGP
7	BRA	25	ISR	43	VNM
8	BGR	26	ITA	44	ZAF
9	CAN	27	KOR	45	ESP
10	CHL	28	KWT	46	SWE
11	CHN	29	LVA	47	CHE
12	COL	30	LTU	48	THA
13	HRV	31	MYS	49	TUR
14	CZE	32	MEX	50	MKD
15	DNK	33	MAR	51	RUS
16	FIN	34	NLD	52	GBR
17	FRA	35	NOR	53	USA
18	DEU	36	PER		