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Following the "general theory of macro-finance", IMI aims to become a world-class think tank, focusing on the studies of international finance, in particular the international monetary system and RMB internationalization. Despite its relatively short history so far, IMI has established itself as a leading research institution and important forum, where industry leaders, policy makers and academic experts from home and abroad share their insights and expertise.

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Special Column on Chinese Banks Going Global

The Path from Trade Finance to International Banking and Global Banking: Chinese Banks Following the Trend

By HERBERT POENISCH*

Chinese banks have followed this international trend lately by extending credit from their head offices to finance trade, then lending to emerging market borrowers, notably through their Belt and Road Initiative and finally to global banking through their affiliates in emerging markets. This article based on Bank for International Settlements research will first cover the evolution of banks' business models, then cover the history of advanced economies' banks' model and finally the role of banks from emerging markets, notably China in financing emerging markets' funding needs.

Most of this analysis is based on the BIS locational banking statistics (LBS) with some 50 reporting countries including China. Data on national banking systems are derived from the consolidated banking statistics (CBS) with only some 25 reporting countries. China is still not reporting these statistics to the BIS although Chinese banks play an increasing role in financing emerging markets. The BIS has used LBS statistics to assess activities of Chinese owned banks.

1. Banks evolving business models

Banks operating outside their borders run risks called country risks and transfer risks. The first one is posed by the new operating environment and the second one is posed by shortage of foreign exchange in a country to service their debt. As from 1970 supervisors worldwide have required banks to take into account these risks. The international business model focuses on banks funding their overseas operations from the mother banks. The multinational business model focuses on the activities of local operations of banks. There was a big crisis of the international model in the 1980 when some major emerging markets such as Mexico could not repay their international liabilities mostly in foreign currencies. Banks moved to the multinational model whereby they raise funds locally in order to finance local operations, trade as well as investment. The BIS statistics capture the cross border flows in the LBS and the local operations in domestic currency in the CBS.The international model is adhered to by Japanese banks and German banks. Their funding is cross border from the mother bank. The multinational banks are mainly represented by Spanish and British banks. The second dimension is either centralised versus decentralised banking. The centralised ones such as Swiss banks use home office funding to distribute across the banking group. The decentralised ones, such as Spanish banks tap funds in many locations to fund lending in other jurisdictions. There is even greater centralisation with intra group financing in US and Canadian banking systems. The global tendency is towards the multinational model in relation to business in emerging markets.

The next aspect is the vulnerability of the two business models. The international model contains a lot of currency risk in its funding operations. Non US banks have most of their assets in USD and most of their liabilities in their local currencies such as euro and yen. They rely on the swap market to hedge the currency risks. Banks in the multinational decentralised model were less exposed to disruptions in the wholesale funding and swap market.

The international model was subject to dislocations from cross border lending not adequately funded by cross border liabilities. Many banking systems such as Belgian, Swiss, UK accounted for 40 to 60% of their countries' foreign liabilities. Particularly risky is short term cross border funding to finance long term claims. The European banks funded asset backed securities operations in the US only to face liabilities shortages in

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the 2008 crisis. They had to hedge the currency risk through swap operations and even the FED had to provide swap lines as lender of last resort.

The evidence speaks for greater stability of the multinational decentralised model. Local retail and corporate lending funded by local deposits have proven more resilient under stress.

2. The history of banks international business

International banking business grew rapidly between 1950 and 2007, propelled by avoiding regulation in domestic markets, by financial liberalisation that facilitated investment in foreign markets and financial innovation that allowed managing new risks. Most of these lending activities, either from home base or in offshore centres were conducted in foreign currency whereas funding remained in national currencies. The rise in offshore financial centres in the 1960s facilitated this international lending. Banks found themselves competing with others on these international platforms.

The volume of this cross border banking activity was only 2% of GDP in 1963 when the BIS started collecting these statistics. Just before the GFC in 2007 this business peaked at 60% of GDP. Since then it has declined markedly to some 40% recently.

The regulations which drove banks to cross border business were regulations on deposit rates, reserve requirements and deposit insurance. Offshore activities could offer higher deposit rates, was not subject to reserve requirements and it was outside national deposit insurance schemes.

Financial liberalisation reduced the regulatory arbitrage. Banks which lent to each other in offshore centres started to lend directly to emerging markets in the 1980s. Interbank lending was also facilitated by the Basel capital regulation as lending to OECD banks required only 20% capital. However, new risks emerged by lending directly to borrowers such as country risk and transfer risk. The Mexican crisis in the early 1980s was an illustration of these risks.

The new risk management was enhanced by syndication of loans and derivatives. The syndication of loans allowed smaller banks to participate in lending to overseas borrowers. The derivatives on interest rates and exchange rates allowed banks to hedge the risks and reduce their balance sheet exposure. Derivative assets increased from USD 1tr in 1990 to USD 8tr in 2020. Funding patterns also changed. Deposits lost importance as money market funds expanded and repos became a standard tool for short term refinancing.The US banks were the dominant international lenders in the 1970s, the Japanese banks became most important in the 1980 and European banks followed in the 1990s and 2000s. The US banks withdrew after the Latin American crisis, the Japanese banks after the Asian Financial crisis in 1997/8. European banks started to increase their cross border lending to developing Asia and newly emerging markets in Europe in the 1990. They also increased their lending to the US subprime market by buying CDOs until this market collapsed in 2008.

Since then, Japanese banks have been withdrawing and European banks have been shrinking their balance sheets. Since then we have seen rising involvement of Chinese banks (see below) and banks from smaller countries.

Policy responses to these crisis were manifold. The statistics of the BIS moved into focus to monitor banks' international business. The concern shifted from monetary concerns in the 1960s and 1970s to financial stability concerns. As a result supervision and regulation was tightened in response to the GFC and finally swap lines were established to bridge liquidity shortfalls. The banking sector is thus less exposed but non-bank finance has picked up the slack but in a much less regulated environment. As non-bank finance is far more footloose than banking finance we do not know who bears the risk in this new environment.

3. Chinese banks going global

In step with China's rise to become the second largest economy in the world Chinese banks have played their role of facilitator for China to become a global player. Chinese banks finance bilateral trade, foreign direct investment and potfolio investment overseas.

They have followed the same pattern as US banks, Japanese banks and European banks. They are the latecomers in financing financial flows to emerging market economies. Thanks to the Belt and Road strategy their client recipients are well defined according to political goals. As the main players are the 5 big state banks they assist the Chinese government in achieving the targets set by political authorities. In their overseas business profit concerns are secondary to a political mandate. Western and Japanese banking systems had to scale down their operations when country risk and transfer risk impaired the repayment of loans.

Chinese banks are different as their function is not only to earn profits but to fulfil the political mandate of their owners. Chinese banks have already taken on big domestic risks and are now adding cross border

risks. The major domestic risk are lending to the property sector which has stagnated since 2020 and the local governments caught in the property slump as 80% of their revenue was derived from property reallocation. This shortfall in form of Local Government Financing Vehicles has been financed by banks and insurances.

The international risks are twofold, lending to advanced economies (mainly portfolio) and lending to emerging markets (mainly trade and FDI). The biggest bank lending to AE has been to the USA, Australia and Russia as FDI and portfolio investment. The biggest lending to emerging markets has been to Venezuela, Pakistan, Angola, Kazakhstan, Brazil and Indonesia. Add now the new Chinese 5year plan where exports will account for 1.7% of economic growth of 5%. As recipient countries such as the USA and Europe have put up additional trade barriers, exports will be directed to emerging markets. As these will not be able to pay for the Imports from China, they will require additional loans either in USD but increasingly in renminbi.

This general picture of the lending by Chinese banks does not come from official Chinese sources. Bank statements are opaque and official statements cover only partial aspects. The full picture has been constructed by the BIS using the LBS statistics and their nationality breakdown. Each financial reporting centre displays the activities of banks of different nationalities including Chinese banks on their soil. This gives a partial view of total Chinese banks' activities. Private data collectors such as Aiddata.org add their estimates. At the end of 2025 Chinese banks lent a total of USD 2.2 tr in aid and loans to some 200 countries across the globe.

The breakdown in a study of the IMF based on BIS statistics shows the following picture: in mid 2018 Chinese banks provided 7% of total cross-border lending to some 197 out of 216 borrowing countries. They lent to 143 out of 153 emerging markets and to 30 out of 31 AE. Altogether they are already the biggest lender to 63 borrower economies. Getting a clear picture of Chinese banks' global activities allows us to assess the risks for the Chinese banking system and the spillover in case of crises in borrower or lender countries.

Emerging market banks extend their lending to borrowers (banks and non-banks) in emerging markets mainly through their affiliates. Cross border interbank positions are substantial. Banks from countries with developed banking systems such as China usually borrow on the interbank market whereas those from smaller countries usually lend funds in the interbank market. China used to be a net borrower of interbank funds until 2020. Since then their role changed markedly.

Emerging market banks mainly through their affiliates provided 12% of cross border lending in 2018 compared with only 3% in 2008. Chinese banks are main lenders with a total of close to USD 1tr in 2018 which is about 64% of total lending to emerging markets by EM banks The reasons are increased trade and infrastructure projects within the Belt and Road strategy which encompasses some 150 countries by now. Most of the lending went to Asia and Africa, less to Latin America and emerging markets in Europe. Most of the lending was in USD but recently lending in renminbi has surged.

Conclusion

Chinese banks over the last few years have followed other banking systems in lending to borrowers in emerging markets. They have assumed the creditor and transfer risks which triggered a withdrawal of other banks by 2020. The risks assumed by Chinese banks are not the risks of the banks but of the country as a whole. These are politically accepted as lending to the main trading partners of China and Belt and Road partner countries is a geopolitical strategy of China. Chinese banks have become global banks by lending mainly through their affiliates in emerging markets. This globalisation of Chinese banks is expected to continue although the volumes of lending might be adjusted to geopolitical developments.

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IMI International Monetary Review

Steady Progress, Timely Renewal: A Review and Outlook of the Banks International Development

By BEN SHENGLIN, YU JIEFANG, GU YUE*

Introduction

In early 2026, Academy of Internet Finance (AIF), Zhejiang University International Business School (ZIBS), and Institute of Finance Research (IFR) , Zhejiang University jointly present the latest BII (Bank Internationalization Index) report, "Steady Progress, Timely Renewal—A Review and Outlook of the Bank International development". Guided by the principles of systematic design, scientific rigor, and dynamic adaptability, the report evaluates banks' internationalization across three core dimensions: (i) overseas asset accumulation, (ii) overseas operating outcomes, and (iii) global institutional footprint. The study covers 157 banks across 60 countries; for 112 banks with relatively complete disclosures, we compute BII scores. By end-2024, these 112 banks held total assets of USD 105 trillion—more than half of global banking assets—and comparable to about 95% of global GDP. Through broad, multi-angle evidence and case analysis, the report reviews banks' internationalization paths and identifies future directions amid a changing world.

Importantly, this report is not confined to year-on-year ranking shifts. Instead, it traces the evolution of global bank internationalization since the BII first release from 2015. We find that internationalization is not a one-way expansion curve. It is a long-run contest shaped by macro cycles, geopolitical shocks, regulatory re-writes, and technological change. Even more striking is the accelerating divergence—across regions, bank types, and capabilities—which increasingly determines a bank's ceiling and resilience. That is why internationalization today requires both the patience to "advance steadily" and the decisiveness to "renew in step with the times".

BII Rankings: a gradient structure led by Europe and the U.S., with emerging markets catching up

To present a more objective and comprehensive picture, this report groups banks into four regions based on headquarters location—Europe, the Americas, the Middle East & Africa, and Asia-Pacific—and analyzes each region's performance. In the latest BII results, global bank internationalization forms a clear gradient: Europe leads, the Americas follow, the Middle East & Africa sits in the middle, and Asia-Pacific remains lower. Average BII scores are: Europe 32.06; the Americas 23.46; the Middle East & Africa 17.17; and Asia-Pacific 11.23. These differences are not merely static outcomes of "who is more internationalized"; they reflect a dynamic interplay of market maturity, regulatory and compliance costs, historical network accumulation, and cross-border business models.

Europe shows a high-balance pattern of "overall leadership with coordinated development." Beyond the leading multinationals, a substantial middle tier supports a robust internationalization ecosystem. In the global BII ranking, UK-based Standard Chartered (68.51) and HSBC Holdings (62.42) have ranked #1 and #2 for two consecutive years. Banco Santander (57.89) and ING Bank (55.80) have held #3 and #4 for two consecutive years. Among the global TOP5 banks, 80% (4 banks) are from Europe; among TOP10, 80% (8 banks); among TOP20, 70% (14 banks). Meanwhile, about one-third of European banks cluster between 18 and 35, with a tight, continuous distribution—forming a solid "waist" that, together with the global leaders at the top and a small set of domestically focused banks at the bottom, creates a mature and balanced ecosystem.

Table 1 BII TOP10 of European Banks

Regional Rankings	Bank	Country	BII Score	Global Rankings
1	Standard Chartered	UK	68.51	1
2	HSBC Holdings	UK	62.42	2

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Yu Jiefang, Associate Professor, College of Economic, Zhejiang University
Gu Yue, lecturer, Business School, Hangzhou City University

3	Banco Santander	Spain	57.89	3
4	ING Bank	Netherlands	55.80	4
5	Nordea Bank	Sweden	49.96	6
6	UBS Group	Switzerland	49.21	7
7	Barclays Bank	UK	48.47	8
8	Deutsche Bank	German	47.95	9
9	OTP Bank	Hungary	44.30	11
10	BBVA	Spain	44.00	12

Source: AIF

The Americas exhibit a pronounced dual structure: North America as the core and South America as the periphery. Internationalization resources are highly concentrated in the U.S., Canada, and Brazil. North American banks, supported by mature global networks and business systems, form the region's dominant core. The Americas' TOP10 are all U.S. or Canadian banks. Citigroup leads the Americas with a BII of 45.58 and ranks within the global TOP10, creating a clear lead. By contrast, disclosure among most South American banks remains limited; this report therefore evaluates only three Brazilian banks, all scoring below 14 and ranking below #60 globally—an order-of-magnitude gap relative to North American peers.

Table 2 BII TOP10 of American Banks

Regional Rankings	Bank	Country	BII Score	Global Rankings
1	Citigroup	USA	45.58	10
2	Scotiabank	Canada	33.12	20
3	State Street Corp	USA	32.54	21
4	Royal Bank of Canada	Canada	32.28	22
5	TD Bank	Canada	31.52	24
6	Goldman Sachs	USA	29.26	31
7	JP Morgan Chase	USA	25.11	37
8	Canadian Imperial Bank of Commerce	Canada	24.98	40
9	Bank of New York Mellon	USA	24.74	41
10	Morgan Stanley	USA	24.02	42

Source: AIF

The international performance of banks from Middle East & Africa is characterized by "single-pole leadership with an even distribution." Arab Bank of Jordan stands out, while other banks' scores form a relatively smooth distribution. Within the Middle East, dispersion is large—ranging from Arab Bank at the top to many banks in Saudi Arabia, Qatar, Turkey and others with scores typically below 10, producing a "top-heavy, tail-concentrated" pattern. In Africa, scores are comparatively more even, with banks in Nigeria, South Africa, and Kenya clustering between 18 and 30, forming a middle-clustered distribution with few extreme highs and relatively few extreme lows.

Table 3 BII TOP10 of Middle Eastern & African Banks

Regional Rankings	Bank	Country	BII Score	Global Rankings
1	Arab Bank	Jordan	50.51	5
2	Ahli United Bank	Bahrain	29.67	28
3	Access Bank Nigeria	Nigeria	29.56	29
4	Standard Bank	South Africa	26.13	35
5	Mashreq Bank	UAE	22.64	44
6	First Bank of Nigeria	Nigeria	21.83	46
7	Kenya Commercial Bank	Kenya	21.13	47
8	Amalgamated Banks of South Africa Group	South Africa	18.51	50
9	Abu Dhabi Commercial Bank	UAE	16.24	54

10	Nedbank	South Africa	13.80	59

Source: AIF

Asia-Pacific shows the largest internal dispersion, forming a three-tier structure: Japan and Singapore lead; a mid-tier follows; and a large tail spans many banks. This report presents and compares BII scores and ranks for 50 Asia-Pacific banks. Japan's three megabanks—Mitsubishi UFJ (40.83), Mizuho (40.58), and Sumitomo Mitsui (38.68)—rank within the global TOP20, reflecting mature global networks and cross-border operating systems. Singapore's major banks—UOB (31.40), OCBC (30.04), and DBS (26.31)—follow closely (global ranks concentrated around 25–34), illustrating the institutional advantages of an international financial hub. Around one-fifth of Asia-Pacific banks score between 15 and 30; despite cross-border intent and foundations, they still rely primarily on domestic business and trail the leaders. Finally, a large tail of low-internationalization banks reflects both uneven development and the region's diversity of countries and markets.

Table 4 BII TOP10 of Asian Banks

Regional Rankings	Bank	Country	BII Score	Global Rankings
1	Mitsubishi UFJ FG	Japan	40.83	16
2	Mizuho FG	Japan	40.58	17
3	Sumitomo Mitsui Banking Corporation	Japan	38.68	18
4	UOB	Singapore	31.40	25
5	OCBC	Singapore	30.04	27
6	Bank of China	China	26.40	33
7	DBS	Singapore	26.31	34
8	Maybank	Malaysia	25.73	36
9	ANZ Bank	Australia	25.10	38
10	Commercial Bank of Ceylon	Bangladesh	17.35	51

Source: AIF

BII Trends: from extensive expansion to structural reconfiguration

Over the past decade, global bank internationalization has not risen linearly; it has fluctuated at a high level under financial cycles, regulatory shifts, and geopolitical shocks. More fundamentally, the logic has moved from pursuing coverage and scale to pursuing capital efficiency, controllable risk, and organizational coordination.

First, leading banks are increasingly converting scale into internationalization advantage. For 63 The Banker TOP100 banks with relatively complete overseas disclosures, average BII rises year by year during 2014–2024, overtaking the global average after 2019 and maintaining the lead thereafter. Global systemically important banks' BII averages remain above the global mean, with the gap widening over time and reaching 14.66 points in 2024—indicating strengthening global operating capability. Scale does not automatically create internationalization; but once aligned with organizational, compliance, and global resource-allocation capability, scale can translate into persistent leadership.

Second, comparing banks from mature markets (OECD, G7) with those from emerging-market groupings (Global South, BRICS, Belt and Road), we find a differentiated pattern: mature-market banks occupy the "center" with rule-setting power and network advantages, while emerging-market banks expand gradually in the "periphery." During 2014–2024, OECD banks' average BII declines from 32.20 to 27.57; G7 banks fall slightly from 31.93 to 31.39—suggesting a phase of steady adjustment rather than continued ascent. Emerging-market trends contrast with this: Belt and Road banks show smaller fluctuations and a 10-year decline of 5.5%; Global South banks decline 9.5% over the decade but recover gradually after 2022 as regional trade arrangements take effect; BRICS banks decline only 1.2% and remain broadly stable, with recovery after 2021 as cooperation deepens.

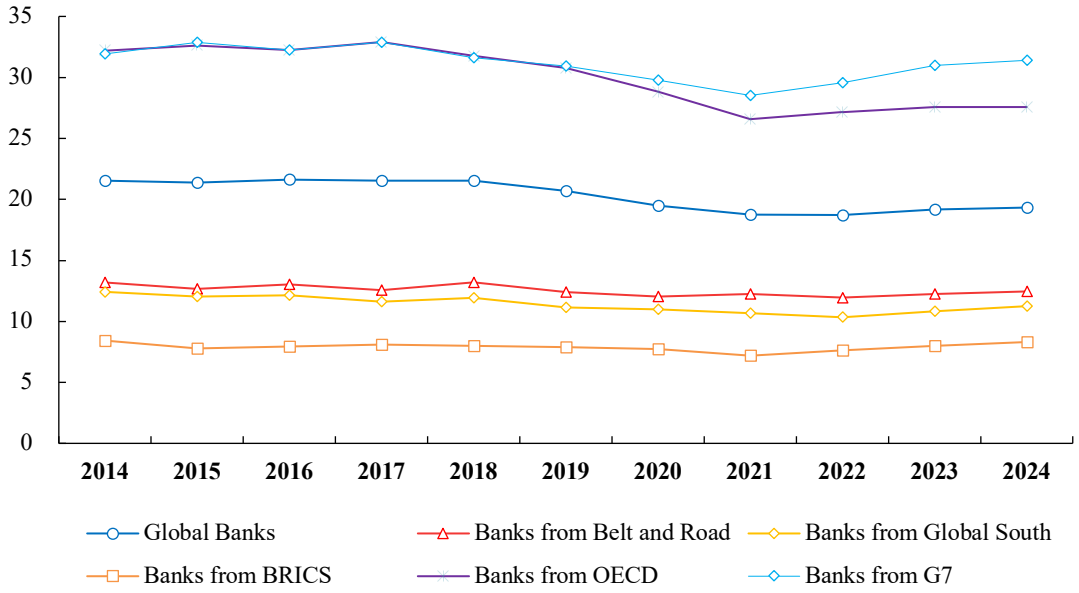

Figure 1 Average BII trends in mature vs. emerging markets

Source: AIF

Third, Chinese banks remain below the global average but are upgrading their internationalization paradigm. The latest average BII for Chinese banks is 6.25, still behind the global mean. By type, large state-owned banks are more internationalized: average overseas asset share is about 10.15% and overseas income share about 9.92%, versus 3.11% and 3.13% for joint-stock banks. More importantly, since 2019 Chinese banks have entered a phase of "digital technology and rule output," using blockchain and AI to reshape cross-border supply-chain finance ecosystems and participating in green-energy and infrastructure rule-making. For example, ICBC's "China–EU e-Document Link" compresses document verification from 7 days to within 4 hours, creating a replicable cross-border digital-finance paradigm.

Table 5 BII of Chinese Banks

Tier	Bank	BII Score	Global Rankings
Tier 1	BOC	26.40	33
	中国工行 ICBC	16.85	53
	Average	**21.63**	
Tier 2	BOCOM	8.56	72
	CCB	7.15	74
	China Minsheng Bank	5.63	79
	ABC	5.60	80
	Shanghai Pudong Development Bank	4.80	83
	China Citic Bank	4.60	86
	China Everbright Bank	3.10	93
	China Merchants Bank	2.44	96
	China Zheshang Bank	2.20	99
	Average	**4.90**	
Tier 3	Huaxia Bank	1.95	101
	Industrial Bank	1.91	102
	China Guangfa Bank	1.55	103
	Pingan Bank	0.99	107
	Average	**1.60**	

Source: AIF

BII Outlook: digital and green forces will redraw boundaries and rules

Digitalization lowers cross-border transaction costs and improves settlement, compliance, and risk control—shifting internationalization from "built on branches" to "built on platforms and capabilities." Standard Chartered's digital strategy is not merely moving services online; it aims to rebuild global

infrastructure around cross-border payments and digital assets. The bank plans to pilot cross-border CBDC settlement networks in Africa to reduce transaction costs by 40%, and to expand the SC PayLink platform to cover 50 Belt and Road countries by 2026, further improving cross-border payment efficiency by 50%. Similarly, NatWest plans to invest GBP 3.5 billion in innovation and digitalization in 2023–2025, and to enhance transparency, reduce costs, and improve capital efficiency via blockchain initiatives such as Digital Capital Markets. Digitalization is extending the boundary of internationalization from "opening institutions" to "building networks," and shifting competition from coverage radius to cost, efficiency, risk control, and customer experience.

Green finance is becoming a common language—and a passport to high-quality cross-border cooperation. For instance, Bank of Shanghai and Banco Santander launched a RMB 100 billion green credit facility for new energy and low-carbon industries and proposed using PagoNxt intelligent routing to optimize cross-border green trade settlement. Siam Commercial Bank (SCB) has announced a 2050 net-zero target and integrated ESG risks into its management framework, promoting low-carbon transition via green bonds and sustainable project finance. These cases suggest that the "quality" of internationalization will increasingly depend on whether banks can build internationally recognized capabilities in green standards, ESG disclosure, and sustainable financing instruments.

In sum, a decade of BII tracking reinforces a central conclusion: globalization has not ended, but the 'rules of entry' have changed. Digital transformation and green finance are opening new opportunities for bank internationalization; yet they also raise the bar for capability building in an increasingly complex environment.

Conclusion

We examine the international development of global banks by tracking changes in the BII over the past decade. We find that global bank internationalization has long been led by Europe and the United States; meanwhile, emerging-market banks retain meaningful room to expand, with stronger differentiation and resilience. We introduce BII rankings by region. Europe posts an average BII of 32.06 versus the global average of 19.35; the Americas score 23.46; the Middle East & Africa 17.17; and Asia-Pacific 11.23—forming a clear gradient. Besides, internationalization is shifting from "branch-and-network expansion" toward an operating model driven by efficiency, rule embedding, and ecosystem coordination. For The Banker TOP100 and global systemically important banks, BII averages for the leaders have risen year by year and have outpaced the global average since 2019. Even as some global leaders (e.g., HSBC and Standard Chartered) have reduced physical coverage in recent years, the latest average BII for global systemically important banks is 34.01—far above the global average of 19.35. Internationalization is no longer about "having overseas presence" per se, but about turning cross-border costs, efficiency, compliance, and resource allocation into a coherent system capability. Furthermore, the next turning point will be shaped jointly by digitalization and green transformation. Competition is moving from geographic coverage to a two-engine model: digital infrastructure plus sustainable-finance capability. Digital technology reshapes the boundary and efficiency of internationalization, while green finance determines rule participation and brand premium.

Banks Move to Lift Yuan's Global Standing*

By JIANG XUEQING

China's major State-owned commercial banks recently launched new cross-border renminbi solutions, signaling a stronger push to internationalize the currency as global investors and policymakers increasingly look beyond a single-currency-dominated system amid mounting geopolitical uncertainty.

Industrial and Commercial Bank of China unveiled its comprehensive cross-border renminbi financial solutions on Friday. The move implements key directives from the outline of the 15th Five-Year Plan (2026-30) to advance the internationalization of the renminbi — also known as the yuan — and expand its use in international trade, investment and financing, while fully supporting efforts to build China into a strong trading nation and further expand high-standard opening-up.

According to its plan, ICBC has introduced 10 major service systems, including cross-border trade settlement, financial market investment and wealth management, market risk management, and global cash management.

It has also established a special financing quota of 1 trillion yuan ($145.3 billion) to connect Chinese and overseas markets, providing cross-border RMB financing support to eligible enterprises and institutions at home and abroad. Priority will be given to areas such as new quality productive forces, digital trade and the global expansion of Chinese enterprises.

Liu Jun, president of ICBC, said the current volatile global economic and political landscape has made it increasingly clear that building a diversified and balanced international financial system is an urgent priority. Liu said trust in a monetary system dominated by a single sovereign currency is eroding, prompting a growing number of investors worldwide to adopt more diversified currency allocations.

"For a major economy like China, which accounts for about 15 percent of global GDP, it is both reasonable and necessary — whether from the perspective of efficiency or security — for its currency to hold a status commensurate with its economic position," Liu said, adding, "A growing market consensus is emerging that the internationalization of the renminbi has entered an important historical window."

In recent years, cross-border trade and investment activities have become increasingly active, and the use of the yuan in cross-border transactions has continued to rise. In 2025, RMB settlements accounted for more than half of China's total cross-border receipts and payments, said Li Bin, deputy head of the State Administration of Foreign Exchange.

Tao Ling, deputy governor of the People's Bank of China — the nation's central bank — said that under a supportive policy environment, more and more enterprises are recognizing the tangible benefits of using the RMB in cross-border transactions. These include reduced financial costs, better hedging against exchange rate risks and improved resilience to external shocks.

The RMB has become an important payment and settlement tool for Chinese companies expanding overseas. Last year, the value of cross-border RMB receipts and payments handled by Chinese commercial lenders on behalf of clients reached 71 trillion yuan, up 10 percent year-on-year, with RMB settlement in goods trade accounting for nearly one-third, Tao said.

Last week, the Shanghai branch of Bank of China unveiled version 2.0 of its financial services plan to support the cross-border use of the yuan by State-owned enterprises, expanding coverage to a wider range of scenarios such as cross-border account management, diversified financing and digital system integration, and offering more comprehensive support for the global expansion of these enterprises.

The bank has also signed cross-border renminbi financial service agreements with more than 10 State-owned enterprises, under which it will provide a full suite of services including cross-border settlements, financing, cash pooling and bond issuances.

Meanwhile, ICBC on Friday signed a memorandum of understanding on renminbi cooperation with South Africa's Standard Bank. The two sides have worked together to expand the use of the Chinese currency across Africa and promote its adoption along the China-Africa corridor. The MOU reflects "a future in which financial connectivity between China and Africa becomes more seamless, more digital and more anchored in the renminbi", said Sim Tshabalala, CEO of Standard Bank Group, the continent's largest bank by assets.

* The article was first published on China Daily on March 22th, 2026.

Standard Bank views its deeper participation in RMB internationalization as an opportunity to better serve Chinese and African companies and individuals by making payments cheaper and simpler, Tshabalala said.

Tao of the PBOC said the RMB offers a safe and stable currency option for both Africa and the broader global economy. As China-Africa economic and trade ties continue to strengthen and cooperation along industrial chains deepens, she said that the use of the RMB across the continent has broad prospects.

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China Banks the World

By DREW BERNSTEIN

How should the West respond when China holds the purse strings?

Last week, China made headlines when it disclosed that its trade surplus hit a record $1 trillion in the first 11 months of 2025. Despite the Trump Administration's tariff wall on Chinese goods, surging exports to Europe, South America, and Southeast Asia kept China's factories humming.

All those export earnings must go somewhere.

A new report, Chasing China: Learning to Play by Beijing's Global Lending Rules, issued by AIDDATA last month, shines a spotlight on China's growing role as the banker to the world. The report, which combed through the records of over 30,000 projects, concluded that China's overseas lending portfolio has reached $2.1 trillion as of 2023, more than twice previous estimates.

This makes China the world's largest official creditor, supplying loans to projects in 179 out of the world's 217 countries. China has become the creditor of "first -and last -resort" for developing countries, according to the authors, and has rewritten the playbook for development finance established by the IMF, the World Bank, and other pillars of the post-war order. Rather than offering below-market loans to advance the welfare of low-income populations, China is portrayed as a sharp-elbowed operator that tightly ties its financial firepower to its own economic and strategic objectives.

The report argues that Western nations are now scrambling to remain relevant and to adapt to the model China has established. What are the factors that make China's state-led overseas financing distinctive?

Strong Profit Orientation

Commerce trumps charity when China doles out capital.

China's official development aid, or ODA, has dropped to its lowest level in two decades — just $1.9 billion in 2023 — even as its lending portfolio has burgeoned. The report argues that recent moves by the United States and European countries to reduce funding of foreign aid, may be influenced by the Chinese example.

China has a reputation for funding major development projects in the Global South, including resource-rich countries in Africa and South America. However, the report found that funding for developing countries fell from 88% of the total in 2000 to just 24% in 2023. In 2023, 76% of its new loans were made to higher-income nations, which have reduced repayment risk, stronger credit profiles, and valuable brands and technologies.

The single largest recipient of funding from China's state-controlled banks has been, surprisingly, the United States.

Chinese loans have helped to finance LNG projects in Texas and Louisiana, oil and gas pipelines crisscrossing America, data centers in Northern Virginia, and new terminals at JFK Airport in New York and Los Angeles International Airport in California. While some of China's investments in the U.S. have enabled Chinese companies to acquire critical technologies or brands, "many of China's lending operations in the United States are guided by the pursuit of profit rather than the pursuit of geopolitical or geoeconomic advantage," the report says.

When extending loans to developing countries, China's state-owned banks finance infrastructure built by state-owned Chinese companies and double-collateralized to ensure repayment.

Whereas Western institutions traditionally required open bidding on development projects, "Beijing has also blended the use of concessional and commercial financing to help its firms gain a competitive advantage," according to the report. These projects helped open new markets and establish China as an industrial and infrastructure superpower.

Arm of Industrial Policy

In addition to profits, these massive loans are a tool to advance strategic industries.

An earlier wave of lending was centered around China's "Belt and Road Initiative" to secure trade routes through an ambitious network of ports, railways, roads, and other major infrastructure projects. But the report found that recently, BRI-related lending has dropped to less than 25% of its loan portfolio.

Instead, the "Made in China 2025" policy, aimed at achieving self-sufficiency in a range of advanced technologies, has been the driving force behind a surge of debt-fueled acquisitions. The report suggests that since the policy's adoption, China's lending to finance acquisitions in sectors designated as "sensitive" from a national security perspective surged from 46% to 88% of the portfolio. This includes deals to gain control of companies in industries including semiconductors, robotics, biotechnology, quantum computing, and defense technologies.

The West Reacts

As the full impact of China's financing activity has become apparent, Western developed nations are being forced to rewrite the rules of both development aid and international finance to be oriented toward raw national interest, rather than altruistic goals.

For example, the Trump Administration has proposed repurposing foreign aid spending to create an "America First Opportunity Fund" that would invest billions of dollars to secure rare-earth deposits in Greenland and the Ukraine, counter China's interests, and reduce immigration to the U.S.

The U.S. launched the International Development Finance Corporation in 2019 as a response to China's Belt and Road Initiative, and it has since financed projects ranging from mines in Brazil to railways in Angola and the Democratic Republic of Congo, and data centers in Africa. As part of the reauthorization this year, the Administration has proposed making it easier for the DFC to take equity stakes in growth-stage companies tied to national security, finance projects in higher-income countries, and even invest in U.S.-related projects related to supply chains and infrastructure.

Europe is now carefully scrutinizing technology-sector acquisitions. The Dutch government took control of the semiconductor company Nexperia in September, citing concerns that its Chinese financial backer, Wingtech, was seeking to transfer its key technology to China. This move led China to temporarily restrict chip shipments to European automotive manufacturers in retaliation.

"The international regime that governs aid and credit is undergoing a period of contestation and reinvention," according to the authors. "Beijing has dislodged the status quo, forcing its competitors to fundamentally rethink the purposes, the recipients, and the instruments of international aid and credit."

It is unlikely that the United States will be successful simply by copying China's playbook for development financing. The U.S. government does not control our banking system. We are not piling up large trade surpluses. In fact, our trade deficits have continued to grow in 2025, although showing some improvement in September. And we lack the massive industrial planning capacity of the Chinese state, whose economic ministries work off detailed 5-year plans.

The U.S. is more likely to find success if targeted government financing stimulates the capacity of our private sector. One encouraging sign is that VC investment in defense and national security is booming, with $28 billion of capital going into defense tech startups in the first nine months of 2025. And in October, J.P. Morgan announced a goal of committing $1.5 trillion of financing to American "security and resiliency" across supply chain, defense, energy, and frontier technology sectors.

In the worst case, the new era of development finance could lead to cronyism that enriches connected insiders and advances partisan causes while leaving taxpayers on the hook for bad investments. In the best case, government support stimulates American innovation and the capital market's capacity not merely to copy but to leapfrog into new industries, new technologies, and new opportunities not yet on the roadmap of our competitors.

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Banking across Borders: Are Chinese Banks Different?*

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I. INTRODUCTION

China is the second largest economy in the world and the country's rapid rise is also reflected by the growing international footprint of its banks. In terms of total assets, China constitutes the largest banking system in the world[1]. Four Chinese banks feature among the 30 largest global systemically important banks (G-SIBs) as communicated by the Financial Stability Board (FSB) after consultations with the Basel Committee on Banking Supervision (BCBS) and national authorities in November 2019. This top position among major global banking systems is mostly driven by domestic activity. However, Chinese banks have also been expanding abroad at great speed. As of mid-2018, they represent about 7 percent of total cross-border bank lending and reported claims on 196 out of 216 borrower countries according to BIS locational banking statistics (BIS LBS). More precisely, Chinese banks lend to 135 out of 143 emerging market and developing economies (EMDEs), and to 30 out of 31 advanced economies (AEs)[2]. Moreover, 63 EMDEs already borrow more from Chinese banks than from any other bank nationality. In this context, a better understanding of what is driving the global business of Chinese banks is key for assessing potential risks and spillovers that could arise from crises in either borrower or lender countries.

Our aim is to analyse the geographical distribution of Chinese banks' global cross-border lending and to compare Chinese with other bank nationalities. To the best of our knowledge, this is the first paper to present such analyses. We use the nationality (ultimate owner) perspective of the BIS international banking statistics instead of an approach by bank residence. More specifically, we examine the cross-border claims extended by banks from their home country, and add the cross-border claims that are issued by their affiliates located abroad[3]. As highlighted by Cerutti, Koch, and Pradhan (2018), taking the global network of foreign affiliates into account is key. Across all bank nationalities, only about 60 percent of their cross-border lending is extended from their home country. The nationality perspective is even more important when studying the lending patterns of EMDE banks. On average, offices in the home country grant only about one third of their total cross-border claims on other EMDE borrowers, while the rest is granted from abroad. Thus, proceeding by bank residence instead of nationality would provide a distorted, incomplete picture.

We analyze the geographical distribution of cross-border claims by using a gravity approach. These models originate from the trade literature and have been frequently applied in empirical studies of cross-border finance (e.g., among others, Aviat and Coeurdacier 2007, Buch 2002, Lane 2006, Lane and Milesi-Ferretti 2008, Porter and Rey 2005). A series of theoretical contributions has supported such models for financial holdings (e.g., Okawa and van Wincoop 2012). In our cross-sectional setup, we exploit the multiple dimensions of our data to separate borrower-and lender-specific aspects from bilateral factors. More concretely, we let individual lender-and borrower-country fixed effects absorb features that shape cross-border lending patterns from each angle. For instance, from the lenders' perspective, these control for the fact that banks from richer countries with higher financial development often lend more. From the borrowers' side, the fixed effects absorb the fact that more financially open countries typically borrow more[4].

Going beyond the traditional gravity variables, we explore the role of bilateral economic ties while controlling for traditional gravity variables and a new distance measure. To capture bilateral economic ties, we let past bilateral trade, FDI, and portfolio investment enter the analysis. This is in line with how portfolio flow studies proceed using either trade or FDI (e.g., Andrade and Chhaochharia 2010, Lane 2006, and Lane and Milesi Ferretti 2008). These bilateral economic ties might help to reduce information asymmetries

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[1] See IMF 2019 WEO for statistics on the size of the Chinese economy, and Cerutti and Zhou (2018b) for some banking sector measures. As of today, China is the largest banking system in the world. With $35 trillion in total assets (about 300 percent of China's GDP), it has surpassed the U.S. banking system in 2010, and all euro area banking systems put together in the last quarter of 2016.

[2] Our analysis focuses on 185 borrowing countries/jurisdictions, of which 31 are AEs, 143 EMDE, and 11 are offshore centres. For 31 small jurisdictions there is no data available in terms of GDP and other bilateral ties like trade and capital flows (many may not be independent countries). We follow the BIS definition to classify advanced economies (AEs), emerging market and developing economies (EMDEs), and offshore financial centres. Annex Table 3 in this paper provides the country group classification.

[3] China became a BIS reporting country in 2016 (with data starting as of end-2015). Cross-border lending as used in this paper includes bank loans, holdings of debt securities and other instruments. Loans make up only about 67 percent of total claims, while debt securities account for about 22 percent as of Q3:2019. The terms lending and claims are used interchangeably.

[4] Also following the trade literature, we check whether our results could be biased given that bilateral lender-borrower links without positive cross-border lending are not included in the baseline regressions. We show that our results are robust to this type of sample bias by constructing a balanced panel with all possible bilateral lender-borrower relationships and by using the PPML estimator (Santos Silva and Tenreyro, 2006, see the robustness checks in Section IV for further details).

between borrower and lender countries. In that sense, we interpret a positive correlation between international banking and other types of economic interaction as reflecting a complementary effect[5]. As traditional gravity measures of information asymmetries, we use colonial relationships, common language and the simple geographical distance between borrower and lender country. However, these traditional distance measures do not capture all aspects of the international banking business, as they ignore the location of affiliates outside of the parent banks' home country. We compute an alternative distance measure to fill this gap. It weighs, across all locations (home and/or affiliates abroad) from where a given bank nationality extends claims on a specific borrower country, each location-borrower distance by the relative importance of this location for the respective borrower-lender bank relationship. This novel distance measure ultimately provides an alternative bilateral proxy of information asymmetries.

Our analysis yields two main sets of findings. The first set relates to information asymmetries in global banking, while the second set relates to Chinese banks in specific. First, we show that larger distances deter cross-border lending to EMDE borrowers relatively more than to borrowers in AEs. This finding pertains to most lending bank nationalities and thereby highlights the role of distance as a proxy for information asymmetries. It holds for both distance measures, but it is more pronounced for our weighted distance measure that explicitly captures the global network of banks' foreign affiliates. The stronger impact of the new distance measures suggests that the traditional, simple measure underestimates the significance of distance since it does not capture the role of geographically closer lending affiliates. In fact, the negative distance-lending correlation remains significant even after taking other measures of bilateral economic interaction, like past trade, FDI, and portfolio investment, into account. Our results suggest that past trade, portfolio investment and FDI are positively correlated with cross-border lending for the average borrower-lender bank relationship. We interpret these positive correlations as evidence of a complementary relationship that can generally reduce information asymmetries. These findings are not exclusively driven by cross-border claims denominated in U.S. dollars. Nonetheless, at the level of individual bank nationalities, our results reveal some more nuanced patterns.

The second set of results relates to Chinese banks in particular. We find that Chinese banks' expansion resembles the global reach of banks from AEs when lending to EMDEs and these results turn out be more pronounced when isolating claims denominated in U.S. dollars. In fact, Chinese banks seem to perceive distance to their borrowing EMDE counterparties as less of a barrier than other EMDE banks. In that respect, they act more like U.S. and European banks, even though most of the Chinese cross-border lending originates in state-owned banks and it is relatively more recent. With respect to other types of economic interaction like trade, FDI and portfolio investment, correlations differ, too. On the one hand, Chinese banks' positive correlation between cross-border bank lending and trade with EMDE countries stands out. It is much stronger than the trade-lending relationship exhibited by Japanese and European banks, and is again more in line with patterns exhibited by U.S. banks. This strong positive correlation between bilateral trade and cross-border lending even prevails when considering the China-specific policy initiatives like the Belt and Road Initiative (BRI) or bilateral currency swap arrangements between the PBOC and other central banks. On the other hand, unlike all other banking systems, past portfolio investment is negatively correlated with cross-border lending to EMDE borrowers in the case of Chinese banks. This seems linked to China's capital outflow restrictions and the fact that Chinese portfolio investment is mostly narrowly distributed within a few AE countries. As a matter of fact, when lending to AE borrowers, strong complementarities with portfolio investment emerge. There is only weak evidence on the relationship between Chinese FDI and cross-border lending.

Our contributions to the literature are threefold. First, our analysis provides significant evidence from international banking that supports the need to use a nationality approach when analysing global capital flows in a world with multinational entities. While using the term ultimate owner instead of nationality, Damgaard and Elkjaer (2017) or Coppola and others (2020) highlight that the presence of offshore financial centres and special purpose entities hide ultimate bilateral linkages that are necessary to understand both financial and real economic links between economies. To diagnose financial vulnerabilities, Avdjiev and others (2016) argue that the decision-making unit needs to be considered when analysing capital flows which are more closely related to nationality than residence in a global economy of multinational entities. Niepman

[5] The interpretation of the relationships does not imply causality since there are many two-way channels. For example, Caballero, Candelaria, and Hale (2018) show that the formation of international bank linkages can also increase exports. For bilateral portfolio holdings, Aviat and Coeurdacier (2007) argue that asset holdings may endogenously affect goods trade. When using the "substitution/complementarity" terminology, we borrow from the literature that analyses the relationship between foreign production (through FDI) and exports. The idea is to express how changes in one quantity (e.g. FDI inflows) relate to changes in another quantity (e.g., cross-border bank lending, see Blonigen (2001) for more details).

(2015) offers a theoretical framework of why different banks service foreign markets to a different degree through foreign affiliates. A nationality (ultimate owner) approach also takes care of the China's "hidden" loans as revealed by Horn, Reinhart and Trebesch (2020)[6]. In addition, the nationality dimension lends support to our novel, more comprehensive measure of distance, as a proxy of information asymmetries. Not only do the differences between the simple and weighted distance measure indicate that lending is booked through affiliates closer to the borrowers on many occasions, but they also show that the expected negative sign for distance is more often present when we use the weighted distance measure rather than the simple distance.

Second, we complement and extend the gravity literature that links bilateral financial investments and trade to information asymmetries. We show that the distribution of cross-border bank claims varies with traditional gravity variables (e.g., distance) as well as past trade, FDI, and portfolio flows. Petersen and Rajan (2002) are among the first to explore information asymmetries in the context of the physical distance between small firms and their lending banks' organizational geographical structure in the US. On foreign banks, Mian (2006) finds that they rely relatively more on hard information while applying more conservative lending standards. As highlighted by Brei and von Peter (2018), the role of distance remains substantial for cross-border lending, even though transport costs are immaterial. Similar to Lane and Milesi-Ferretti (2008) and Lane (2006) for equity and bond holdings, we find a strong positive relationship between trade and cross-border bank lending. This is in line with the "follow the client hypothesis" of the literature of international banks' expansion (Claessens and van Horen 2015). The fact that past FDI flows also have a positive general association with cross-border banking is in line with Andrade and Chhaochharia (2010)'s use of historical FDI positions as proxy for information endowments. More related to EMDE banks, our results also seem in line with the Karolyi, Ng and Prasad (2015) finding that past trade and capital assets can generate information endowments for emerging market investors once they invest abroad. At the micro-data level, Claessens and van Horen (2020) and Caballero and others (2018) show that foreign bank presence and individual lending links matter for trade. Our results suggest that distance (especially weighted distance), trade, FDI, and portfolio investment capture different channels with respect to information asymmetries in the context of cross-border bank lending.

Third, we provide new evidence on Chinese banks, their growing footprint, and the factors associated with their cross-border lending expansion. Although there have been several studies analysing international bank activities, they have not been able to capture the global activity of Chinese banks and their affiliates located abroad. For example, Minoiu and Reyes (2013)'s analysis was based on BIS locational banking statistics (LBS) by residence before China started to report in 2016. Cross-border claims extended from offices in China did not enter their analysis. The paper could only indirectly reflect the cross-border lending of Chinese banks operating from Hong Kong SAR and other third countries/jurisdictions. This partial coverage of Chinese banks' lending is also present in numerous papers using the BIS Consolidated Banking Statistics (CBS), such as Cerutti and Zhou (2017, 2018a), Benetrix and others (2019) and Cheung and others (2019), since China is currently only reporting LBS data to BIS[7][8]. In fact, the data used in our paper shows that Chinese banks' cross-border lending is not only as geographically diversified as trade and FDI, but also that China's global market share in cross-border bank lending to EMDEs is larger than in most other types of international economic interaction. This fact originates from the considerable concentration of Chinese cross-border bank lending to EMDE borrowers, from their offices at home and in other BIS reporting countries. Moreover, even though we find that the presence of swap lines between the Chinese central bank and a borrower country (but not BRI) might help explain some variation, our results highlight the importance of bilateral trade in explaining the distribution of Chinese banks' cross-border lending.

The growing international footprint of Chinese banks and their G-SIB status highlights the importance of understanding their global operations and business model. The strong positive correlation of Chinese banks' cross-border lending with bilateral trade, and their unusual current negative correlation with portfolio investment (resulting from China's low portfolio investments outside a few AEs) could interact with some ongoing macroeconomic trends. On the one hand, a prospective reduction in global trade (e.g., resulting

[6] Horn, Reinhart and Trebesch (2020), following the methodology by Cerutti and Zhou (2018b), calculate bilateral Chinese cross-border lending using the BIS LBS by residence. Then, they compare those estimates with other loan-based sources capturing the cross-border bank borrowing by different countries. They use the term "hidden" debt to characterize the difference between those aggregates. As highlighted in this paper and Cerutti, Koch, and Pradhan (2018), the BIS LBS by nationality provides a much more comprehensive measure of Chinese bank cross-border lending in terms of coverage and scope.

[7] Chinese banks operating from Hong Kong SAR are classified as "Hong Kong banks" in the BIS CBS, since they are not owned by banks from countries reporting to BIS CBS.

[8] There are other studies analyzing international bank activities without using BIS data, but, to our knowledge, they do not include a good coverage of Chinese banks' cross-border activities. For example, Hale (2012) and Hale, Kapan, and Minoiu (2019), using syndicated bank loan data, do not include Chinese banks' activities. Similarly, Claessens and Van Horen (2015) coverage of Chinese banks' foreign affiliates is minimal, using foreign subsidiary data from BankScope. They capture only 23 Chinese foreign affiliates (9 of them in Hong Kong SAR) among the more than 5,000 foreign affiliates in their sample.

from the shortening of value chains due to trade tensions and/or the impact of the COVID-19 virus) could be associated with a decline in Chinese cross-border bank lending, especially to EMDEs. On the other hand, the Chinese authorities' planned further integration of equity and bond markets (see Schipke, 2019) could move Chinese banks' correlation between cross-border bank lending and portfolio investment closer to the behaviour of other bank nationalities, and increase even more the reach and cross-border bank lending importance of Chinese banks.

The rest of the paper is structured as follows. Section II shows that adopting a nationality perspective requires a new measure that takes the global network of affiliates into account. It also puts bank lending into the broader context of other types of economic interaction with a specific focus on China. Section III then describes our empirical approach, while Section IV presents the main results. Finally, Section V summarizes our conclusions.

II. INTERNATIONAL BANKING, DISTANCE AND OTHER BILATERAL ECONOMIC TIES

Our paper takes the perspective of bank nationality when analysing bilateral cross-border relationships between banks and their foreign borrowers. The recent rise in the number of BIS reporting countries offers a unique opportunity to map and analyze cross-border banking relationships worldwide not only for AE banks[9], but also for banks from EMDEs. For instance, China and Russia started to report data to the BIS locational banking statistics in 2016 with information on end-2015. Overall, our analysis builds on bilateral relationships between 39 lender countries and up to 185 borrower countries. This section first describes global lending patterns from a nationality perspective in more detail to highlight the need for a new measure of bilateral borrower-lender distance. It then puts bank lending into the broader context of other types of bilateral economic interaction between borrower and lender countries, with a specific focus on China.

A. Using Bank Nationality is Key

Taking a nationality perspective paints a more complete, undistorted picture of global banking than the frequently used concept of residence. According to the nationality perspective in the BIS locational banking statistics, claims of resident banks in different reporting jurisdictions are attributed to the home country of banks. We choose the bank nationality perspective for two reasons. First, it has a more comprehensive coverage. As pointed out by Cerutti, Koch and Pradhan (2018), across all lender bank nationalities, about 60 percent of their cross-border claims are extended from their home country, while 27 percent are extended from offices in host AEs, about 11 percent are extended from host offshore centers and the rest from offices in other host EMDEs. When banks of EMDE nationalities make cross-border loans to borrowers in other EMDEs, only about one third is booked from their respective home country[10]. Second, for some hubs of international banking like the U.K. and Hong Kong SAR, the residence perspective would capture a blend of different nationalities. Also, it would mask the fact that a large share of offshore business is actually conducted from elsewhere, again distorting the measurement of the bilateral lender-borrower business relationships. In this respect, foreign banks account for about 92 percent of all cross-border claims booked from offshore financial centers vis-à-vis all borrowers worldwide. A split reveals that AE banks make up about 65 percent, while EMDE banks represent 27 percent of these foreign banks.

B. Taking a Bank Nationality Perspective Requires a New Distance Measure

As a proxy of information asymmetries, an appropriate distance measure should take the global network of affiliates into account. In this context, a traditional simple distance measure captures the bilateral geographical distance between the country of loan origination and the country where the borrower resides. However, this distance measure might be inappropriate by ignoring the difference between home offices and the global network of affiliates located in third countries abroad. In principle, if distance was a perfect proxy for information asymmetries in banking, and banks always tried to minimize information asymmetries, there should always be only one optimal location from which a bank should lend to a particular borrower. Within each bank holding company, that would be the affiliate that was most closely located to the ultimate borrower[11].

[9] As highlighted in BIS (2019), the definition of "banks" conforms to other widely used definitions, such as "Deposit-taking corporations, except the central bank" in the System of National Accounts (SNA) and in the Balance of Payments Manual (BPM6); "other (than central bank) depository institutions" in the IMF money and banking statistics. In the case of China, BIS LBS data does include the Export-Import bank of China and China Development Bank, but not the insurance corporation Sinosure. The definition for inclusion is being a deposit-taking institution. Some other countries also include mortgage and financial institutions that are licensed as credit institutions, as this license permits them to accept deposits even if they do not do so.

[10] We do not include local claims (claims of affiliates abroad on the residents where the affiliates are located) in our calculations, because those claims tend to be locally funded (Cerutti 2015).

[11] In our paper, we only use a cross-sectional approach and hence take the existence of foreign affiliates as given. Buch and others (2014) show that only the largest and most productive banks open affiliates abroad as there is a fixed cost of market entry. Based on microdata of German banks they show that greater distances and activity restrictions deter banks, while more developed financial markets attract more lending.

Our novel measure of weighted distance takes into account the full network of affiliates for each pair of borrower country and lending bank (by nationality), while summing across all locations including the home country. Formally, the weighted distance measure is computed as

$$Dist_{lb} = \sum_{r=1}^{R} Dist_{rb} \left({}^{XBC_{lrb}}/_{XBC_{lb}} \right)$$

with l denoting the parent country for each lending bank nationality, r referring to residence(s) from where banks of nationality l can extend credit, and b referring to countries that borrow from banks of nationality l. Hence, $Dist_{rb}$ stands for the bilateral distance between residence r from where credit to borrowers in country b is granted. More precisely, bilateral distance $Dist_{rb}$ captures the distances between the capitals of the borrower and the residence countries from where the lending banks grant cross-border loans. Further, $\left({}^{XBC_{lrb}}/_{XBC_{lb}} \right)$ represents the portfolio weight as a relative share of residence r in the global total of all cross-border lending extended by banks from parent country l to borrowers in country b[12]. For each lender-borrower pair, we sum across all residences to obtain a measure at the level of individual lender-borrower relationships that matches our empirical setup.

On average, banks tend to prefer lending through foreign affiliates that are located closer to the borrower than their home country. Figure 1 compares the mean of both distance measures for each bank nationality, across all AE borrowers in the top panel, and across all EMDE borrowers in the bottom panel. If the simple distance (red dot) is above the weighted distance measure (blue dot), Figure 1 indicates that banks book claims through foreign affiliates located closer to the borrower, on average. Substantial differences between both measures emerge for those bank nationalities whose home countries[13] are located on the periphery of financial flows.15 When extending claims to borrowers in AEs, banks from Australia, Brazil and the U.S. often use their foreign affiliates to book these claims. On average, when lending to EMDEs, the difference between the simple and the weighted distance measure seem to be less pronounced. Only for U.S. banks does the difference increase. With respect to Chinese banks, they seemingly prefer booking their claims on AEs from offices closer to these borrowers. When cross-border lending to EMDEs, a substantial share seems to be extended either by mainland offices, or by affiliates that are geographically close, like those located in Hong Kong SAR, Macao SAR, or Singapore.

C. Cross-Border Bank Lending and Other Bilateral Economic Ties

The global footprint of Chinese banks is considerable, especially regarding EMDE borrowers. For the largest banking systems, Table 1 shows the number of countries for which banks of a particular nationality are the most important creditor as well as their market shares. It distinguishes between total cross-border bank lending to all borrower countries (top panel), AE borrowers (center panel) and EMDE borrowers (bottom panel), respectively.

At the global level, Chinese banks are the most important creditor for 66 (out of 185) borrower countries, more than any other banking system. However, even though Japanese banks lend to fewer borrowing countries than other nationalities, they report the highest individual country market share (15.4 percent) in global cross-border lending. They are followed by U.S. (11.3 percent), French (11.3 percent), U.K. (9.5 percent), Chinese (7.1 percent), and Swiss banks (6.4 percent). While the market share of Chinese banks in cross-border lending to AEs is small, about 2.4 percent, when turning to EMDE borrowers, the order almost reverses. Now, Chinese banks rank the highest when it comes to market shares. They extend about 24 percent of total cross-border bank lending to EMDE borrowers, more than double that of Japanese banks, which are the second largest individual bank nationality in this market (11.2 percent). Out of 143 EMDEs, Chinese banks are also the most important creditor for almost half, namely 63 borrower countries, more than six times larger than the 10 EMDEs for which French banks count as the most important lender. The statistics for the other creditor nationalities are shown in Annex Table 1[14].

[12] We drop backflows from the entire computation (i.e., claims on the home country that are intermediated by offices located abroad). These lending flows capture aspects of the funding structure and do not reflect the global expansion and customer business of banks.

[13] For European banks the differences between the means of simple and weighted distances are small, except for U.K. banks' lending to EMDE borrowers. This seems to capture the fact that a lot of the U.K. banks' lending to Asia is performed from U.K. bank affiliates located in Hong Kong SAR or Singapore (McGuire and Van Rixtel, 2012).

[14] In principle, note that it could be the case that foreign affiliates could be located even further away from the borrower country than the banks' headquarters. If the average weighted distance was above the simple distance, this would clearly call into question whether distance is an appropriate proxy for information asymmetry in international banking. Other reasons like different tax codes or location-specific features might play a role. However, only in some isolated cases (lending banks from Greece and Turkey) do both measures almost coincide for AE borrowers and generate weighted distance measures that slightly exceed simple distances for EMDE borrowers.

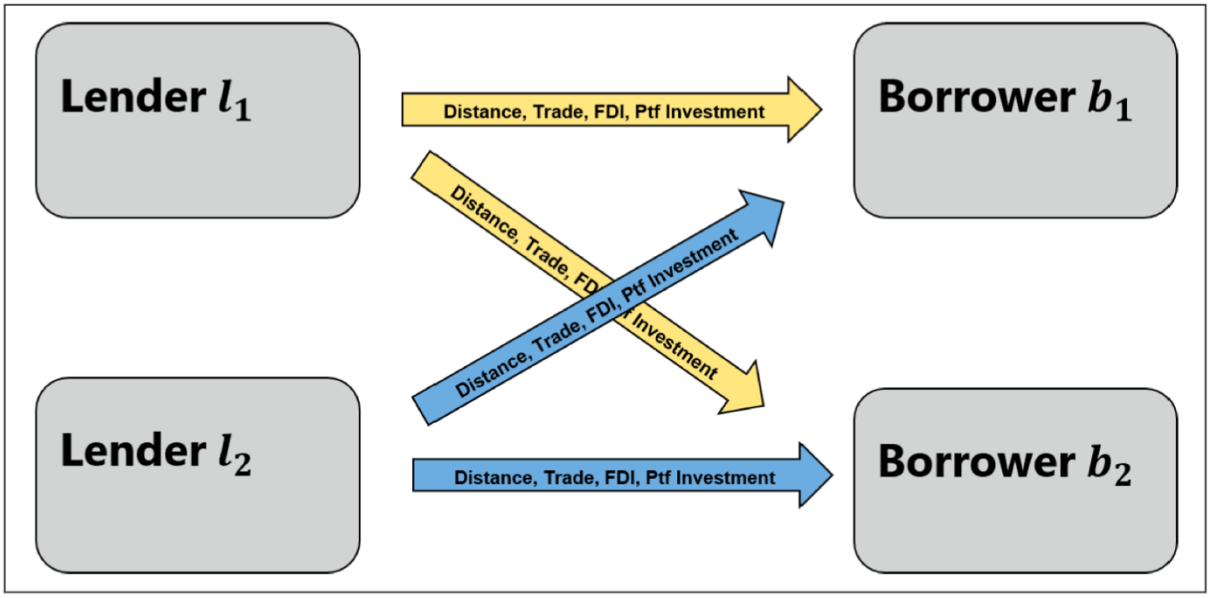
What about other bilateral economic ties? In addition to cross-border bank lending, we consider three types of other bilateral economic interactions between the lending parent banks' home and the borrower country. First, we consider bilateral trade as the sum of exports and imports as reported by the lender with respect to the borrower country (e.g., capturing imports by China and exports from China). Second, we use outward FDI. To match the "by nationality" perspective of the BIS data, we follow Damgaard and Elkjaer (2017), who adjusted FDI data to reflect the ultimate investor perspective. Third, portfolio investment enters the analysis, featuring both debt securities and equities holdings as captured by the IMF Coordinated Portfolio Investment Survey (CPIS)[15].

The market shares of the largest bank nationalities' in other types of international economic interaction vary considerably. The low market share of Chinese banks' cross-border lending to AE borrowers is similar to the Chinese low shares in FDI and portfolio investments. However, the country's large market share in international trade stands out. As shown in Figure 2A, the U.S. holds the highest market share in FDI and portfolio investment with business partners in other AEs, and similar shares in trade as the U.S., Japan, Switzerland, U.K., and France have larger shares in cross-border banking than other bilateral economic ties.

The role of China is much larger with respect to EMDEs. China features among the dominant players in all markets except for portfolio investment (Figure 2B). While China plays the most important role in FDI and cross-border lending, the U.S. dominates portfolio investment in EMDEs. The market shares in international trade are above cross-border banking in the case of China, France, US, and Japan. The market share of China in terms of portfolio inflows is almost nil since China's portfolio investments are concentrated on a few AEs.

III. EMPIRICAL APPROACH

This section presents our empirical approach. We start with a simple cross-sectional analysis to explore the bilateral correlations between international banking on the one side, and gravity variables and other types of international economic activities on the other. In a second step, we examine how lender-specific aspects might impact these correlations. The figure below illustrates the setup of our dataset. To mitigate endogeneity concerns, our regression analysis draws on lagged values for trade, total portfolio investment and FDI.



A. Simple Cross-Sectional Analysis

Recent theoretical contributions have shown that bilateral financial asset holdings follow patterns that are similar to those revealed by gravity models in the trade literature. In this context, we draw on Okawa and van Wincoop (2012) and Lane and Milesi-Ferretti (2008), while adjusting their gravity framework to our setup with bilateral cross-border claims:

$$\ln(XBC_{lb}) = \alpha + \beta_d \ln Dist_{lb} + \boldsymbol{\beta'_g OtherGRAVITY_{lb}} + \boldsymbol{\beta'_e} \ln(\boldsymbol{ECON_{lb}}) + \boldsymbol{FE}(\boldsymbol{PC_l} + \boldsymbol{BC_b})' + \varepsilon_{lb} \quad (1)$$

[15] With respect to portfolio investment, we do not separate between equity and debt securities in order to maximize the number of bilateral observations. Many bilateral observations are not available when downloading portfolio equity and securities investments from IMF CPIS dataset separately (e.g., due to confidentiality issues). Results for smaller samples breaking down portfolio equity and securities investments do not significantly change our results with respect to portfolio investment.

In our baseline specification (1), we let $\ln XBC_{lb}$ denote the logged outstanding stock of bilateral cross-border lending of the parent country l on borrower country b. We borrow from the gravity literature to find proxies for time-invariant information asymmetries that might hamper cross-border lending. First, geographical distance between lender and borrower country can act as a catch-all proxy for all kinds of informational frictions $\ln Dist_{lb}$. Besides the standard distance measure that captures the bilateral distance between the capitals of borrower and lender country, we use our weighted distance measure. This novel distance measure fits the nationality point of view by taking into account that a cross-border loan can be extended by an affiliate located in a third country that is different from the lender's home country itself. If this location of the affiliate was geographically closer to the ultimate borrower, the weighted distance measure would be smaller (see Section II.B). We challenge both distance measures by adding societal and historical aspects. The vector $\boldsymbol{OtherGRAVITY_{lb}}$ introduces two other indicators, one for colonial relationships after 1945, $Colonial(0/1)_{lb}$, and the other signals if the borrower and lender countries share the same language, $\text{Common Language}(0/1)_{lb}$.

Apart from the time-invariant gravity variables, we consider three other types of bilateral economic interaction between the lender and the borrower country. These bilateral economic ties might also foster cross-border bank lending by reducing informational frictions and thereby act as complements. Following the literature on the geographical distribution of portfolio holdings, vector $\mathbf{ln}(\boldsymbol{ECON_{lb}})$ captures the logged volume of bilateral trade as the sum of imports and exports, $\ln(Trade_{lb})$, total portfolio investment referring to debt plus equity investment, $\ln(Invetment_{lb})$ and $\ln(FDI_{lb})$. As a way to address potential endogeneity concerns, we lag these economic relationship variables by at least one year.

To properly identify the impact of bilateral variables, we use two sets of fixed effects. In particular, we let lender nationality fixed effects absorb general differences in the propensity to extend cross-border lending (e.g., richer countries with better-developed financial systems, global financial centers, current-account surplus countries that persistently export savings, etc.). Separate borrower country fixed effects soak up country-specific aspects like average creditor quality, characteristics of the local banking system, economic size, etc.

B. Lender-Specific Aspects Impact the Effect of Bilateral Variable

Our aim is to explore whether some parent banks are special by revealing patterns that deviate from the common effect of informational frictions on cross-border bank lending. To identify these deviating patterns, we interact the proxies of information asymmetries with a vector of parent country indicators $\boldsymbol{C_l(0/1)'}$. For general frictions, we let the interacted distance term $(\ln Dist_{lb} * \boldsymbol{C_l(0/1)'})$ captures this differential impact. For economic ties that could potentially reduce information asymmetries, we interact past trade, FDI, and portfolio holdings with a vector of bank nationality indicators $\boldsymbol{C_l(0/1)}$. In particular, we flesh out countries l of parent banks that are headquartered in China, other EMDEs, the U.S., Japan and Europe against a residual category that captures banks from other AEs like Australia and Canada, as well as offshore financial centres like Hong Kong SAR and Singapore[16].

$$\ln(XBC_{lb}) = \alpha + \beta_d \ln Dist_{lb} + \boldsymbol{\beta'_e}\,\mathbf{ln}(\boldsymbol{ECON_{lb}}) + (\boldsymbol{\gamma'_{dl}C_l(0/1)} * \ln Dist_{lb}) + \sum_{k=0}^{3}(\boldsymbol{\gamma'_{lk}C_l}(0/1) * \ln ECON_{lb}^{k}) + \boldsymbol{FE}(\boldsymbol{PC_l} + \boldsymbol{BC_b})' + \varepsilon_{lb} \quad (2$$

Overall, our analysis builds on bilateral relationships between up to 39 lender countries and up to 185 borrower countries. Table 2 provides some descriptive statistics. More detailed definitions and data sources of our variables are presented by Annex Table 2. For cross-border bilateral claims denominated in all currencies, the average outstanding stock reaches US$4 billion,, while the median is at US$20 million. Other measures of bilateral economic interactions are also very skewed. The average volumes of bilateral trade and portfolio investments amount to about US$5 billion and US$8 billion, respectively, while their median values only reach US$243 million and US$12 million. As traditional gravity variables, our baseline analysis draws on geographical distance and two other bilateral indicator variables capturing common colony and common language. Finally, while 14 percent of our bilateral country pairs indicated that they speak a common language, only 2 percent are linked by historical colonial ties.

[16] Europe captures the main EU banking systems namely BIS reporting countries from the euro area and the U.K. Our main findings remain intact when using alternative groupings of parent countries. In a series of robustness checks, we always keep China separate while changing the baseline category and isolating other bank nationalities. Accordingly, we combine U.S. and Canadian, as well as Japanese and Australian banks. Further, we add other European banking systems (NO, SE, DK and CH) to the group of European countries. By doing so, only offshore financial centers are left in the residual group. This robustness check turns out to be a re-scaling exercise in that our findings on Chinese banks remain almost entirely unaffected and most other results remain intact, as well.

IV. EMPIRICAL RESULTS

Our empirical analysis proceeds in several steps. We start by exploring how cross-border bank lending broadly correlates with gravity variables and other types of bilateral economic interactions. Within the set of gravity variables, we provide a novel comprehensive analysis on the role of distance (simple and weighted), trade, FDI, and portfolio flows as proxies of information asymmetries. In the second step, we examine whether the effect of distance and other types of economic activity on cross-border lending differs by bank nationality. In the third step, we isolate cross-border claims in U.S. dollar to see whether our results are driven by a particular currency denomination. Finally, we restrict the view to Chinese banks and examine the impact of policy initiatives like the BRI or bilateral Swap arrangements with the PBOC on cross-border lending patterns. A series of robustness checks shows that our main findings prevail even when controlling for a potential bias that could arise in the context of zero outstanding amounts.

A. Simple Cross-Sectional Analysis

Among the traditional gravity variables, distance plays the most important role in the geographical distribution of cross-border lending. As we are interested in bilateral borrower-lender relationships, we let borrower and lender fixed effects absorb any unilateral aspects as described in the cross-sectional specification in equation (1). The baseline gravity regression is restricted to simple distance, colonial ties and common language, and reveals the familiar findings from the trade literature (Table 3, upper panel, column 1). More precisely, higher bilateral distances go along with lower levels of outstanding bilateral cross-border bank claims. By contrast, colonial relationships and common language are associated with higher bilateral outstanding amounts between borrower and lender countries[17].

Going beyond the traditional gravity approach, our expanded framework suggests that other types of bilateral economic ties seem to act as a complement when studying the geographical distribution of cross-border lending. Columns 2 to 4 show the results when considering bilateral lagged trade, portfolio investment and FDI, one at a time, while columns 5 to 9 take them jointly into account[18]. Positive correlation coefficient estimates suggest that higher bilateral trade, total portfolio investment and FDI are associated with higher amounts of bilateral cross-border lending. The positive correlation signs with the international economic variables indicate complementarities between international banking and other types of economic interaction. These complementarities could be driven by different motivations. One such motivation might be a "follow your customer considerations" (Buch 1999, Claessens and van Horen 2015). Another motivation might be that the other economic ties reduce information asymmetries between borrower and lender, in the sense of the information endowments presented by Andrade and Chhaochharia (2010).

The additional benefit from having traditional gravity variables other than distance in our specification might be limited. Even though the literature suggests that traditional gravity variables, such as language and historical colonial relationships, reduce information asymmetries, they do not contribute additional information in our cross-sectional setup (beyond what is already captured by distance, trade, portfolio investment and FDI). In fact, when dropping the commonality indicators, the adjusted R2 declines only marginally. Only the distance measure continues to play a key role after controlling for past trade, FDI, and portfolio investment as shown by the R2 differences between columns 5 and 6 (Table 3). Across all borrowers and lenders, a 1 percent rise in bilateral borrower-lender distance is associated with a 0.62 percent decline in cross-border lending. From here on, we drop the gravity indicators of common colony and language, from our cross-sectional specification (column 6) in order to save presentational space. Yet the results are comparable if included.

Borrowers in AEs and EMDEs imply different risk-return trade-offs for the lending banks that go along with different levels of complementarity. For borrowers in AEs, a 1 percent rise in trade is associated with a 0.77 percent increase in cross-border lending (column 7). For borrowers in EMDEs, this rise is about 0.63 percent. The positive correlation of portfolio investment and FDI is weaker, but also more similar for AEs and EMDEs. A 1 percent increase in total portfolio investment goes along with a 0.35 percent rise in lending to AE borrowers, and a 0.31 percent for EMDE borrowers, respectively. The impact of FDI is weaker (0.05-0.06 percent) and only marginally significant for EMDE borrowers. When distinguishing AE from EMDE borrowers, distance seemingly only matters for EMDE borrowers. By contrast, the distance effect carries an

[17] We have also estimated the impact of other traditional gravitational variables like similarities in legal and economic systems, other geographical characteristics, political relationships etc. To arrive at a parsimonious specification, we limit our focus to the most significant ones that revealed to be robust across a number of specifications. Results on other variables are available on request.

[18] To the best of our knowledge, our paper is the first one to test together the correlation of trade, FDI, and portfolio investment with cross-border bank lending.

insignificant positive coefficient for borrowers in AEs[19]. This finding suggests, that economic ties can reduce information asymmetries relatively more for borrowers in AEs than for borrowers in EMDEs.

Yet, is our measure of simple distance appropriately capturing international information asymmetries in international banking? An appropriate measure should take the complex intermediation structures in global banking into account. To address this issue, we use the new distance measure introduced in Section II that explicitly captures the global network of affiliates located outside of the banks' home country.

Results based on the weighted distance measure see some significant changes when distinguishing between different groups of borrower countries (Table 3, bottom panel). The complementarities with trade, portfolio investment, and FDI remain unaffected when controlling for weighted instead of simple distance. Yet, the coefficient estimate on weighted distance for AE borrowers turns negative and significant at the 10 percent level, which is more in line with the traditional interpretation of distance as a proxy of information asymmetries. For lending to EMDEs, the distance coefficient raises in size and remains statistically significant.

In sum, our results at this stage highlight that distance, especially when taking into account weighted distance, is a general key factor underpinning the current geographical distribution of global cross-border lending. Unlike other traditional gravity variables, it plays a role even after controlling for past trade, FDI, and portfolio investment. The correlation of other economic ties with international banking are also significant, and they imply interesting complementarities. These complementarities seem to play out stronger for borrowers in AEs than for borrowers in EMDEs. For the rest of this paper, we will focus on the weighted distance measure when describing the regressions and only report the simple version of distance for the sake of comparison.

B. Differences Across Lenders

Do all bank nationalities that extend cross-border lending exhibit the same patterns? Is there anything special about banks from EMDEs, and Chinese banks in particular? To answer these questions, we build on the full sample regression from columns 7 and 8 in Table 3, but we now interact the distance and economic relationship variables with an indicator of parent bank nationality as described by equation (2). At the level of individual bank nationalities, our results reveal some more nuanced patterns.

While cross-border lending declines if bilateral weighted distance increases across all bank nationalities, there are differences across borrowers and lenders. Table 4 shows that the impact of distance is more pronounced for EMDE borrowers than for borrowers from AEs. On average, a 1 percent increase in distance is associated with a 0.43 percent drop in outstanding cross-border claims on AE borrowers (Table 4, column 2). For EMDE borrowers, this drop reaches 0.67 percent (Table 4, column 4).

Chinese banks seem to perceive distance to their borrowing EMDE counterparties as less of a barrier than other EMDE banks. The interaction effect of our weighted distance measure and the Chinese bank indicator is insignificant, but the standalone coefficient persists (Table 4, column 4). This result also holds for claims extended by U.S. and European banks. By contrast, larger distances deter banks from other EMDEs and Japan relatively more. The sum of the standalone and the interaction coefficient indicates that a 1 percent increase in weighted distance reduces outstanding amounts by more than 1 percent for both types of lenders. In this context, Chinese banks' large expansion not only resembles the global reach of banks from the U.S. and Europe, but also in their sensitivity to distance when their global network of affiliates is considered.

When turning to AE borrowers, bank nationalities also differ in their sensitivity to information asymmetries. Chinese, European and banks from other EMDEs do not significantly deviate from the standalone coefficient. However, a remarkable contrast emerges for Japanese banks, as larger distances effectively increase cross-border lending to AE borrowers due to the country's remote geographical position and the operations of its international affiliate network[20]. At the same time, the cross-border lending to AEs by U.S. banks seems to be almost insensitive to changes in distance. The sum of standalone and interaction terms suggest that distance has almost no effect: a 1 percent increase is associated with outstanding stocks that are about 0.07 percent lower[21].

Stronger trade relationships go hand in hand with more cross-border lending. Table 4 confirms these findings and it also underlines that trade plays a similar role for borrowers in EMDEs and AES, on average.

[19] Relative results are similar when considering the distribution of the economic variables. A one standard deviation increase in trade is associated with an increase in cross-border bank lending of about 1.8 standard deviations, 1.1 standard deviations in the case of portfolio investment, and 0.1 standard deviations in the case of FDI.

[20] As suggested by Figure 1, the weighted distance measure clearly differs from the simple distance measure for Japanese lenders. This highlights the importance to take the global affiliate network into account. The interaction coefficient for Japanese banks would lead to the opposite, conclusion when relying on the simple distance measure.

[21] In the case of Japanese banks, the large differences in the estimated interaction effects of distance between using simple and weighted distance is driven by the large volume of lending to AE borrowers that is booked from 29 different reporting locations.

A 1 percent increase in bilateral trade is associated with a 0.57 percent rise in lending to AEs(Table 4, column 2), and a 0.52 percent raise in lending to EMDEs (Table 4, column 4), respectively.

Chinese banks' positive correlation between cross-border bank lending and trade with EMDE countries stands out. When lending to EMDE borrowers, the complementary impact of trade turns out to be even stronger for lending by both Chinese and U.S. banks. The sum of standalone and interaction coefficients for these lenders suggests that a 1 percent increase of cross-border trade is almost matched with a 1 percent increase in cross-border lending. The fact that the sensitivity of Chinese banks' cross-border lending to EMDEs is similar to U.S. banks also with regard to trade is particularly interesting taking into account that most Chinese banks are state-owned unlike U.S. banks (Allen and others 2012). The complementarity is a bit weaker for European and Japanese lenders, and the weakest for banks from other EMDEs. When lending to AE borrowers the effects are less pronounced for Chinese, U.S. and Japanese banks. For Chinese banks, a 1 percent rise in bilateral trade raises their outstanding claims by only 0.4 percent.

On average, *portfolio investment* also seems to complement bilateral cross-border bank lending relationships --almost to an equal extent for borrowers in AEs and EMDEs. Bilateral country pairs that exhibit a 1 percent higher level of portfolio investment also see 0.37-0.38 percent higher level of outstanding cross-border claims, as revealed by the standalone coefficient estimate. Nonetheless, results are also nuanced for some parent bank countries, especially in the case of China, which deviates from this pattern when lending to EMDEs. For EMDE counterparties, bilateral claims extended by Chinese banks are 0.21 percent lower. By contrast, for AE counterparties, if bilateral portfolio investment raises by 1 percent, Chinese banks report a 0.76 percent higher level of outstanding bilateral amounts. Capital outflow controls in China are most likely driving this sharp contrast. As shown in Figure 2 and Annex Table 1, the market share and the geographical distribution of Chinese portfolio investment are much lower, and concentrated on AE countries. One might also interpret this finding in the light of information asymmetries in that Chinese banks, unlike other banking systems, do not benefit from reducing information asymmetries through portfolio investment.

As a function of the respective parent bank nationalities, FDI has a largely heterogeneous relationship with cross-border bank lending. On average, a 1 percent increase in FDI is associated with a 0.11 percent rise in cross-border bank lending, independent from whether the borrower resides in an AE or an EMDE (Table 4). However, substantial differences emerge for some parent bank nationalities when turning to FDI in EMDEs. The net effect of a 1 percent rise in bilateral FDI is associated with a 0.17 percent decline in lending to EMDE borrowers originated by Japanese banks. For Chinese and U.S. banks, the decline is much lower, about 0.05 percent and 0.03 percent, respectively. When turning to AE borrowers, the net effect of bilateral FDI is marginally positive for Chinese, U.S. and other EMDE banks, but almost zero for European and Japanese banks.

C. U.S. Dollar Denominated Cross-Border Bank Lending

When restricting the focus to U.S. dollar denominated claims, most relationships turn out to weaken slightly, but for Chinese banks our core findings become even more pronounced. Tables 5 replicates Table 4, while considering only the subset of cross-border claims that are denominated in U.S. dollars. Remarkably, the effect of distance as a proxy of information asymmetries turns insignificant for cross-border lending to AE borrowers, on average. For borrowers in EMDEs, it remains only marginally significant. By contrast, bilateral economic ties still seem to complement international banking. Trade continues to play the most important role in offsetting information asymmetries when lending in U.S. dollars to AEs, but for lending to EMDE borrowers, the relationship between portfolio investment becomes more important. We interpret the differences between AE and EMDE borrowers in light of the fact that most types of business from trade to financial investments with EMDEs are still denominated in U.S. dollars. As opposed to that, cross-border lending as well as other types of financial flows and trade among AEs is more likely to take place in other currencies like the euro or the pound.

Chinese banks' sensitivity to information asymmetries as proxied by distance seem to be more pronounced when restricting the focus on US-dollar denominated lending. The net effect of a 1 percent increase in bilateral distance to an EMDE borrower is associated with a 0.94 percent decline in U.S. dollar claims, and similar in magnitude to the net effect exhibited by banks from other EMDEs. Only for Japanese banks does bilateral distance have an even more negative impact on their lending to EMDEs. Turning to borrowers in AE, there is no effect of distance on U.S. dollar lending neither for Chinese, nor for European banks. For Japanese banks, it seems that U.S. dollar-denominated claims contribute to the effect previously described for lending to AEs in all currencies: the net effect of distance is positive which can be explained by the

geographical structure of its affiliate network. In the context of U.S. dollar claims, U.S. banks' cross-border lending to AEs is special as they act as key funding sources in their home currency.

In terms of bilateral economic relationships, differences with respect to trade stand out again. Chinese banks display the strongest complementarity with respect to EMDE borrowers. A 1 percent increase in bilateral cross-border trade is associated with an almost 1.2 percent increase in U.S. dollar claims of Chinese banks on EMDE borrowers. This rise is only about 0.6 percent in the case of U.S. banks and Japanese banks. This difference between Chinese and other EMDE banks is even larger for U.S. dollar claims than in the case of total cross-border claims. Two aspects might help to explain this finding. First, it might be related to the fact that a lot of bilateral trade is still invoiced in U.S. dollar (see Gopinath and others 2020). Second, Chinese banks play an important part in trade finance vis-à-vis EMDE borrowers. When granting loans in U.S. dollar to borrowers in AEs, the effect of trade becomes very small for Chinese banks.

In terms of portfolio inflows, the contrasting patterns that Chinese banks showed for lending to AE and EMDE borrowers persists. Complementarities are again particularly strong for portfolio investment when extending cross-border claims to borrowers in AEs, but not so for lending to EMDEs. Evidence on the relationship between FDI and Chinese banks' lending is again weak and ambiguous.

D. Zooming in on Chinese Banks

This strong positive correlation between bilateral trade and cross-border lending prevails when considering the China-specific policy initiatives. Up to now, we have highlighted the differences between Chinese banks and banks from other parent countries. At this stage, we restrict the sample to Chinese banks and their borrowers from EMDEs. We then analyse whether some China-specific international policy initiatives impact Chinese banks' cross-border lending. More specifically, we use a dummy variable that indicates whether a particular EMDE that participates either in the BRI initiative as of 2015 (Table 6, columns 1 to 4) or whether it has a bilateral swap-line arrangement with the PBOC (columns 5 to 8). We add these dummies to our baseline specification (1) and interact the policy indicator with distance, trade, portfolio investment and FDI, respectively.

In this very narrow subset of observations, trade is the only economic relationship variable that displays a positive and statistically significant relationship with cross-border bank lending. The negative coefficients for portfolio investment are in line with our full sample regressions, but they are not statistically significant. While the BRI indicator is not statistically significant itself, neither on a standalone, nor on an interacted basis, the swap-line indicator is only marginally significant. The lack of significance of the BRI relationship could be related to the fact that it is positively correlated with trade and trade already absorbs any potential contribution from BRI.

E. Robustness Checks

Our main results are robust to a number of tests. For instance, we test whether there was a bias that could arise from the fact that we have several bilateral lender-borrower links without positive cross-border lending. Why does the issue arise in the first place? When creating our sample, many zeros emerge as we allocate 185 potential borrower countries to each reporting country, and ultimately to each of the 39 considered bank nationalities. In the context of BIS data, each reporting country submits its claims on the universe of all possible counterparty borrower countries worldwide, while distinguishing between domestic and foreign banks with a split by foreign bank nationality. We have access to the full dataset. Even if data points are flagged as confidential or restricted on the BIS website, they enter our analysis, but they are not available to a broader audience. Hence, in our dataset a missing value indicates that no outstanding amounts exist, and thus missing values essentially correspond to zeros.

The presence of zero outstanding cross-border amounts inflates our sample and could create a problem for the use of log linear models in the context of gravity equations, since the zeros might not be randomly distributed. To alleviate concerns that these zeros bias our results, we follow the steps taken in recent papers, for instance by Caballero and others (2018) or Claessens and van Horen (2020). First, we estimate the Poisson Pseudo-Maximum Likelihood (PPML) estimator (Table 7, columns 1 to 4) as presented in Santos Silva and Tenryro (2006). Second, we replicate the Table 4 regression while adding a small positive dollar amount to those relationships with zero reported outstanding amounts to avoid dropping these observations when taking logs (Table 7, columns 5 to 8). In both cases, the stand-alone variables have the expected signs when looking at the weighted distance measure and the results confirm our previous findings: negative coefficients for distance and positive correlation coefficients for trade, portfolio investment, and FDI. These results are mostly statistically significant, especially when considering EMDE borrowers. The specific results for Chinese banks are also similar. Chinese banks, compared to other nationalities, lend relatively

more to EMDE borrowers with higher bilateral trade. Similar to other EMDE banks, distance is also more negatively correlated with Chinese bank lending to EMDE borrowers.

V. CONCLUSIONS

This paper studies the global footprint of Chinese banks and compares it with that of other major bank nationalities. Global banks extend cross-border claims and operate networks of foreign affiliates that can propagate shocks when crises occur in either borrower or lender countries. Chinese banks' cross-border lending is sizeable, reaching 18 percent of the country's GDP. Chinese banks' business is also relatively focused, as 43 percent of their total lending goes to EMDE borrowers. In terms of market share, Chinese banks account for 24 percent of all cross-border lending to EMDE borrowers, more than double that of Japanese banks, the second largest competitor (making up 11 percent of the EMDE total). Further, almost half of all EMDE borrower countries rely on Chinese banks as their most important lender.

Our paper proceeds on the basis of bank nationality by exploring a unique dataset that captures the cross-border operations of the banks' home offices and their global network of affiliates located abroad. Taking a nationality perspective is important to understand financial and real economic links between different economies as highlighted by Damgaard and Elkjaer (2017), or Coppola and others (2020). The multiple dimensions of the BIS locational banking statistics allow us to distinguish between more than 5000 lender-borrower pairs both from AEs and EMDEs. These data dimensions also allow us to create a new distance measure as an alternative proxy of information asymmetries. Across all locations from where a given bank nationality extends claims to a specific borrower country, it weights distances by the relative importance of each location for the respective lender-borrower relationship. To examine how banking relates to other economic ties, we have combined the BIS statistics with data on trade and international capital flows. We explore the bilateral correlations between banking and other types of economic interaction as they might complement each other by reducing bilateral information asymmetries.

Our analysis yields two main sets of findings. The first set pertains to all bank nationalities combined, while the second explicitly focuses on Chinese banks. Accordingly, our first set of results shows that lenders are much more sensitive to distance when extending claims to borrowers in EMDEs than to borrowers in AEs. This finding highlights persistent information asymmetries and it still holds after considering that a loan can be made by an affiliate located outside of a bank's home country. We also find that the negative distance-lending relationship remains significant after controlling for other bilateral economic ties between the borrower and the lender that could potentially reduce information asymmetries. In fact, our results show that past trade in particular, but also portfolio investment and FDI frequently can act as complements to cross-border lending, in the sense of revealing positive correlations.

The second set of results suggests that Chinese banks' global operations resemble the global operations of banks from other major AEs when lending to EMDE borrowers. In terms of complementarities, bilateral trade between China and its EMDE borrowers stands out. Our results show that the positive effect of trade persists even when considering China-specific policies like the Belt-and-Road Initiative, or bilateral Swap arrangements that China's central bank, the PBOC, initiated with other central banks. When lending to borrowers in AEs, strong complementarities with portfolio investment emerge. There is also some evidence that Chinese FDI can act as a complement to cross-border banking with AEs. This effect, however, disappears when isolating cross-border claims that are denominated in U.S. dollars.

Our paper provides three main contributions. First, it supports the need to follow a nationality approach in the analysis of global business operations as banks from EMDEs, and China in particular, grant a substantial share of their cross-border lending from abroad. Second, it extends the literature on bilateral financial ties and information asymmetries by presenting a new distance measure that takes the global network of affiliates into account, and by highlight the role of other economic ties in reducing information asymmetries. Third, it contributes to a better understanding of China's role as a lender in international capital markets, and in particular for borrowers from EMDEs.

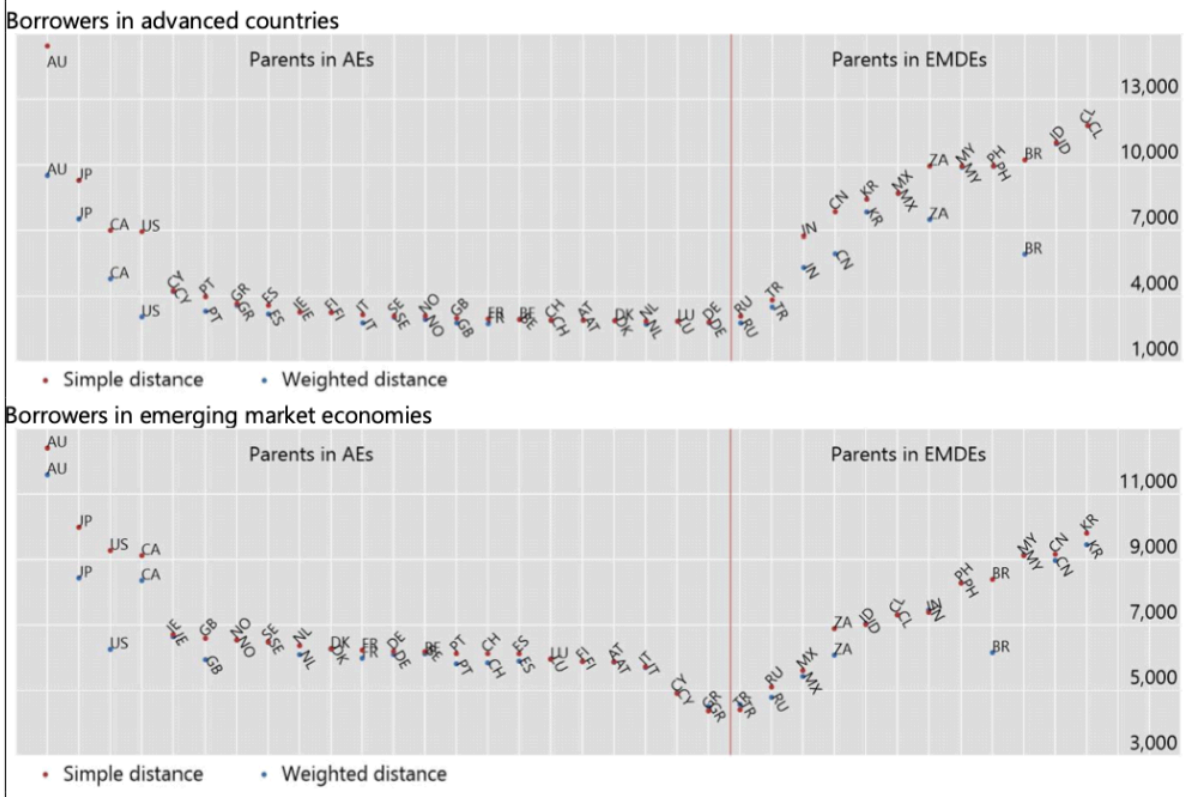
Our findings provide some interesting policy implications. On the one hand, if trade tensions or the aftermath of the COVID-19 crisis translate into a persistent decline in global trade, we could expect cross-border bank lending to fall in parallel. In fact, the decline in global banking could be more pronounced for Chinese banks as they display significantly higher correlations than some of their peers. On the other hand, the ongoing and planned liberalization reforms in the Chinese bond market could foster further inward and outward portfolio investment. If the liberalization of portfolio investment makes China more similar to other

AE and EMDE countries, Chinese banks' investments abroad could surge in an attempt to further diversify. This could lower information asymmetries for Chinese cross-border bank lending.

Future research might explore which China-specific factors might play significant roles. For instance, although our analysis highlights broad resemblance with AE banks when lending to EMDE borrowers, the government's considerable ownership shares in the largest Chinese banks could play an important role on geopolitical and economic aspects (e.g., state-owned banks lent relatively more during the global financial crisis as they pursued an objective of helping to stabilize the economy, as shown in Bosshardt and Cerutti, 2020). As of now, our results are constrained by the cross-sectional nature of our empirical approach. Future research might benefit from a longer time series, as China only started to report to the BIS locational banking statistics with positions from Q4:2015.

Figure 1. Simple and Weighted Distance Measures[1]

(By bank nationality; distance in km; cross-border lending in all currencies)

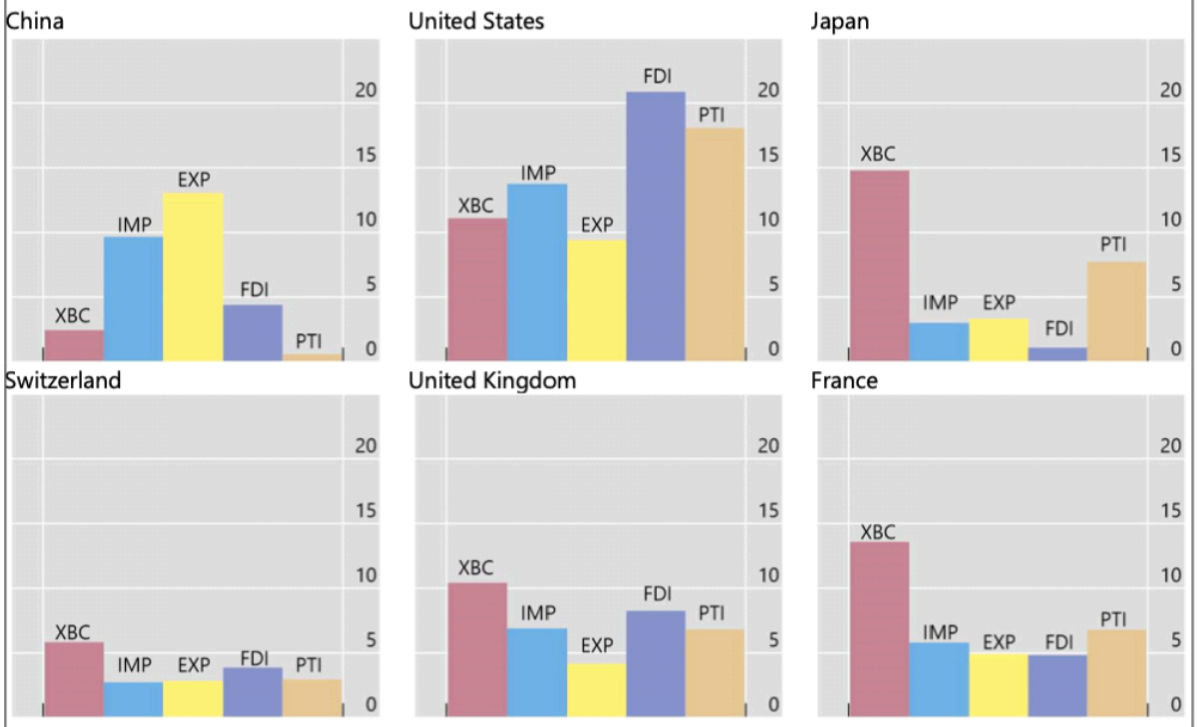


Sources: BIS locational banking statistics (by nationality); CEPII database; authors' calculations.

[1] For each depicted parent bank nationality, simple distance is the simple average across all pairs of distances from the respective capital of the lending banks' parent country (nationality) to the respective capital of borrowing countries. Weighted distance for each depicted bank nationality is the simple average across all pairwise weighted distance measures. Each pairwise weighted distance measure sums across all locations from where a given bank nationality extends claims to a specific borrower country, while weighting distances by the relative importance of each location for the respective lender-borrower relationship. Formally, the weighted distance measure is computed as $Dist_{lb} = \sum_{r=1}^{R} Dist_{rb} \left({}^{XBC_{lbr}}/_{XBC_{lb}} \right)$ with l denoting the parent country for each lending bank nationality, r the residence(s) of lending banks outside of their home country, and b the borrowing country. Hence, $Dist_{rb}$ stands for the distance in km between location r from where the bank l lends to borrowers in country b, and $\left({}^{XBC_{lbr}}/_{XBC_{lb}} \right)$ represents the portfolio weight as relative share of bank l's offices in location r in the global total of all cross-border lending extend by lending banks l to borrower country b. We drop backflows from the entire computation (ie lending to the home country that is extended by offices located abroad). These lending flows capture aspects of the funding structure and do not reflect the global expansion and customer business of banks.

Figure 2A. Market Shares in Different Types of International Economic Interactions with AEs[1]

(As a share total vis-à-vis AE counterparties)



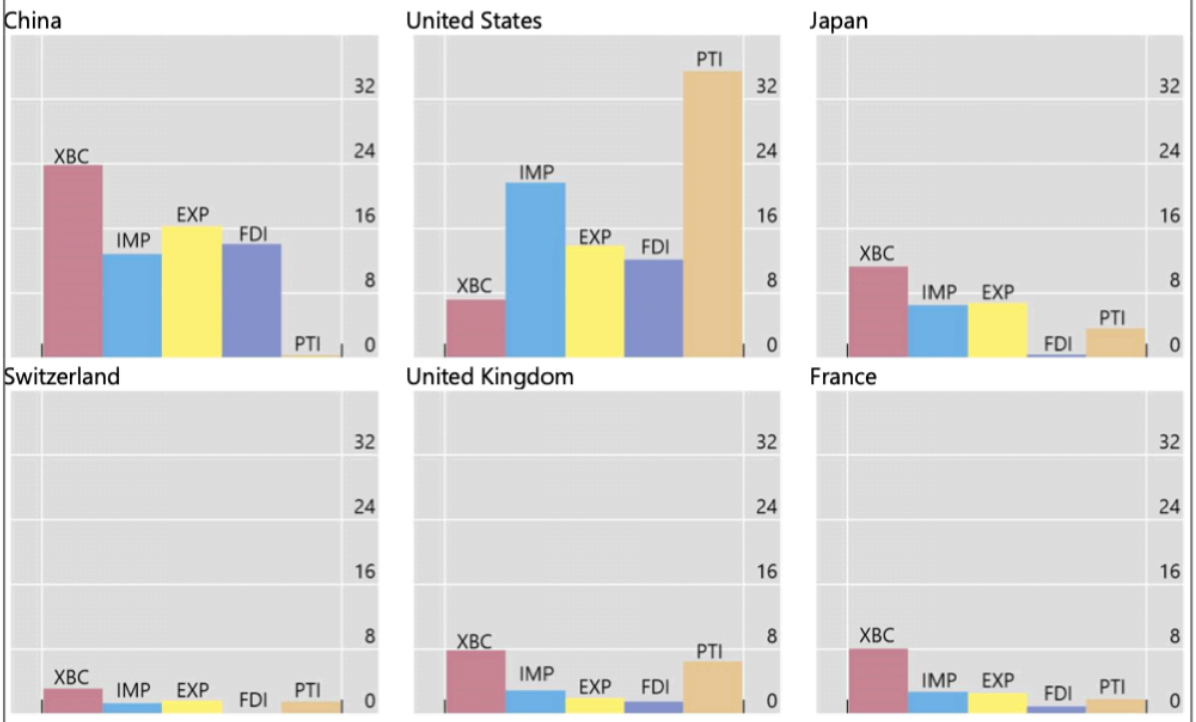
Sources: BIS locational banking statistics (by nationality); CEPII database; and authors' calculations.

XBC = Cross-border lending in all currencies, by bank nationality; IMP = Imports; EXP = Exports; FDI = Foreign direct investment, by nationality; PTI = Portfolio investment.

1/ Annex Table 2 provides variable description

Figure 2B. Market Shares in Different Types of International Economic Interactions with EMDEs[1]

(As a share of total vis-à-vis all EMDE counterparties)



Sources: BIS locational banking statistics (by nationality); IMF; World Bank; and authors' calculations

XBC = Cross-border lending in all currencies, by bank nationality; IMP = Imports; EXP = Exports; FDI = Foreign direct investment, by nationality; PTI = Portfolio investment.

1/ Annex Table 2 provides variable description

Table 1. Measures of Global Relevance by Bank Nationality: Top Cross-Border Creditors and Market Share

(Excluding claims of foreign affiliates on home country, as of Q2:2018)

	CN banks	JP banks	US banks	UK banks	CH banks	FR banks[2]
Borrowers Worldwide(185)[1]:						
Number of borrower countries	176	136	156	175	179	175
Total credit (US$ billions)	2,101	4,540	3,318	2,808	1,875	3,341
Share in total outstanding (%)	7.1	15.4	11.3	9.5	6.4	11.3
Number of countries for which banks are the top creditor	66	11	11	5	7	16
Borrowers in AEs(31)[1]:						
Number of borrower countries	30	30	30	31	31	31
Total credit (US$ billions)	488	2,953	2,215	2,081	1,164	2,715
Share in total outstanding (%)	2.4	14.8	11.1	10.4	5.8	13.6
Number of countries for which banks are the top creditor	0	3	1	0	1	6
Borrowers in EMDEs(143)[1]:						
Number of borrower countries	135	98	115	133	137	133
Total credit (US$ billions)	919	434	277	303	120	312
Share in total outstanding (%)	23.7	11.2	7.1	7.8	3.1	8.1
Number of countries for which banks are the top creditor	63	6	9	5	4	10

Sources: BIS locational banking statistics (by nationality); authors' calculations.

1 The number of borrower countries in our estimation sample is 185, while the total number of borrower countries that potentially exists in the BIS data is 216. As some of these countries have missing observations in the other datasets, we lose 31 mainly very small jurisdictions.

2 Shares and numbers of French(FR) banks are the highest among euro area reporting nationalities. The 12 other euro area bank nationalities that report to the BIS are Austria, Belgium, Cyprus, Finland, Germany, Greece, Ireland, Italy, Luxembourg, Netherlands, Portugal and Spain.

Table 2. Descriptive Statistics

Variables[1]	N	mean	p50	sd	min	max
All counterparties						
Total lending, ln(X)	5,090	2.69	2.97	4.32	-6.91	14.00
USD lending, ln(X)	3,712	3.01	3.40	3.92	-6.91	13.93
Colony (0/1)	5,090	0.02	0.00	0.15	0.00	1.00
Common Language (0/1)	5,090	0.14	0.00	0.35	0.00	1.00
Trade, ln(X+1)	5,090	5.48	5.50	2.70	0.00	13.30
Investment, ln(X+1)	5,090	3.39	2.53	3.56	0.00	14.30
FDI, ln(X+1)	5,090	1.84	0.00	3.14	0.00	14.00
Simple distance, ln(X) [2]	5,090	8.59	8.84	0.85	4.09	9.89
Weighted distance, all, ln(X)[2,3]	5,090	8.52	8.74	0.85	0.00	9.89
Weighted distance, USD, ln(X)[2,4]	5,090	8.54	8.75	0.83	4.10	9.89
Total lending, all, (X)[3]	5,090	4,022.64	19.51	29,432.10	0.00	1,202,826.00
Lending, USD, (X) [4]	3,712	2,464.54	29.85	25,249.75	0.00	1,124,981.00
Trade (X)	5,090	4,939.20	243.09	25,450.35	0.00	597,118.10
Investment(X)	5,090	8,125.61	11.54	56,072.84	0.00	1,620,968.00
FDI (X)	5,090	2,853.85	0.00	27,367.18	0.00	1,196,809.00
Advanced counterparties						
Total lending, ln(X)	1,071	5.67	6.13	3.89	-6.91	14.00
USD lending, ln(X)	942	4.50	5.04	3.86	-6.91	13.93
Colony (0/1)	1,071	0.02	0.00	0.13	0.00	1.00
Common Language (0/1)	1,071	0.10	0.00	0.30	0.00	1.00
Trade, ln(X+1)	1,071	7.24	7.32	2.37	0.00	13.22
Investment, ln(X+1)	1,071	6.43	6.75	3.83	0.00	14.30
FDI, ln(X+1)	1,071	4.80	5.53	4.01	0.00	13.51
Simple distance, ln(X) [2]	1,071	8.21	8.58	1.10	4.09	9.88
Weighted distance, all, ln(X)[2,3]	1,071	8.05	7.95	1.06	4.12	9.86
Weighted distance, USD, ln(X)[2,4]	1,071	8.13	8.09	1.02	4.10	9.86
Total lending, all, (X)[3]	1,071	15,009.26	458.88	60,998.79	0.00	1,202,826.00
Lending, USD, (X) [4]	942	7,030.48	153.71	48,996.32	0.00	1,124,981.00
Trade (X)	1,071	12,191.95	1,505.36	40,059.43	0.00	549,720.30
Investment(X)	1,071	33,328.48	851.94	117,219.20	0.00	1,620,968.00
FDI (X)	1,071	10,952.94	252.34	45,752.88	0.00	735,798.20
EMDE counterparties						
Total lending, ln(X)	3,700	1.72	1.94	4.03	-6.91	11.35
USD lending, ln(X)	2,486	2.35	2.78	3.75	-6.91	10.33
Colony (0/1)	3,700	0.03	0.00	0.16	0.00	1.00
Common Language (0/1)	3,700	0.14	0.00	0.34	0.00	1.00
Trade, ln(X+1)	3,700	5.02	5.03	2.58	0.00	13.30
Investment, ln(X+1)	3,700	2.48	0.89	2.96	0.00	12.71
FDI, ln(X+1)	3,700	0.94	0.00	2.15	0.00	11.80
Simple distance, ln(X) [2]	3,700	8.68	8.86	0.73	4.93	9.89
Weighted distance, all, ln(X)[2,3]	3,700	8.63	8.78	0.73	0.00	9.89
Weighted distance, USD, ln(X)[2,4]	3,700	8.65	8.79	0.71	5.38	9.89
Total lending, all, (X)[3]	3,700	707.81	6.99	3,219.59	0.00	84,938.02
Lending, USD, (X) [4]	2,486	580.74	16.16	2,212.85	0.00	30,624.81
Trade (X)	3,700	2,973.91	151.34	19,431.18	0.00	597,118.10
Investment(X)	3,700	1,268.85	1.44	9,982.75	0.00	332,224.50
FDI (X)	3,700	309.79	0.00	3,037.25	0.00	133,079.90

[1] X in USD millions; borrower countries relate to customers of BIS reporting banks; Annex Table 2 gives their precise definitions and Table A3 lists the countries grouped into EMDEs and AEs, respectively.

[2] Distance in KM.

[3] Lending in all currencies to all sectors.

[4] Lending denominated in U.S. dollar to all sectors.

Table 3. Cross-Border Lending, Distance and Other Types of Economic Interaction

(Dependent Variable: Total lending in all currencies to all sectors (ln))

	All borrower countries						AEs	EMDEs	OFFs
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)	(9)
Simple Distance	-1.673***	-0.854***	-1.306***	-1.593***	-0.634***	-0.619***	0.031	-0.774***	-1.328***
	(0.134)	(0.130)	(0.131)	(0.134)	(0.123)	(0.129)	(0.140)	(0.168)	(0.254)
Colony (0/1)	1.697***	0.885***	1.498***	1.659***	0.815***				
	(0.359)	(0.245)	(0.306)	(0.346)	(0.234)				
Language (0/1)	0.650***	0.408*	0.463**	0.588**	0.268				
	(0.231)	(0.208)	(0.227)	(0.231)	(0.207)				
Trade		0.731***			0.638***	0.670***	0.772***	0.630***	0.390***
		(0.055)			(0.058)	(0.060)	(0.111)	(0.071)	(0.131)
Investment			0.365***		0.298***	0.304***	0.352***	0.314***	0.254***
			(0.044)		(0.043)	(0.043)	(0.072)	(0.044)	(0.091)
FDI				0.079***	0.024	0.031	0.053**	0.058*	0.053
				(0.029)	(0.024)	(0.025)	(0.024)	(0.032)	(0.066)
Adjusted R-square	0.708	0.732	0.726	0.709	0.744	0.743	0.830	0.681	0.749
R2_all-FF	0.0713	0.0942	0.0882	0.0724	0.105	0.104	0.192	0.0475	0.141
Weighted Distance	-1.609***	-0.870***	-1.270***	-1.510***	-0.712***	-0.702***	-0.233*	-0.808***	-1.007***
	(0.137)	(0.121)	(0.112)	(0.134)	(0.101)	(0.102)	(0.132)	(0.144)	(0.247)
Colony (0/1)	1.568***	0.792***	1.389***	1.526***	0.774***				
	(0.399)	(0.241)	(0.318)	(0.374)	(0.231)				
Language (0/1)	0.922***	0.476**	0.626***	0.807***	0.300				
	(0.239)	(0.199)	(0.215)	(0.230)	(0.197)				
Trade		0.777***			0.651***	0.682***	0.676***	0.660***	0.479***
		(0.061)			(0.064)	(0.064)	(0.094)	(0.072)	(0.141)
Investment			0.403***		0.302***	0.307***	0.346***	0.318***	0.336***
			(0.043)		(0.042)	(0.042)	(0.072)	(0.043)	(0.091)
FDI				0.115***	0.026	0.033	0.048**	0.062*	0.110*
				(0.032)	(0.024)	(0.025)	(0.023)	(0.033)	(0.064)
Adjusted R-square	0.702	0.734	0.724	0.704	0.746	0.745	0.831	0.683	0.750
R2_all-FF	0.0654	0.0958	0.0870	0.0679	0.108	0.107	0.193	0.0492	0.142
Observations	5,090	5,090	5,090	5,090	5,090	5,090	1,071	3,700	319
Fixed Effects	LC+BC	LC+BC	LC+BC	LC+BC	LC+BC	LC+BC	LC+BC	LC+BC	LC+BC
LCs	39	39	39	39	39	39	39	39	39
BCs	185	185	185	185	185	185	31	143	11

Note: This table shows the estimation results presented in specification (1) for the 2018 cross-section with 39 lending parent countries (LCs) and up to 185 borrower countries (BCs). The dependent variable is the logarithm of outstanding cross-border bilateral lending. Only positive outstanding amounts enter the analysis, zero values are dropped. Except for the gravity indicators (0/1), all explanatory bilateral variables enter the analysis in logs. *Simple Distance* captures the respective bilateral distance between the capitals of the lending parent and the borrower countries. *Weighted Distance* captures the sum across all locations through which lending is extended by a parent country to a specific borrower country. Shares in total lending that are intermediated through a specific location by LC-BC pair serve as weights. *Simple Distance* and *Weighted Distance* are formally described in Section II and Graph 1. Columns 1-6 show the results for all borrower countries. Column 7 draws on a subsample of lending on advanced economies (AEs), column 8 refers to emerging market economies, and column 9 refers to offshore centres as borrower countries, respectively. All columns include separate lending parent and borrower country fixed effects. R2_all-FF shows the difference between the adjusted R2 based on the full specification as shown, and a regression with only LC and BC fixed effects. Table 2 shows some descriptive statistics, Annex Table 2 gives their precise definitions and Table A3 lists the countries grouped into EMDEs and AEs, respectively. Standard errors in parentheses are clustered by lending parent country with *** p<0.01, ** p<0.05, * p<0.1.

Table 4. Do Results Differ by Nationality of the Lending Bank?

(Dependent Variable: Total lending in ***all currencies*** to all sectors (ln))

	Borrower countries: Advanced		Borrower countries: EMDEs	
	Simple	Weighted	Simple	Weighted
	(1)	(2)	(3)	(4)
Standalone Variables				
Distance	-0.203	-0.431**	-0.440*	-0.666***
	(0.246)	(0.183)	(0.250)	(0.192)
Trade	0.597***	0.567***	0.504***	0.521***
	(0.123)	(0.108)	(0.081)	(0.084)
Investment	0.379***	0.371***	0.366***	0.381***
	(0.113)	(0.107)	(0.045)	(0.047)
FDI	0.120**	0.112*	0.115**	0.108**
	(0.058)	(0.056)	(0.046)	(0.043)
Interaction Effects				
Dist*CN(0/1)	1.221***	-0.083	-0.207	-0.065
	(0.285)	(0.204)	(0.255)	(0.200)
Dist*US(0/1)	0.641**	0.361**	-0.126	-0.041
	(0.249)	(0.170)	(0.345)	(0.163)
Dist*JP(0/1)	-3.274***	3.109***	-0.099	-0.801***
	(0.956)	(0.327)	(0.254)	(0.165)
Dist*EU(0/1)	0.156	0.272	-0.205	0.076
	(0.251)	(0.209)	(0.252)	(0.208)
Dist*EMDEexCN(0/1)	-0.041	-0.111	-1.076**	-0.699*
	(0.307)	(0.246)	(0.417)	(0.358)
Trade*CN(0/1)	-0.097	-0.163*	0.452***	0.453***
	(0.078)	(0.084)	(0.083)	(0.083)
Trade*US(0/1)	-0.195**	-0.299***	0.398***	0.408***
	(0.084)	(0.092)	(0.066)	(0.073)
Trade*JP(0/1)	-0.475***	-0.419***	0.228**	0.176*
	(0.078)	(0.087)	(0.087)	(0.090)
Trade*EU(0/1)	0.041	0.031	0.189**	0.226**
	(0.100)	(0.104)	(0.093)	(0.091)
Trade*EMDEexCN(0/1)	0.195	0.177	0.061	0.091
	(0.157)	(0.158)	(0.108)	(0.107)

Table 4. Do Results Differ by Nationality of the Lending Bank? (Concluded)

(Dependent Variable: Total lending in ***all currencies*** to all sectors (ln))

	Borrower countries: Advanced		Borrower countries: EMDEs	
	Simple	Weighted	Simple	Weighted
	(1)	(2)	(3)	(4)
Investment*CN(0/1)	0.312***	0.389***	-0.601***	-0.590***
	(0.099)	(0.096)	(0.062)	(0.062)
Investment*US(0/1)	-0.018	-0.025	-0.040	-0.060
	(0.089)	(0.089)	(0.047)	(0.049)
Investment*JP(0/1)	0.370***	0.250**	0.025	0.046
	(0.095)	(0.093)	(0.048)	(0.050)
Investment*EU(0/1)	-0.018	-0.013	-0.123**	-0.129**
	(0.101)	(0.098)	(0.057)	(0.059)
Investment* EMDEexCN(0/1)	-0.093	-0.080	-0.088	-0.080
	(0.151)	(0.148)	(0.092)	(0.100)
FDI*CN(0/1)	0.121	0.102	-0.170***	-0.162***
	(0.085)	(0.081)	(0.053)	(0.053)
FDI*US(0/1)	-0.034	0.004	-0.181***	-0.137***
	(0.068)	(0.065)	(0.045)	(0.048)
FDI*JP(0/1)	-0.054	-0.110*	-0.185***	-0.273***
	(0.057)	(0.056)	(0.049)	(0.045)
FDI*EU(0/1)	-0.141**	-0.137**	-0.056	-0.054
	(0.063)	(0.060)	(0.066)	(0.063)
FDI*EMDEexCN(0/1)	0.056	0.056	-0.064	-0.034
	(0.110)	(0.108)	(0.067)	(0.066)
Observations	1,071	1,071	3,700	3,700
Adjusted R-squared	0.840	0.844	0.688	0.688
Fixed Effects	LC+BC	LC+BC	LC+BC	LC+BC
R2_all-FF	0.0813	0.0844	0.119	0.119
LCs	39	39	39	39
BCs	31	31	143	143

Note: This table shows the estimation results presented in specification (2) for the 2018 cross-section with 39 lending parent countries (LCs). Columns 1-2 feature borrowers in up to 31 advanced economies as borrower countries (BCs), while columns 3-4 restrict the sample to borrowers in up to 143 EMDEs. The dependent variable is the logarithm of outstanding cross-border bilateral lending. Zero values are dropped. Except for the lending parent bank indicators (eg CN(0/1) for China as a parent country), all explanatory bilateral variables enter the analysis in logs. Columns alternate between using the simple distance (col 1 and 2) and weighted distance measure (col 2 and 4). *Simple Distance* and *Weighted Distance* are described in Section II and Graph 1. All columns include separate lending parent and borrower country fixed effects. EU captures the major EU banking systems like BIS reporting countries from the euro area and the UK. R2_all-FF shows the difference between the adjusted R2 based on the full specification as shown, and a regression with only CP and BC fixed effects. Table 2 shows some descriptive statistics, Annex Table 2 gives their precise definitions and Table A3 lists the countries grouped into EMDEs and AEs, respectively. Standard errors in parentheses are clustered by lending parent country with *** p<0.01, ** p<0.05, * p<0.1.

Table 5. Do Results Differ by Nationality of the Lending Bank? U.S. Dollar Lending

(Dependent Variable: Lending denominated ***in USD*** to all sectors (ln))

	Borrower countries: Advanced		Borrower countries: EMDEs	
	Simple	Weighted	Simple	Weighted
	(1)	(2)	(3)	(4)
Standalone Variables				
Distance	-0.345	-0.144	-0.258	-0.418*
	(0.302)	(0.209)	(0.273)	(0.207)
Trade	0.416**	0.427***	0.293***	0.297***
	(0.159)	(0.149)	(0.089)	(0.086)
Investment	0.312***	0.298***	0.390***	0.384***
	(0.106)	(0.101)	(0.067)	(0.067)
FDI	0.104	0.115	0.153***	0.147***
	(0.087)	(0.086)	(0.047)	(0.054)
Interaction Effects				
Dist*CN(0/1)	1.019***	-0.081	-0.755**	-0.522**
	(0.358)	(0.251)	(0.332)	(0.198)
Dist*US(0/1)	0.956***	0.576***	-0.757**	-0.251
	(0.295)	(0.194)	(0.349)	(0.170)
Dist*JP(0/1)	-7.247***	1.884***	-0.150	-0.831***
	(1.173)	(0.278)	(0.342)	(0.210)
Dist*EU(0/1)	0.539**	0.191	0.079	-0.067
	(0.236)	(0.194)	(0.320)	(0.233)
Dist*EMDEexCN(0/1)	-0.389	-0.607**	-0.597*	-0.448*
	(0.393)	(0.256)	(0.315)	(0.248)
Trade*CN(0/1)	-0.251**	-0.312**	0.876***	0.895***
	(0.114)	(0.120)	(0.111)	(0.101)
Trade*US(0/1)	0.063	0.016	0.275***	0.328***
	(0.136)	(0.126)	(0.092)	(0.094)
Trade*JP(0/1)	-0.471***	-0.372***	0.458***	0.339***
	(0.108)	(0.105)	(0.108)	(0.104)
Trade*EU(0/1)	-0.049	-0.115	0.178*	0.153
	(0.127)	(0.131)	(0.095)	(0.093)
Trade*EMDEexCN(0/1)	0.255	0.229	0.152	0.155
	(0.166)	(0.167)	(0.139)	(0.137)

Table 5. Do Results Differ by Nationality of the Lending Bank? U.S. Dollar Lending (Concluded)

(Dependent Variable: Lending denominated ***in USD*** to all sectors (ln))

	Borrower countries: Advanced		Borrower countries: EMDEs	
	Simple	Weighted	Simple	Weighted
	(1)	(2)	(3)	(4)
Investment*CN(0/1)	0.432***	0.488***	-0.490***	-0.509***
	(0.101)	(0.101)	(0.090)	(0.091)
Investment*US(0/1)	-0.131	-0.227*	-0.128*	-0.144*
	(0.129)	(0.134)	(0.075)	(0.074)
Investment*JP(0/1)	0.313***	0.311***	-0.037	-0.003
	(0.104)	(0.105)	(0.068)	(0.071)
Investment*EU(0/1)	0.152	0.182	-0.098	-0.082
	(0.151)	(0.150)	(0.089)	(0.091)
Investment* EMDEexCN(0/1)	0.113	0.126	-0.091	-0.085
	(0.141)	(0.134)	(0.097)	(0.100)
FDI*CN(0/1)	0.161	0.131	-0.248***	-0.231***
	(0.113)	(0.113)	(0.053)	(0.060)
FDI*US(0/1)	-0.016	0.009	-0.039	-0.034
	(0.125)	(0.120)	(0.060)	(0.061)
FDI*JP(0/1)	0.065	-0.082	-0.230***	-0.300***
	(0.086)	(0.083)	(0.064)	(0.070)
FDI*EU(0/1)	-0.173*	-0.190**	-0.027	-0.026
	(0.087)	(0.086)	(0.061)	(0.067)
FDI*EMDEexCN(0/1)	-0.109	-0.121	-0.058	-0.044
	(0.094)	(0.094)	(0.067)	(0.073)
Observations	942	942	2,481	2,481
Adjusted R-squared	0.713	0.713	0.583	0.583
Fixed Effects	LC+BC	LC+BC	LC+BC	LC+BC
R2_all-FF	0.0650	0.0648	0.0997	0.100
LCs	39	39	39	39
BCs	31	31	136	136

Note: This table shows the estimation results presented in specification (2) for the 2018 cross-section with 39 lending parent countries (LCs). Columns 1-2 feature borrowers in up to 31 advanced economies as borrower countries (BCs), while columns 3-4 restrict the sample to borrowers in up to 143 EMDEs. The dependent variable is the logarithm of outstanding cross-border bilateral lending. Zero values are dropped. Columns alternate between using the simple distance (col 1 and 3) and weighted distance measure (col 2 and 4). Except for the lending parent bank indicators (eg CN(0/1) for China as a parent country), all explanatory bilateral variables enter the analysis in logs. *Simple Distance* and *Weighted Distance* are described in Section II and Graph 1. All columns include separate lending parent and borrower country fixed effects. EU captures the major EU banking systems like BIS reporting countries from the euro area and the UK. R2_all-FF shows the difference between the adjusted R2 based on the full specification as shown, and a regression with only CP and BC fixed effects. Table 2 shows some descriptive statistics, Annex Table 2 gives their precise definitions and Table A3 lists the countries grouped into EMDEs and AEs, respectively. Standard errors in parentheses are clustered by lending parent country with *** p<0.01, ** p<0.05, * p<0.1.

Table 6. Zooming in on Chinese Banks

(Dependent Variable: Total lending in all currencies (ln), all control variables)

Variables	X=BRI 2015				X=Swap line			
	Simple distance		Weighted distance		Simple distance		Weighted distance	
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Standalone Variables								
Distance	-0.524	-0.337	-0.600	-0.432	-0.200	-0.210	-0.280	-0.345
	(0.472)	(0.665)	(0.498)	(0.755)	(0.381)	(0.593)	(0.382)	(0.547)
X	-0.302	3.590	-0.363	2.585	1.359*	0.437	1.360*	-0.942
	(0.649)	(10.688)	(0.674)	(10.532)	(0.720)	(7.583)	(0.715)	(7.419)
Trade	0.935***	0.922***	0.936***	0.920***	0.932***	0.952***	0.928***	0.946***
	(0.190)	(0.248)	(0.189)	(0.248)	(0.190)	(0.208)	(0.189)	(0.207)
Investment	-0.038	-0.037	-0.042	-0.034	-0.150	-0.217	-0.149	-0.213
	(0.185)	(0.338)	(0.184)	(0.336)	(0.206)	(0.237)	(0.203)	(0.231)
FDI	0.032	0.047	0.031	0.043	0.042	0.027	0.037	0.016
	(0.133)	(0.223)	(0.131)	(0.219)	(0.134)	(0.157)	(0.132)	(0.154)
Interaction Effects								
X*Distance		-0.460		-0.357		0.103		0.249
		(1.060)		(1.057)		(0.693)		(0.680)
X*Trade		0.032		0.043		-0.163		-0.156
		(0.441)		(0.433)		(0.556)		(0.556)
X*FDI		-0.018		-0.021		0.002		0.015
		(0.293)		(0.287)		(0.322)		(0.320)
X*Investment		-0.011		-0.025		0.370		0.365
		(0.391)		(0.388)		(0.434)		(0.431)
Constant	3.233	1.554	3.929	2.442	0.208	0.290	0.960	1.562
	(4.848)	(6.794)	(5.019)	(7.549)	(3.995)	(6.042)	(3.968)	(5.578)
Observations	137	137	137	137	137	137	137	137
R-squared	0.354	0.355	0.355	0.356	0.368	0.372	0.368	0.373

Note: This table restricts the estimation sample to the 2018 cross-section of Chinese lending parent banks and all EMDE borrower countries (BCs). To evaluate the effects of bilateral initiatives like the BRI ("X" in col 1-4) and swap-lines ("X" in col 5-8), it interacts the covariates with indicators of whether the borrower countries take part in the respective initiate. The dependent variable is the logarithm of outstanding bilateral cross-border lending. Except for the indicators X, all explanatory variables enter our analysis in log. Annex Table 2 gives their precise definitions and Table A3 lists the countries grouped into EMDEs and AEs, respectively. Standard errors in parentheses are robust. *** p<0.01, ** p<0.05, * p<0.1.

Table 7. Alternative Estimation Methods: PPML and Keeping Zeros

(Dependent Variable: Total lending in all currencies (ln) to all sectors)

Variables	PPML				Keep Zeros with ln(Y+1)			
	AEs		EMDEs		AEs		EMDEs	
	Simple distance	Weighted distance	Simple distance	Weighted distance	Simple distance	Weighted distance	Simple distance	Weighted distance
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Standalone Variables								
Distance	0.130	-0.017	-0.087	-0.352**	-0.365	-0.212	-0.152	-0.205*
	(0.159)	(0.215)	(0.207)	(0.170)	(0.242)	(0.181)	(0.134)	(0.115)
Trade	0.574***	0.468***	0.304***	0.275***	0.298**	0.312***	0.273***	0.271***
	(0.125)	(0.118)	(0.101)	(0.103)	(0.112)	(0.115)	(0.047)	(0.046)
Investment	0.343***	0.340***	0.367***	0.367***	0.341***	0.331***	0.325***	0.329***
	(0.083)	(0.087)	(0.054)	(0.058)	(0.084)	(0.080)	(0.050)	(0.051)
FDI	0.034	0.036	0.109**	0.104**	0.167**	0.174**	0.171***	0.167***
	(0.039)	(0.041)	(0.053)	(0.049)	(0.070)	(0.068)	(0.052)	(0.053)
Interaction Effects								
Dist*CN(0/1)	-0.089	0.347	-0.216	0.005	0.993***	0.178**	-0.322**	-0.303**
	(0.255)	(0.286)	(0.218)	(0.175)	(0.274)	(0.085)	(0.133)	(0.116)
Dist*US(0/1)	0.157	-0.002	0.163	0.151	0.714***	-0.060	-0.063	-0.203***
	(0.164)	(0.184)	(0.335)	(0.193)	(0.261)	(0.073)	(0.173)	(0.055)
Dist*JP(0/1)	1.003*	-0.332	0.210	0.267*	-2.359***	1.908***	0.055	-0.678***
	(0.565)	(0.455)	(0.208)	(0.150)	(0.728)	(0.183)	(0.139)	(0.068)
Dist*EU(0/1)	0.080	0.146	-0.175	-0.149	0.193	0.031	-0.113	-0.064
	(0.151)	(0.219)	(0.233)	(0.196)	(0.249)	(0.196)	(0.178)	(0.119)
Dist*EMDEexCN(0/1)	0.234	0.344	-0.345	-0.050	0.005	-0.390**	-0.575***	-0.486***
	(0.239)	(0.240)	(0.320)	(0.261)	(0.281)	(0.145)	(0.188)	(0.176)
Trade*CN(0/1)	-0.125	-0.131	0.166*	0.169*	0.017	0.009	0.551***	0.553***
	(0.088)	(0.089)	(0.096)	(0.099)	(0.075)	(0.079)	(0.045)	(0.044)
Trade*US(0/1)	-0.337**	-0.437***	0.050	0.052	-0.094	-0.212**	0.263***	0.245***
	(0.135)	(0.146)	(0.087)	(0.098)	(0.077)	(0.091)	(0.040)	(0.039)
Trade*JP(0/1)	-0.291***	-0.306***	0.080	0.047	-0.279***	-0.109	0.378***	0.311***
	(0.076)	(0.086)	(0.094)	(0.095)	(0.080)	(0.081)	(0.048)	(0.046)
Trade*EU(0/1)	0.051	0.050	0.071	0.060	0.122	0.109	0.178**	0.185**
	(0.071)	(0.076)	(0.104)	(0.104)	(0.098)	(0.101)	(0.078)	(0.072)
Trade*EMDEexCN(0/1)	-0.282***	-0.269**	0.089	0.114	0.110	0.098	-0.060	-0.054
	(0.106)	(0.107)	(0.137)	(0.143)	(0.101)	(0.102)	(0.058)	(0.058)

Table 7. Alternative Estimation Method: PPML (Concluded)

(Dependent Variable: Total lending in all currencies (ln) to all sectors)

Variables	PPML				Keep Zeros with ln(Y+1)			
	AEs		EMDEs		AEs		EMDEs	
	Simple distance	Weighted distance	Simple distance	Weighted distance	Simple distance	Weighted distance	Simple distance	Weighted distance
	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Investment*CN(0/1)	0.109	0.021	-0.135***	-0.143***	0.209***	0.240***	-0.340***	-0.342***
	(0.073)	(0.062)	(0.044)	(0.053)	(0.076)	(0.071)	(0.051)	(0.051)
Investment*US(0/1)	-0.080	-0.045	-0.050	-0.035	0.306***	0.359***	0.008	0.003
	(0.165)	(0.210)	(0.062)	(0.071)	(0.072)	(0.068)	(0.052)	(0.053)
Investment*JP(0/1)	0.295***	0.398***	0.212***	0.224***	0.531***	0.422***	0.172***	0.199***
	(0.088)	(0.103)	(0.061)	(0.068)	(0.072)	(0.074)	(0.046)	(0.049)
Investment*EU(0/1)	0.060	0.079	0.065	0.060	0.104	0.115	-0.056	-0.058
	(0.055)	(0.050)	(0.051)	(0.057)	(0.080)	(0.079)	(0.092)	(0.093)
Investment* EMDEexCN(0/1)	-0.112*	-0.109*	-0.116	-0.115	-0.072	-0.058	0.111	0.112
	(0.065)	(0.063)	(0.099)	(0.105)	(0.105)	(0.105)	(0.072)	(0.074)
FDI*CN(0/1)	-0.053	-0.001	-0.222***	-0.215***	0.026	-0.006	-0.166***	-0.161***
	(0.079)	(0.065)	(0.064)	(0.061)	(0.077)	(0.073)	(0.047)	(0.049)
FDI*US(0/1)	0.380**	0.454**	-0.038	-0.038	-0.143*	-0.144**	-0.027	-0.003
	(0.174)	(0.213)	(0.057)	(0.056)	(0.071)	(0.068)	(0.051)	(0.054)
FDI*JP(0/1)	-0.023	-0.021	-0.131**	-0.160***	-0.160**	-0.237***	-0.161***	-0.244***
	(0.052)	(0.058)	(0.061)	(0.062)	(0.067)	(0.067)	(0.051)	(0.058)
FDI*EU(0/1)	-0.038	-0.041	-0.048	-0.048	-0.168**	-0.175**	0.000	0.005
	(0.042)	(0.044)	(0.056)	(0.053)	(0.070)	(0.069)	(0.068)	(0.069)
FDI*EMDEexCN(0/1)	0.287**	0.285**	-0.047	-0.041	-0.030	-0.044	-0.065	-0.056
	(0.126)	(0.120)	(0.075)	(0.076)	(0.083)	(0.080)	(0.071)	(0.074)
Observations	1,187	1,187	5,565	5,565	1,187	1,187	5,565	5,565
R-squared	0.958	0.956	0.819	0.832				
Fixed Effects	LC+BC	LC+BC	LC+BC	LC+BC	LC+BC	LC+BC	LC+BC	LC+BC
R2_all-FF					0.0719	0.0729	0.152	0.152
LCs	39	39	39	39	39	39	39	39
BCs	31	31	143	143	31	31	143	143

Note: This table shows the estimation results presented in specification (2). The sample is based on the 2018 cross-section with 39 parent countries (LCs). Columns 1+3 feature borrowers in up to 31 advanced economies, while columns 2+4 restrict the sample to borrowers in up to 143 EMDEs. Columns 1-4 apply the PPML estimator and use outstanding values including zeros as dependent variable. Columns 5-8 replicate Table 3 but keep zeros by using as the dependent variable ln(Y+1). Except for the parent bank indicators (eg CN(0/1) for China as a parent country), all explanatory bilateral variables enter the analysis in logs. Columns alternate between using the simple distance (col 1+2, 5+6) and weighted distance measure (col 3+4, 7+8). *Simple Distance* and *Weighted Distance* are described in Section II and Graph 1. All columns include separate lending parent and borrower country fixed effects. Table 2 shows some descriptive statistics, Annex Table 2 gives their precise definitions and Table A3 lists the countries grouped into EMDEs and AEs, respectively. Standard errors in parentheses are clustered by lender parent country with *** p<0.01, ** p<0.05, * p<0.1.

IMI International Monetary Review

Chinese Banks Top Global Peers as Main Lenders to the Gulf

By KARI SOO LINDBERG, MIRETTE MAGDY

The Gulf is fast emerging as part of China's next big financial play, with years of diplomatic overtures now translating into hard cash.

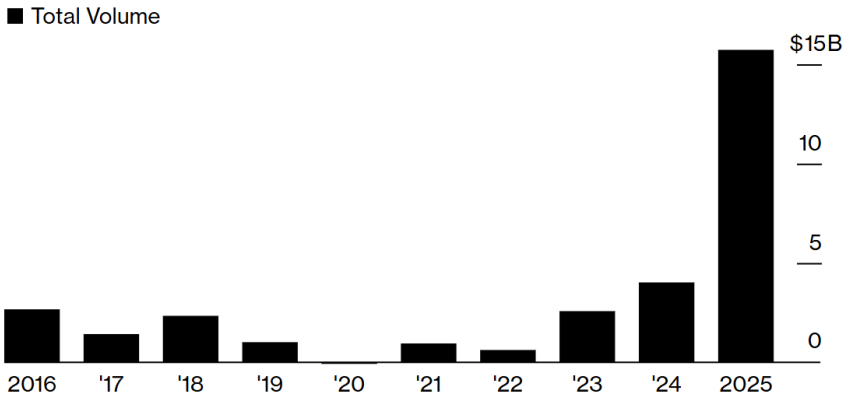
Chinese banks' lending to the region jumped nearly three-fold to a record $15.7 billion in 2025, excluding bilateral loans, with the bulk going into Saudi Arabia and United Arab Emirates, according to Bloomberg-compiled data. In contrast, banks from the US, UK and eurozone together provided only about $4.6 billion to the Gulf last year, the data showed.

China's appetite extends beyond loans. Already this year, Saudi Arabia raised $11.5 billion through a dollar bond sale, with major Chinese banks among bookrunners for the deal.

In another measure of the deepening ties, the chairman of a major Chinese bank made a rare visit to Riyadh, Dubai and Abu Dhabi last year, while another senior executive traveled to the Gulf three times in 2025 — a first in their career, according to people familiar with those trips. Both had one goal in mind: to capture financing opportunities fueled by deepening ties and rising capital flows between China and the Middle East.

Chinese Banks Lent Record Amounts to the Gulf in 2025

The Asian nation's financial firms participated in 12 deals last year



Source: Bloomberg

This strengthening of relations reflect both geopolitics and economics. As competition with the US intensifies, Chinese banks are diversifying away from American markets, while supporting domestic companies expanding into the Gulf — a region rich in oil and wealth.

For Saudi Arabia, this liquidity will help fund its $2 trillion economic transformation plan at a time when low oil prices have pushed the kingdom's budget into deficit. The UAE, meanwhile, is channeling funds into infrastructure as it positions itself as a global hub for artificial intelligence.

"It's an incredible marriage of convenience," said Vasuki Shastry, a Dubai-based senior adviser at geopolitical risk firm Gatehouse Advisory Partners. "The Gulf countries are eager to learn from China and at the same time, they want access to capital."

Still, Saudi Arabia and the UAE are likely to remain cautious about opening sensitive sectors — particularly artificial intelligence and defense — to Chinese banks, wary of straining ties with Washington that have enabled them to make progress on both fronts. Last year, the US approved the sale of advanced AI semiconductor chips to both countries, bolstering their high-tech ambitions, while also authorizing an estimated $3.5 billion weapons deal for Saudi Arabia.

The UAE and Saudi Arabia are also among countries that have made hundreds of billions of dollars in investment pledges to the US, though questions have been raised about those commitments.

Trade Expansion

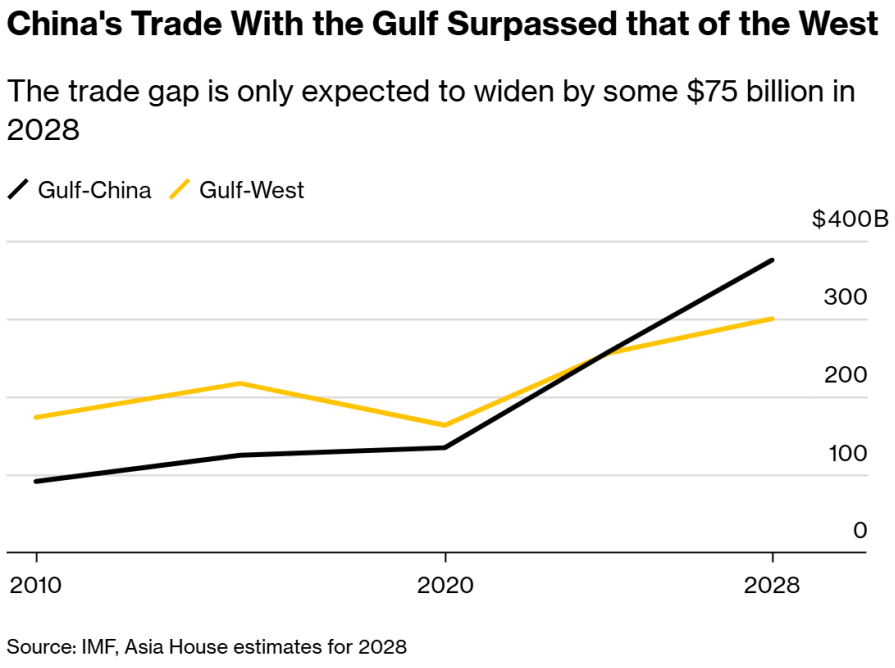
China is growing its financial footprint during an era of disruption in global trade as the tariff war started by US President Donald Trump reshapes commerce. Just as the world's biggest manufacturing nation has started to export more to the Gulf, it's also ramped up purchases of oil after Saudi Arabia cut prices to their lowest in five years.

In 2024, China overtook the West as the Gulf's largest trading partner, with volumes hitting $257 billion — a historic milestone, according to a November report from think tank, Asia House. That figure could rise to $375 billion in 2028, the report said.

Gulf borrowers are also increasingly seeking financing in Chinese yuan to facilitate trade. Last year, the government of one of the emirates that make up the UAE secured its first-ever 1.78 billion-yuan ($255 million) syndicated loan, according to people familiar with the matter. Saudi National Bank and Abu Dhabi National Oil Co. are also considering so-called dim sum bonds, while Arab Energy Fund plans to raise panda notes of as much as 10 billion yuan.

Dim sum and panda bonds are both denominated in Chinese yuan. The former is issued offshore to international investors, while the latter is launched within China by foreign entities, primarily targeting the domestic market.

These developments have prompted repeated trips by Chinese bankers to strengthen cooperation with regional counterparts, according to at least half a dozen bankers who spoke to Bloomberg News on the condition of anonymity. These visits are also driven by their need to drum up more business overseas to offset strains at home, where a prolonged property crisis has weighed on the financial industry, they said.



At the same time, Chinese lenders are following their clients into the Gulf. Solar firms such as Jinko Solar Co. and TCL Zhonghuan Renewable Energy Technology Co. are planning manufacturing plants in Saudi Arabia, with more set to follow — creating fresh demand for financing.

The growing trade relationship between China and the Gulf, coupled with a rise in Chinese firms setting up factories in the region "gives the ties more substance," said Simon Williams, chief economist for Central & Eastern Europe, Middle East and Africa at HSBC Holdings Plc.

Against that backdrop, Gulf borrowers offer what Chinese banks need: investment-grade deals with relatively low risk but higher yields than comparable Asian credits.

Recent examples include Riyad Bank SJSC, which closed a five-year loan offering a margin of 90 basis points over the benchmark Secured Overnight Financing Rate. In contrast, South Korea's Shinhan Card is paying just 80 basis points on its recent five-year facility. The former entity is rated A1 by Moody's Ratings and A by S&P Global Ratings, while the latter is rated A2 and A-, respectively.

IMI International Monetary Review

The Chinese Economy

China's New Chapter: Rebalancing and Unleashing Market Forces*

By DAN KATZ*

Distinguished guests, ladies, and gentlemen. It's an honor to be here. I want to thank the China Development Forum for inviting me to speak today.

We meet at a time of unrelenting change. The forces reshaping the global economy—in trade, geopolitics, technology, and demographics—are moving faster than at any point in recent history.

However, as recent weeks have shown, this era of rapid change has also been an era of more frequent shocks. And although I had planned to speak today more about change than shocks—and in particular about the historic and rapid rise of China in the global economy—let me first offer some thoughts on recent developments in the Middle East.

The conflict in the Middle East has introduced a significant new source of risk into the global economy, that until recently, had looked reasonably resilient.

The full consequences are still difficult to assess, but we expect these developments to pose complicated trade-offs for policymakers.

Of course, the first line of defense against supply disruptions is prices. Demand should be allowed to adjust to a certain degree to ensure that the marginal uses of energy are the most productive ones.

But understandably, fiscal policy might need to play a role in adjusting to the energy shock. Governments may try to protect households with energy caps and subsidy schemes. This may cushion cost of living pressures in the short run, but these measures are fiscally costly at a time when many government budgets are stretched. And because they suppress price signals, they often prevent an orderly reduction in energy usage and may keep overall energy prices—and demand generally—elevated for longer.

For central banks, the policy environment is particularly challenging. If energy prices remain higher for longer, central banks may have to balance risks to price stability against a downturn in the economy and a potential tightening of financial conditions. Former U.S. President Teddy Roosevelt once said that in moments of decision, the "worst thing you can do is nothing." While this logic might have applied to the combat or high-stakes political situations for which President Roosevelt is famous, it does not apply to central banks facing an energy shock.

Doing nothing is perfectly logical if it is the best available alternative, and for central banks in the current moment, there is very high option value to waiting for now. Central banks with less firmly anchored inflation expectations and that have been struggling with persistently high inflation may need to respond faster. But central banks that were on hold or in the process of gradually adjusting policy can likely afford to take their time and receive additional clarity about the rapidly evolving situation before deciding whether a pivot—either toward a more restrictive stance to address inflation risks or a more accommodative stance to address output risks—is warranted.

Critically, all central banks should articulate their potential reaction functions, including with scenario analysis, to sensitize the market to potential policy paths should risks to inflation and output materialize.

Of course, it is early days, and much could change. But what is clear is that policymakers and businesses alike will need to adapt, underscoring a lesson successive shocks have taught us: that robust policy frameworks and agility are essential. Recent experience has also shown that allowing the private sector to adapt and innovate in response to shocks can enhance the overall resilience of the economy.

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* The article was first published on March 22th, 2026. Remarks by IMF First Deputy Managing Director Dan Katz at the China Development Forum.

* Dan Katz, IMF First Deputy Managing Director.

It is with these lessons in mind that I turn to China. China has proven resilient in the face of massive shocks in past decades, due in part to the adaptability of its private sector. Giving market forces an even greater role going forward could provide a deeper and more durable foundation for that resilience.

China's meteoric rise

Over the past 40 years, China's policymakers engineered one of the most impressive achievements in the history of the global economy.

In 1978, on the eve of the launch of the "reform and opening up" campaign, China had one of the lowest per capita income levels in the world. Skillful, long-term leadership as well as the hard work of the Chinese people powered decades of rapid growth and transformed China into the world's second largest economy. Over 800 million people were lifted out of extreme poverty and the middle class expanded dramatically.

Behind these achievements was a deliberately constructed policy mix that combined both market-oriented reforms and state direction of resources, with a general trend toward a greater role for the private sector. For example, from 1999 to 2015, the share of total industrial revenues of state-holding enterprises went from approximately 50 percent to approximately 20 percent. Yet in recent years, the increased role of the private sector has stalled.

This has coincided with the slowing of China's overall growth amid less efficient resource allocation, declining returns on investment, and demographic pressures. Significant challenges remain, including from deflationary pressures that risk becoming entrenched if domestic demand—and especially consumption—stays weak. Reforms are more important now than ever to foster new engines of growth.

Rebalancing and unleashing the power of market forces

Indeed, China's policymakers recognize these challenges and are taking steps to address them. They adopted a more expansionary fiscal policy stance in 2025 and 2026 and began their anti-involution campaign to reduce over-investment in some industries. Their 15th Five-Year Plan prioritizes increasing consumption as a driver of economic growth, which would also help reduce China's external imbalances.

These are helpful measures, but China can do more to increase consumption and domestic demand—especially for services—by boosting household incomes and reducing incentives for precautionary savings. That means shifting resources away from industrial subsidies and infrastructure and toward social safety net programs and stabilizing the property sector to give citizens the confidence to spend more and save less. It also means shifting the incidence of taxes from already heavily taxed middle-income households toward higher-income households and reducing corporate tax exemptions.

Productivity is another essential part of the reform effort. And here, deeper market-oriented structural reforms are critical. Enabling a greater role for markets to direct resources to areas of greater productivity could be transformative for China's growth and prosperity. We see three pillars of reform that could be particularly impactful.

First, authorities should continue to level the playing field across firms. China has relied heavily on a mix of subsidies, tax breaks, and cheap credit to support priority sectors. These were helpful in some cases to correct market failures and support policy aims like national security, but they have not been costless. IMF estimates suggest that scaling back preferential treatment provided to specific firms and sectors could boost aggregate productivity by over 1 percent, in turn raising China's level of GDP by up to 2 percent. Allowing a more level playing field, where private firms, small and medium enterprises, and even foreign companies can compete fairly is key for innovation and productivity and will generate higher incomes and give consumers more choices. The government's Private Economy Promotion Law is a useful start.

The second pillar is greater reliance on market-based pricing. One of the most important prices in any economy is the cost of capital. It shapes investment decisions and influences where resources flow. In China, the direction of capital toward less-productive borrowers has led to rising debt, weakened financial institutions, and contributed to involution as weaker firms are supported at the expense of stronger and more efficient firms. Market-oriented reforms that enable a larger share of funding to go to more productive enterprises and that reduce incentives for overproduction—by for example, doing away with targets for GDP growth and production in specific sectors—could make better use of Chinese savings. In the property sector, accelerating the exit of unviable developers and allowing greater housing price flexibility would help clear the overhang that has weighed on household and business confidence.

A third pillar is to strengthen the services sector to create more durable economic growth. The Chinese service sector overall is significantly smaller than other major economies, and with China already accounting for approximately 30 percent of global manufacturing output, the service sector has much more room to grow. Indeed, total factor productivity in market services in China is already growing faster than in

manufacturing. With less regulation and by allowing the market to play a much larger role, other sectors in the service economy could grow faster, including healthcare, education, and professional and technical services, which would durably raise productivity.

China's next chapter

Market forces are the key to unlocking the next phase of China's economic growth. The state's role will need to evolve. Rather than directing investment toward specific industries, government should instead build the conditions that enable private sector innovation and market forces to direct China's immense resources to where they can generate the most value.

This transition would be good for China, and in a rapidly changing and shock-prone world that needs durable sources of dynamism and stability, it would be good for us all.

Thank you very much.

How China's Economy Can Pivot to Consumption-Led Growth*

By SONALI JAIN-CHANDRA, SIDDHARTH KOTHARI, DANIEL GARCIA-MACIA, YIZHI XU *

More forceful macroeconomic stimulus, stronger social protection, and fiscal support for the property sector can help boost domestic demand, especially consumption

China's economy has proved resilient in the face of multiple shocks, boosted by robust exports and fiscal stimulus, and it remains a major driver of global growth.

The economy expanded by 5 percent in 2025, and we project 4.5 percent growth this year, up 0.3 percentage points from our October forecast.

Despite this resilience, the growth model of the world's second-largest economy faces increasing challenges. Domestic demand has been subdued, in part because the protracted property slump, combined with a weak social safety net, hurt consumers' willingness to spend.

This has resulted in deflationary pressures and has made growth increasingly dependent on external demand. Yet China cannot count on ever higher exports to drive durable growth in the coming years. That makes pivoting to consumption-led growth the overarching policy priority.

China's policymakers recognize these challenges and are taking steps in the right direction. They adopted a more expansionary fiscal policy stance in 2025 that involved targeted social subsidies, and reduced over-investment in some industries, while easing monetary policy. Looking ahead, the 15th Five-Year Plan (2026-30) prioritizes increasing consumption as a driver of economic growth. In addition, a gradually increasing retirement age, building on the 2024 reform, will help reduce the drag from a contracting labor force and boost economic prospects.

These are helpful measures, but China can do more to increase consumption and domestic demand for years to come. A more forceful macroeconomic expansion will be critical. So, too, will be efforts to strengthen social safety nets and support the recovery of the property sector.

Fiscal stimulus

We recommend a comprehensive macroeconomic policy package focused on additional fiscal stimulus, supported by further monetary policy easing and greater exchange rate flexibility. This combination of measures would help lift inflation to a healthy level and raise domestic demand, making the economy less dependent on exports.

At the same time, policymakers will need to change the composition of fiscal spending. This means paring back public investment and industrial policies that support specific industries. Doing so, in turn, would increase productivity by better allocating resources and letting market forces play a bigger role. It would also free up budgetary resources to lift social spending and address the property sector contraction, including by supporting buyers of unfinished housing.

Improved social protection

Fiscal policy should prioritize strengthening social protection to give people confidence to spend more. Think of healthcare, pensions, unemployment benefits, and social assistance. In all these areas, we see scope for increased benefits and broader coverage. This would reduce the need for vulnerable people to save excessively to protect against unexpected shocks or life events. A recent IMF working paper shows that doubling social spending in rural areas can lead to a cumulative increase in consumption over a five-year horizon, reaching 2.4 percentage points of gross domestic product.

Easing household registration requirements will also help. The hukou system classifies residents as urban or rural, effectively excluding migrant workers from rural areas from fully accessing social benefits in large cities. Relaxing hukou requirements can significantly lower saving rates. We estimate that granting urban status to 200 million rural migrants could raise the consumption-to-GDP ratio by an additional 0.6 percentage points.

Finally, making taxes on labor more progressive and strengthening taxes on capital can reduce inequality and increase disposable income for lower-income people who tend to spend more of their income. That would encourage additional consumption.

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* The article was first published on IMF on February 18th, 2026.

* Sonali Jain-Chandra is the IMF mission chief for China. Siddharth Kothari is deputy chief. Daniel Garcia-Macia is a senior economist in the Asia and Pacific Department, where Yizhi Xu is an economist.

Taken together, the IMF's policy recommendations would significantly rebalance the economy toward consumption. They could boost the consumption-to-GDP ratio by about 4 percentage points over five years. Unlocking the potential of the vast domestic market would make growth less dependent on external demand and therefore more resilient.

And let's not forget: with China contributing about 30 percent to global growth, a better-balanced economy also means a stronger and healthier world economy.

Infrastructure Investment Is the Key to China's Growth*

By YU YONGDING*

China's government has now set its growth target for 2026 at 4.5-5%. With China's GDP deflator still in negative territory and ample policy space for more expansionary fiscal and monetary policy, this is achievable, but it will require boosting both consumption and investment spending.

BEIJING—Despite a fraught geopolitical environment and a US-led trade war in 2025, China achieved its growth target of 5%, with GDP reaching CN¥140.19 trillion ($20.4 trillion). The contributions to last year's GDP growth from the three components of aggregate demand—final consumption, capital formation, and net exports—were 52%, 15.3%, and 32.7%, respectively.

Despite the impressive overall growth performance for 2025, the structure of aggregate demand was problematic. Consumption growth, as measured by total retail sales of consumer goods, stood at only 3.7% year on year. Fixed-asset investment, a proxy for capital formation, fell by 3.8%, the second-lowest since the 1980s. Of the three main categories of FAI, manufacturing investment grew by 0.6%, significantly slower than in the year-earlier period, while real-estate investment plummeted by 17.2% and infrastructure investment fell by 2.2%, the first annual decline since statistics became available. Unexpectedly, net exports in 2025 remained as strong as in 2024, registering a trade surplus of CN¥8.5 trillion. In the absence of official data on the share of net exports in GDP at the beginning of 2025, one can reasonably infer that China's net exports grew at a double-digit rate.

China's government has now set its growth target for 2026 at 4.5-5%. This is achievable with China's GDP deflator still in negative territory and ample policy space for more expansionary fiscal and monetary policy. But it will require accelerating the growth of both consumption and investment.

For starters, the Chinese government must build on the relatively successful policies it introduced in recent years to stimulate consumption. These included issuing CN¥300 billion worth of ultra-long-term treasury bonds for a consumer-goods trade-in program, exempting the purchase tax for new-energy vehicles (worth more than CN¥200 billion), and offering hundreds of billions of renminbi in subsidies for vehicle and appliance purchases. The government also increased spending on social-security benefits, including pensions and livelihood programs.

A more serious challenge is the decline in investment. To be sure, investment in high-tech manufacturing was a bright spot, growing by double digits. But it was not enough to offset the continued decline in real-estate investment, which has fallen by more than 10% for three consecutive years. The Chinese government has responded with a series of policies, including purchasing unsold housing units and lowering interest rates on existing mortgages. Nevertheless, it will take longer than expected to stabilize the market and return real-estate investment to positive territory.

The unprecedented fall in infrastructure investment represents the main challenge. Although China has made remarkable progress on infrastructure development, more must be done, including upgrading transportation, energy, water-conservation, and communication networks, and building new frameworks to support an aging society. This will cost an enormous amount of money. For example, over the next five years, China will construct and renovate more than 700,000 kilometers of urban underground pipelines, which alone will require more than CN¥5 trillion.

Given this, and because the Chinese government's "dual circulation" strategy calls for boosting domestic demand while reducing dependence on external demand, policymakers will focus this year on that and rebalancing trade. In terms of short-term macroeconomic management, the more effective solution to both problems is to increase infrastructure investment.

Despite positive results, government efforts to boost consumption were less successful than expected in stimulating GDP growth. This is because household consumption is a function of permanent income. If households are not confident that income gains are permanent and that incomes will continue to rise in the foreseeable future, they are unlikely to increase consumption significantly.

It is a "chicken-or-egg" problem: Higher GDP growth requires stronger consumption, but the latter depends on the former. To break this impasse, policymakers must significantly expand infrastructure

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* Yu Yongding, a former president of the China Society of World Economics and director of the Institute of World Economics and Politics at the Chinese Academy of Social Sciences, served on the Monetary Policy Committee of the People's Bank of China from 2004 to 2006.

investment, which is under the government's discretion and independent of both existing income levels and consumption expenditure. This makes it the most effective way to begin boosting economic growth.

Of course, one could argue that China's consumption stimulus, including direct subsidies and social-security reforms, was not big enough. Last year's package was indeed much smaller than the post-COVID stimulus that the United States introduced in 2021. But one should not forget that US inflation reached a four-decade high of 9.1% in June 2022. By contrast, upping investment in infrastructure is less likely to create inflationary pressure because it increases production capacity in the long run.

Fortunately, China is not facing an inflation threat (though this could change due to external shocks) and still has ample fiscal space, which the government should use to adopt a more expansionary policy, supported by accommodative monetary policy. Many other fiscal authorities have already abandoned adherence to rigid targets, such as Europe's Maastricht criteria; China should do the same. Raising the budget-deficit-to-GDP ratio substantially to finance infrastructure investment would help China establish a more sustainable composition of aggregate demand and, crucially, continue to hit its growth targets.

Global Economy

The Global Economy's Many Chokepoints*

By MICHAEL SPENCE*

In a highly decentralized and competitive network, investors are incentivized to optimize for efficiency rather than for resilience. This dynamic has produced a highly fragile global economy, owing to single points of failure that extend far beyond geographical bottlenecks like the Strait of Hormuz.

Iran's effective closure of the Strait of Hormuz, through which about a fifth of the world's oil and a quarter of its fertilizer passes, has highlighted a well-known vulnerability of our complex networked global economy: a single point of failure can create massive and costly disruptions. Yet such points of failure have been proliferating for decades.

Global trade flows through a number of other critical passages, which could also become disruptive bottlenecks. The Strait of Malacca between Malaysia and the Indonesian island of Sumatra—one of only two sea lanes linking the Indian Ocean to the Pacific—receives much attention in war simulations. When the Suez Canal was blocked for six days by a massive container ship, the Ever Given, in 2021, the disruption reverberated across supply chains for months. The Panama Canal raises similar risks.

Excessive market concentration generates similar vulnerabilities. The dominance of a few Japanese producers of microcontrollers and engine airflow sensors—small but essential components in automaking—meant that, when a massive earthquake and tsunami hit Japan in 2011, the global auto industry contracted sharply.

Such vulnerabilities are somewhat easier to address than those embedded in geography, like the Strait of Hormuz. Since 2011, automakers have diversified their suppliers, built up buffer stocks, and created large data systems that improve transparency in complex supply chains, making it easier to identify hidden single-source risks.

But diversification comes with trade-offs, as the advanced-semiconductor sector is likely to learn. A single Dutch company, ASML, produces all the extreme ultraviolet lithography equipment required to produce the most advanced semiconductors, and only two companies, Taiwan's TSMC and South Korea's Samsung, have the capabilities to produce 2-nanometer semiconductors.

Given the obvious vulnerabilities this creates, governments are now promoting diversification. The United States and the European Union have introduced incentives for TSMC and Samsung to diversify their production geographically, and the US government is backing the development of Intel's advanced-semiconductor capabilities. Meanwhile, China is investing heavily to reduce its dependence on external sources in semiconductor design and fabrication.

But while this approach might increase resilience, the sector can ill afford lower efficiency. The most advanced semiconductors are crucial not only to training generative-AI models, but also to advancing physical-AI applications (such as robotics and autonomous vehicles), which require low latency, high thermal efficiency, low power consumption, and a long battery life. It is not clear that the diversified supply chains currently being built will be able to keep up with demand.

Rare earths represent another notable vulnerability in technology supply chains. A range of critical and strategic products—including electric vehicles, consumer electronics, medical technologies, and advanced military technologies—depend on these essential ingredients, yet China alone controls about 60% of global rare-earth mining and over 90% of processing.

Points of failure characterize the financial sector as well. The US-controlled SWIFT inter-bank messaging system for cross-border transactions is an obvious example.

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* The article was first published on *Project Syndicate* on March 27th, 2026.

* Michael Spence, a Nobel laureate in economics, is Professor Emeritus of Economics and a former dean of the Graduate School of Business at Stanford University.

At the economy level, excessive dependence on any one source for anything—from energy to demand—can generate a point of failure, as Europe learned after Russia's full-scale invasion of Ukraine in 2022. This is true not only because of the risk of an accident or shock, but also because excessive dependence enables extortion or other forms of pressure, exemplified by China's rare-earth export controls, America's enforcement of sanctions via SWIFT, and US President Donald Trump's use of tariffs.

The proliferation of points of failure has to do with the global economy's design and incentives. In a highly decentralized and competitive network, investors are more motivated to optimize for efficiency (the benefits of which are appropriable, meaning they accrue largely to the investor) than for resilience (the benefits of which are spread across the network). When there are many investors, none has an incentive to internalize the costs of balancing efficiency and resilience.

Networks with a greater concentration of ownership are more likely to optimize for resilience. Three companies (Alcatel Submarine Networks, SubCom, and NEC) supply and maintain 87% of the vast global network of undersea fiber-optic cables, which convey over 95% of international data traffic, including payments and other financial transactions. These "architects" have a powerful incentive to build resilience into the system, such as by increasing the number of cables, spreading out landing points, ensuring wide dispersion, implementing looped designs, using internet protocols for seamless rerouting around blockages, and including spare capacity. After all, resilience is part of the package they are selling.

The same is true in the auto sector, where large players like Toyota control a sufficiently large chunk of the supply chain to benefit from optimizing for both cost and resilience. For the internet, it was the US government that acted as the primary architect, ensuring, for example, that embedded protocols automatically reroute traffic around blockages. In fact, large national economies are important players because, to some extent, they internalize and aggregate the benefits of resilience across a range of small private-sector players.

When markets undersupply resilience, countries become important players in delivering it. To this end, they have a few options. They can go it alone, such as by "onshoring" the production of critical goods like semiconductors. They can increase international cooperation—for example, by forming a coalition to maximize alternative sourcing of rare earths. Or they can pursue some combination of the two. A crude rule of thumb might be that cooperation is less expensive than onshoring, more effective in principle, and in certain cases, essential—but much harder to achieve.

Whatever approach countries choose, eliminating or mitigating points of failure will be expensive. But, at a time of growing fragmentation and deteriorating cooperative, it is a cost they will have to bear.

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Incremental Outcomes of the Trade Talks Expected as New Equilibrium Emerges*

By XU YING*

When the sixth round of Sino-American trade consultations convenes in France this spring, it will mark an unusual milestone. After years of tariff battles, technological embargoes, and diplomatic theatrics, the world's two largest economies have settled into something resembling a working rhythm. The turbulence that once defined their economic relationship has not disappeared, but it has been channeled into a more structured relationship—one that resembles managed rivalry rather than outright confrontation.

The past year of negotiations illustrates this shift. Since May 2025, Chinese and American officials have met five times, from Geneva to Kuala Lumpur, gradually assembling a framework for regular dialogue. The first meeting produced a fragile tariff truce. Subsequent rounds extended the ceasefire and explored mechanisms for stabilizing the relationship. By the time negotiators gathered in Madrid, and later in Kuala Lumpur, the talks had begun to address more complex questions, including digital governance, investment barriers, and sector-specific cooperation.

The achievement of these discussions is modest, but meaningful. Instead of lurching from crisis to crisis, the two countries now possess a channel through which disputes can be managed. Tariff suspensions have been extended, some restrictions have been softened, and cooperation has resumed in areas such as agricultural trade and anti-narcotics enforcement. These developments have restored a measure of predictability to global markets, which remain deeply sensitive to fluctuations in the Sino-American relationship.

Yet, the progress should not be mistaken for reconciliation. Even as negotiations continued, Washington introduced new export restrictions and expanded investigations under Section 301 of the Trade Act. These moves reveal the underlying contradiction of American trade policy: a willingness to negotiate tactical compromises while maintaining a broader strategy of technological containment.

This tension reflects a deeper transformation in the global economic order. For decades, economic integration between China and the United States was guided primarily by efficiency. Production gravitated to where it was cheapest, supply chains stretched across continents, and political concerns were often subordinated to commercial logic. That era is fading. Today, economic policy is increasingly shaped by considerations of security, resilience, and geopolitical hurdles.

China's newly launched 15th Five-Year Plan (2026-30) underscores this shift. The plan promises to eliminate remaining restrictions on foreign investment in manufacturing and to expand market access in services ranging from healthcare to education. It also proposes new frameworks for cross-border data flows and regulatory alignment with international trade standards.

These initiatives are designed partly to reassure foreign investors that China remains committed to integration with the global economy. At the same time, the plan highlights priorities such as technological self-reliance, green development, and domestic demand expansion. In practice, this means China seeks a delicate balance—deeper openness in selected sectors, alongside stronger domestic capacity in strategic technologies.

For American companies, the opportunities are evident. China's vast consumer market, especially in services and green technology, continues to expand. The liberalization of sectors such as healthcare, finance, and tourism could create new avenues for foreign participation. In theory, this provides a basis for pragmatic cooperation between the two economies.

In reality, however, structural obstacles remain formidable. The most obvious is technology. Washington's restrictions on semiconductor exports—backed by the CHIPS and Science Act—aim to slow China's progress in advanced computing and artificial intelligence. Beijing, in turn, has accelerated efforts to develop domestic alternatives and diversify supply chains. The result is a partial technological decoupling.

American efforts to rebuild domestic semiconductor manufacturing have proven expensive, as constructing advanced fabrication plants in the United States costs significantly more than in Asia. Meanwhile, China continues to expand its own chip production capacity, particularly in mature

* The article was first published on *China Daily* on March 15th, 2026.
* Xu Ying is a Beijing-based commentator.

manufacturing processes. The outcome may be less a clean separation than a fragmented global industry operating across parallel technological ecosystems.

Protectionist instincts in Washington extend beyond technology. The latest wave of Section 301 investigations not only targets China, but also a wide range of trading partners accused of contributing to global industrial overcapacity. This expansion suggests that America's trade disputes are no longer confined to strategic rivals—they increasingly reflect a broader domestic anxiety about manufacturing decline.

Yet, the effectiveness of tariffs as a remedy remains doubtful. Studies repeatedly show that the bulk of tariff costs are borne by American importers and consumers. Higher import prices ripple through supply chains, raising production costs and fueling inflationary pressures. For an economy already grappling with slowing industrial growth, such policies risk compounding existing weaknesses.

The global consequences are equally significant. As major powers reshape their economic relationships, supply chains are fragmenting and regional trade blocs are gaining prominence. At the same time, China is strengthening economic ties with Southeast Asia and other developing regions through trade agreements and infrastructure projects.

However, this reconfiguration does not amount to a wholesale retreat from globalization. Rather, it represents a shift toward a more complex and politically mediated form of economic integration. Supply chains are becoming shorter, more diversified, and increasingly influenced by strategic calculations.

Against this backdrop, the upcoming round of trade talks in France will likely focus on a handful of practical issues. Tariff suspensions may be extended once again. Negotiators could explore limited cooperation in semiconductor supply chains, particularly for mature technologies. Discussions on cross-border data governance and digital platforms are also expected to be featured prominently.

While none of these topics is likely to produce dramatic breakthroughs—the structural relationship between the two countries is simply too entrenched—incremental progress remains valuable. By maintaining a dialogue, both sides reduce the risk that economic tensions escalate into full-scale confrontation.

For global markets, this incrementalism may be the most realistic outcome. Businesses and investors have already begun adapting to a world in which Sino-American relations are neither fully cooperative, nor entirely hostile. Supply chains are being diversified, investment strategies recalibrated, and technological partnerships reconsidered.

In this sense, the sixth round of negotiations symbolizes something larger than a routine diplomatic engagement. It reflects the emergence of a new equilibrium in international economics—one in which relationships are carefully managed, and where cooperation survives within limits.

The relationship between China and the United States will continue to oscillate between friction and accommodation, but—as the past year of negotiations demonstrates—even strategic rivals can recognize the mutual benefits of stability. In a fragile global economy, that may be the most important outcome of all.

The views don't necessarily reflect those of China Daily.

Global Economy Shakes off Tariff Shock Amid Tech-Driven Boom*

By TOBIAS ADRIAN*

But risks are rising, including from the concentration of tech investment and the negative effects of trade disruptions, which may build over time

Global economic growth continues to show notable resilience despite significant US-led trade disruptions and heightened uncertainty. Our latest projections indicate that global growth will hold steady at 3.3 percent this year, an upward revision of 0.2 percentage points compared to October estimates, with most of the improvement accounted for by the United States and China. Remarkably, current projections are broadly unchanged from a year earlier, as the global economy shakes off the immediate impact of the tariff shock.

This surprising strength reflects a confluence of factors, including easing trade tensions, higher-than-expected fiscal stimulus, accommodative financial conditions, the agility of the private sector in mitigating trade disruptions and improved policy frameworks especially in emerging market economies.

Another key driver of this resilience is the continued surge in investment in the information technology sector—especially in artificial intelligence. While manufacturing activity remains subdued, IT investment as a share of US economic output has surged to the highest level since 2001, providing a major boost to overall business investment and activity. Although this IT surge has been concentrated in the United States, it is also generating positive spillovers globally, most notably to Asia's technology exports.

Financial conditions fuel expansion

The IT investment boom reflects businesses and markets' optimism about the transformative potential of recent tech innovations—in automation and AI—to deliver sizable productivity gains and to lift profits. Since late 2022, coinciding with the introduction of the first widely used generative-AI tools, stock prices have risen sharply.

Favorable financial conditions and robust earnings have supported rising stock prices and helped fund new capital spending. But as the expansion accelerates, debt financing is becoming more prevalent, increasing leverage. This shift introduces notable risks: higher leverage could amplify shocks if returns fail to materialize, or if broader financial conditions tighten, adversely impacting firms and raising concerns about spillovers to the broader financial system.

Moreover, profitability could become sensitive to assumptions around depreciation schedules for advanced processors. Frequent equipment upgrades will squeeze profit margins, weigh on earnings, and require significant additional debt financing. These factors underscore the importance of monitoring leverage accumulation and its potential to amplify vulnerabilities.

Lessons from the dot-com era

The comparison with the dot-com boom of 1995-2000 is instructive. Even though IT investment as a share of gross domestic product is broadly similar to levels then, the recent rise has been more gradual, accelerating markedly only last year. Furthermore, while market valuations relative to economic output have expanded at a similar pace in both episodes, the rise in price-earnings ratios has been more modest in the current boom given more robust earnings.

Overall, our analysis suggests that potential overvaluation for the broad equity index in the United States is only about half that of the dot-com episode. That said, the overall vulnerability of global macroeconomic growth to a repricing of technology stocks may be substantial for three reasons.

First, rising stock prices over the past few years have been driven predominantly by the technology sector, in particular AI-related stocks, and this narrow group has become a major driver of the index. Second, many critical AI-related firms are not currently listed on stock markets. Their debt borrowings could have consequences that were not seen during the dot-com era. Third, market capitalization is now much higher relative to output, from 132 percent in 2001 to 226 percent now for the United States; so even a more modest correction could have a sizable effect on overall consumption.

Risks to the outlook

* The article was first published on IMF on January 19th, 2026.

* Tobias Adrian is the Financial Counsellor and Director of the IMF's Monetary and Capital Markets Department.

Looking ahead, the current tech boom raises important upside and downside risks for the global economy. On the upside, AI could start to deliver on its productivity promises, raising US and global activity by 0.3 percent this year, relative to the baseline.

On the downside, AI firms could fail to deliver earnings commensurate with their lofty valuations, and investor sentiment could sour. For reference, a scenario in our October 2025 World Economic Outlook—which included a moderate correction in AI stock valuations with a tightening of financial conditions—reduces global growth by 0.4 percent relative to the baseline. This could have far-reaching consequences if real investment in technology sectors declines more sharply, triggering a costly reallocation of capital and labor. Combined with lower-than-expected total factor productivity gains, and a more significant correction in equity markets, global output losses could increase further, concentrated in tech-heavy regions such as the United States and Asia.

Given the decade-long increase in foreign ownership of US equities, this sharp correction could also trigger sizable wealth losses outside the United States and exert a drag on consumption, spreading the downturn more globally. Even economies that have little exposure to technology, including many high-debt and low-income countries, would be buffeted by negative external demand spillovers and higher external borrowing costs.

Such downside risks arise at a time of heightened geopolitical uncertainty, increased use of export controls on critical inputs and trade-related restraints, and eroded fiscal space in many countries. This could interact with any reassessment of AI-related productivity growth and repricing of risky asset valuations in a self-reinforcing manner.

Policy for stability, discipline, inclusion

With asset valuations stretched, debt financing on the rise, and uncertainty elevated, strong prudential oversight is essential to safeguard financial stability. Supervision and regulation should ensure robust underwriting standards by banks and nonbanks especially those exposed to the technology sector. Internationally agreed standards on bank capital and liquidity should be adhered to. Policymakers must be ready to deploy contingency plans for diverse risks.

Monetary policy faces a delicate balancing act. If the tech boom continues, it may push real neutral interest rates higher—as occurred during the dot-com era—calling for a monetary policy tightening. This would contract fiscal space, especially in countries that do not get a growth boost from AI.

Should the downside scenario materialize, the rapid decline in aggregate demand will call for a speedy reduction in policy rates.

Proper diagnosis and calibration of the monetary policy to achieve price stability requires that central banks operate within their mandate. Central bank independence remains paramount for monetary and financial stability and economic growth, protecting the credibility of monetary policy and anchoring inflation expectations.

On the fiscal side, governments should renew efforts to reduce public debt and restore fiscal space where needed.

AI's uneven impact on workers is another important consideration. While innovation drives growth, it risks displacing jobs and depressing wages for certain segments of the workforce. Policies should focus on lowering barriers to adoption, helping workers to invest in the right skills, supporting job mobility through targeted programs, and maintaining competitive markets to facilitate entry and ensure that innovation benefits are broadly shared.

Balancing act

Global growth has been impressively resilient amid trade disruptions, but this masks underlying fragilities tied to the concentration of investment in the tech sector. And the negative growth effects of trade disruptions are likely to build up over time.

AI-driven investment offers transformative potential—but also introduces financial and structural risks that demand vigilance. The challenge for policymakers and investors alike is to balance optimism with prudence, ensuring that today's tech surge translates into sustainable, inclusive growth rather than another boom-bust cycle. This is especially relevant in an environment marked by intensifying geopolitical strains and growing threats to institutional frameworks which make the implementation of good policies more challenging.

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Coping and Thriving in a Fluid World*

By KRISTALINA GEORGIEVA*

Good afternoon. I want to applaud Japan's Ministry of Finance for convening this important and timely discussion.

The topic of the symposium, "The Future of the Global Economy in a Fluid International Economic and Monetary Order," poses exactly the right question.

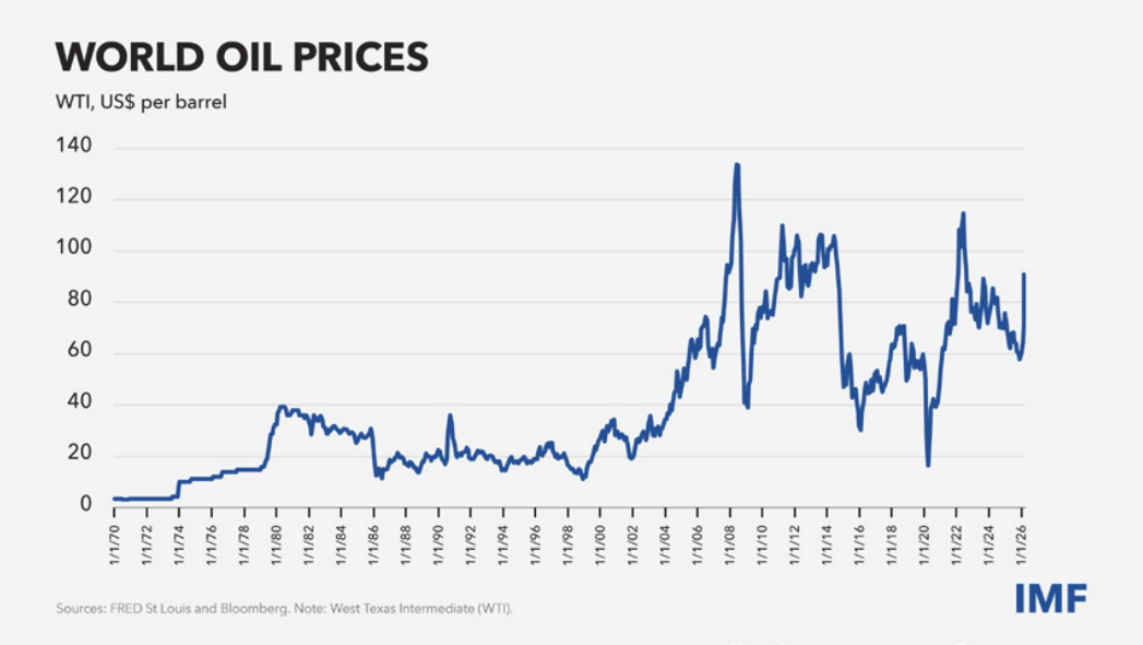
And "fluid" is exactly the right word. The global economy faces deep currents of change—in technology and demographics, in geopolitics and trade, in climate—while also dealing with shock after shock.

During my 6½ years at the helm of the IMF, we have seen Covid, four years of war in Ukraine, a cost-of-living crisis, and much more. The fact that world growth has held up quite well—we currently forecast it at 3.3 percent in 2026 and 3.2 percent in 2027—speaks of remarkable resilience.

But the shocks keep coming. We are seeing resilience tested yet again by the new conflict in the Middle East. Important oil and gas facilities have suffered damage and stoppages; shipping traffic through the Strait of Hormuz has fallen by 90 percent.

For much of Asia and the world, energy security has shot up the list of concerns. If the new conflict proves prolonged, it has clear and obvious potential to affect market sentiment, growth, and inflation, placing new demands on policymakers.

Two facts. One, about a fifth of global oil supply and LNG trade normally transits through the Strait of Hormuz. This includes almost half of Asia's oil imports and about one-quarter of its LNG imports. For Japan, the figures are almost 60 percent of oil imports and 11 percent of LNG imports. And two, world oil prices are up nearly 50 percent since December, while Asia and Europe face steep increases in gas prices.



As a rule of thumb, we see every 10 percent increase in oil prices—if persistent through most of this year—resulting in a 40 basis point increase in global headline inflation and a 0.1-0.2 percent fall in global output.

We are collecting data, analyzing it, and assessing the potential impact on our member countries. Everyone can expect the IMF's careful analysis very soon, in our upcoming World Economic Outlook.

And if, as we all hope, the conflict ends soon, then be sure that, before long, some new shock will come. My advice to policymakers everywhere in this new global environment? Think of the unthinkable and prepare for it.

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* The article was first published on IMF on March 9th, 2026. Keynote Speech by IMF Managing Director Kristalina Georgiev at Japan's Ministry of Finance's "Future of the Global Economy amid a Fluid International Economic and Monetary Order" Symposium in Tokyo, Japan.

* Kristalina Georgieva, IMF Managing Director.

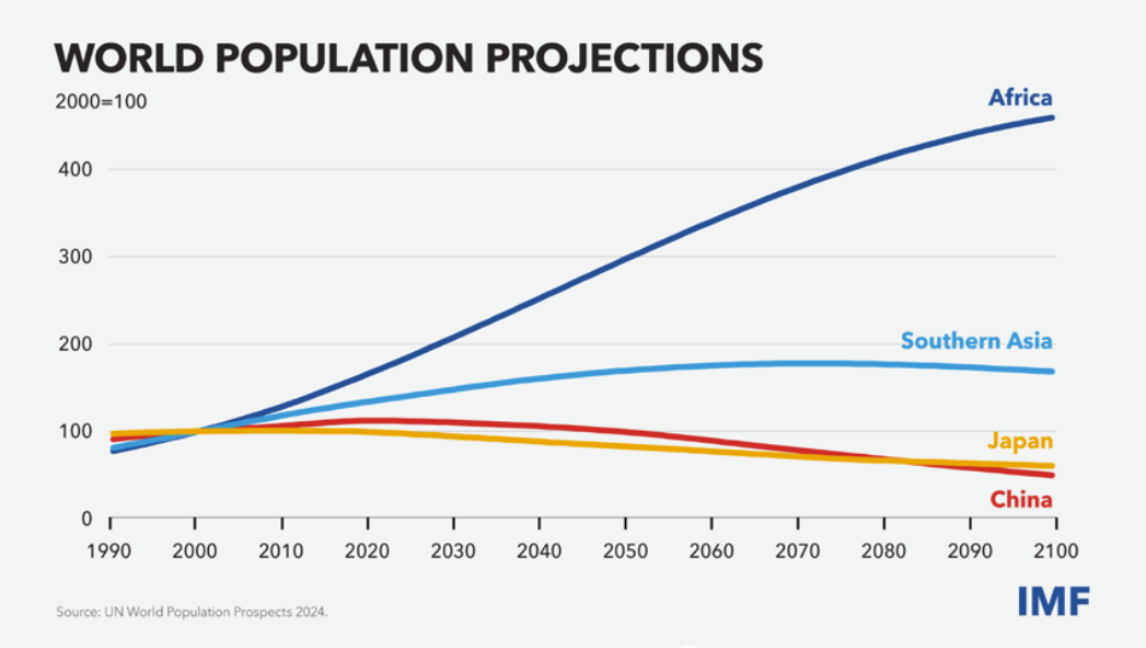
Yes, but how? By focusing on what you can control. Three pieces of advice. One, invest in strong institutions and policy frameworks to underpin strong economies and private sector-led growth. Two, use policy space when needed and be sure to replenish it. Three—above all—be agile.

First: on institutions and policy frameworks. One core role for public authorities is to provide a guiding hand—ensuring forward-leaning, economy-wide responses to transformative forces; regulating wisely, not unduly; and providing the institutional bedrock for the private sector to flourish. As most emerging market economies have learned in recent years, it pays off—in better growth and inflation outcomes—to have independent central banks, fiscal rules, and other policy frameworks.

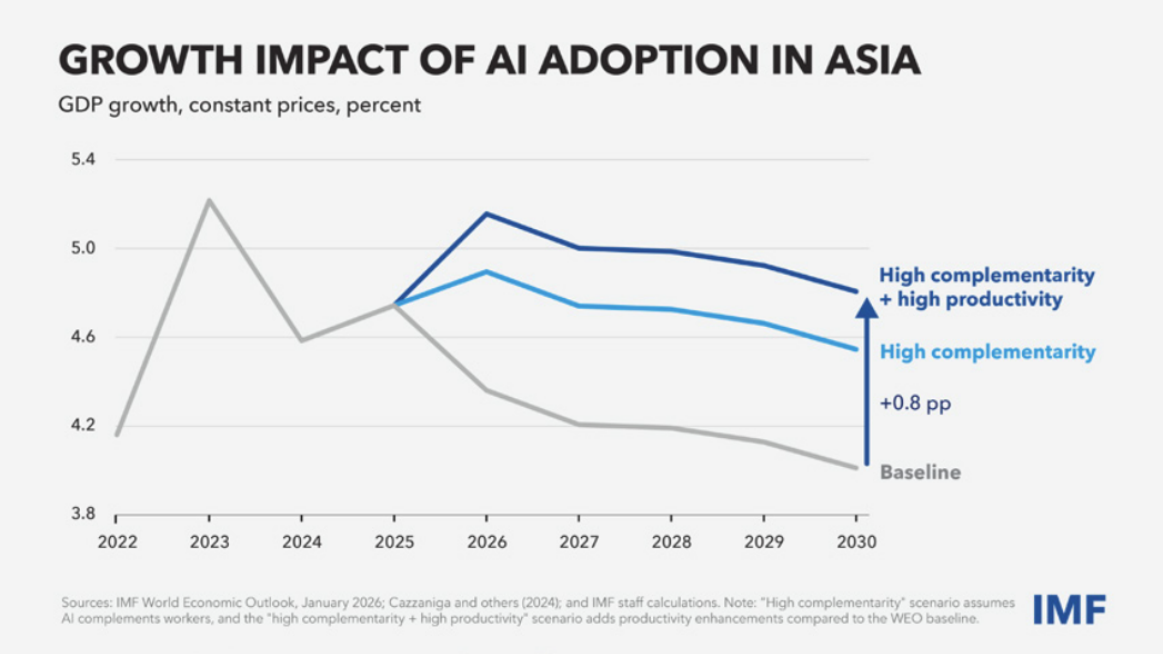
This helps economies navigate change, manage risks, and seize opportunity.

Take the example of the twin transformations of AI and demographics as they fundamentally reshape job markets. AI has vast potential to raise productivity, but also to eliminate old jobs and create new ones—harnessing it to improve overall welfare will require careful policymaking.

Demographics, in turn, leave us in a multi-speed world: aging societies in need of more labor force participation and more automation; and youthful, rapidly growing populations in need of jobs.



In Asia, we estimate AI could boost annual growth by up to 0.8 percentage points over the medium term. For Japan, this is fantastic news. Having for long been at the forefront in automation, Japan now seeks the largest possible productivity boost from AI, including by maximizing its workforce adaptability. It is leading the way in navigating the change brought about by the twin transformations of demographics and AI, supported by its strong institutional foundations.



Let me turn to the second element for coping with this fluid world: financial buffers, which provide both governments and firms with room for maneuver.

In the private sector, buffers allow firms to compress their profit margins to absorb shocks. In the last 11 months, we have seen such actions by exporters and importers limiting the passthrough of higher tariffs to sales prices, notably in the U.S. market.

In the public sector, buffers allow policymakers to countercyclically cushion the impact of economic shocks, the best example being the global policy response to the pandemic. For this reason, the IMF always advises countries to maintain fiscal space—so it can be used as a policy offset when shocks come and private demand slackens.

Equally, we insist that the ability to pursue countercyclical fiscal policy requires strong commitment to replenishing buffers in the good times—formalized, ideally, in a robust medium-term fiscal framework.

With that, let me move to the third key element for success: agility. Ultimately, buffers are only as good as the uses they are put to.

Generally speaking, the private sector tends to be more agile than governments. We see this in the way trade policy shocks and the forces of geopolitics more broadly are combining to deliver a private sector-led global reconfiguration of trade.

But governments also need to show greater agility in an uncertain and fluid world—seeing not only challenges, but also opportunities. One obvious example: regional integration, especially here in Asia. The EU sees internal trade making up some 60 percent of its total trade; in ASEAN, the figure is closer to 20 percent.

We at the IMF estimate that a push for closer regional trade links within Asia—focused on lowering nontariff barriers—could raise Asian GDP by 1.8 percent, on average, in the long run. This is an opportunity to be seized!

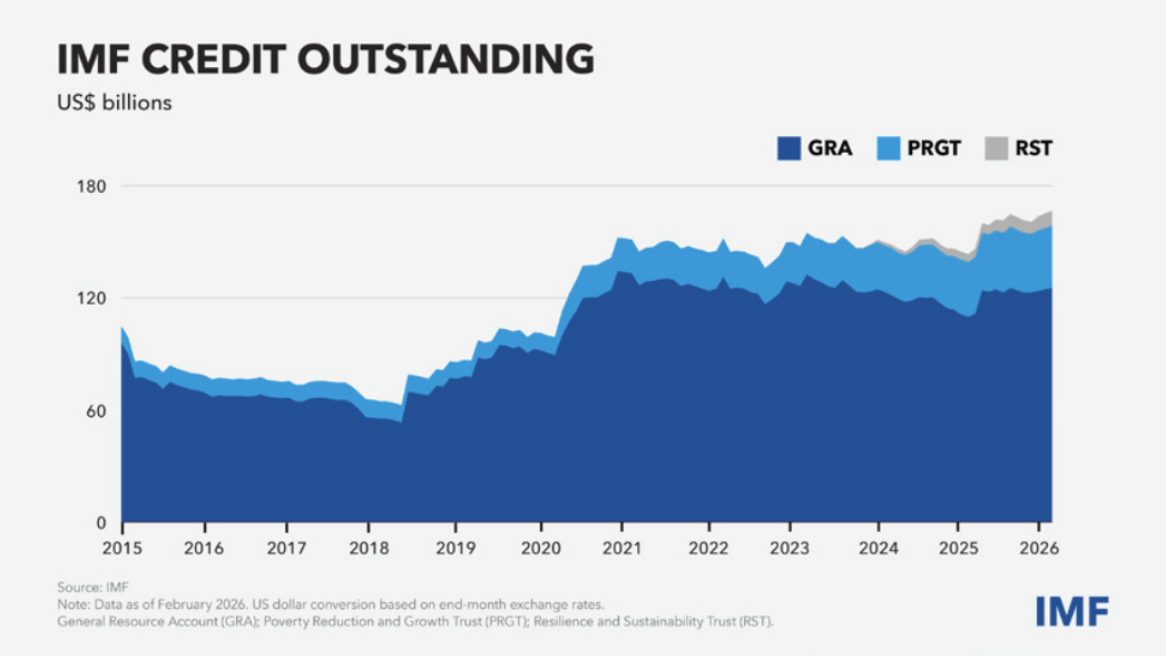
Another example of agility. Central banks have mandates that set their broad direction—be it an inflation target or a currency peg—but, beyond that, must always be attentive to the data in deciding how to use their policy space. Right here in Japan, we are witnessing a central bank nimbly responding to a transition out of prolonged below-target inflation with a series of deft policy decisions.

I salute Japan for its policy sophistication, and I cannot stress enough our appreciation for Japan's constructive contributions as the IMF's second-largest shareholder. For Japan, good policy goes beyond the pursuit of resilience and dynamism at home, to the enlightened promotion of stability and success abroad.

Japan helps us at the IMF deliver on our mandate as guardian of the international monetary system—as protector of stability and jobs—Japan supports the IMF along many dimensions: through its generous support for our capacity development work; its financial contributions to our quota base and concessional lending facilities for low-income countries; its peer review of 190 other IMF member countries' policies at our Board; and much much more.

In an uncertain and fluid world, more countries are needing more of our support. At the IMF, we help our members assemble and adopt strong institutions and policy frameworks, set their direction of travel in light of the global transformations, build and use their buffers, and be agile.

We do this through our surveillance, lending, and capacity development work. Our policy advice acts as a transmission line for best practice. Our capacity development improves the nuts and bolts. And, last but not least, our lending provides a safety net, catching countries that fall and lifting them back up—this last slide shows that we currently have over $165 billion in total credit outstanding. None of this we can do without Japan's leadership, as the largest donor to capacity development and concessional lending!



In closing, let me also recognize Japan's unwavering support for our Regional Office for Asia and the Pacific, right here in Tokyo. It symbolizes Japan's outward-looking view and its commitment to international cooperation. We are truly grateful.

I wish you all an excellent day of discussion, on trade, fiscal policy, and the international monetary system.

Thank you.

Outlook 2026: Foreign Exchange Markets Will Be Less Exciting than in 2025*

By MARK SOBEL*

Last year saw the misguided attempt at a Mar-a-Lago Accord and Liberation Day in the US cause turbulence and a sharp dollar sell-off in global foreign exchange markets. But with the Federal Reserve and European Central Bank approaching or having reached the end of the rate-cutting cycle, foreign exchange trading should be far less exciting in 2026.

Predicting foreign exchange markets is a fool's errand, but it has nonetheless sprouted a cottage industry with analysts even audaciously offering pinpoint numerical forecasts conjuring up the fallacy of false precision. Joining the fray, here are six observations on the foreign exchange outlook for 2026.

1. The dollar overall may be broadly steady to slightly down

The Fed, having already cut 175 basis points, has entered the neutral range. If US inflation proves somewhat sticky near 3%, growth holds up or performs slightly better than in 2025, as many predict, and soft labour markets continue without much higher unemployment, the Fed's scope for rate cuts could prove limited, as the latest dot plot suggested. A new Fed chair may seek to tilt the Fed towards dovishness, but whether that commands a consensus or sows dissension will be closely watched.

Regardless, longer-term rates, especially given US fiscal excesses, will not appreciably follow any decline in short rates. President Donald Trump's unpredictability and poor treatment of allies may further take some shine off the dollar, though market participants are more likely to continue hedging exposures rather than selling the underlying assets.

A pronounced rise in unemployment, however, could be a gamechanger, prompting more-than-expected accommodation from the Fed and driving the dollar down.

2. US/European rate differentials may narrow somewhat, supporting the euro a little

Notwithstanding forecasts for an upturn in growth, the German outlook is uncertain and fiscal support may not come on stream as quickly as expected, only hesitantly lifting protracted stagnation. Modest global growth and China competitiveness will inhibit European exports. France and Italy face fiscal constraints amid low potential growth. A further ECB cut later in the year cannot be precluded, which could also temper any euro upside.

3. The yen could rise slightly against the dollar

The Bank of Japan raised rates by 25 basis points at the end of 2025 and may do so again later in 2026. But yen demand will remain tepid to modest in response. Markets increasingly question—justifiably or not—Japan's fiscal sustainability.

Further, the BoJ will cautiously approach any rate hiking given concerns long-term rates could jump and create frictions with the government due to worries about fiscal costs on Japan's enormous debt. Simply put, macro policy will remain riddled with contradictions. Absent bolder BoJ hiking, if the yen stays 'too weak', Japan will unleash more banal open-mouth operations.

4. The Canadian dollar and Mexican peso may fluctuate narrowly against the dollar

The Canadian economy could pick up in the second half of 2026, prompting a firmer Bank of Canada stance and slightly pushing up the Loonie, notwithstanding oil prices that are likely to be tepid. Mexican macroeconomic policy flexibility remains hamstrung given fiscal restraint and inflation. Renegotiation of the US-Mexico-Canada Agreement—which makes up one-quarter of US trade—could throw a wild card into North American currency pairs.

5. The renminbi should rise modestly against the dollar, but don't confuse nominal with real appreciation

* The article was first published on OMFIF on January 5th, 2025.
* Mark Sobel is US Chair of OMFIF.

The trade-weighted renminbi is woefully undervalued—perhaps by some 20%—reflecting China's massive current account surpluses and deflation. Given anaemic domestic demand and an unwillingness to proactively use fiscal policy to support consumption, China is relying on a weak renminbi to buttress exports, even though doing so doubles down on its distortionary state-led investment growth model and exacerbates global protectionism.

Further, with China facing no inflation, a stable nominal renminbi results in added real appreciation. The renminbi is a managed currency, though facing challenges due to capital outflow. Given these conflicting forces, China will allow modest nominal renminbi appreciation, but preserve its strong real competitiveness.

6. The US may put exchange rates back on the international agenda

Despite Trump's focus on reducing the US trade deficit and resuscitating manufacturing, US deficits will remain high and little changed while the longstanding secular decline in manufacturing is not budging. The administration has not yet zeroed in on exchange rates given Trump 2.0's trade focus and recent efforts to de-escalate trade tensions with China.

But with huge entrenched Chinese surpluses—even if down bilaterally with the US—continuing transshipments, Europe waking up to renminbi weakness and French President Emmanuel Macron emphasising G7 talks on global imbalance, rifts over renminbi undervaluation may return. Similarly, despite Japan's trade deficits, the massive current account surplus and the highly undervalued yen could generate controversy. US Treasury Secretary Scott Bessent has criticised yen weakness. Perhaps the Treasury's Foreign Exchange Reports will find some bite, or Trump 2.0 might wrongheadedly return to currency undervaluation trade cases.

Of course, the administration will find it easier to blame others for large US trade deficits than acknowledge the strong contribution made from America's longstanding fiscal recklessness. Nonetheless, rhetoric aside, expect more calm on major FX markets in 2026. Perhaps hedge funds will have to work hard to beat the market average, let alone earn their 2/20.

Shaping Asia's Future*

By KRISTALINA GEORGIEVA*

A very good morning to all.

Governor Vitai, thank you for co-hosting this conference in the run-up to our Annual Meetings here in Bangkok later in the year.

Having just seen the amazing location for the meetings and knowing the hospitality of the Thai people, I am very excited about coming back in October with all the delegations of our 191 member countries.

At the outset of our proceedings, I also would like to express my gratitude to the government of South Korea for its financial support for this conference.

We gather at a time of global transformations in technology, demographics, trade, and geopolitics; a time of shocks and uncertainty.

This week, global economic resilience is tested yet again by the new conflict in the Middle East. As in all conflicts, I mourn the human suffering and loss of life.

Let me stress that the IMF, as guardian of international economic and financial stability, is watching the events unfold very carefully. We are assessing and quantifying the regional and global economic ramifications, and you will find this reflected in our World Economic Outlook to be published next month.

This conflict, if it proves to be more prolonged, has obvious potential to affect global energy prices, market sentiment, growth, and inflation, placing new demands on policymakers.

For most of Asia, what is at stake is energy security and, through that, confidence. Stock markets are already reacting.

But today let me not discuss this latest shock any further—it is still too soon. Let me simply note that it is emblematic of our new world. For some time now I have been warning our global membership that uncertainty is the new normal. We have not entered some neat global transition from State A to State B; we are in a potentially prolonged period of flux.

In this new world, policymakers and private sector players alike need to have not only robust strategies and financial strength but—importantly—agility. New shocks in different shapes and sizes will keep coming. Most of the time we cannot predict them, but all of the time we must strive to be ready for them.

For Asia, it means building on past successes, asking the right questions, preparing the answers, and then acting on them. No point lamenting forces outside your remit; much better to focus on what is under your own control.

Let me start with Asia's past successes.

Few would dispute that the last quarter century has been Asia's golden hour. A region that, back in the year 2000, was still shaking off the pain of a financial crisis and went on to build new policy frameworks; new systems of financial sector oversight; official reserves; and above all, trust.

The result? Progress on a vast scale. Financial stability. Low inflation. FDI, technology upgrades, and trade. Record-breaking, private sector-led growth. Jobs. Poverty reduction as never seen before, with China and India in particular lifting hundreds of millions of people out of subsistence—just see this figure.

Today, Asia generates two-thirds of global GDP growth and accounts for almost 40 percent of world trade—here two more charts.

No longer is it possible to talk about the future of the global economy without talking about Asia.

Looking back 25 years, Asia has every reason to be proud. And, looking forward 25 years to the year 2050—as this conference will do—we can agree that by and large Asia has created excellent initial conditions for continued success.

So let me now turn to the future, sharing some thoughts on the transformative challenges as they pertain to Asia and how best to address them.

I want to zoom in on three challenges: one, lifting productivity and competitiveness by harnessing AI; two, managing labor market pressures; and three, building resilience and preserving trade as an engine of growth through regional integration.

First challenge: productivity and competitiveness. Across the globe, AI is creating great opportunity. In Asia, we estimate AI could boost annual GDP growth by up to 0.8 percentage points, depending on its productivity impact and how it interacts with labor in the production process.

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* The article was first published on IMF on March 5th, 2026.

* Kristalina Georgieva is IMF Managing Director.

Harnessing the benefits calls for large-scale public and private investment to deliver the technology and, equally, to ensure economies are prepared to receive it—digital infrastructure, internet connectivity, skills enhancement, and more. This in turn requires good policies—to educate and train; to remove undue regulatory barriers; to let firms have a fresh start if appropriate; to deepen stock and bond markets in support of private risk-taking; and to put appropriate AI guardrails in place.

Asia is making an excellent start. Singapore is at the top of our index of AI preparedness. China and Korea lead the way in AI adoption and model design. India is paving a path to democratizing AI at home and abroad. Japan is a seasoned user of AI in robotics. Indonesia, Korea, Malaysia, and Thailand have new out-of-court debt restructuring mechanisms to help struggling firms get back on their feet. My advice: keep it up!

Second challenge: people. New IMF research shows that not everyone will benefit from AI: demand for high- and low-skilled jobs will increase, but many positions in the middle could take a beating. We are particularly concerned about the impact on entry-level jobs—those that often include routine, easy-to-automate tasks—and what it would mean for young people. Adaptable workforces will be key—Singapore's efforts in this regard are at the heart of its AI preparedness. I like to say it's about "learning to learn."

Demographics will compound the challenge, with Asia set to age faster than any other region as we see here.

By 2050, the number of Asians aged 65 or more will have doubled. Yet conditions vary. In Japan, aging is well advanced. China, Korea, and some others are younger on average but aging rapidly. In contrast, India, Bangladesh, and several ASEAN member countries will still see rising young populations for some time. Policy responses need to differentiate accordingly: some must focus on labor force participation, others on job creation.

The forces of technology and aging will come together to put more people in service sector jobs, ranging from AI-enhanced professions to old-age care. Simultaneously, more tasks could be performed virtually. One question that arises is what this will mean for urbanization. In the last 25 years, Asia has seen vast migrations to its cities, delivering positive agglomeration effects. Will these effects continue, or will Asia in 2050 see a more dispersed workforce?

Third challenge: trade. The role of exports and imports as a growth engine for Asia dates back to the 1960s. Yes, it is true that in this multipolar world trade is now being hit by one policy shock after another. And yes, it is therefore also true that openness can be a vulnerability—please look here at the export-to-GDP ratios of a selection of Asian countries.

But we also know from thousands of years of experience that trade is like water: try to obstruct it, and it finds a way to flow around the barrier. We see this in the reconfiguration of global trade today.

In trade, I see an example of an area where Asia can take steps on its own to address the problem. How? By pressing forward with regional integration. IMF analysis suggests a push for closer trade links—focused on lowering nontariff barriers—could on average raise Asian GDP by 1.8 percent in the long run.

Of course, longstanding national rivalries mean integration is not easy, but note that Europe—a continent once marred by war—has done it, building a union that supports domestic demand and delivers strength on the global stage. Let Asia's vision for integration be equally ambitious, aspiring to go beyond trade agreements to building an internal market like the EU's across many countries. It is possible.

The shift to digital services could help advance this agenda. Asia leads the world in mobile broadband subscriptions, giving it a natural advantage in digital payments. Already, ASEAN has created one of the world's most innovative and interconnected cross-border mobile payment networks. These are successes to build on.

Circling back to where I began, we at the IMF plan to spotlight Asia's leading role in digital payment innovations by featuring safe and inclusive digital finance as a key theme at our upcoming Annual Meetings.

Let me wrap up. For the sake of Asia's youth, I hope—I expect—that in 2050 we will see a vastly more interconnected region: energetic, dynamic, and prosperous. One where many more countries will have achieved advanced-economy status, overcoming the famous "middle-income trap."

I wish you all a very successful two days of discussion on what Asia has achieved, the challenges it faces, and how to overcome them. May your deliberations generate an ambitious vision for Asia in 2050 and a set of concrete policy priorities to get there.

Asia: you have performed incredible feats in the last 25 years—please, focus on what is within your power to do, and achieve the same and much more in the next quarter century! The future is yours to take!

Thank you!

Sino-US Talks Can't Erase Differences but Can Bridge Them*

By ZHANG ZHOUXIANG

By March 2026, China and the United States had held six rounds of economic and trade talks, with meetings across the Eurasian continent, reflecting both the complexity of the issues and the two sides' determination to keep talking to resolve their differences.

As Chinese international trade representative Li Chenggang said, the two sides held in-depth, candid, and constructive exchanges; discussed establishing a bilateral working mechanism to promote trade and investment cooperation; and agreed that stable bilateral economic and trade relations benefit both countries and the world.

The latest results, together with those of the five preceding rounds, show that these talks have gradually enhanced mutual understanding and helped both sides find common ground on a number of difficult issues.

In Geneva, London and Stockholm, the two countries agreed to suspend the additional 24 percent tariffs, easing tensions in bilateral trade and sending a reassuring signal to global markets. In Madrid, the two sides reached a basic framework consensus on the TikTok issue. Later, in Kuala Lumpur, they expanded agricultural trade and advanced cooperation on the fentanyl problem. Each of these topics touches on important economic and social interests for both nations, and the progress made on such sensitive matters demonstrates the sincerity of the negotiating teams and their willingness to seek pragmatic solutions.

Perhaps more importantly, these rounds of talks have effectively established a pattern of face-to-face dialogue between China and the United States. The fact that Chinese and US delegations can sit at the same table and discuss issues of shared concern is itself valuable. Direct exchanges help dispel misunderstandings that remote communication often fails to resolve and foster expectations that dialogue will continue.

As the world's two largest economies, it is natural for China and the US to have differences. Yet experience has shown that when two sides sit down and talk, it becomes possible to reach meaningful consensus and practical agreements.

Such a mechanism of sustained in-person consultation is particularly valuable at a time of global turbulence. Conflicts in regions such as the Middle East have pushed oil prices higher and added volatility to energy markets, while many economies are erecting or strengthening trade barriers to protect domestic interests, placing additional pressure on global growth. Against this backdrop, China and the US engaging in candid dialogue sends an encouraging message that both sides recognize the value of cooperation and there is ample space for them to cooperate.

Of course their divergences still exist.

The US has introduced several restrictive measures toward China on trade and the economy. The recent launch of two Section 301 investigations targeting China in particular has raised Beijing's concerns. Li said China's position on Section 301 investigations is consistent: it opposes such unilateral probes.

That's the deeper meaning of continued dialogue: it will not eliminate all differences but can help manage them, reduce uncertainty, and contribute to a more stable global economic environment. That Chinese and US representatives can hold six rounds of talks and reach consensus is a step forward in bridging their differences.

More importantly, whether the world's two largest economies choose cooperation or confrontation will have a profound impact on the global economy. China has consistently been committed to safeguarding the international economic and trade order, and the world hopes the US will move in the same direction to advance the shared interests of both countries and the broader global community.

* The article was first published on *China Daily* on March 16th, 2026.

IMI International Monetary Review

Geo-Economics

Revisit: Gold as a Weapon of War*

By HAROLD JAMES*

Countries have historically turned to gold in periods of instability, and today's environment is no different.

Since the start of 2026, the price of gold has climbed by more than 22%, reaching above $5,000 per troy ounce for the first time. Unpredictable US policy-making and a weakening dollar are leading investors to flock to the safe asset in droves. But this is not a new story: investors have always turned to gold during periods of uncertainty and conflict. This article by Harold James, first published in the July 2025 edition of the OMFIF Bulletin, explains why. Gold has been inextricably linked with conflict since the earliest civilisations. By the 19th century, it had appeared in the global economic system as a weapon, and war was baked into the assumptions that underpinned the great financial revolution of the late 17th century.

The Bank of England was established in 1694, with the parliamentary statute specifying as the only explicit purpose of the Bank 'the carrying on the Warr against France.' When Napoleon established the Banque de France a century later, his motivation was equally clear: the credibility of the bank depended on the setting of strict limits on credit to the government, and the institution was constructed so as to ensure a strict balancing of government and private interest.

Preparing for global conflict

Central banks, and the monetary management they offered, assumed a new significance as Great Power competition intensified. Before the first world war, countries rushed to build up gold reserves that they believed they would need to conduct war effectively. The ability to borrow was crucial, and gold provided a security. Reserves became the key focus of attention and public debate.

The mobilisation of gold for the military had long-term consequences. First, gold became less visible in and after the war. It was no longer carried in pockets; instead it was held by governments. Second, putting gold out of sight meant that confiscation during times of war became easier. That took place in countries and between them.

Third, the management of public debt altered the rules of managing the gold standard. Governments that wanted to return to the gold standard needed to struggle to pay off high debts – governments that did or could not instead resorted to inflation to reduce and often wipe out domestic debt obligations. They still sought credibility, however, in the hope of lowering their borrowing costs. In gold standard countries, debt management thus became the central theme of monetary policy in the 1920s, with increasing complaints about the high amounts paid by governments in interest to holders of government debt.

Gold in the 1930s

Gold shaped policy more and more as security deteriorated, with the implications especially notable in smaller and more vulnerable countries. By the late 1930s, Poland was desperately negotiating for credit, associated with urgently needed military spending, that it could only find in Britain and France. The US was no longer a player to be reckoned with, either in financial or in security terms, but Britain and France too were overstretched.

The prewar notion of the gold standard as a credible commitment mechanism can be applied to the interwar story. Countries that adhered to gold did for a time get better borrowing conditions. But then the international capital market dried up with the Great Depression, and borrowers were faced by creditor runs.

* The article was first published on OMFIF on January 28th, 2026. This article is a shortened version of a lecture given by Harold James at Rutgers University to mark the retirements of Michael Bordo, Hugh Rockoff and Eugene White. It featured in the most recent edition of the OMFIF Bulletin.

* Harold James is Claude and Lore Kelly Professor in European Studies at Princeton University.

Economic historians have often puzzled as to why some countries remained on gold for so long in the Great Depression. The UK benefitted greatly by suspending gold convertibility in September 1931, and the US in April 1933. Suspension allowed a stabilisation of prices and an escape from the deflationary spiral; a new capacity to make autonomous monetary policy saved banks from runs and also helped to ignite consumer spending. Scandinavia rapidly followed the UK's example.

Other countries, however, seemed surprisingly slow to see the allure of giving up gold. Belgium, France, Switzerland and Poland all stayed on. But look at where these countries are on the map: they were neighbours of Nazi Germany. They thought they needed gold as part of their defence, a corollary of the security system that linked France to allies in central-eastern Europe.

As war drew near, the rationale became ever clearer and more pressing. A former head of Bank Polski, Colonel Adam Koc, explained: 'The purpose of gold during war is to serve the defence of the state. It does not play the role that it played during peace when it was the foundation of the Polish currency.'

A move towards globalisation

After 1945, a long period of world peace and steady moves in the direction of more globalisation was built monetarily around the dollar: first in the shape of the Bretton Woods system, then from the 1970s around a de facto dollar standard in which the dominant role of the currency remained astonishingly constant.

Gold became more and more invisible: from 1968, the official gold market, in which gold was still valued at $35 an ounce, was decoupled from the private market. In August 1971, President Richard Nixon closed that official gold window. Effective security provision meant that gold was not needed.

As the 21st century unfolded, suspicions and hostilities mounted, and central bank purchases of gold surged at moments of geopolitical tension: after 2011, and then much more dramatically after 2020. The new emerging economies saw a way to free themselves from the dollar by buying gold. China, India, Kazakhstan, Türkiye and Russia became major purchasers. But Europeans also joined that gold surge.

In 2013, the Bundesbank announced a plan to bring half of Germany's gold reserves back to Frankfurt by 2020, with the result that around 300 tonnes of gold were shipped from New York and 374 tonnes of gold from Paris. In 2015, China dramatically announced that it had increased its gold reserves since 2009 by 60%, to 1,658 tonnes. Russia began large-scale purchases and in 2018 almost caught up with China in terms of gold holdings, with the central bank buying gold from banks that financed expanded Russian gold production.

Post-2008 financial crisis

The dramatic rise in the gold price since the 2008 financial crisis reflects at least two considerations. Gold looked more attractive in a low- or negative interest rate environment, since the cost of holding gold and foregoing interest on reserves declined. And second, the security calculations on the need for a strategic reserve were analogous to those of the 19th century, as was the logic of countries responding to the gold policy of other countries.

When the Czech Republic joined Nato in March 1999 it immediately sold all its gold reserves. The linkage was very clear, membership in a security alliance was a much cheaper way of getting the same assurance. From 2018, the signs were reversed, and gold was great again.

In 2018 Narodowy Bank Polski made a strategic decision to significantly expand its gold reserves, and in 2018-19 bought 125.7 tonnes of gold, more than doubling the gold stock to 228.7 tonnes. A few years later, after Russia's attack on Ukraine threatened Polish security quite directly, President Adam Glapiński explained: 'We have huge gold reserves, we buy them all the time… This makes Poland a more credible country.'

These messages gave an ominous air to an increasingly fearful moment: as in the late 1930s, as the security threat mounted, Poland seemed to need gold. In an unstable world, gold became once more the country's best friend. In April 2021, Magyar Nemzeti Bank tripled its gold holdings from 31.5 tonnes to 95 tonnes. From 2022, the Czech National Bank started to buy gold, and promised to double its holdings to 100 tonnes by 2028.

Gold has a special place in that imaginary, cemented in place by the experience of the first era of globalisation and high imperialism, that reaches well beyond its narrow monetary role. Every country developed its own particular tale.

For Britain gold was a dream, for America a division, and for both over the course of the 20th century it became more and more invisible. The shattering of the gold standard, above all as a consequence of the military conflict, carrying with it the possibility of seizure and confiscation, produced a dramatic reversal. Gold had become a weapon that turned into a fetter: vanity of vanities.

IMI International Monetary Review

The Iran War Has Put Asia on the Brink of an Energy Panic*

By THE ECONOMIST

NOW INTO its second week, the American-Israeli war with Iran has all but stopped seaborne oil exports from the Gulf's big producers. As trading resumed after the weekend the price of Brent crude, the global benchmark, leapt above $100 a barrel. It is up by 37% over the past week. American motorists are already paying over $3.40 for a gallon of petrol on average, around 50 cents more than on February 27th. In Europe prices of natural gas, of which the Gulf normally ships lots in liquefied form, are 64% higher than before the war.

The nastiest effects of the energy shock, however, are being felt in Asia. The Gulf supplies 40-80% of the seaborne crude imports of China, India, Japan and South Korea. It also accounts for nearly a third of China's LNG imports, more than half of India's and much more for some smaller Asian countries. In 2025 Asia absorbed 87% of the crude and 86% of the liquefied natural gas (LNG) transiting via the Strait of Hormuz. Now the strait is blocked and Asia risks running out of fuel, fast. Many governments and firms see a grave threat—and are struggling to respond. The knock-on effects on their economies could be profound.

One way to gauge anxiety is to look at the gap in prices of different grades of crude in different places. The Omani variety—still available in decent volumes because Oman's export terminals sit outside the Gulf—usually trades at a discount to Brent, which is less viscous ("lighter"), less sulphurous ("sweeter") and so easier to refine. Today Omani oil is much dearer than Brent as Asian refiners, whose plants are often set up to process similar grades from Oman and other Gulf producers, vie for dwindling supplies.

Evaporating Gulf supply is leading Asian refiners to look farther afield. After spending months pressing India to stop buying Russian crude, the Trump administration on March 5th gave the country a 30-day waiver to resume purchases. But if President Donald Trump was hoping that the near-record volume of Russian oil floating around the world for want of buyers would plug the gap and ease pressure on global energy prices, the ploy has not worked.

In normal times America's main grade, West Texas Intermediate (WTI), flows mostly to Europe, which outbids Asia for these light and sweet American barrels. Since the war began, Asian buyers have been offering to pay more than Europeans, despite WTI being less well suited for their plants and producing less of their desired output. Chinese ones are now paying $103 a barrel for WTI. It is no longer possible to buy a barrel of any grade in China for less than $100 (except for embargoed Russian and Iranian stuff). A barrel of Omani oil costs over $110.

Surging Asian demand for WTI is reflected in the cost of ferrying it from America's Gulf Coast to China. This has nearly doubled in the past week, in part because one in ten of the world's tankers (excluding those under sanctions) is trapped in the Persian Gulf.

Despite having an enviable 1.3bn barrels of crude in reserves, enough to cover a year of lost Gulf imports, Chinese authorities have ordered big domestic refiners to suspend exports of diesel and petrol. Less well endowed Asian countries such as India, Singapore and South Korea, with 50 days or less in stock, may follow suit.

Many refineries there are reducing output by 10% or more as it is, reckons Kpler, a data provider. The Mangalore MRPL refinery, which accounts for 6% of India's crude-processing capacity, has shut one unit out of three and reportedly declared force majeure on some of its exports (though it denies this). Deeper cuts seem inevitable.

Since these countries are big suppliers of finished fuel to the rest of Asia, fears of shortage are spreading. "Crack spreads"—the measure of Asian refiners' profit margins—for diesel, petrol and jet fuel have rocketed in Singapore, a regional oil-trading hub. Spreads for naphtha, a crucial ingredient in plastics production that Saudi Arabia once supplied in abundance, have also soared. This signals that final customers expect large price rises or shortages and are willing to pay a premium to build up their stocks. Several petrochemical firms have already declared force majeure, citing a lack of raw materials.

The alarm signals in Asia's gas markets are even more acute. Last year LNG from the Gulf accounted for half of India's imports, three-quarters of Bangladesh's and virtually all of Pakistan's. Now not a single LNG

* The article was first published on The Economist on March 8th, 2026.

tanker has exited Hormuz since February 27th. Qatar's main LNG export facility—which normally accounts for 17% of global flows—is offline after being struck by an Iranian drone. On March 6th Saad al-Kaabi, Qatar's energy minister, told the Financial Times it could take "weeks to months" for it to resume deliveries at a normal rate even if the war ends now.

Asian buyers are not waiting to find out if he is right. Last week the profit American LNG exporters stood to pocket by sending cargoes to Asia rather than Europe hit its highest since December 2022, when the loss of Russian gas after Vladimir Putin's invasion of Ukraine triggered a Eurasian bidding war. Now prices for delivery to Asia in May and June are higher than for delivery to Europe, implying that Asian buyers expect the disruption to last at least until the summer. They are now bidding aggressively enough to attract Nigerian cargoes, says Qasim Afghan of Spark Commodities, another data firm.

As with oil, China has Asia's biggest buffers; its LNG stores hold enough to last 19 weeks. Everyone else is in a panic. Asian countries hold weeks of stocks at most, says Natasha Fielding of Argus, a price-reporting agency. Bangladesh, India, Japan, South Korea and Thailand are therefore desperately trying to secure LNG on the spot market, high prices notwithstanding. A few cargoes from America have been rerouted. Asian demand for gas has pushed up freight rates. It now costs $264,000 a day to ferry LNG from the Atlantic basin to Asia, a six-fold increase since February 27th.

At $20 per million British thermal units (mBtu) for May, the Asian spot price for gas remains well below its peak of $70 per mBtu in 2022. But poorer Asian countries are struggling to afford it. Last week tenders issued by Bangladesh and India failed to attract a single seller. Pricey LNG will push those countries, along with Pakistan, to switch to dirtier fuels and curtail power generation and industrial output. In many places LNG is, unusually, already more expensive than fuel oil (per unit of energy), despite surging oil prices. It looks likely to get pricier still, as Europe goes after spot cargoes this summer to restock its unusually low reserves.

Prices for LNG delivered under long-term contracts—which typically cover most Asian imports—are set to soar, too. They are linked to global oil prices. That may force slightly better-off buyers, such as Thailand and Vietnam, to trim purchases. South Korea and Taiwan, more affluent but heavily reliant on Gulf supplies, face either hefty bills or rationing.

China will chug along for a while thanks to its ample stockpiles of oil and gas. But the rest of the region is likely to suffer serious economic consequences. The havoc caused by Russia's invasion of Ukraine cost the euro zone 2.4% of GDP between the third quarter of 2021 and the third quarter of 2022, according to the European Central Bank. Now a part of the world that has for decades powered global economic growth looks perilously close to running on empty.

IMI International Monetary Review

The Gulf's Resilience Faces a New Geopolitical Test*

By YARA AZIZ*

Deeper impacts of conflict will be felt beyond short-term oil price volatility

The Gulf Cooperation Council economies entered 2025 in a position of notable strength. High hydrocarbon revenues, expanding sovereign wealth portfolios and sustained diversification programmes had improved fiscal balances across Saudi Arabia, the United Arab Emirates, Qatar, Kuwait, Bahrain and Oman. Yet the escalation in tensions between Israel and Iran in 2025, followed by a wider regional war in 2026, has exposed the limits of that resilience.

For GCC economies, geopolitical shocks are transmitted not only through oil prices, but also through trade routes, shipping costs, food and industrial input chains, and shifts in investor sentiment. The aftermath of conflict therefore raises a broader economic question: how far can the Gulf's recent economic gains withstand prolonged regional instability?

The region's economic architecture places it at the centre of global energy supply and international capital markets. As the world's largest concentration of hydrocarbon exporters, GCC economies remain deeply embedded in global energy systems even as diversification efforts gather momentum. When tensions rise in the region, markets respond quickly. Oil prices soar as supply risk premiums widen, shipping insurance costs increase and financial markets reprice geopolitical exposure. The immediate effects are visible in commodity markets within days. The more important consequences, however, emerge over a longer horizon.

Immediate effects on energy markets and financial flows

Wars in the Middle East have historically amplified volatility in global energy markets. The Israel-Iran confrontation in 2025 offered a clear example. Israeli strikes on Iranian infrastructure curtailed Iran's oil exports during the conflict, underlining both the fragility of regional supply chains and the sensitivity of global markets to geopolitical risk. Although that episode subsided relatively quickly, it reinforced a structural reality: the Gulf remains the world's most important energy corridor, and disruption in the region carries global macroeconomic consequences.

That vulnerability became more visible in 2026 when the broader war between Israel, Iran and their respective allies triggered a crisis in the Strait of Hormuz. The waterway, situated between Iran and Oman, handles a significant share of global oil and liquefied natural gas trade. Heightened security risks, threats to shipping and repeated disruption to tanker traffic forced energy companies to delay, reroute or suspend shipments. The resulting uncertainty moved rapidly through global energy markets. Brent crude prices climbed above $100 per barrel as supply fears intensified and production shutdowns spread across the Gulf.

Liquefied natural gas markets also tightened, particularly in Europe and Asia, where reliance on Qatari exports remains considerable. Yet for GCC states, this produced a paradox. Higher oil prices would ordinarily strengthen fiscal revenues and improve sovereign balance sheets. In many cases, price spikes generate windfall revenues that can support public investment and diversification. But when higher prices are driven by conflict that threatens export routes and energy infrastructure, the gains are offset by operational risks, shipping delays and logistical constraints.

Financial markets reflected this tension. Sovereign spreads across emerging markets widened as investors reassessed geopolitical exposure. GCC issuers, however, proved more resilient than many peers. Strong external balances, substantial foreign reserves and sizeable sovereign wealth assets provided an important cushion against volatility.

Transmission channels into GCC economies

The economic transmission mechanisms extend beyond commodity prices. The most important channel runs through the Strait of Hormuz itself. Despite efforts to diversify export routes, a large share of Gulf energy exports still passes through this narrow maritime corridor. Saudi Arabia and the UAE possess alternative pipeline routes that reduce reliance on the strait, but these cannot fully replace maritime shipments.

* The article was first published on OMFIF on March 17th, 2026.

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Others, particularly Kuwait, remain even more dependent on the route, leaving export capacity highly exposed to disruption.

The effects have been tangible. Insurance premiums for tanker transit have risen, shipping delays have become more frequent and the risk to regional infrastructure has complicated logistics across global supply chains. The shock is not confined to energy. Disruptions to fertiliser trade, shipping costs and industrial inputs risk feeding through into food prices, a particular concern for highly import-dependent Gulf economies operating under structural water constraints. Even if hostilities ease, damaged infrastructure, reduced shipping confidence and disrupted trade flows can persist.

Another transmission channel runs through fiscal policy and sovereign wealth management. Higher oil prices can temporarily strengthen government revenues across the Gulf, providing room to sustain capital spending, industrial policy and social expenditure. Sovereign funds also play a central role. Institutions such as the Abu Dhabi Investment Authority, the Public Investment Fund and the Qatar Investment Authority can use periods of volatility to preserve liquidity, rebalance portfolios and take advantage of dislocated asset prices abroad.

Medium-term structural implications

Beyond the immediate market reaction, prolonged instability may influence longer-term shifts in global energy markets. Major consuming economies have increasingly sought to diversify supply sources to reduce exposure to disruption in the Gulf. That does not diminish the region's importance. The GCC still holds some of the world's largest and lowest-cost hydrocarbon reserves and remains central to global energy security, particularly for Asia.

Even so, persistent volatility may accelerate efforts by importers to broaden supply networks and reduce dependence on a single corridor. Recent US moves to reopen access to Venezuelan crude after Nicolás Maduro's removal also point in the same direction, underscoring how major importers may seek alternative supply options when instability in the Gulf threatens global flows.

For the GCC, this reinforces the case for diversification at home. Programmes such as Saudi Arabia's Vision 2030 and the UAE's expansion into technology, logistics and renewable energy are not simply growth strategies. They are increasingly part of a resilience strategy. The lesson from 2025 and 2026 is not only that high oil prices can deliver fiscal gains, but that concentrated export dependence remains a structural vulnerability.

Policy considerations for the region

For policy-makers across the GCC, managing the aftermath of regional conflict means balancing short-term fiscal gains against longer-term structural risks. Elevated energy prices may support revenues, but volatility underscores the importance of prudent fiscal frameworks and cautious expenditure planning.

Investment in alternative export infrastructure is one response. Expanding pipeline capacity and strengthening routes that bypass Hormuz would reduce vulnerability over time, even if such measures cannot remove it entirely. Regional co-ordination also matters. Greater co-operation on maritime security, energy infrastructure protection and trade logistics would improve resilience to future disruptions. At the same time, continued investment in non-hydrocarbon sectors remains essential if the region is to reduce its exposure to commodity and transit shocks.

Looking ahead, geopolitical shocks in the Middle East inevitably echo through the global economy. For GCC economies, the immediate consequences appear in energy markets and export logistics, while deeper effects emerge through investment patterns, fiscal strategy and long-term planning. The region's financial buffers provide some insulation against short-term volatility.

Yet the events of 2025 and 2026 have shown that Gulf prosperity remains closely tied to the stability of global energy trade routes. Strengthening diversification, expanding export redundancy and maintaining prudent fiscal management will therefore remain central to the region's long-term economic resilience.

IMI International Monetary Review

Joachim Nagel: Priorities and Challenges for Europe in a Changing World*

By JOACHIM NAGEL*

1 Introduction

Ladies and gentlemen,

I am honored to have the chance to address you here, at the New Year's Reception of the American Chamber of Commerce in Frankfurt. The AmCham has always served as a vital bridge between Germany and the United States, fostering collaboration and understanding between our two nations.

The Mexican novelist Homero Aridjis once said: There are centuries in which nothing happens and years in which centuries pass.1 He had in mind the year 1492, when Columbus discovered the American continent. Today many may have a similar feeling of compressed time, a feeling that our world is rapidly changing. In a certain sense, we are also rediscovering America, an America that behaves differently than in the past. All this is challenging for our economic and political future. We cannot rely on transatlantic cooperation and the rules-based international order to the same extent as before.

In my speech, I would like to highlight economic perspectives for Europe in this new geopolitical reality. How should Europe adapt to these changes? But before I do so, let me briefly touch upon the economic significance of transatlantic relations and outline their current state.

2 Economic dimension of transatlantic relations

Let's look at our trade relationship. The United States is the largest export market for Germany and the European Union. Nearly 20 percent of German exports to non-EU countries go to the United States. The figure is much the same for the European Union as a whole. The relationship is mutual, since the European Union is the largest trading partner of the United States, and Germany alone is among the top five. Notably, the United States stands out as the leading provider of digital technologies such as artificial intelligence, various digital services, and online retail payment solutions to the European Union. This partnership is essential—not just for our individual economies—but for the global economy as well. Combined, the European Union and the United States account for 30 % of global trade and 44 % of global GDP.

Moreover, the mutual stock of direct investment between the European Union and the United States amounted to 5.4 trillion euro in 2023. EU foreign direct investment in the United States is more than five times the size of EU investment in China and India put together. Total US investment in the European Union is even ten times higher than its investment in those two countries.These investments reflect not only the opportunities and advantages presented by economic exchange, but also the mutual trust and collaboration established in the past.

Trust and collaboration have grown on common values, under an umbrella of common security. This is also where institutions like the American Chamber of Commerce in Germany play an indispensable role. By bringing together businesses, policymakers, and civil society, they contribute to maintaining the dense network of personal and professional ties that underpin the transatlantic partnership.

3 Current state of affairs

These days, however, the previously solid ground of the transatlantic partnership values seems shaky. And the umbrella giving us security looks much less durable than before. The US administration seems to be doubting that a strong commitment to the previous form of multilateralism will benefit the country as much as it used to. It has embarked on a tremendous change of course.

What goes around, comes around. The European Union's recent political agenda places significantly more emphasis on Europe's strategic priorities. To be fair, we should also acknowledge that some criticism from the United States is justified. Indeed, the European Union should be willing to address its own weaknesses.

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* The article was first published on BIS on February 25th, 2026. Keynote speech by Dr Joachim Nagel, President of the Deutsche Bundesbank, at the New Year's Reception of AmCham Germany, Frankfurt am Main, 16 February 2026.

* Joachim Nagel, President of the Deutsche Bundesban.

And that process is already underway. The European Union is necessaril—and rightly—rethinking its economic policies. It is adapting to a world that has changed.

4 Priorities for Europe

Despite protectionist headwinds, Europe strongly believes in the benefits of mutual exchange and of open rules-based trade. However, as an economy deeply integrated into global trade and value chains, Europe is greatly affected by geoeconomic fragmentation. This process has contributed to slowing economic growth and decreasing competitiveness over the last couple of years. We in Europe have to take decisive measures to boost our economic dynamics. Such measures should not only aim at securing export markets, but also at exploiting the huge potential of the European internal market. Let me discuss three of them.

First, rules, regulations and bureaucratic costs hamper growth and investment in Europe. With rules and regulations in mind, it is, of course, not their mere existence that causes problems. It is their extraordinary complexity and rigidity. The reports by Enrico Letta and Mario Draghi call for a simplification of regulations in the European Union to enhance the competitiveness of the European economy. 2 Simple, digital solutions that work identically throughout the euro area, that is what businesses and citizens long for as well.

So, we have to simplify the rules. Or at least, Member States need to do their share by implementing these rules as they are instead of gold-plating them. Meanwhile, the European Commission has taken the initiative to streamline regulations and lighten the administrative load. 3 Similarly, financial regulation can be simplified, while maintaining stability. In line with the initiative of the Commission, the Governing Council of the European Central Bank has established a High-Level Task Force dedicated to simplifying financial regulation and banking supervision. I am a member of this Task Force.

Second, we need more investment in our energy and digital infrastructure, especially regarding renewables and artificial intelligence. A stronger common market for energy and artificial intelligence will support resilience and growth. Achieving these objectives will not be possible without more private investment in Europe, which in turn calls for more financing. The Savings and Investments Union is a unique opportunity to meet these needs, and we cannot pass it up.

We have had the single market in the European Union for more than 30 years already, yet a high degree of economic fragmentation still remains. So far, progress on financial integration in the euro area has been particularly limited. This is putting a strain on the EU economy as a whole and, in particular, on the development of young and innovative EU companies. Thus, we can gain a lot by deepening European capital market integration. In particular, high savings in Europe could be better channelled into fostering innovation, productivity and competitiveness. In the past year, the European Union has made significant strides in establishing the Savings and Investments Union, although the process is still in its early stages and many measures are still in the legislative process.

Third, we should channel efforts into supporting the international role of the euro. This includes making Europe more independent in terms of payment systems and solutions. 4 Currently, the Eurosystem is working hard on the introduction of the digital euro—a retail central bank digital currency, or CBDC. This will be the first pan-European retail digital payment solution, based solely on European infrastructures.

Furthermore, we have already accomplished important exploratory work on the possible introduction of a wholesale CBDC. Notably, a wholesale CBDC would allow financial institutions to make programmable payments in central bank money. I also see merit in euro-denominated stablecoins, as they can be used for cross-border payments by individuals and firms at low cost.

Overall, the aforementioned goals—simplification of regulation, advancing the Savings and Investments Union and a stronger international role of the euro—constitute an ambitious programme. However, I regard this programme as essential to successfully overcoming the current challenges.

5 Concluding remarks

Ladies and gentlemen,

Let me conclude. Will 2026 or 2027 be years in which centuries pass, as the novelist Homero Aridjis argued? We do not know yet. I am sure entering into the new geopolitical and geoeconomic reality will be challenging for Europe.

But we in Europe can make use of our strategic strengths: our huge internal market, our single currency, and our strong trade relationships around the globe that are built on mutual trust and cooperation. Despite strong headwinds, Europe is not willing to abandon its commitment to multilateralism.

In my view, we should do what we can on our side to uphold transatlantic cooperation. Irrespective of difficulties, it is crucial that we remain in dialogue, that we seek common solutions. Having been founded in 1903, the American Chamber of Commerce in Germany has already survived several crises in transatlantic

relations—to which Germany has contributed a considerable part. The American Chamber of Commerce in Germany is therefore itself a good example of such dialogue that is maintained even during difficult periods.

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Eurobonds Not the Answer to Europe's Defence Funding Need*

By OTMAR ISSING*

Europe faces a new era in security policy. The Russian war of aggression against Ukraine and an unpredictable transatlantic partnership require a substantial and expensive strengthening of Europe's defence capability. The call for joint European debt has therefore again become louder. Eurobonds appear to some as a quickly available instrument with symbolic power—a sign of European resolve in challenging times.

This issue has been debated at least since 2010. Joint European Union debt is viewed as an all-purpose weapon that seems suitable for every problem. It is seen variously as a method to calm markets, stimulate investments, lower energy prices, strengthen sovereignty and now finance defence. In the end, this is old wine in new bottles.

Strengthening European ability to act in a crisis requires clarification on decision-making and liability. Good decisions are made only by people who are liable for the consequences. This is one of the constituent principles of our market economy. And it also applies to state debt.

Competence over taxes and public spending is a basic right of sovereign states. In the European Union, these decisions remain national matters. If the EU were to finance member states through common bonds, they would no longer be fully responsible for the consequences of their decisions. But the fiscal baselines are highly divergent. This is all the more problematic as public debt is already high. In the euro area it stood at 89% of gross domestic product at the end of last year, 117% in France, 137% in Italy and 147% in Greece. Germany is still in the lower range with 63%.

Where interest rate differences reflect different pressures for reform, attempts to smooth out these variations weaken incentives for sound budget management. Implicit transfers between countries, not decided transparently in parliaments, would be the consequence. If, for example, the impression arises that raising the retirement age in one country finances early retirement in another, this undermines solidarity and can divide Europe.

Rising debt adds to burdens on states' current budgets, especially if increased debt leads to higher interest rates. This puts pressure on central banks to keep interest rates as low as possible. If the central bank submits to this pressure, fiscal policy gains precedence over price stability and fiscal dominance prevails. That is why central banks should have an elementary interest in solid government finances as a condition for price stability.

Clearly, security policy can justify temporary debt expansion. The decisive factor is whether new funding actually flows into new defence capability – or whether it is misused to fill spending gaps elsewhere. Budgetary funds are politically substitutable. So politicians have incentives to use budgets in areas of greatest political return—not necessarily for the original purpose.

The German constitutional 'debt brake' exception for defence, decided in March 2025, illustrates the pitfalls. Germany spent around 1.3 % of GDP on defence before the exception, and the Nato target was 2%. Nevertheless, the threshold was set at 1%, opening potential for higher federal government spending in non-defence fields. Similar substitution effects are evident in European programmes. In the Next Generation EU reconstruction instrument, decided in 2020 in response to the Covid-19 pandemic, funds were partly used for long-planned projects, at most, loosely related to intended objectives.

In addition, there is no transparency in individual nations' debt statistics on the obligations impinging on them from EU debts. This contravenes fundamental transparency requirements.

If common European debt for defence is not to undermine stability principles, conditions would be necessary that seem politically unrealistic to fulfil. European funds should be allocated only for clearly identified projects, approved by a European authority. The funds would need to be subject to permanent monitoring and control. Incorrect usage would have to lead immediately to cancellation and recovery of the money.

Another frequently heard argument for Eurobonds is detached from defence concerns. A major reason for what some regard as the euro's unsatisfactory development as a reserve currency is said to be a lack of secure euro investment opportunities. With a massive issue of Eurobonds, European 'safe assets' could allegedly be made available quickly on a large scale.

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* The article was first published on OMFIF on February 23th, 2026.
* Otmar Issing, a former board member for economics at the Bundesbank and European Central Bank, is honorary president of the Center for financial Studies, Frankfurt. Jens Weidmann, a former Bundesbank president, is chairman of the supervisory board of Commerzbank.

But would additional debt be an appropriate way to create safe investments? German state bonds have hitherto been considered ‘safe assets’ because they are backed by German taxation power. The security of additional European debt would depend on national states’ repayment guarantees—thus affecting the sustainability of German public debt.

In view of rapidly and significantly increasing German national debt due to extensive ‘special funds’, there is only very limited scope for additional ‘safe’ European debts. Ultimately Eurobonds would be anything but ‘safe assets’. And this status would be lost for German bonds too.

True strength requires responsibility. Responsibility requires institutional coherence. Eurobonds to finance higher defence spending will strengthen the EU only if they are embedded in a fundamental reform that secures common decisions in this area and guarantees sustainable public finances through strict budgetary rules. The Stability and Growth Pact no longer meets these requirements, because it has been made far too flexible and is subsequently no longer recognisable. For all these reasons, under present conditions, Eurobonds are not the answer to Europe’s defence financing needs.

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Fallout of Trump's War Will Be Protracted and Foundational*

By MARK SOBEL*

A durably harmed America and more irreparable harm to the rules-based order

Economists are filling the news pages with a consensus view – how sustained the Iran war will be is unknown and until more information is gathered on whether it ends soon or persists, the fallout on oil prices and the economy cannot be readily gauged. That is a fair view insofar as it goes, but it doesn't go far enough. Despite President Donald Trump's declaration that 'very strong talks' are now taking place between the US and Iran, there are good reasons to believe the fallout will be higher for longer and extend far beyond energy prices. Policy-makers should be preparing these longer-lasting contingency scenarios.

The US and Israel have already significantly crippled and demolished Iran's military capabilities. But as many military analysts observe, one cannot decapitate the Iranian regime from the air and the regime has deep tentacles throughout society which make regime change highly unlikely. Assassination of existing leadership may also serve to perversely radicalise and empower hard-liners further.

Though enfeebled, the military and Islamic Revolutionary Guard Corps still have enough munitions to deploy drones and missiles throughout the Middle East and threaten the Straits of Hormuz. Iran has proxies in the Houthis and Hezbollah that can stir up guerilla-like actions and woes throughout the Middle East. These fear factors alone will allow Iran to imperil flows through the Straits not only of oil, but also raise the spectre of snarled supply chains and inflation from other materials such as fertiliser for a while. Iran's neighbours have seen their production capabilities hammered and, in some cases, shut in. Meanwhile, Iranian oil continues to flow through the Straits.

'Unpopular war'

Trump may want to extricate himself from his unpopular war as gas prices in the US surge, inflation concerns rise and Republicans increasingly fret the midterm elections. But even if weakened, Iran's continued ability to wreak havoc throughout the Middle East does not offer an easy face-saving path for him to declare victory and find an off ramp.

And, even if Trump soon pulls out of the war, that doesn't mean Israel stops some of its campaigns nor that Iran suddenly becomes well behaved. In short, the Straits of Hormuz and its surroundings are highly unlikely to soon return to normal activity any time, even if a significant portion of the pre-war average 20m barrels per day oil flows out. An uncertainty and political risk will be embedded. Oil prices will remain elevated – $60 per barrel oil will not be seen again anytime in the future.

The global economic fallout will be more serious than initially thought. Many highly energy-dependent nations in Europe, Asia and Africa will see growth fall and inflation surge. Fiscal positions will worsen. Central banks will have to be vigilant, guarding against second-round effects and perhaps keeping rates higher than otherwise. The fallout, though, will be less for the US. But for the rest of the world, a key question will be whether stagflation returns.

Knocks to world economy

It doesn't stop with oil. Liquified natural gases are up more than oil, which will be a major blow to the European economy. The spread between Brent and West Texas Intermediate oil has widened, proving tough for Europe. The European Central Bank may no longer remain 'in a good place' throughout the year. The Bank of Japan's already excessively accommodative monetary policy is facing more acute risks on the growth and inflation front, exacerbated by a weakening yen. China too is energy-dependent but has built up strong reserves and can fall back on coal.

In the most unfortunate of unintended consequences, the self-inflicted extreme pain facing the Russian economy will be somewhat lessened. It will be able to finance its barbaric war against Ukraine a bit more readily.

Meanwhile, an energy-independent US will be the least economically affected. Growth and inflation could be hit by up to 0.5%, according to many economists. But energy independence and fiscal support will lessen the decline in growth relative to others. The fiscal deficit will worsen – especially because a defence supplemental of up to $200bn is being sought by the Pentagon from the White House. But the US has stopped worrying about red ink, acting like an ostrich with its head in the sand while awaiting a budget crisis down the road. Expectations of a near term Federal Reserve easing have been put on hold.

* The article was first published on OMFIF on March 25th, 2026.

* Mark Sobel is Vice Chair and Chief Economist at OMFIF.

Nonetheless, in other respects, the US is the biggest loser of them all. Trump didn't consult the allies who he is now asking to help out, nor do they view this as a war they support. They trust Trump even less now, if that is imaginable. Despite longstanding transatlantic unity and partnership, they have brutally rebuffed Trump, who is now further enflaming the situation by calling Nato into question. The US is no longer seen by Europe as a trustworthy and reliable partner, and no matter what happens in 2028, there will be no way to fully go back.

The Iran war is sending reverberations throughout the global economy that will take a long time to quell. The damage to the already disturbed foundations of the global rules-based order goes still deeper — with consequences that may well be irreparable.

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Monetary and Fiscal Policy

When Monetary Innovation Makes Money Obsolete*

By OUSMÈNE MANDENG*

Instant financial transactions and the demise of money (at the limit)

Tokenisation promises to make financial transactions effectively instantaneous and frictionless across a broad range of assets. Interest-bearing securities could be converted into money on demand and converted back just as quickly. In such an environment, holding money in advance of payments may no longer be necessary. Money balances would shrink towards zero and, at the limit, disappear altogether. Reducing transaction frictions would therefore not just improve efficiency, it would recalibrate the value of money itself.

In monetary theory, money derives its value not from intrinsic payoff but from the frictions that characterise decentralised exchange. When payments must be settled before receipts are obtained, when assets cannot be instantly converted into purchasing power or when valuation and settlement are costly or uncertain, holding money relaxes a binding constraint on trade. These frictions generate a liquidity premium that makes it rational to hold non-interest-bearing balances despite their opportunity cost.

Friction creates value

This logic is central to cash-in-advance and transactions-cost models. In these frameworks, money is held because converting interest-bearing assets into means of payment is costly or slow. Classic inventory-theoretic approaches, from the Baumol-Tobin model onwards, show that agents optimally carry transaction balances across time to economise on portfolio adjustment costs. Money demand is therefore proportional to the cost or latency of moving resources from the asset market into the payments market. When frictions are large, agents pre-fund purchases by holding money; when frictions are small, they rebalance more frequently and carry smaller idle balances.

When any securities portfolio can be converted into money on demand, without delay, cost or haircut, the cash-in-advance constraint ceases to bind in any meaningful intertemporal sense. Agents no longer need to hold money. Instead, money is obtained just in time for settlement and immediately reconverted into yield-bearing assets. Money continues to exist as a settlement instrument, but only as a transient state within the transaction flow rather than as an asset held across time.

Collapsing transaction costs

A typical transaction would proceed as follows. To acquire an asset, the buyer converts their securities portfolio into money to pay the seller in a delivery-versus-payment transaction. Upon receipt, the seller immediately converts the money into a securities portfolio. Money would exist as a unit of account but no longer be held as a store of value.

In this limit, equilibrium money holdings approach zero even as payment volumes remain large. Required transaction balances are proportional to payment flows multiplied by settlement time; as settlement time tends to zero, the stock of money required to support any finite flow of transactions also tends to zero. Measured velocity therefore becomes unbounded – not because money is irrelevant, but because the same unit of money can intermediate an arbitrarily large volume of transactions when it is recycled almost instantaneously.

Crucially, this does not imply a return to barter. Prices continue to be quoted in a single unit of account and exchange remains organised around centralised valuation rather than bilateral negotiation over asset-specific terms. Instant conversion shifts the complexity of valuation upstream into the pricing and clearing

* The article was first published on OMFIF on January 23th, 2026.
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infrastructure; the buyer's asset is priced in money terms before payment, while the seller receives settlement balances denominated in the unit of account. Assets function as a funding source for transactions, not as objects of exchange.

Bank deposits would compete directly with asset portfolios and interest rates would converge across instruments. At the limit, interest rates could fall materially as the supply of funding overwhelms the supply of investable assets. The traditional boundary between banking and capital markets would increasingly blur.

The opportunity cost of holding money also depends on the level of interest rates. At very low rates, the distinction between holding money and holding assets narrows. At positive rates, however, holding money becomes increasingly costly relative to interest-bearing alternatives, strengthening the incentive to minimise idle balances when conversion is frictionless.

Settlement, not storage

Naturally, a fully frictionless environment remains difficult to achieve in practice. Yet tokenisation moves markets decisively in that direction. If money has largely been an artefact of transaction frictions, then their erosion will cause money balances to shrink dramatically.

The implications are profound. It would in large part change the funding structure of the banking system and hence in large part of the economy. Banks' balance sheets may look more like investment funds. The demise of money may be the next big thing in money innovation.

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Revamping Public Accounting Rules to Spur Investment on Energy, Defence and Resilience*

By IAN BALL*

New approach on valuing nations' assets and liabilities would open capacity in fiscal frameworks

Governments are under pressure to invest more—in infrastructure, the energy transition, defence and resilience—while remaining constrained by fiscal frameworks that appear increasingly ill-suited to these demands.

Within this tension lies a simple but consequential problem: most fiscal frameworks govern only part of the state's balance sheet.

Public debate remains dominated by debt and deficit metrics. These indicators are easy to communicate and politically entrenched, but they capture only a narrow slice of the public sector's economic reality. The international policy-making community should use every opportunity to advance thinking on this matter. A good opportunity will come at International Monetary Fund-World Bank spring meetings in Washington on 21-26 April.

In the debate on fiscal frameworks, public assets, especially non-financial assets, are largely ignored. Non-debt liabilities, including pensions and long-term contractual obligations, receive limited attention. The consumption of public capital through depreciation is rarely treated as a fiscal cost at all. This is often defended as prudence. In practice, it distorts decision-making.

Debt is a financing measure, not a measure of fiscal health. Borrowing to fund consumption and borrowing to build productive assets are treated identically, even though their long-term economic consequences differ fundamentally. Fiscal frameworks that ignore assets therefore bias policy against long-term investment and in favour of short-term fiscal optics.

The IMF's balance-sheet turn and the missing step

The analytical foundations for a better approach already exist. Over the past decade, the IMF has developed a balance-sheet view of public finances, building on the 2001 Government Finance Statistics Manual. Its research shows that countries with stronger public sector balance sheets and higher net worth experience shallower recessions, recover faster from shocks, and face lower borrowing costs. Financial markets, in practice, already assess sovereign risk using far more than headline debt ratios.

The IMF's accrual-based framework integrates stocks, flows and other economic changes. It captures what governments own as well as what they owe, and how policy choices reshape that balance sheet over time.

Yet in most advanced economies, balance sheets—often compiled using information not drawn directly from the accounting system—do not anchor fiscal rules, budget formulation or political accountability. Fiscal policy continues to be guided by indicators that deliberately exclude large parts of the state's economic position. This is not a failure of analysis, but of adoption.

Why partial accounting distorts policy

This disconnect has real consequences. First, it discourages productive public investment. When the fiscal cost of investment is recorded immediately but the value of the resulting asset is ignored, capital formation is systematically penalised. Maintenance is deferred, infrastructure deteriorates and productivity suffers.

Second, it weakens asset stewardship. Governments are among the largest asset holders in their economies —often the largest landowner, infrastructure owner and corporate shareholder—yet these assets are rarely managed with the same discipline applied to financial liabilities.

Third, it allows non-debt liabilities to grow in the shadows. Pension obligations and long-term guarantees expand without triggering meaningful fiscal scrutiny, despite representing real claims on future public resources.

Incomplete governance

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Concerns are often raised about balance-sheet-based fiscal governance. Asset valuation is complex, net worth measures can be volatile and the concepts are harder to communicate than debt ratios. These concerns are legitimate but they are design challenges, not arguments for continuing with partial accounting.

Valuation uncertainty does not justify valuation blindness. Consistent asset measurement is essential for tracking depreciation, assessing asset condition and disciplining investment decisions. Failure to measure assets systematically guarantees mismanagement. Volatility can be mitigated through valuation ranges, sensitivity analysis and complementary indicators. No credible fiscal framework relies on a single headline number.

Crucially, balance-sheet-based frameworks must be symmetrical. They must recognise both assets and liabilities, investment and depreciation, capital gains and losses. Partial adoption—for example, using asset values only to justify higher borrowing—would undermine credibility rather than strengthen it.

The relevant question is not whether balance sheet governance is simple. It is whether governing with incomplete information is sustainable.

Three advanced economy stress tests

This issue cuts across institutional models. In the US, federal budgeting remains overwhelmingly cash-based—despite state, local and federal governments all producing accrual-based financial statements. These statements are rarely used to guide budget decisions, often ignore revaluation of assets and fail to treat depreciation as a fiscal cost.

While investment expenditure is capitalised for accounting purposes, once incurred, it disappears from fiscal consideration. Maintenance competes with discretionary spending caps. The result is a persistent bias against investment and asset maintenance, even as infrastructure gaps widen.

In Japan, the challenge is different but related. High public debt rightly commands attention, yet focusing on debt alone obscures the broader question of balance sheet resilience in an ageing, low-growth economy. Public assets, pension liabilities and long-term service obligations interact in ways that debt ratios alone cannot capture. In such an environment, asset quality and stewardship become central to fiscal sustainability.

Across the euro area, rules-based fiscal discipline has delivered credibility but at the cost of chronic underinvestment. Fiscal frameworks anchored narrowly in debt and deficit measures struggle to distinguish between consumption and capital formation. As debates on fiscal rules reform continue, the absence of a balance-sheet perspective remains a key structural weakness.

Different systems, same conclusion

Fiscal sustainability cannot be assessed without reference to the full public sector balance sheet. Some countries have shown that a different approach is feasible. Where accrual accounting is embedded across financial reporting, budgeting and accountability, balance-sheet information becomes operational rather than decorative. Investment decisions improve, asset maintenance is taken seriously and fiscal buffers are built over time. Crucially, such systems tend to be more resilient in the face of shocks.

This requires accounting reform not just in reporting, but in how fiscal rules, budget ceilings and performance frameworks are constructed. Without that step, balance sheets remain analytical artefacts rather than instruments of governance.

For the IMF, this represents a natural next step, building on its existing analytical work and toolkits—including Debt Sustainability Analyses and Article IV surveillance—to help governments strengthen their balance-sheet position over time. The challenge is now one of operationalisation: translating balance-sheet insights into fiscal frameworks that guide policy in real time.

For advanced economies, this shift is not about loosening discipline; it is about redefining discipline around productivity, asset stewardship and intergenerational fairness.

Fiscal sustainability is not a question of how much a government owes in isolation. It is a question of whether today's policies leave the state stronger or weaker tomorrow.

That is ultimately a question for the balance sheet—and fiscal frameworks that ignore this reality will increasingly struggle to meet the demands placed upon them.

Financial Stability

The Financial Stability Implications of Artificial Intelligence and Digital Finance*

By TAO ZHANG*

Introduction

Thank you for the invitation to speak at this important forum. It is a pleasure to join you here in Hong Kong.

The title of this session is "Development and innovation of AI and digital finance". These changes are reshaping how financial services are delivered, how markets function and how risks are managed. From a central bank perspective, they also raise important questions for financial stability.

Today, I would like to focus on the financial stability implications, including tokenisation, which is a central element in current policy discussions.

My remarks will proceed in three parts:

First, I will briefly discuss how artificial intelligence (AI) and digital finance are developing and why they matter for the functioning of the financial system.

Second—and this will be the core of my remarks—I will turn to the financial stability implications, drawing on recent analytical work by the Bank for International Settlements (BIS) and the Financial Stability Board (FSB).

Finally, I will say a few words about international cooperation and the role of the BIS.

Development and innovation: implications for market functioning

Let me begin with how AI and digital finance are developing, and why they are attracting such attention from policymakers.

AI is being adopted across the financial sector for a wide range of purposes. Financial institutions use AI to process large volumes of data, support credit underwriting, detect fraud, manage risks and automate back-office functions. More recently, advances in large language models and generative AI have expanded the range of possible applications, including customer interaction, internal analysis and supervisory processes.

The drivers of AI adoption are well understood. On the supply side, rapid advances in computing power, data availability and model capabilities have lowered barriers to entry. On the demand side, firms are seeking productivity gains, cost reductions and competitive advantages, while authorities are exploring the use of AI to enhance regulatory and supervisory effectiveness.

Digital finance, more broadly, refers to the increasing digitalisation of financial assets, processes and infrastructures. A key component of this is tokenisation which, loosely speaking, is the representation of financial assets, such as securities or deposits, in digital form using technologies such as distributed ledger technology.

As we have already witnessed, tokenisation affects how financial transactions are organised and executed. It can bring trading, settlement and collateral management closer together, reduce reconciliation costs and support more efficient use of liquidity and collateral. Tokenisation may also reduce frictions in cross-border payments and securities settlement—an issue of particular relevance for regions with deep trade and financial linkages, including Asia.

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* Tao Zhang, BIS Chief Representative for Asia and the Pacific.

Taken together, AI and digital finance can improve efficiency, reduce costs and support more integrated financial markets. However, these same developments also change the way risks arise and propagate across the financial system, and they post challenges for regulators and supervisors. In short, they have strong financial stability implications.

Financial stability implications: three channels

Let me now turn to the channels through which the financial stability risks may rise. Recent research and policy analysis suggest that AI and digital finance may affect financial stability through multiple channels. To illustrate, I will focus on the three channels that are particularly relevant from a central bank perspective, because they relate to market functioning, operational resilience and the propagation of stress through the financial system.

Market functioning and liquidity

First, AI and digital finance can affect market functioning and liquidity:

AI can speed up trading and portfolio adjustments, which may intensify short-term price movements when market conditions change.

Tokenisation represents financial claims digitally, which can make transactions and settlement more efficient. But digital claims may move or be redeemed more quickly than the underlying assets can be sold or funded.

In normal conditions, these features can improve efficiency. But in periods of stress, faster trading and faster-moving claims can strain liquidity, amplify volatility and contribute to disorderly market conditions.

Operational dependencies and resilience issues

Second, these technologies raise operational risk and resilience issues:

AI systems often depend on specialised hardware, cloud computing services, external data providers and pretrained models, many of which are concentrated among a small number of providers. Digital finance and tokenisation similarly rely on shared platforms, protocols and service providers that can become systemically important.

Operational disruptions, cyber attacks or technology failures can therefore have significant implications for the financial system.

Amplification and propagation of stress

Third, AI and digital finance can influence how stress propagates across the financial system:

The widespread use of similar AI models, data or decision rules can lead institutions to respond to shocks in similar ways, increasing correlations in behaviour. Tokenisation platforms can create new and sometimes complex interdependencies across markets and activities.

These features can amplify shocks through contagion and procyclicality, allowing stress to spread more rapidly and broadly across institutions, markets and jurisdictions.

Complications for central banks in identifying and managing financial stability risks

These risk channels are not fundamentally new. However, technological change associated with AI and digital finance may increase the intensity, speed and complexity of the flow of these financial stability risks, complicating how central banks and regulators identify, assess and manage them.

First, intensity. As the adoption of AI and tokenisation becomes more widespread, exposures and interdependencies may become more concentrated. Reliance on shared platforms, common data sources, similar models or key service providers can increase the scale of the potential impact when disruptions occur. As a result, shocks that might previously have affected individual institutions could have more pronounced system-wide consequences, raising the intensity of financial stability risks.

Second, speed. Both technologies can accelerate how risks materialise. AI enables faster and more automated decision-making, while tokenisation can shorten transaction chains and settlement processes. Under stress, this may compress the time available for institutions and authorities to respond, as liquidity pressures, operational disruptions or market reactions unfold more rapidly. Faster transmission can therefore make risks harder to contain once they emerge.

Third, complexity. AI and digital finance can also increase the complexity of the financial system, making risks more difficult to observe and assess. In the case of AI, opaque models, unstructured data and reliance on third-party service providers can complicate risk assessment and validation. For digital finance and

tokenisation, programmability, composability and the involvement of multiple intermediaries across jurisdictions can create intricate and sometimes opaque interdependencies.

International cooperation, governance and the role of the BIS

The developments I have discussed have a strong cross-border dimension. AI services, digital platforms and tokenisation arrangements often operate across jurisdictions, while responsibility for financial stability remains largely national. This creates a natural role for international cooperation, particularly in the area of governance.

As finance becomes more digital and interconnected, governance frameworks—covering accountability, risk management and oversight—become increasingly important. In the case of AI, governance issues arise around model risk management, data governance and reliance on third-party service providers. For digital finance and tokenisation, governance and design choices—such as access arrangements, operational responsibilities and settlement processes—can have important implications for resilience, especially when activities span borders.

Because these developments cut across jurisdictions, fragmented or inconsistent approaches to governance can create gaps and frictions. This highlights the value of greater alignment and coherence in governance and regulatory frameworks, while respecting national mandates and differences in market structure.

In this context, the Bank for International Settlements plays a supporting role. The BIS provides a forum for central banks to exchange views on governance challenges, supports analytical work to clarify the financial stability implications of AI and digital finance, and facilitates collaboration and shared learning, including through the BIS Innovation Hub. By working with the FSB, International Monetary Fund and other strategic partners, we at the BIS stand ready to help foster sound and interoperable governance approaches that support innovation while safeguarding financial stability.

Conclusion

Let me conclude.

Artificial intelligence and digital finance, including tokenisation, are reshaping how financial markets function. They offer important opportunities to improve efficiency, integration and innovation. At the same time, as these techno

logies grow, they may intensify familiar financial stability risks – affecting liquidity, operational resilience, interconnectedness and procyclicality.

For central banks, the challenge is not to resist innovation, but to understand how it changes the nature and transmission of risks, and to ensure that governance frameworks and policy approaches remain fit for purpose. By strengthening international cooperation and drawing on shared analysis, central banks can help ensure that technological innovation supports a stable and resilient financial system.

Thank you.

IMI International Monetary Review

The Insurance Protection Gap: A Growing Risk to Financial Stability*

By REGULA HESS*

Across advanced economies, the widening insurance protection gap is becoming a material concern for financial regulators, central banks and governments. As climate-related disasters intensify, a growing number of economic losses are going uninsured, shifting risk from insurers' balance sheets onto households, businesses and public finances.

A new WWF white paper warns that the trend cannot be reversed without addressing a critical blind spot in financial and supervisory frameworks: the accelerated loss of nature.

How nature loss increases the cost of climate-related disasters

While climate change is central to the problem, WWF's analysis shows that ecosystem degradation is a major and often underestimated source of economic loss.

Healthy ecosystems, such as forests, wetlands and coastal systems, play a crucial role in reducing the physical impacts of extreme weather. When these natural buffers are degraded, climate hazards push risks beyond insurable thresholds. In regions of widespread deforestation, for example, the risk of large-scale flooding can increase by as much as 700%. This sets off a vicious cycle: losses mount, resilience erodes and insurers pull back, amplifying the impact of the next disaster.

In 2023, global disaster-related losses reached an estimated $2.3tn once indirect impacts and losses from ecosystems were included, revealing the true scale of degraded natural capital and climate change.

Indirect effects beyond property insurance are underestimated

In the US, uninsured direct disaster losses averaged around $64bn per year between 2021 and 2024. In the European Union, the gap reached approximately €59bn per year between 2021 and 2023. Yet this is only a lower bound estimate. It excludes direct losses such as damage to nature and indirect effects on household income, asset prices, mortgage markets or credit conditions.

The insurability challenge goes well beyond property insurance. Climate- and nature-related risks are increasingly driving losses across health, agriculture, infrastructure, liability and business-interruption insurance lines.

Public finances are particularly exposed (Figure 1). As private insurance withdraws from high-risk regions, governments are increasingly assuming the role of 'insurer of last resort', often without explicit, or well-designed frameworks. Fiscal pressures are rising, driven by higher emergency response and reconstruction costs, greater pressure on public and public-private insurance schemes, and falling tax revenues following major disasters.

At the same time, ecosystem restoration falls on taxpayers and remains systematically underfunded.

Prevention as a financial stability tool

Prevention delivers far greater value than post-disaster relief. In the US, every dollar invested in climate resilience can save up to $13 in avoided losses; in the UK, each £1 spent on flood risk management avoids around £8 in damages.

Nature-based solutions are among the most cost-effective preventive measures. In Switzerland alone, protective forests generate benefits estimated at CHF4bn ($5.17bn) annually in disaster risk reduction and can be up to 25 times more cost-effective than engineered alternatives. Such investments reinforce insurance markets by lowering expected losses, thereby supporting insurability.

Implications for financial regulators, central banks and governments

These findings underline the need for a strategic rethink on how to address the insurance protection gap: financial resilience depends not just on risk transfer, but on climate mitigation and nature restoration for risk reduction (Figure 2). For financial authorities, this has four implications.

First, supervisory assessments need to go beyond recording physical destruction caused by extreme weather events to capture their economic and financial consequences. This includes insurance availability

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and affordability, household income and wealth, business competitiveness, price and financial stability, and the fiscal position of governments. This requires a macroprudential approach to addressing insurance and protection gaps.

Second, supervisory frameworks need to better reflect nature-related risks and the role of risk-reducing ecosystems. Current stress tests and supervisory tools increasingly incorporate climate risk, but biodiversity loss, ecosystem degradation and the role of nature-based solutions remain largely absent. This leads to an incomplete risk assessment.

Although attention to insurance protection gaps is growing, regulatory responses remain fragmented. WWF's SUSREG Assessment 2025 shows that macroprudential approaches to climate and nature-related risks are not yet fully embedded in insurance supervision.

Third, policy responses should incentivise the reduction of root causes. Public-private insurance schemes are essential, but strong incentives for resilience are required to reduce underlying risks. Public interventions in private insurance markets should be systematically linked to investments in prevention and adaptation, and require transition plans from participating insurance companies.

Fourth, nature should be better embedded in adaptation, response and recovery planning. Post-disaster recovery efforts that ignore ecosystems can increase future risks and fiscal costs.

As the impacts of climate change and nature loss intensify, the challenge for public authorities is no longer whether insurance markets will come under pressure, but whether policy frameworks can evolve to reduce risk at its source. Protecting and restoring nature is not only an environmental priority; it is necessary to safeguard public finances, stabilise insurance markets and preserve the foundations of financial stability.

IMI International Monetary Review

Working Paper

Measuring Systemic Risk from Textual Analysis: Evidence from Chinese Banks*

By YI FANG, HAO LIN, LIPING LU*

Indirect effects beyond property insurance are underestimated

In the US, uninsured direct disaster losses averaged around $64bn per year between 2021 and 2024. In the European Union, the gap reached approximately €59bn per year between 2021 and 2023. Yet this is only a lower bound estimate. It excludes direct losses such as damage to nature and indirect effects on household income, asset prices, mortgage markets or credit conditions.

The insurability challenge goes well beyond property insurance. Climate- and nature-related risks are increasingly driving losses across health, agriculture, infrastructure, liability and business-interruption insurance lines.

1. Introduction

Systemic risk of the banking sector is a core regulatory issue in China, especially the small and medium-sized banks since the recent bankruptcy of Baoshang Bank, i.e., a city commercial bank. According to the National Financial Regulatory Administration (NFRA), there are more than four thousand small and medium-sized banks, which account for about 40% of total banking assets. In contrast to large state-owned banks, small and medium-sized banks are more vulnerable with lower capital adequacy, more aggressive business strategy and less government preferential treatment, which have become a key driver for the systemic risk in the banking sector.

Systemic risk is defined as the risk that negative shocks to certain financial institutions spread to other financial institutions through their interconnections, which results in the collapse of the whole financial system and further spillovers to the real economy (Billio et al., 2012; Benoit et al., 2017). Negative shocks are the fuse of the systemic risk (Dicks & Fulghieri, 2019), which include internal shocks such as bank runs or defaults of counterparties (Elliott et al., 2014), external shocks such as a downturn in the real economy (Bernanke et al., 1999). Interconnection is an important factor in constructing the indicators of systemic risk (Allen & Babus, 2009; 2013). The higher the interconnectedness among financial institutions, the more likely that the risk is amplified in the network topology and heat maps can display network[22] (Battiston et al., 2012; Glasserman & Young, 2015).

To capture the interconnections among banks, existing studies often utilize the direct or indirect business connection methods, or the co-movement method. The direct business connection method employs the data on inter-bank asset and liability, while bank risks can be contagious through derivatives trading and inter-bank lending. If a financial institution fails, it will lead to losses of its counterparties, and may even bring domino-like failures. As most data on bilateral exposures is proprietary, which is even partially accessible for financial authorities (Anand et al., 2015; Bisias, Flood, Lo, & Valavanis, 2012; Upper, 2011). Therefore, the maximum entropy method and the minimum density method are often employed to estimate the bilateral exposures (see, e.g., Anand et al., 2013; Bargigli et al., 2015). However, these estimations do not fully

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[22] Some research argues that a complete network allows for risk diversification, which can enhance systemic stability under small shocks (Acemoglu et al., 2015; Allen & Gale, 2000). Nevertheless, the network constructed in this paper is incomplete and some of the shocks in this paper have wide-spread impacts, such as the global financial crisis in 2008 and stock market crash in China in 2015. Thus, we only consider the positive correlation between interconnectedness and systemic risk.

capture the features of financial network due to the strong underlying assumptions. Mistrulli (2011) shows that the maximum entropy approach based on bilateral exposures overestimates the contagion under certain conditions. Anand et al. (2015) employ the minimum-density method to construct a multiplex network with a core-periphery structure for more than 1700 banks in Germany, while it tends to overestimate the contagion in stress testing. In contrast, the indirect business connection method captures the network due to common assets holdings, which employs balance sheet data with higher accessibility. It focuses on asset liquidity risk, i.e., price discount of asset sales by the bank will end up in losses suffered by banks with common asset holdings, which is an indirect risk contagion (Greenwood, 2015). Duarte and Eisenbach (2021) extend the model by Greenwood (2015) and introduce time-varying haircuts to track bank risks over time. Using balance sheet data for large US banks during 1996-2016, Duarte and Eisenbach (2021) show that a concentration of illiquid assets, i.e., indirect interconnectedness due to fire sales, plays an important role for banks' aggregate vulnerability, which can serve as a measure of systemic risk. Di Gangi et al. (2018) employ the maximum entropy approach in the framework of Greenwood (2015), which is a more generalized method based on bank assets and capitalization. Nevertheless, the financial data is lagged with a low frequency, and banks often have incentives to manipulate the data, which undermines the data reliability (Cao et al., 2022; Karpoff, 2021). In addition, many unlisted banks do not disclose their financial data, which attract less attention from the academia and regulators.

The co-movement method is based on the data from the financial market, which uses the correlation of stock volatility, stock returns, credit default swap (CDS) and other market data of financial institutions to measure the systemic risk. Diebold and Yilmaz (2009) measure a dynamic correlation of stock return volatility of financial institutions in 19 stock markets during 1992-2007 with generalized forecast error variance decomposition, and show that the peak of volatility overflow index corresponds well to the breakout of major risk events. Ando et al. (2022) modify the Diebold-Yilmaz method by estimating quantile dependencies in a quantile-VaR model which allows for residuals driven by a series of latent factors, which is particularly suitable for studying large and rare idiosyncratic shocks. Patro et al. (2013) examine 22 bank holding companies and investment banks during 1988-2008, and find that the correlation of daily stock returns is a simple and robust indicator for the systemic risk. Tobias and Brunnermeier (2016) propose a measure of systemic risk, ΔCoVaR, which is defined as the difference between the CoVaR of financial system in the context of distressed financial institutions and that in the median state. Markose et al. (2012) construct the network of CDS market in the US and find that the risk of highly inter-connected financial institutions will cause connected institutions to fail. Oh and Patton (2018) employ copula-based models to estimate time-varying high-dimensional distributions of CDS spreads on U.S. firms, which evaluates the expected distress proportion of firms conditional on another firm's distress. Their findings suggest that risk spillovers from the real sector to the financial sector are greater than those in the reverse direction. Tian et al. (2022) develop a GARCH copula quantile regression model to measure dynamic risk spillovers between oil markets and stock markets. However, some empirical studies identify the inefficiency of financial markets in China (Chen et al., 2017; Kristoufek & Vosvda, 2013), while a violation of efficient market hypothesis may lead to a bias in the estimation of systemic risk (Cercello et al., 2017; Malkiel, 2003). Besides, a limited availability of market data for unlisted financial institutions renders it impossible to fully capture the risk of the whole financial system.

Generally speaking, these standard methods have some limitations. On the one hand, they cannot monitor a large number of unlisted banks due to limited data availability. On the other hand, they only capture certain aspects of the inter-connectedness. Interconnectedness includes not only the direct connections due to inter-bank transactions and co-movements in the market data, but also indirect connections from inter-bank competition, management profiles, customer and investor characteristics, reputational linkages, and competitive dynamics (Acemoglu et al., 2015; Acharya & Thakor, 2016; Allen et al., 2012; Capponi et al., 2016; Dicks & Fulghieri, 2019; Eisenberg & NOE, 2001). All these linkages are potential channels for the risk contagion (Aharony & Swary, 1983; Racickas & Vasiliauskaitė, 2012; Sarlin, 2016), while we can employ measures with alternative datasets to overcome the weakness of standard methods.

Due to the limitations of standard datasets, researchers have explored textual data to measure systemic risk. An emerging strand of literature uses investor sentiment similarity to estimate inter-institutional connections. For instance, Cerchiello et al. (2017) employ Twitter sentiment indices to estimate systemic risk for Italian banks, while Nyman et al. (2021) analyze narrative topic consensus in UK news to provide early warning indicators of systemic risk events. Similarly, Andries et al. (2022) find that covariates of news sentiment convey information on risk spillovers from global systemically important banks to other systemically important institutions. In addition, some literature explores inter-institutional connections from 10-K discussions. For example, Hoberg and Phillips (2016) use similarities of the description of products in

firms' 10-Ks to measure firms' interconnectedness. Similarly, Bushman et al. (2016) assess banks' interconnectedness based on the similarities of topics of 10-Ks discussions.

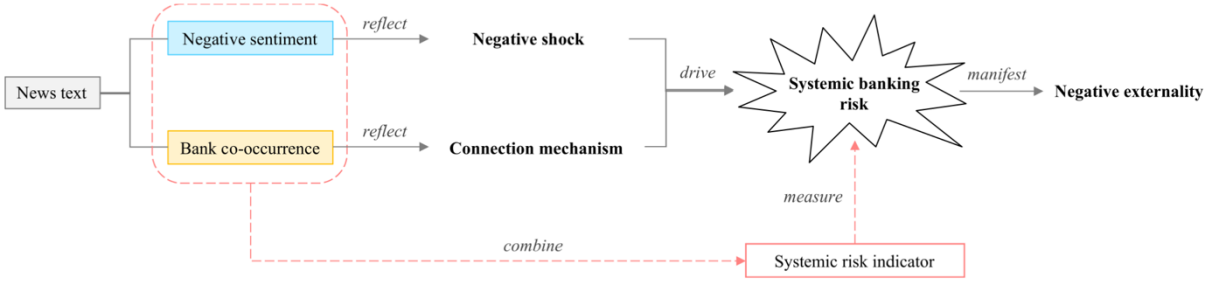


Figure. 1. News sentiment, co-occurrence and systemic risk.

While these studies have made significant contribution in the text-based systemic risk measurement, they primarily focus on interconnection, which represents only one element of systemic risk. Few studies attempt to capture both interconnections and negative shocks, the two core elements of systemic risk. We combine co-occurrence analysis and sentiment analysis techniques to capture both interconnections and negative shocks. By precisely identifying bank co-occurrences in negative news, we construct a novel risk indicator, NCOI, which can capture the evolution of systemic risk across thirteen major risk events from 2000 to 2021.

Specifically, we estimate inter-bank connectedness through news co-occurrence, which can measure direct and indirect connections. Co-occurrence analysis captures the connection tightness among these keywords by counting the co-occurrence frequency of keywords in the text. Firms reported in a piece of news often have certain connections, such as business contact, management mode similarity, customer or investor interactions, reputational linkages, geographical proximity and competitive dynamics (Bernstein et al., 2002; Kazinnik et al., 2024; Yaros & Imielinski, 2014). By counting the co-occurrence frequency of firms in the text, co-occurrence analysis captures the relative strength of these connections. An emerging strand of literature supports the validity of this approach. For instance, Ronnqvist and Sarlin (2015) employ pairwise co-occurrence of banks in Reuters online news as the links' weights of bank network, and use the information centrality in network analysis to measure the systemic importance of banks. Wan et al. (2021) construct a co-occurrence network with 87 firms that show up most frequently in Reuters news, and find that clustering firms by co-occurrence tightness is consistent with traditional industry classification. Similarly, Zheng and Schwenkler (2020) find that distressed firms' linkages implied in news act as channels for risk contagion. Yang et al. (2023) identify communities in the co-occurrence network of Chinese financial firms using headline news from Sina Finance, while Kazinnik et al. (2024) examine the dynamic co-occurrence network of DFast banks in response to COVID-19. These studies provide empirical evidence that co-occurrence in news articles reflects the strength of interconnections among financial institutions.

We also employ the text sentiment analysis to capture negative shocks, another core element of systemic risk. Bank-related news contain comments on the movement of financial markets or banks from banks' insiders, analysts, institutional investors, and regulators, etc. (Engelberg et al., 2012; Kearney & Liu, 2014; Thompson et al., 1987). News with positive sentiment does not necessarily mean positive signals for banks due to the existence of media corruption or control, while news with negative sentiment often corresponds to negative shocks suffered by banks (Li, 2013; Wang & Ye, 2015; Zou et al., 2019), e.g., credit defaults, devaluation of asset holdings, stock price plummet, regulatory pressure, and geopolitical crisis, etc. Recall that bank co-occurrence reveals inter-dependencies between banks, which are potential links for risk contagion (Azizpour et al., 2018; Herskovic et al., 2020; Zheng & Schwenkler, 2020). Therefore, the co-occurrence of two banks reported in the same negative news implies that the risk derives from the shock to a bank spillovers to the other through the interconnection. Fig. 1 shows that we identify the inter-bank risk contagion precisely through combining sentiment analysis and co-occurrence analysis, which distinguishes our work from Ronnqvist ¨ and Sarlin (2015).

We employ news data to measure the systemic risk due to the following advantages. First, news data offers more comprehensive information on direct and indirect inter-bank connections, such as business activities, investment strategies, stock performance, management, customer and investor characteristics, etc. Second, news data has a higher data availability and frequency, which can cover both listed and unlisted banks. Also, real-time news data is conducive to track the risk of financial institutions in a timely way. Besides, a huge volume of news data can alleviate the concern on the noise, which can reveal inter-dependencies between banks more INFOBANK economic news database precisely (Wan et al., 2021).

We use co-occurrence analysis to calculate news co-occurrence frequency of bank pairs and store them in co-occurrence matrix, and construct co-occurrence network and heat map of large banks versus small and medium-sized banks. We show that news co-occurrence can reveal inter-bank connections in a proper way. We further introduce the sentiment index in order to obtain the co-occurrence index based on negative news (NCOI). We examine the validity of co-occurrence index through the comparison with traditional risk indicators. We also examine the capability of co-occurrence index to capture individual bank risk and explore the factors that can affect the systemic risk.

We employ news co-occurrence analysis and sentiment analysis to construct a systemic risk indicator from the news reports. Our indicator serves for large banks as well as small and medium-sized banks, which captures the two drivers of systemic risk, i.e., negative shock and interconnection. A vast amount of real-time news can capture the inter-bank connections in various dimensions, which renders our measurement with substantial practical value. Besides, we present the banking network using data from about 950,000

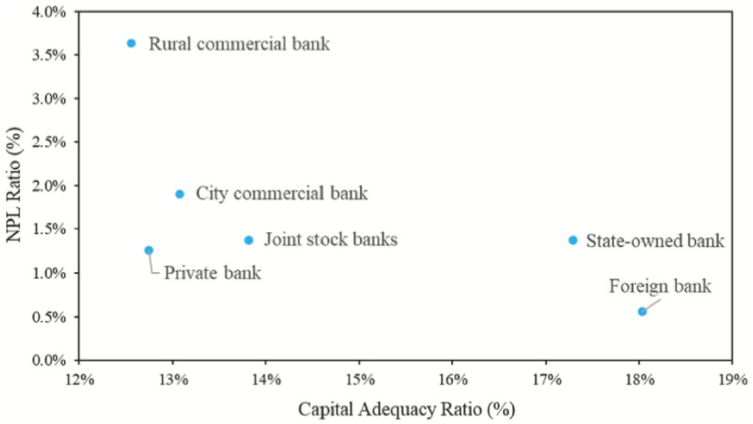


Figure. 2. Non-performing loan ratio and capital adequacy ratio of banks in 2021.

news articles in the INFOBANK economic news database[23], which enables us to track more than 700 banks over 20 years. The network topology and heat maps can display the hierarchical structure of the banking sector and the interconnections among banks reported in the news in China. We show that inter-bank connectedness of large banks is relatively stable during the financial crisis, while that of small and medium-sized banks is characterized by a transition to decentralization. The significant risk fluctuation highlights the importance of studying the risks of small and medium-sized banks in China.

This paper contributes to a growing literature on systemic risk measurement in the banking sector, which predominantly relies on market and balance sheet data of listed banks. A lot of research has applied systemic risk measures, such as ΔCoVaR and MES, to evaluate the systemic risk contributions of Chinese listed banks, i.e., Duan et al. (2021), Lee et al. (2023), and Yan et al. (2023). Wang et al. (2014) employ extremal quantile regression with market data to measure systemic risk, who show that listed banks contribute more to systemic risk than other financial institutions. Using 16 Chinese listed banks during 2010-2016, Fang, Xiao, Yu, and You (2018) find that the PCA model provides more reliable systemic risk rankings than five popular risk measures, while fundamentals-based measures perform better than price-based measures in terms of risk ranking. Gong et al. (2019) construct a causal network model to measure systemic risk across Chinese financial institutions, and find intensified network connections during crisis periods. Shi et al. (2024) employ bank balance sheet data in a bipartite network model, and find that indirect losses from common exposures often exceed direct losses, while mortgage exposure is the primary vulnerability.

In contrast, this paper adopts the most comprehensive sample with over 700 banks, which covers various types of banks, such as large state-owned banks, joint-stock banks, city/rural commercial banks, rural credit cooperatives and new types of rural financial institutions, foreign banks, and private banks, etc. Our study captures systemic risk across a spectrum of institutions that are often excluded in the existing literature, which often focuses on listed banks. Furthermore, we employ textual analysis on millions of news reports to assess systemic risk, which offers a novel perspective that complements the existing research. This comprehensive approach enables us to provide a more holistic view of systemic risk in the Chinese banking sector, and addresses a critical issue by covering less-studied institutions that play a significant role in the

[23] INFOBANK is a popular news database in China. Wang and Ye (2015) collect news reports on 366 Chinese listed firms from INFOBANK during 2003–2006 and examine the impact of media reports on corporate valuation. Zou et al. (2019) show that media reports on a listed firm increase investors' recognition of the firm, which is reflected in a higher stock return. Huang (2018) finds that news reports on listed firms have a positive impact on the stock return in the short term, but there is a reversal effect in the long term. INFOBANK has collected daily news data since 1992, which covers professional news reports from more than 1200 mainstream media in mainland China, such as general newspapers, financial and economic newspaper, and financial and economic websites. Therefore, we select "China Economic News Database" in INFOBANK as the news data source considering the coverage, information density and crawl difficulty.

financial system. This paper makes a distinctive contribution to the literature on systemic risk of Chinese banks.

The rest of the paper is organized as follows. Section 2 introduces the methodology and data. Section 3 shows the static and dynamic characteristics of bank network and constructs a measurement for the systemic risk. Section 4 substantiates the validity of the measurement in various dimensions. Section 5 examines the robustness of the indicators to various types of news media. Section 6 concludes the paper.

2. Institutional background

According to the China Banking and Insurance Regulatory Commission (CBIRC), the number of banking financial institutions has reached 4604 in 2021, which includes 6 large state-owned banks, 12 joint-stock banks, 133 city commercial banks, 1539 rural commercial banks, and 1637 village and town banks. While the total assets of the big six state-owned banks account for 40.1% of total banking assets in 2021, city commercial banks and rural financial institutions account for 13.1% and 13.3% respectively. The total number of small and medium-sized banks and their total assets have been growing rapidly, which are essential players in the banking market.

The banking sector has a tight inter-bank connectedness in China, which forms a highly dependent and complex network. The risk of a bank can often spread rapidly within the network through inter-bank connections, which ends up in risk contagion effects. Thus, the supervision of systemic risk involves identifying fragile and unstable bank nodes, monitoring their risk status, and curbing risk spillovers in a timely way.

Non-performing loan ratio can measure the loan risk of banks, and capital adequacy ratio can measure the capability to resist risks. We compare non-performing loan ratios and capital adequacy ratios of various types of banks at the end of 2021 in Fig. 2. Large state-owned banks and foreign banks have higher capital adequacy ratios and lower non-performing loan ratios. In contrast, rural commercial banks have the highest non-performing loan ratios and the lowest capital adequacy ratios among all types of banks. In addition, although non-performing loan ratios of private banks and city commercial banks are lower than that of rural commercial banks, their capital adequacy ratios are lower than that of large state-owned banks.

The *People's Bank of China* disclosed the stress tests results of 4015 domestic banks in the China Financial Stability Report (2021). Capital adequacy ratios of 30 large and medium-sized banks met the regulatory requirement of 10.5% under various shocks in the credit risk stress test. However, 1390 (among 3985 in total) small and medium-sized banks could not pass the stress test under the mildest overall credit risk shock, which ends up in a failure rate of 34.88%. In addition, all 30 large and medium-sized banks passed the mild stress test in the liquidity risk stress test, while nearly 140 small and medium-sized banks failed to pass the test. Moreover, small and medium-sized banks in China are subject to less stringent regulation than state-owned banks, which enables them to engage in riskier activities and accumulate risks in less transparent ways. For instance, state-owned banks must meet additional leverage ratio requirements on top of the standard requirements for commercial banks. The additional leverage ratio requirement is 50% of the additional capital requirement for systemically important banks and should be met by Tier 1 capital. These stricter regulatory measures ensure that state-owned banks maintain robust buffers against financial shocks. In contrast, small and medium-sized banks with less regulatory constraints can operate with thinner capital margins, leaving them more vulnerable to risk accumulation (Shi et al., 2022).

The risks of small and medium-sized banks are often contagious, which can be amplified rapidly through the intricate connections in the banking network. The frequent inter-bank trading is a direct connection channel. Banks that fail the liquidity stress test often have high dependence on inter-bank market and liquidity stress at the same time. Thus, a small negative shock could transmit to their counterparties, which creates a collective liquidity crunch and endangers the entire banking system. Besides, the herding behaviors of small and medium-sized banks lead to similar risk exposures, which forms an indirect connection channel.

Banks follow herding behaviors as they want to be rescued first. Acharya and Yorulmazer (2007) show that the optimal regulatory choice is to bail out failed banks in order to avoid continuous losses in the context of a large number of bank failures. The implicit government guarantee stimulates banks towards herding behaviors, such as lending to similar industries and bearing similar interest rate risks in order to increase the possibility of being rescued, i.e., "too many to fail"[24]. Thus, it will increase the common risk exposure of

[24] "Too big to fail" refers to that certain corporations or financial institutions are so large and complex that their failure would have disastrous effect on the economy. It is often related with government intervention to prevent such failures, as the collapse of a "too big to fail" entity could bring severe consequences, such as financial instability and economic recession. The term gained prominence during the global financial crisis, when several large banks and financial institutions in the United States were treated as "too big to fail" and received government bailouts.

banks, which elevates the probability of a crisis (Benoit et al., 2017). Banks adopt herding behaviors in order to cut their borrowing costs. Acharya and Yorulmazer (2008) and Silva-Buston (2019) find that the borrowing cost of a bank will increase in the context of negative news about other banks when bank lending rates have common systemic factors, which may convey unfavorable information about the common factors. Banks have a more pronounced increase in the borrowing costs when there is less commonality in bank lending rates. Thus, banks engage in herding behaviors in the investment to alleviate the impact of information contagion on the borrowing costs.

We emphasize the importance of small and medium-sized banks in curtailing systemic risks due to the concern on "too many to fail" instead of "too big to fail". A small shock can spread to multiple banks in the context of a large number of vulnerable banks, which can trigger contagion effects in a similar way with banks at the center of the network. Therefore, these small banks can also become a vital part of the network (Varotto & Zhao, 2018). The cost of bailouts will also be quite high as the total assets of these banks are sizeable, and the government will face the dilemma between financial crisis and fiscal collapse (Brown & Dinç, 2011; Morrison, 2011).

Thus, the regulatory authorities should strengthen the supervision of small and medium-sized banks due to a high failure risk, a high rescue cost in case of collective failures of these banks, and the moral hazard problem under the implicit government guarantee. However, the standard methods of systemic risk measurement are limited by the data of listed banks, which cannot measure the risks of small and medium-sized banks. We employ innovative data source and risk measurement to bring all banks into a unified framework, which can achieve a comprehensive real-time risk monitoring.

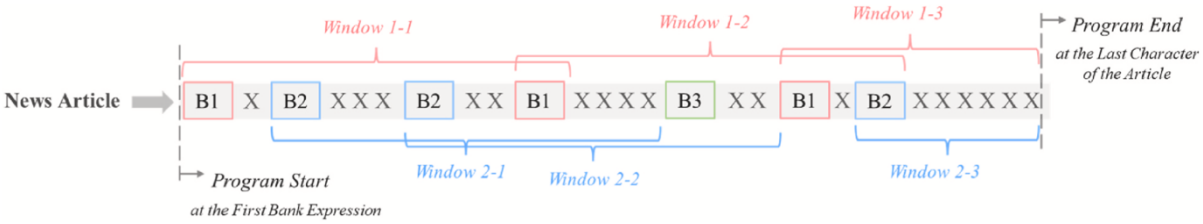


Figure. 3. News co-occurrence frequency. "B1" (or "B2", "B3") represents phrases that match regular expressions of bank "B1" (or "B2", "B3"). The symbol "X" represents other Chinese characters**.**

3. Methodology and data

3.1. Text sentiment analysis

We employ the Chinese financial text sentiment dictionary[25] constructed by Jiang et al. (2019, 2021[26]), which is designed specifically for the analysis of Chinese financial news. The dictionary integrates the word2vec algorithm and manual filtering methods, which expands a couple of Chinese and English financial sentiment dictionaries such as the dictionary by Loughran and McDonald (2011), and NTUSD Simplified Chinese Sentiment Dictionary, etc. The dictionary includes a total of 9228 emotional words, i.e., 5890 negative words and 3338 positive words.

For a news article A the corresponding sentiment index is calculated with the "Relative sentiment shifts" formula in Nyman et al. (2021):

$$Senti_A = \frac{|n(positive)_A| - |n(negative)_A|}{|n(positive)_A| + |n(negative)_A|} \quad (1)$$

We can obtain the sentiment index of each news through capturing the relative sentiment of news text. As the overall sentiment of a news article may not necessarily represent the sentiment of the bank in the report, we narrow the text sentiment analysis to the sentence where the bank keyword is located. We analyze the text sentiment in the units of sentences and take the average value as the sentiment index of the news article, which is simple, easy to interpret, and informative. According to Eq. (1), if the value of $Senti_A$ of a news article A is larger, the overall mood of the article is more likely to be positive rather than negative. Thus, if $Senti_A > 0$, A is considered as positive news, while if $Senti_A \leq 0$, A is considered as negative news.

3.2. Co-occurrence analysis and systemic risk

[25] The dictionary is here: https://github.com/MengLingchao/Chinese_financial_sentiment_dictionary.

[26] Their article was published in the Chinese-language journal China Economic Quarterly. China Economic Quarterly was founded in October 2001. It is a comprehensive economics journal supervised by Peking University, sponsored by the China Center for Economic Research of Peking University, and published by Peking University Press. The journal publishes original theories, experiences, Review and commentary Chinese economics papers, and it is a source journal of Chinese Social Science Citation Index (2021–2022). According to CNKI, as of 2022, China Economic Quarterly has been downloaded 4,706,031 times and cited 136,252 times, with a composite impact factor of 8.173 and a comprehensive impact factor of 6.013 for the 2019 edition.

We use regular expressions in Python to match bank names from the text. A regular expression describes a pattern of string matching, which can check whether a sub-string is contained in a piece of text and extract sub-strings that meet a certain condition from the text. There might be various names for the same bank in the news reports, such as full name, abbreviations, synonymous names, and historical names, etc. Therefore, we should account for these name variations when counting the co-occurrence frequency. We specify each sample bank as a set of regular expressions that represent its full name and name variations.

Ronnqvist and Sarlin (2015) show that too large a text scope may result in a statistical "co-occurrence relationship" with no practical significance. For example, two banks reported in different events may also be treated as co-occurrence. In contrast, too small a text scope may render a long sentence truncated artificially, which may lose some co-occurrence information. Following Ronnqvist and Sarlin (2015), we set the text scope as 400 Chinese characters, and check whether there are bank pairs in each sliding window. Specifically, the program will scan the text, look for sub-strings that match predefined regular expressions, identify all banks reported in the text, and calculate the co-occurrence frequency of banks through pairwise combination. In order to avoid repeated counting, we look backward to see if regular expressions of other banks exist within a 400-character window. Furthermore, the co-occurrence frequency of the same bank pair that occur multiple times in the same text will be accumulated to reflect the importance of the bank pair. The co-occurrence of regular expressions of the same bank will not be counted. The window scope is not consistently equal to 400 characters, as the last window is limited to the scope of the last character of the news article. Fig. 3 shows that the co-occurrence frequency of bank B1 and bank B2 in 3 sliding windows starting at B1 and in 3 windows starting at B2 in the news article equals 2, 1, 1, 1, 1, 0 respectively. Thus, the co-occurrence frequency of the bank pair (B1, B2) equals 6.

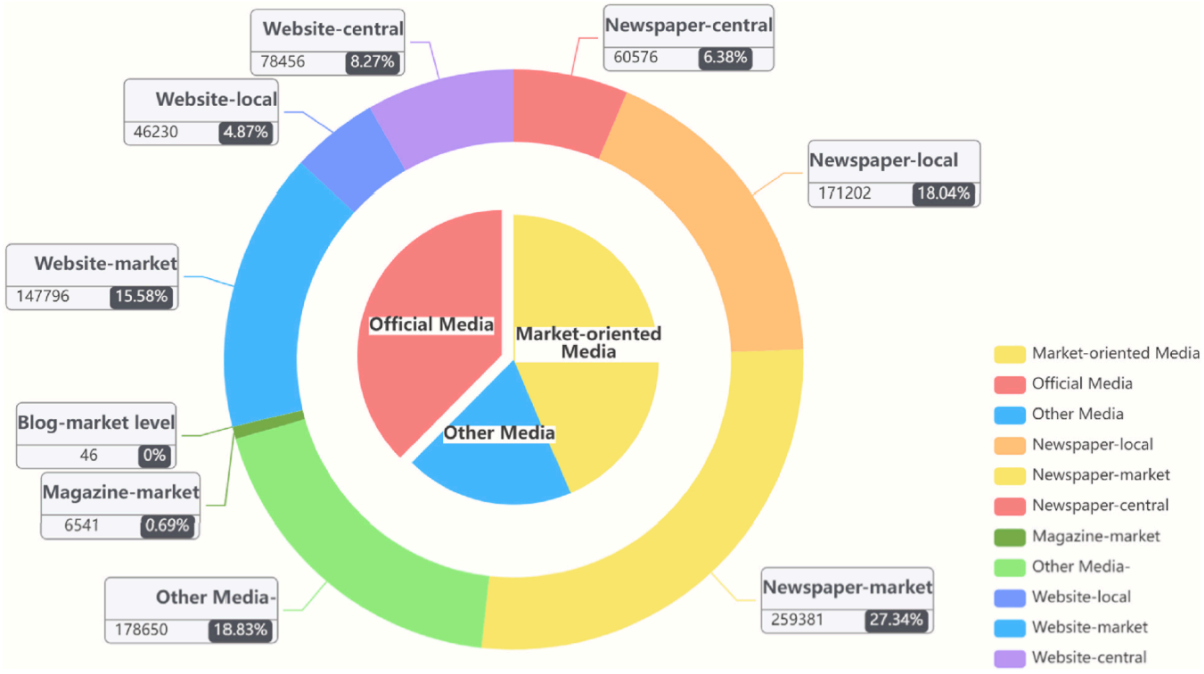


Figure. 4. Distribution of news articles from various types of media.

We store the co-occurrence frequency of bank pair (i,j) in the co-occurrence matrix CM in the corresponding period. We standardize it by the number of sample banks in the current period to eliminate the impact of the number of sample banks on the co-occurrence frequency. Each element of the matrix is taken as the weights of the pair-wise links between each bank node in the network, which can form a series of cross-sectional networks. We can obtain the co-occurrence matrix of the current year by adding the co-occurrence matrix of 12 months in the same year; and we can obtain the co-occurrence matrix of a certain period by taking the average of co-occurrence matrix of several adjacent years.

We use the co-occurrence index COI_t to describe its connection strength for the entire banking system:

$$COI_t = \sum_{i=1}^{N_t} \sum_{j=1}^{N_t} CM_t(i,j) \tag{2}$$

where t is the time (observation month); $CM_t(i.j)$ is the element of the co-occurrence matrix CM_t at the position $(i.j)$ of the observation montht, which equals the co-occurrence frequency of bank i and j in the observation montht divided by $N_t \times (N_t - 1)$[27]; N_t is the number of sample banks. Therefore, if the connection strength among banks is higher, the co-occurrence index of the banking system will be higher. Therefore, if the connection strength among banks is higher, the co-occurrence index of the banking system will be higher.

As the negative shock is one of the driving factors of systemic risk, we calculate the co-occurrence index of negative news as a risk indicator, i.e., $NCOI_t$ at time t. We use the text sentiment analysis to obtain its sentiment index Senti according to Eq. (1) for each co-occurrence news. The co-occurrence index of bank pair $(i.j)$ in a news article is defined as $R_{News}(i.j)$. If all news where co-occurrence bank pair $(i.j)$ reported in observation month t constitute the news set $NewsSetR_{News}(i.j)$, we can obtain the co-occurrence matrix based on negative news. Finally, we can obtain the co-occurrence index based on negative news:

$$CM_t^{neg}(i,j) = \sum_{News \in NewsSet_t(i,j)} R_{News}(i,j) \times 1_{[Senti(News) \le 0]} \tag{3}$$

where $1_{[Senti(News) \le 0]}$ is an integer function, which indicates whether the news corresponding to the bank is negative. Finally, we can obtain the co-occurrence index based on negative news:

$$NCOI_t = \sum_{i=1}^{N_t} \sum_{j=1}^{N_t} CM_t^{neg}(i,j) \tag{4}$$

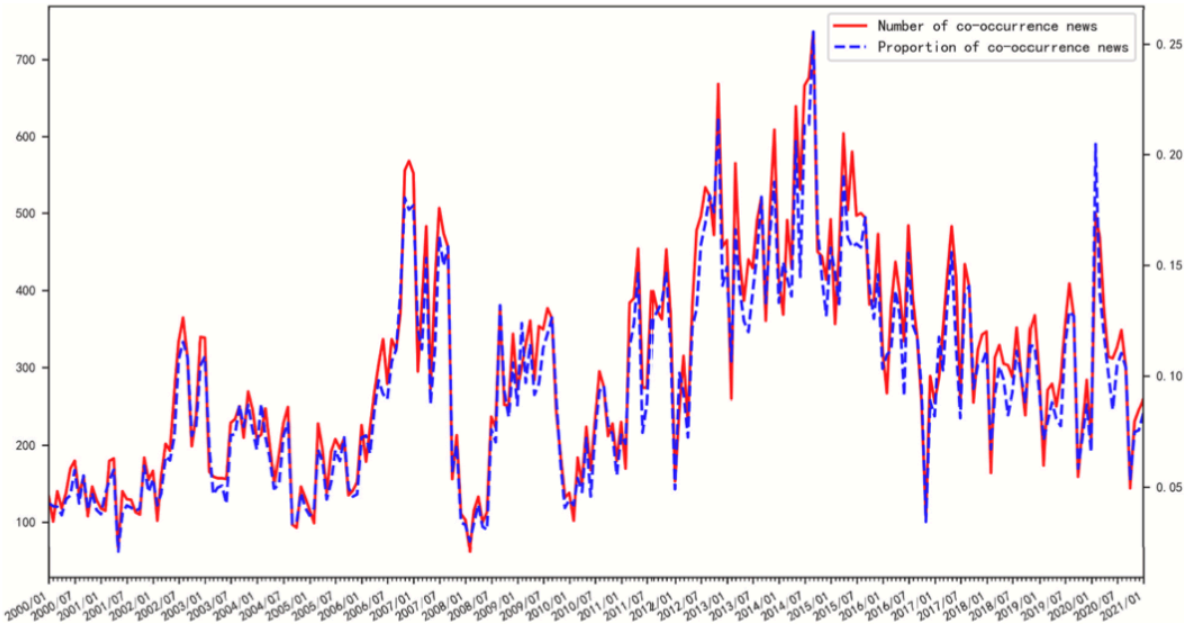


Figure. 5. Monthly changes in the number and proportion of co-occurring news.

Table 1
Sample coverage of banks in China.

Bank Type		Sample #	Total #	Coverage
State-owned bank		6	6	100%
Joint stock banks		12	12	100%
City commercial bank		130	130	100%
Rural small and medium-sized bank	Village Bank	197	1642	12%
	Rural cooperative Bank	9	26	34.62%

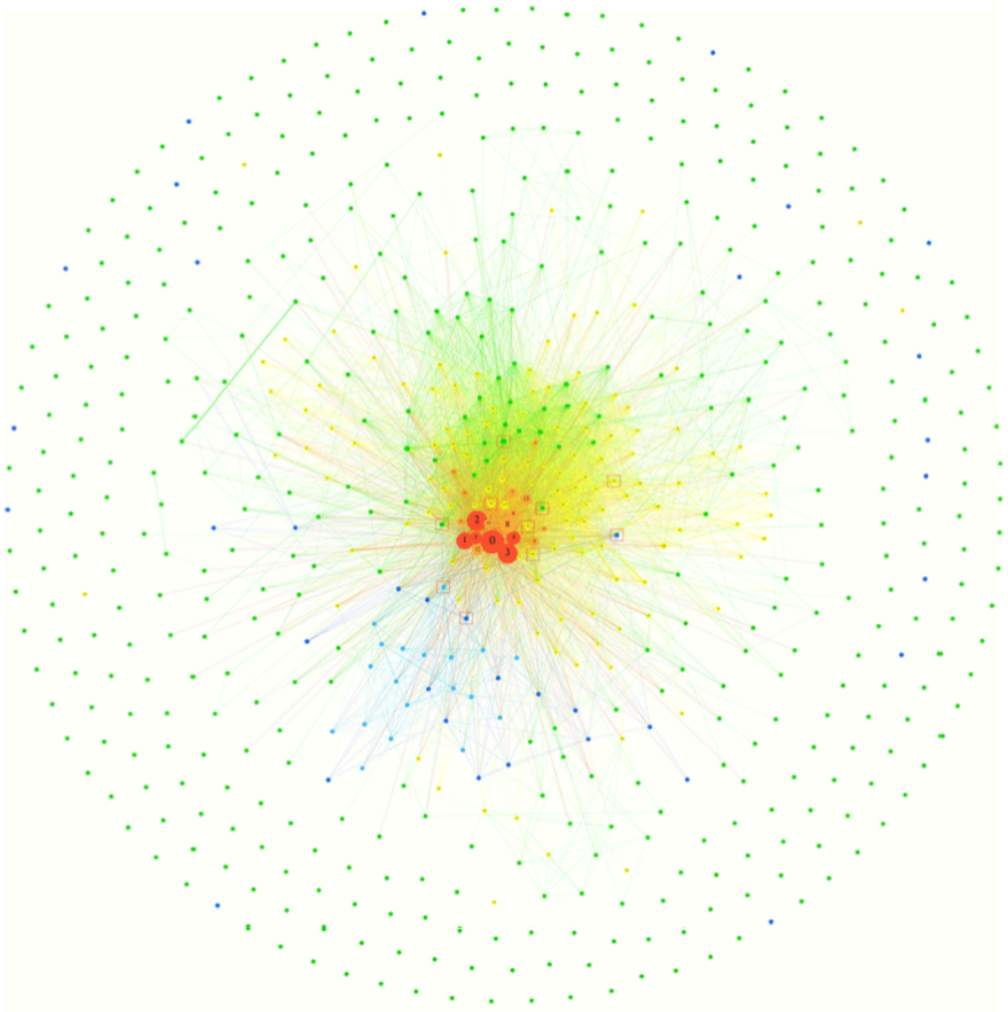
[27] For a network of N banks, the maximum number of internal links is $C_N^2 = N \times (N-1)$.

	Rural commercial Bank	200	1569	12.75%
	Rural credit cooperative	36	609	5.91%
	Rural fund mutual cooperative	4	41	9.76%
Foreign bank		36	41	87.80%
Private bank		19	19	100%

3.3. Sample description

The time span is from Jan 1, 2000 to Dec 31, 2021. The total number of news reports in the sample period is about 6.38 million. We set the fuzzy query condition with bank as the key word, and finally screens out 948,878 news articles to construct a news text database at the monthly frequency. Fig. 4 shows the distribution of media sources for the news article database. News reports from official media (including central and local media) account for about 40 %, which can provide a decent dataset to construct news co-occurrence and sentiment indicators. News reports from official media (including central and local media) account for about 40%, which can provide a decent dataset to construct news co-occurrence and sentiment indicators[28].

Fig. 5 shows the monthly change in the total number of co-occurrence news and its proportion in total news from Jan 2000 to Dec2021.Both the number and proportion of co-occurrence news reach their peaks in 2007-2008, 2013 and 2015, which corresponds to the global financial crisis, the credit crunch in the inter-bank market, and the stock market crash in China respectively. The inter-bank connectedness goes up gradually before the shock, while the transactions between banks are frequent and the bank performance is rising.



[28] For the media classification, we rely on the results by INFOBANK, which is also the database of news articles analyzed in our study. Our dataset comprises 39 central-level newspaper, 132 local newspaper, 308 market-oriented newspaper, 21 market-oriented blogs, 39 central-level websites, 240 local websites, 333 market-oriented websites, and 136 market-oriented magazines. A complete breakdown of all media outlets is in the online appendix: https://lin1103.github.io/Measure-systemic-risk-using-text-analysis/.

Figure. 6. Bank network in China in 2021[29].

When the shock comes, the interconnectedness reaches a peak with a continuous decline afterwards. The decline of connectedness reflects the reduction of inter-bank lending, the number of common customers, and the divergence of performance of banks, etc. Therefore, news co-occurrence can effectively capture the changes in the connections among banks before and after the shock. In addition, the trend of the number and the proportion of co-occurrence news vary with time similarly, which indicates that the number of co-occurrence news is not affected by the total number of news texts in different periods. Thus, similar with existing studies based on news co-occurrence analysis (Ronnqvist & Sarlin, 2015), we take the co-occurrence frequency as a measure to display the change more intuitively, although the sample size of the bank has been considered into the construction of COI_t and $NCOI_t$.

We keep banks reported by at least three news articles[30]. Table 1 shows that the sample covers all state-owned banks, joint-stock banks, city commercial banks and private banks that exist by 2021, and the coverage ratio of foreign banks is 87.8%. Although the sample has a relatively low coverage for rural small and medium-sized banks, the size of these banks is much smaller than other types of banks. In addition, the banking sector has witnessed a wave of bank name changes, restructuring, and M&As, so the list of banks changes over the years. We collect the historical information of each bank, which incorporates its old name[31], name before restructuring, original bank names before M&As, so as to build a dynamic sample with a total of 711 banks[32]. Our sample covers banks covering a majority of the total banking assets, which can reflect the systemic risk of the banking sector. Appendix 1 shows a complete list of sample banks.

4. Co-occurrence network analysis and risk indicator

4.1. Static network of the sample bank

The co-occurrence among banks can reflect the relationship between bank pairs. A complex relationship network can be formed by examining pair-wise co-occurrence of sample banks. We can draw the inter-bank connection network in 2021 by the Fruchterman-Reingold layout algorithm (Fruchterman & Reingold, 1991) in Fig. 6. The numbered nodes represent banks, and the node color represent bank types. Red nodes represent state-owned banks; orange nodes represent joint stock banks; yellow nodes represent city commercial banks; green nodes represent rural small and medium-sized banks; blue nodes represent foreign banks; and dark blue nodes represent private banks. Bank name and type corresponding to each number are listed in Appendix 1. If there is a relationship between two banks, they are connected by an edge. The tighter the inter-bank connectedness, the thicker the edge. Node size is proportional to the degree of the node, which equals the number of nodes associated with the node. The greater the degree of the node, the higher the centrality, and the more important it is in the network.

Fig. 6 shows that the network has a core-periphery structure[33], which has an agglomeration and stratification pattern. State-owned banks are in the center, surrounded by joint stock banks, and small and medium-sized banks on the outside, such as city commercial banks and rural small and medium-sized banks. In terms of the node centrality, state-owned banks have the largest degree and the strongest centrality, and they are the core of the network. The degrees are relatively smaller for joint stock banks and city commercial banks, rural small and medium-sized banks, foreign banks and private banks. A large number of rural small and medium-sized banks (mainly village bank and rural credit cooperative) are even isolated in the network. The business complexity and the importance decrease sequentially from state-owned banks to small and medium-sized banks.

Banks close to the center of the network tend to be larger with stronger business connection among all types of banks. We have circled several representative banks with red boxes. In yellow nodes, we see Bank of Beijing (No. 18), Bank of Shanghai (No. 52) and Bank of Jiangsu (No. 53), which are the top three in total assets among city commercial banks. *Bank of Jinzhou* (No. 36), which is partially owned by Industrial

[29] For high-resolution pictures, please refer to the online appendix: https://lin1103.github.io/Measure-systemic-risk-using-text-analysis/.

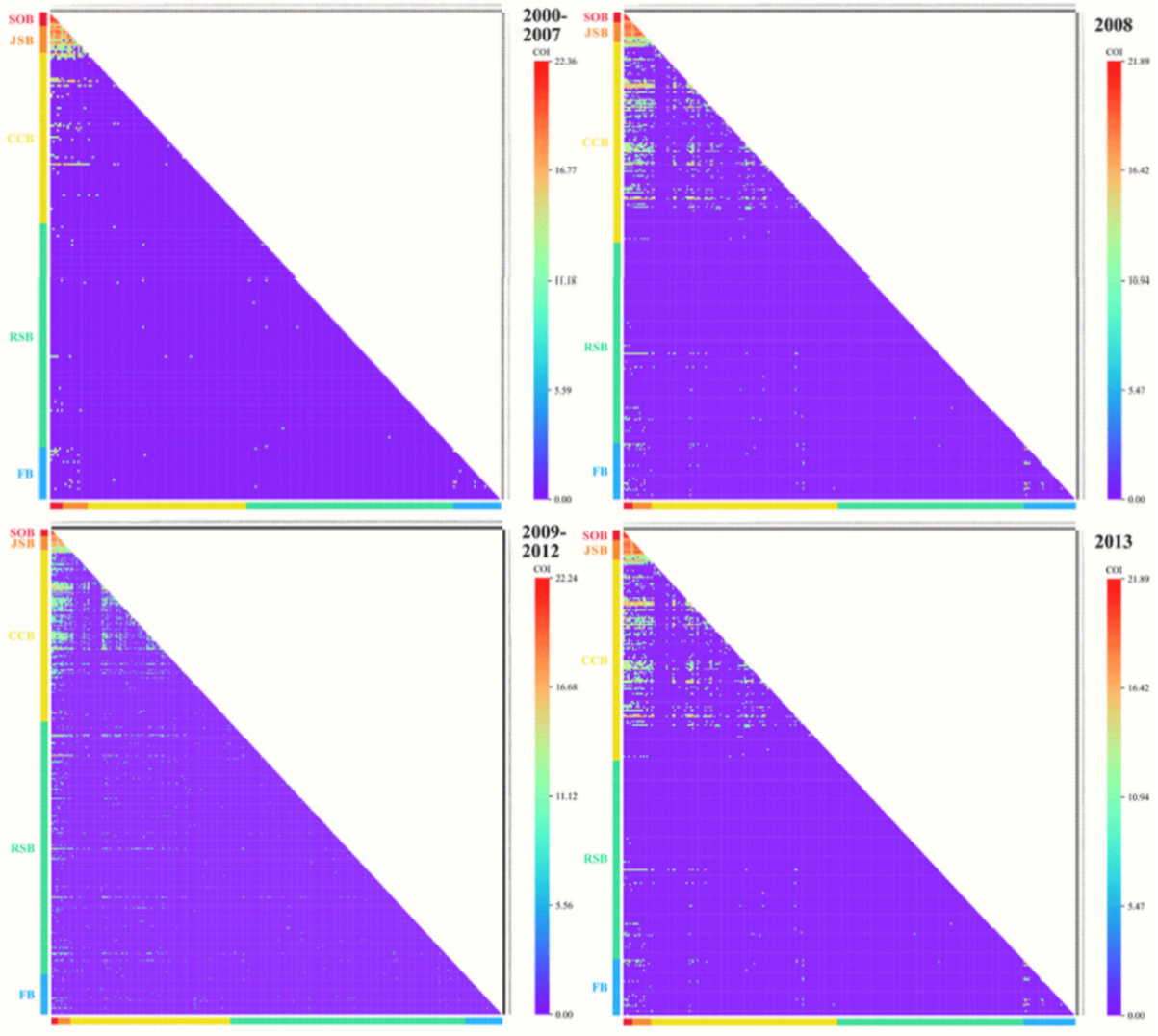
[30] Some banks occur less in the news, probably as they receive less media attention or they have few connections with other banks. To mitigate the bias due to the differences in media attention, we try to find a threshold to filter out banks that have received sufficient attention. We find that keeping banks that have been reported by at least three news articles in the sample can well balance the number of sample banks, the representativeness of banks, and potential differences in media attention.

[31] Some banks have different names in the history without type changes. We put their historical names into their respective regular expressions rather than treating them as different banks. For example, Shengjing Bank used to be named Shenyang Commercial Bank. Moreover, *Mengshang Bank* and Baoshang Bank share the same bank label in our sample, as the former is established based on the latter after bankruptcy.

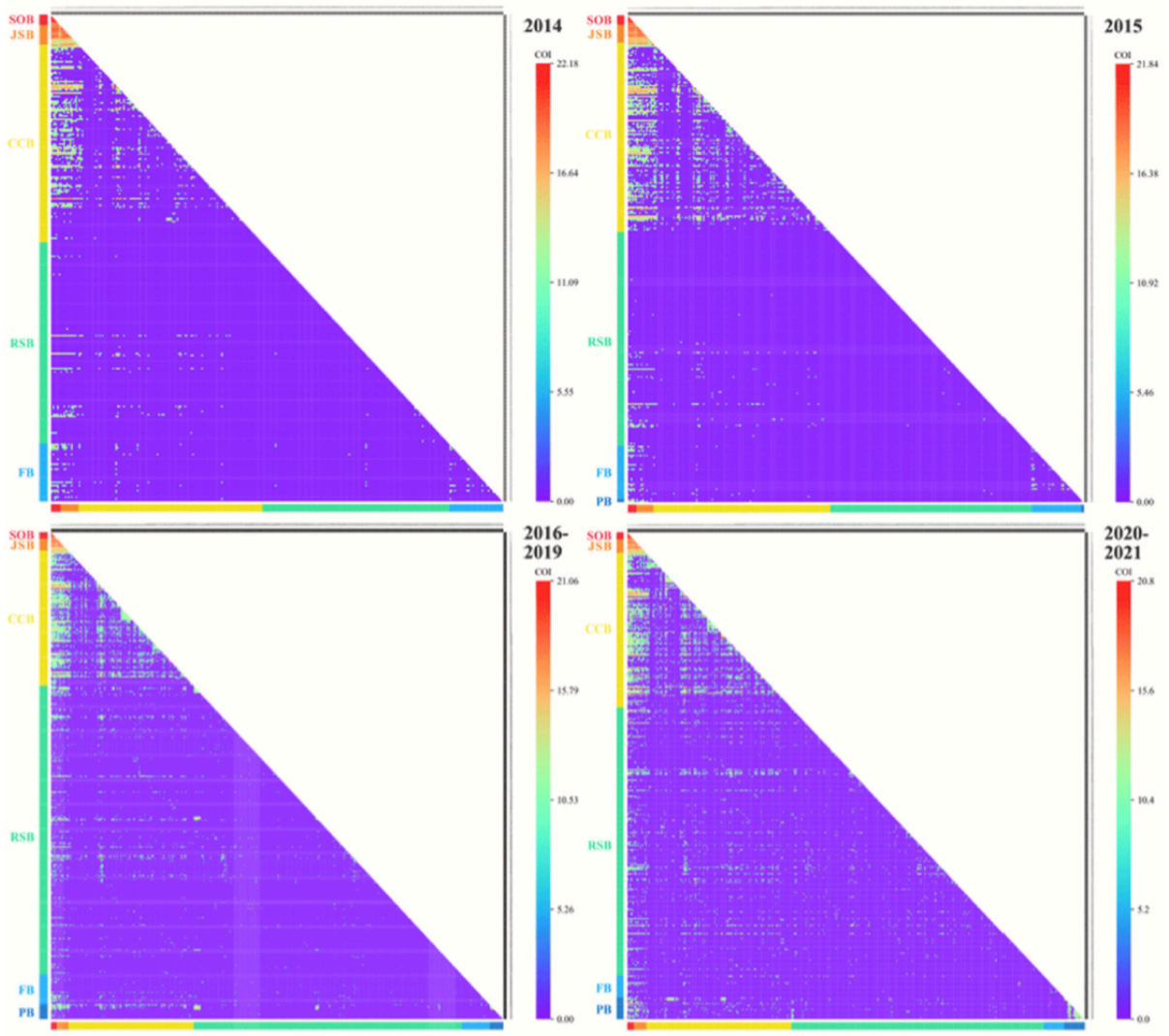
[32] We dynamically adjust the sample year by year, and take the middle of the year as the threshold. Banks that exist between Jan–June of the year will be included in the sample of the current year, while banks that exist between July–Dec of the year will be included in the sample of the next year. Some city commercial banks and small and medium-sized rural banks are restructured from urban/rural credit cooperatives, which are not included in the sample due to the data availability.

[33] This structure also exists in interbank networks in many other countries, such as Italy (Bargigli et al., 2015), Germany (Craig & Von Peter, 2014), and the Netherlands (van Lelyveld, 2014). It is interesting and perplexing that financial institutions form a core-periphery network structure, which is widely believed to increase financial system instability rather than promote adequate risk sharing. Theoretical studies have proposed multiple mechanisms for such network structure. Lux (2015) show that the core-periphery structure is naturally derived from a banking system with heterogeneous balance sheet size. Altinoglu and Stiglitz (2023) suggest that the implicit government guarantee renders small banks with tighter interconnectedness to large banks through inter-bank lending, which leads to the core-periphery structure and excessive risk-taking.

and Commercial Bank of China (No. 0), is also located not far from the center of the network. In green nodes, though Shanghai Rural Commercial Bank (No. 251), Shenzhen Rural Commercial Bank (No. 608) and Chengdu Rural Commercial Bank (No. 525) all rank top 10 in total assets among rural small and medium-sized banks, their interconnection characteristics are different. Shanghai Rural Commercial Bank shows more connection to city and rural commercial banks, while Shenzhen Rural Commercial Bank and Chengdu Rural Commercial Bank are closer to state-owned banks. In dark blue nodes, both HSBC Bank (China) (No. 613) and Standard Chartered Bank (China) (No. 639), top two of foreign banks in terms of branch number, are closely related to state-owned banks. In blue nodes, Zhejiang E-Commerce Bank (No. 150), the largest private banks in China, exhibits stronger connection with other types of banks than with private banks.



a. 2000-2013



b. 2014-2021

Figure. 7. Annual inter-bank connection heat maps. As the co-occurrence matrix is symmetric, the heat map shows only the lower triangular region. Banks which do not co-occur with other banks in one period are not in the heat map for that period. The bank number for each block is marked at the top and right, and the bank type for each block is marked at the left and bottom. SOB (red-colored), JSB (orange-colored), CCB (yellow-colored), RSB (green-colored), FB (blue-colored) and PB (dark-blue-colored) refer to stat-owned banks, joint stock banks, city commercial banks, small and medium-sized rural banks, foreign banks and private banks respectively.

4.2. Dynamic network of various types of banks

In order to visualize the dynamic relationship among various banks, we draw heat maps based on co-occurrence matrix. Fig. 7 displays the interconnections among various types of banks, such as state-owned banks (SOB), joint stock banks (JSB), city commercial banks (CCB), rural small and medium-sized banks (RSB), foreign banks (FB) and private banks (PB).

The heat maps follow the rainbow color system from red to blue, which represents the gradual decrease in the co-occurrence index[34]. Areas with brighter colors in the heat map indicate tighter inter-bank connections. Only banks connected to at least one of other banks are displayed in heat maps due to too large a sample size, and the maximum value represented by red is not always consistent across time as the range of co-occurrence frequency varies over the time.

Fig. 7 shows that the internal connectedness characteristics of large banks and small and medium-sized banks have similar trends from 2000 to 2021. The inter-bank connectedness reaches the peak during four shocks: global financial crisis in 2008, credit crunch in the inter-bank market in 2013, the stock market crash

[34] To be precise, it is equal to multiplying the co-occurrence index by 1,000,000 and taking the logarithm of 2 to balance the large denominator of COI formula.

in 2015, and COVID-19 in 2020, which are manifested in the expansion of bright-colored area (especially the red area) in the heat maps. The tightness of inter-bank connection tends to decrease after these events, which is manifested in the expansion of cool-colored areas.

There is some heterogeneity in the connectedness across bank types. Although the internal connections of state-owned banks and joint stock banks change dynamically, the extent of the change is not significant. The heat map of each period is mainly composed of bright-colored blocks, which indicates that the two types of banks are in high connectedness in general, and the connectedness difference between bank pairs is relatively small. However, the proportion of dark-colored blocks in the heat map is significantly higher than that of the first two types of large banks for many small and medium-sized banks, and the maximum connection tightness of bank pairs is also smaller than that of large banks. Most city commercial banks do not have connections with each other before 2009, which is due to geographical restrictions by the regulation. However, the regulatory authorities relax the restrictions on the branch footprint of city commercial banks since 2009. Thus, city commercial banks start inter-city operations and their internal connections increasingly tighten. This trend was further accelerated by a rapid growth of interbank business after 2013, i.e., see the expansion of bright-colored areas in the upper-left corner of the heat map[35]. Additionally, the increase in inter-connectedness of city commercial banks is also partly attributed to their utilization of shadow banking products. Hachem and Song (2021) show that small banks are more constrained by liquidity requirements than large banks. Therefore, city commercial banks have increasingly utilized shadow banking products with stricter liquidity regulations after 2009, such as non-guaranteed wealth management products (WMPs) and trust loans in order to bypass regulatory restrictions (Hachem, 2018; He & Wei, 2023). Furthermore, city commercial banks tend to connect more frequently with state-owned banks and joint-stock banks up until 2012, i.e., Appendix 2 shows a detailed visualization. After 2013, however, they rapidly increase their connections with other small and medium-sized banks, which is consistent with their expansion.

In contrast with city commercial banks, the internal connection network of rural small and medium-sized banks is sparse. It is mainly due to severe restrictions on the inter-city operation of rural small and medium-sized banks. In addition, the inter-bank and off-balance sheet business has encountered strict regulation since 2016, and it is more difficult for rural small and medium-sized banks to form a close internal network, which is reflected by few bright-colored blocks in the central part of the heat map. In addition, bright-colored area in the lower right corner of the heat map expands rapidly, i.e., the connection tightness among foreign banks and private banks rises drastically. It corresponds to the acceleration of financial opening-up, liberalizing restrictions on foreign banks, supportive policies on consumer finance and inclusive finance, and the surge of private banks in China since 2018.

The internal connection structure of small and medium-sized banks changes from centralization to decentralization around the shocks. For example, only a small number of small and medium-sized banks are highly correlated with each other before the four shocks mentioned above, while other small and medium-sized banks have weak interconnections, i.e., bright-colored blocks are concentrated in some specific regions of the heat map and the value of COI_t on the right side of each heat map is relatively high. However, the difference in the number of bank co-occurrence decreases after these shocks. The connection tightness of strongly correlated banks decreases, while that of weakly correlated banks increases, and the COI_t drops. The number of bright-colored blocks in the heat map is in a significant boost and more evenly distributed in each region, while the inter-bank connection structure has switched from centralization to decentralization.

[35] Unlike state-owned banks, which benefit from stable household deposits and implicit government support, small and medium-sized banks rely heavily on interbank funding, often sourced from large banks such as state-owned banks and some joint stock banks (Acharya et al., 2019; Song & Xiong, 2018). For instance, Industrial Bank's "Yinyin Platform" provides financing and settlement services to hundreds of small and medium-sized banks (Wang et al., 2018).

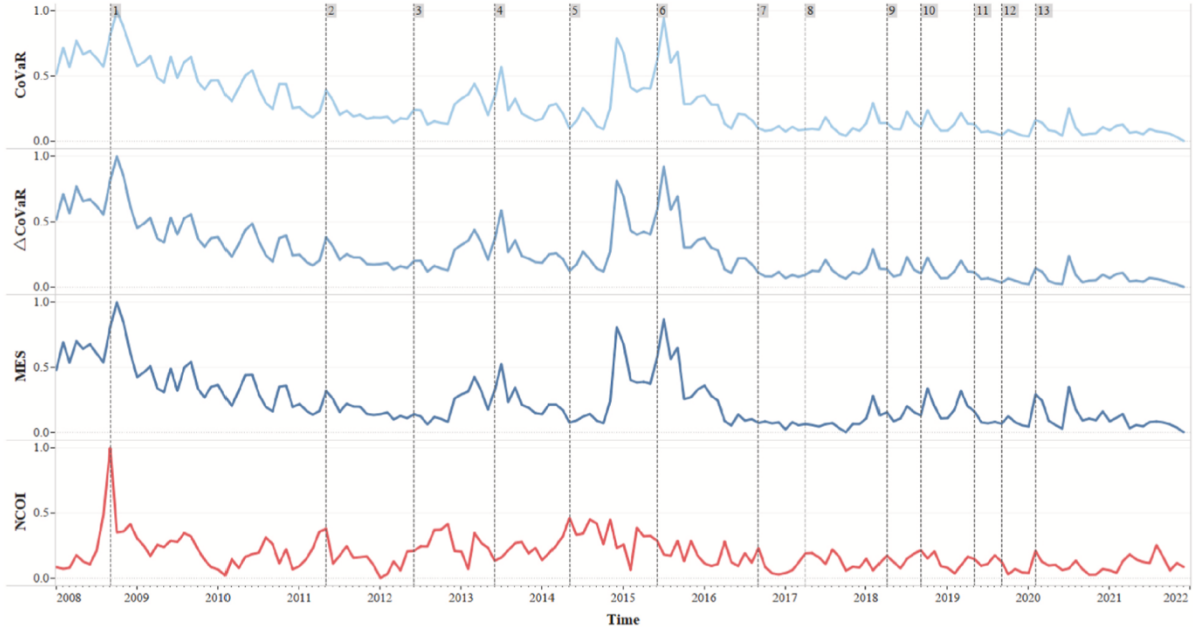


Figure. 8. Comparison of risk indicators.

4.3. Time series analysis of risk indicator

Sections 3.1 and 3.2 show that the co-occurrence index COI_t reflects the actual connectedness tightness between banks. Therefore, $NCOI_t$, which combines sentiment index $Senti_A$ with COI_t, should be able to capture the two driving factors of systemic risk, i.e., negative shock and connection mechanism. We will examine its capability in identifying the risk from the time dimension.

We compare $NCOI$ with traditional risk contribution indexes ($CoVAR_t$; $\Delta CoVAR_t$; MES_t) to investigate whether $NCOI_t$ can capture systemic risk dynamics around shocks[36]. We set the time range between 2008 and 2020, and all indicators have been standardized. Fig. 8 shows that $NCOI_t$ exhibits large fluctuations during the global financial crisis (Event 1), credit crunch in the interbank market (Event 4), the stock market crash (Event 6), COVID-19 (Event 13) and other shocks in Table 2, which is consistent with the traditional indicators of systemic risk around shocks.

However, the peaks of various indicators in different periods are not fully consistent with each other. The peaks that traditional risk indicators reach during the stock market crash equal to that during the global financial crisis, while the peak of $NCOI_t$ in the global financial crisis is significantly higher than that in stock market crash. Traditional risk indicators mostly use stock market data, which often reflects the linkage among listed banks and is sensitive to banks' stock market performance. Traditional risk indicators may overestimate the risk contagion of the stock market crash as unlisted banks' risk are not represented. Instead, $NCOI_t$ has reflected multi-level inter-connectedness which accounts for many unlisted banks. Thus, the fareaching effect of the global financial crisis are by no means the same as those of the stock market crash in China.

In addition, $NCOI_t$ captures the impact of policy events on banks' business activities and operation strategies, while it rises in periods of the event 2, 5, 8, 9, 10 and 12. For example, the "New Asset Management Regulations" (i.e., new AMP Rules) are aimed to curtail the shadow banking sector, which has

Table 2
Summary of shock events from 2008 to 2021.

Index	Time	Description
1	Sep-08	Global financial crisis
2	May-11	Inflationary pressure increases, and the central bank raises the reserve ratio five times in a row, which increases the pressure on bank credit

[36] $\Delta CoVAR_t$ captures risk contribution of institution i relative to institution j or the entire system (Here we omit the subscript of t). The former refers Fig. 8. Comparison of risk indicators.to pairwise spillover effect, while the latter refers to overall systemic impact of institution i. Specifically, $CoVAR_q^{j|i}$ is the value at risk (VaR) of institution j in context of some event $S(X^i)$ of institution i at the level of q, that is, $\mathbb{P}\left(X^j - CoVAR_q^{j|i} | S(X^i)\right) = q$. Tobias and Brunnermeier (2016) define institution i's contribution to j at the level of q as $\Delta CoVAR_q(i,j) = CoVAR_q^{j|X^i=VaR_q^i} - CoVAR_q^{j|X^i=Median^i}$, where $CoVAR_q^{j|X^i=VaR_q^i}$ is for institution j given the distress of institution i, while $CoVAR_q^{j|X^i=Median^i}$ is for institution j given institution i in its normal conditions. In practice, q = 5%. The formulation highlights the impact of i's extreme events on j. MES measures the marginal contribution of institution i to systemic risk, as measured by the expected shortfall (ES) of the system (Acharya et al., 2017).

3	Jun-12	"Commercial Bank Capital Management Measures (Trial)"
4	Jun-13	Credit crunch in the inter-bank market
5	May-14	"Notice on Regulating Inter-bank Business Governance of Commercial Banks" issued by the CBRC to restrain the maturity mismatch of banking institutions and strengthen liquidity management
6	Jun-15	Stock market crash
7	Sep-16	Shanghai Stock Exchange tightens bond issuance by real estate companies, and banks tighten project loans to real estate companies
8	Apr-17	"Notice on Effectively Making Up for Regulatory Shortcomings and Improving Regulatory Efficiency"
9	Apr-18	"New Asset Management Regulations"
10	Sep-18	"Measures for the Supervision and Administration of the Wealth Management Business of Commercial Banks" issued by the CBIRC, which is a supporting rule for the "New Asset Management Regulations" to refine the regulatory requirements for wealth management products
11	May-19	Baoshang Bank is taken over by the central bank and the CBIRC, which entrust China Construction Bank to manage its business; China Merchants Bank's "Qianduan" APP exploded.
12	Sep-19	"Administrative Measures for the Net Capital of Wealth Management Subsidiaries of Commercial Banks (Trial) (Draft for Comment)" issued by the CBIRC, which proposes the net capital requirements of wealth management subsidiaries and rectifies the shadow banking business.
13	Feb-20	COVID-20 (The peak of the epidemic in China)

Figure. 9. Decomposition of co-occurrence index $NCOI$ by bank types.

been expanding rapidly since 2010[37], and created huge risk spillovers in the banking system. Thus, when the regulatory authorities tighten the supervision rules, the risks erupt quickly and form a contagion effect in the bank network. Such connectedness originated from similar business mode is difficult to be revealed directly with market data, and the fluctuations of traditional risk indicators are not significant over the same period. Thus, news-based $NCOI$, can indeed capture more comprehensive inter-bank connections that include information on stock market, operation performance, and business activities, etc.

We decompose $NCOI$ by bank types, i.e., $NCOI_{large}$ considers the connections among state-owned and joint stock banks; $NCOI_{small}$ considers the connections among small and medium-sized

[37] The economic growth has slowed down as the regulatory authorities turned to tightening policies since 2010. In particular, the real estate industry, local government financing platforms and SMEs have a severe shortage of funds, which has stimulated the development of the shadow banking sector. In addition, when the deposit reserve ratio is high, banks have great incentives to use financial innovation to make use of regulatory arbitrage, which further promotes the shadow banking sector. According to the CBIRC, the total size of the shadow banking sector exceeded 90 trillion RMB up to 2016 in China, which endangers the stability of the banking sector in China.

banks; $NCOI_{mixed}$ considers both connections among small and medium-sized banks, and pair-wise connections between state-owned (joint stock banks) and small and medium-sized banks.

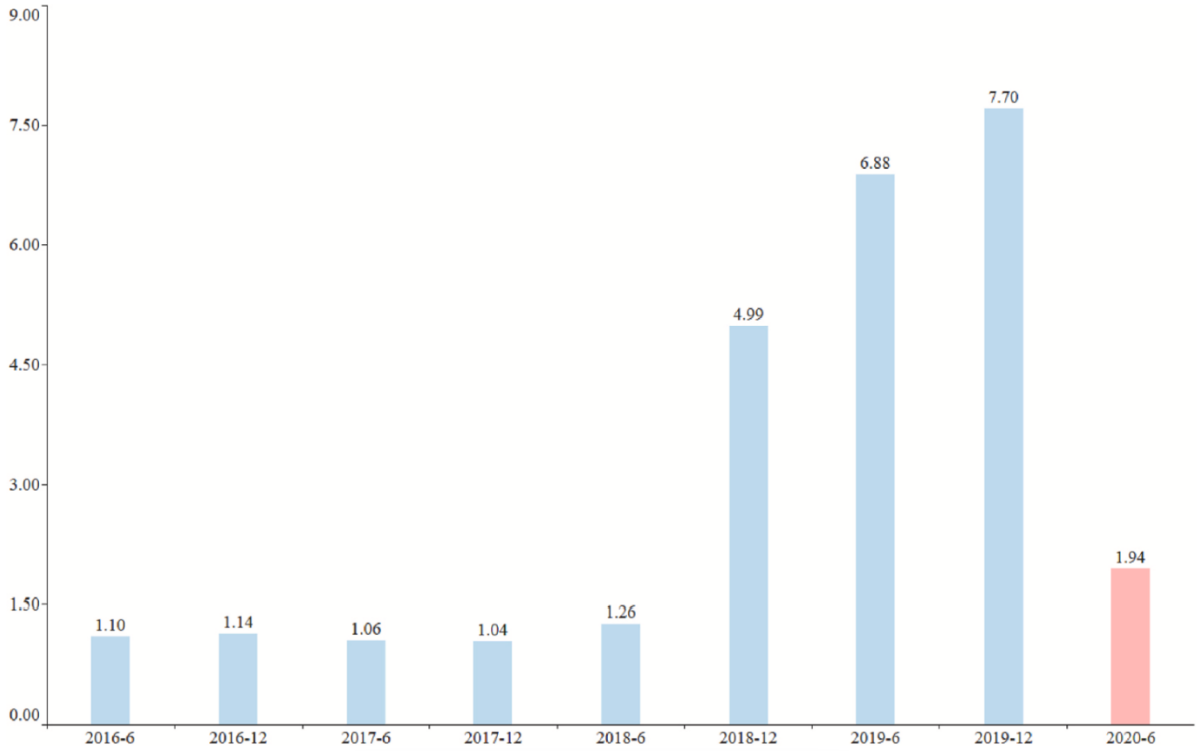


Figure. 10. Non-performing loan ratio of *Bank of Jinzhou* from 2016 to 2020 (%).

Fig. 9 shows the trend of $NCOI$ and its decomposition during 2008-2021. $NCOI_{large}$ captures the risk diffusion by the connection among large banks; $NCOI_{small}$captures the risk diffusion by the connection among small and medium-sized banks; $NCOI_{mixed}$ captures the risk spillovers by the connection between small and medium-sized banks and large banks. As small and medium-sized banks face strict restrictions on international business before the global financial crisis, the shock matter less for them than large banks, i.e., $NCOI_{large}$ has a peak in this period. With the expansion of inter-city operation, interbank businesses, and shadow banking activities of small and medium-sized banks, both $NCOI_{mixed}$ and $NCOI_{small}$ rise dramatically over the time. The impact of the shock on small and medium-sized banks become more pronounced, such as the "Commercial Bank Capital Management Measures (Trial)" released in June 2012 (event 3), which raises regulatory capital standards and renders small and medium-sized banks with low capital adequacy ratios face higher risks. Regulatory pressure makes $NCOI_{small}$ rise slightly although $NCOI_{large}$ has little change in the same period. During the stock market crash, small and medium-sized banks become a main source of risk contributor. The relative fluctuation of $NCOI_{mixed}$ and $NCOI_{small}$ is larger than that of $NCOI_{large}$in the same period. The tightened regulations such as restrictions on related-party transactions and WMPs, contribute to the fluctuation of $NCOI_{small}$ after 2016. While these regulations temporarily reduce risk-taking, our findings suggest that small and medium-sized banks continue to face challenges due to their reliance on interbank funding and shadow banking, which is supported by persistently high magnitudes of $NCOI_{mixed}$ and $NCOI_{small}$. In contrast, large banks exhibit a low and stable magnitude of $NCOI_{large}$ over the past decade, underscoring their relatively conservative risk profiles. This divergence highlights the systemic risk contributed by business structures and regulatory arbitrage of small and medium-sized banks. When the credit risk of Baoshang Bank bursts in May 2019 (event 11), which has more than 60% of inter-bank counterparties as small and medium-sized financial institutions, $NCOI_{small}$ also witness a rapid growth in the same period. It suggests that $NCOI$ has capability in identifying systemic risk, which reveals the instability of small and medium-sized banks versus large banks[38].

[38] Recent studies also suggest an increasingly important role of small and medium-sized banks in systemic risk. For example, Wang et al. (2018) explore a risk contagion network of 24 financial institutions and find that small banks such as Bank of Beijing and Bank of Ningbo are detected as systemic risk emitters due to their huge risk spillovers, particularly from their rapidly developing shadow businesses. Huang et al. (2019) show that the average MES of three city commercial banks (Bank of Beijing, Bank of Nanjing, and Bank of Ningbo) even exceeds that of large state-owned banks during 2008–2014. Shi et al. (2022) find that most of top 10 vulnerable banks in 2019 and 2020 are city commercial banks and rural commercial banks, including Bank of Handan, and Bank of Jiangsu, and Qingdao Rural Commercial Bank, primarily due to

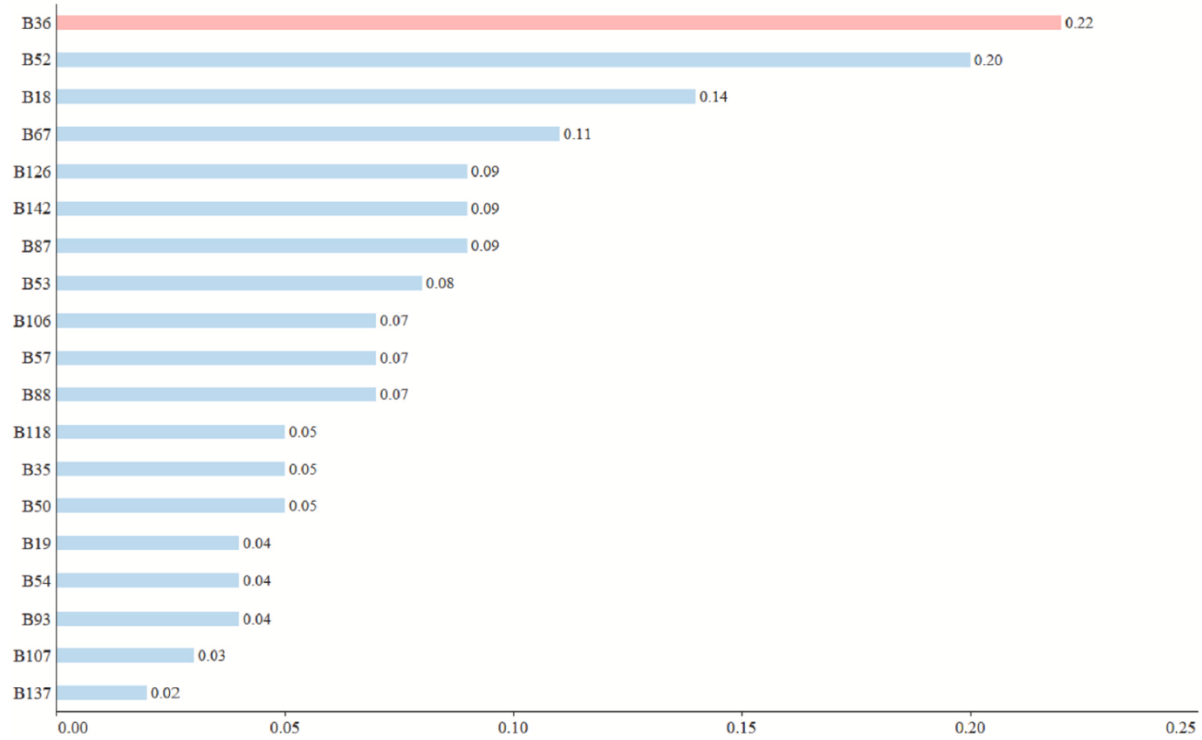


Figure. 11. Inter-bank liabilities/interest-bearing liabilities of listed city commercial banks in June 2018. B36 is the *Bank of Jinzhou*.

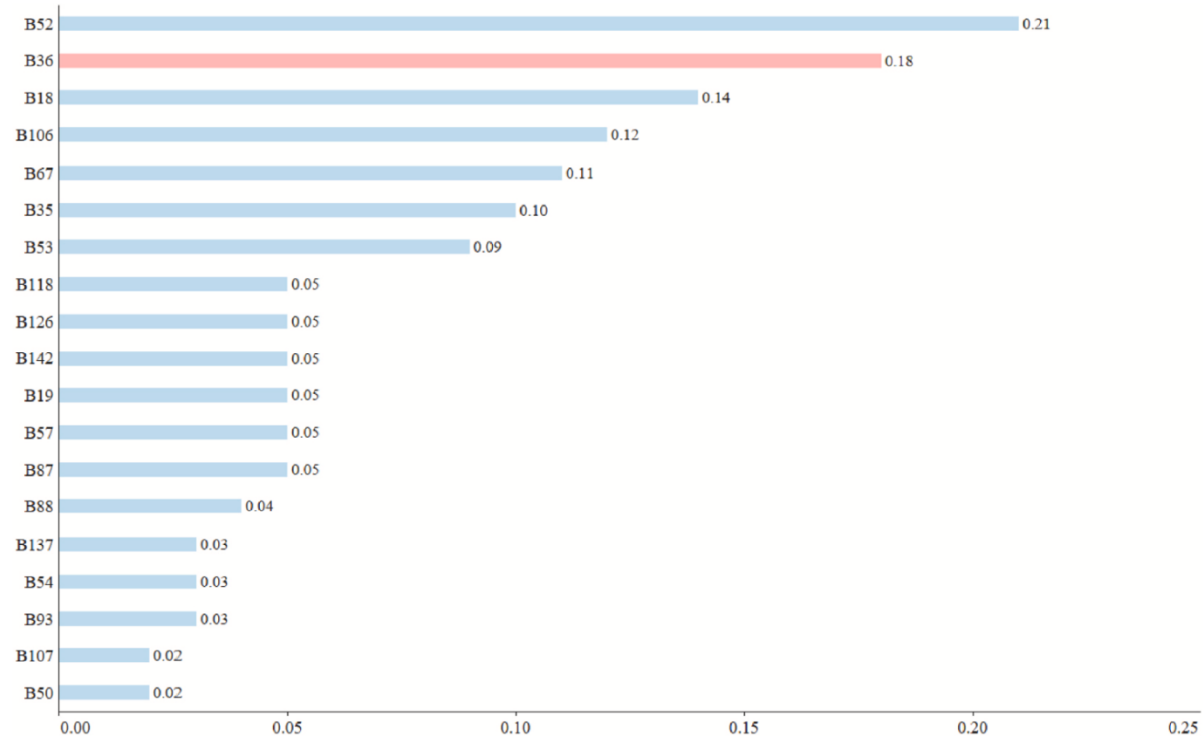


Figure. 12. Inter-bank liabilities/interest-bearing liabilities of listed city commercial banks in June 2019. B36 is the *Bank of Jinzhou*.

5. Further analysis of the measurement

their common exposures to specific asset types. Notably, banks highlighted in these studies are also included in our sample. However, our study offers a more comprehensive examination of small and medium-sized banks, utilizing a much larger sample of 711 banks over 2000 to 2021.

News co-occurrence can capture inter-bank connection from both static and dynamic perspectives. News sentiment index Senti is introduced to construct the risk indicator $NCOI_t$ that considers the two systemic risk drivers of negative shock and interconnection. By comparing $NCOI_t$ with traditional risk indicators and decomposing $NCOI_t$ by bank types, we find that $NCOI_t$ has capability in identifying the systemic risk. Thus, we will conduct an in-depth analysis of the effectiveness of $NCOI_t$ from the time and space dimensions.

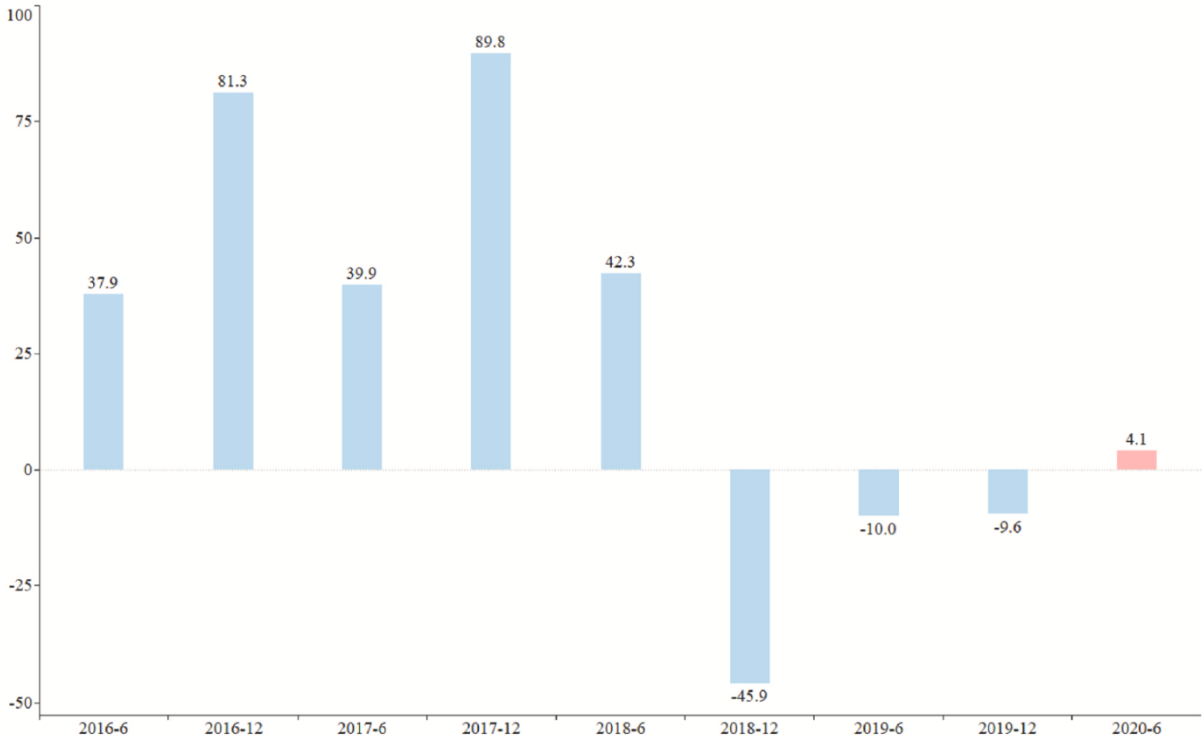


Figure. 13. Net profit of *Bank of Jinzhou* from 2016 to 2020 (Unit: 100 million RMB).

5.1. Time dimension: a case study at the individual level

The capability of $NCOI_t$ in identifying systemic risk is in the banking sector. However, the precise handling of high-risk banks is an arduous task in preventing and resolving financial risks. Thus, it is necessary to test the validity of $NCOI_t$ at the individual bank level. If $NCOI_t$ changes in accordance with financial indicators, it indicates that $NCOI_t$ can capture the risks of individual banks timely in a precise way.

We focus on the *Bank of Jinzhou*, which has witnessed a risk event in the past three years. *Bank of Jinzhou* is the second largest city commercial bank in Liaoning province while Shengjing Bank has the largest assets. In June 2019, a serious inter-bank squeeze broke out in *Bank of Jinzhou*, while the People's Bank of China pushed forward the restructuring of the bank, such as the introduction of strategic investors, management turnover, and asset disposal, etc. The asset quality and profitability of the bank recovered soon, and the "squeeze" crisis and risk contagion were alleviated in time as well. With the capital increase in Oct 2020, *Bank of Jinzhou* achieved the intended goal in the restructuring.

The risk event of *Bank of Jinzhou* originated from the default of Baota Petrochemical Group in July 2018. As a key customer of *Bank of Jinzhou*, the default of Baota Petrochemical Group has a great negative impact on the capital and asset quality of *Bank of Jinzhou*. The deployment of the restructure work in August 2019 is the threshold for the two periods: before the restructure (2018.7–2019.8) and restructure (2019.9–2020.10):

Before the restructure is the period of risk generation and diffusion of *Bank of Jinzhou*, which can be divided into two stages. One stage is the initial shock stage (2018.7–2019.4). In July 2018, the default of Baota Petrochemical Group serves as the risk fuse, which exerts a negative impact on the capital and asset quality of the bank, and leads to a sharp rise in non-performing loan ratio. Fig. 10 shows that non-performing loan ratio of *Bank of Jinzhou* is low during Jan 2016 and June 2018, while it skyrocketed to 4.99 % at the end of 2018 due to the default of Pagoda Petrochemical notes. The other stage is the risk overflow stage (2019.5–2019.8). Ernst & Young resigned from its audit business for the bank at the end of May 2019, and the non-performing loans are gradually revealed. As *Bank of Jinzhou* relies heavily on the inter-bank funds, its risk exposure triggers the advance withdrawal of loans by many banks, which leads to a liquidity crisis. Figs. 11 and 12 show the inter-bank capital dependence of all listed city commercial banks in China including

Bank of Jinzhou in 2018 and 2019[39], i.e., I nter-bank capital dependence is the inter-bank liabilities over interest-bearing liabilities. Before the liquidity crisis, the inter-bank capital dependence of *Bank of Jinzhou* is as high as 0.22, ranking the first among listed city commercial banks. Due to the withdrawal of loans by many banks, its inter-bank funds holdings fall sharply afterwards, which drops to 18 % of the inter-bank capital dependence.

Restructure is the period of risk resolution of Bank of Jinzhou (2019.9–2020.10). The bank has adopted various measures to address non-performing loans, such as introduction of strategic investors, replacement of management, disposal of non-performing loans, and private placement to supplement capital, which improves the asset quality and profitability. Fig. 13 shows that Bank of Jinzhou achieves a net profit of approximately 410 million RMB in the first half of 2020 after two consecutive years of losses. At the same time, Fig. 10 shows that non-performing loan ratio drops to 1.94 % in the same period, and its asset quality has risen as well. In short, bank restructure has contained the risks accordingly.

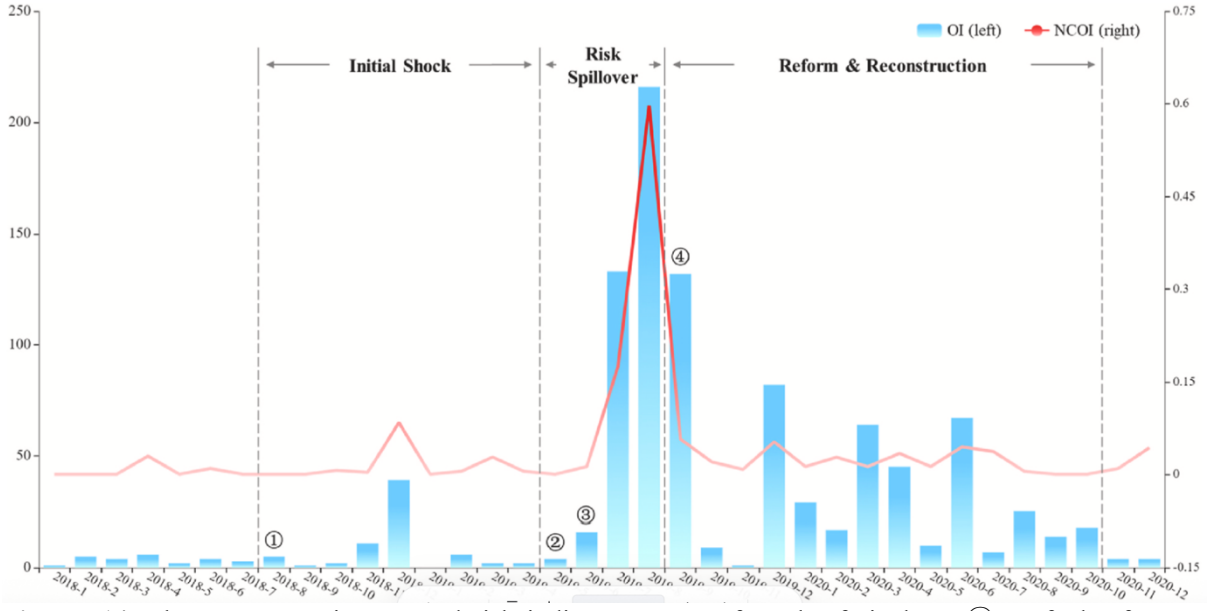


Figure. 14. The news attention OI and risk indicator NCOI of Bank of Jinzhou. ① Default of Baota Petrochemical Group; ② Resignation of Ernst & Young for the audit business; ③ Withdrawal of loans by related banks; ④ Full deployment of the restructure.

If the risk indicator $NCOI_t$ constructed by news co-occurrence and sentiment analysis can identify risks, we should observe the risk and spillover in various stages. In the initial shock stage, as Bank of Jinzhou is affected by the default of its key client, the news attention (i.e., the number of times reported in news, OI_t) should increase. However, the risk indicator $NCOI_t$ may only increase mildly as the risk is contained within the bank. In the risk spillover stage, OI_t may still increase over time as banks suffer fund shortage; the risk may spread through the inter-bank connection due to fund withdrawal by related banks, and thus $NCOI_t$ will reach a peak. In the restructure stage, OI_t drops to a normal level with the risk disposal and the improvement of asset quality, and $NCOI_t$ may decline as well.

Fig. 14 shows the pattern of OI_t and $NCOI_t$ for *Bank of Jinzhou* from 2018 to 2020. In the initial shock stage, the news attention OI_t rises after the default of Baota Petrochemical Group in July 2018 while $NCOI_t$ rises mildly, which substantiates Hypothesis 1. In the risk spillover stage, the news attention OI_t increases for four consecutive months due to the resignation of Ernst & Young. At the same time, the risk indicator $NCOI_t$ shows an upward trend and reaches a local peak in August 2019, which is consistent with a risk spread across the bank network and substantiates Hypothesis 2. During the restructure stage, the news attention OI_t and risk indicator $NCOI_t$ show a declining trend, which suggests that the restructure has improved asset quality and alleviated bank risk and spillover effect. However, the market remains concerned about the bank risk, and OIt and $NCOI_t$ do not revert to their ex-ante level in the short term[40].

In addition, it reveals the necessity of real-time and high-frequency risk monitoring indicators. If the risk is only examined from the financial indicators such as non-performing loan ratio, it is often subject to limited

[39] The interbank liability data of Harbin Bank's semi-annual report is missing and is replaced by the annual report data.
[40] According to Alibaba's judicial auction platform, on Feb 6, 2021, 90 million shares of Bank of Jinzhou held by Jincheng International Logistics Group and 6 million shares held by Dalian Changxingdao Greentown Development were put on auction, but ultimately failed due to a lack of bid.

frequency and disclosure time of financial statements. In contrast, risk indicators based on high frequency news can help monitor risk in the supervision.

5.2. Time dimension: news-based risk indicator $NCOI$

Existing research has highlighted the relationship between bank characteristics and systemic risk measured by traditional indicators such as $\Delta CoVaR$, MES and $SRISK$. Anginer et al. (2018) disclose potential ways that bank size affects systemic risk. De Jonghe et al. (2015) explore the effect of annual growth in bank assets and the ratio of deposits to assets on the systemic risk. Ellul and Yerramilli (2013) show a positive connection between bank risks and capital ratios. Zhang et al. (2021) show that capital adequacy ratio and return on assets mitigate the systemic risk contribution of banks. van Oordt & Zhou (2019) find no strong relationship between the proportion of non-interest income and tail risks of banks. Brunnermeier et al. (2020) examine the relationship between the proportion of non-interest income, liquidity ratio, non-performing loan ratio of banks and the systemic risk.

We include these common factors to conduct an analysis on the determinants of $NCOI$, although the impact of some factors on systemic risk are still controversial. We obtain annual financial data of 223 banks from *Bank Focus* over 2005 and 2021[41], and employ two-way fixed-effect models for the determinants of $NCOI_t$ in Table 3[42]. We find that bank size is significant at conventional levels in all columns, which suggests that it is an important risk factor (Laeven et al., 2016). We add other variables one-by-one to determine the risk factors that can explain $NCOI_t$. Capital adequacy ratio, NPL ratio and ROAA are all significant although the annual growth in assets, liquidity ratio and non-interest income share show limited effect on $NCOI_t$. In order to alleviate the bias due to missing variables, we add these factors into the regression and find that the signs of the coefficients of most factors are as expected. Liquidity ratio and ROAA are all negatively correlated with $NCOI_t$, and NPL ratio is positively correlated with $NCOI_t$. Capital adequacy ratio is positively correlated with $NCOI_t$, which is consistent with Ellul and Yerramilli (2013). However, some factors are no longer significant when we put all variables together in a single regression for $NCOI_t$. Finally, we do not find any significant impact of non-interest income share on the systemic risk, which supports the finding of van Oordt & Zhou (2019). In short, our indicator $NCOI_t$ is driven by similar determinants at the bank level as other traditional risk indicators (see Table 3).

Table 3

Two-way fixed-effect estimates on the determinants of $NCOI_t$. $NCOI_t$ is multiplied by 100. Log assets is the natural logarithm of total assets. Growth in assets is the annual growth in total assets. Capital adequacy ratio is the total capital adequacy ratio. NPL ratio is the non-performance loan ratio. Liquidity ratio is the ratio of liquid assets over total assets. ROAA is return on average assets. Non-interest income share is the ratio of non-interest income over total assets. The inflation rate is calculated based on CPI. Significance ***, 0.01; **, 0.05; *, 0.10.

Variables	(1)	(2)	(3)	(4)	(5)	(6)	(7)	(8)
Log assets$_{t-1}$	30.2**	34.6***	29.1**	58.6**	30.5***	32.7***	30.4***	65.6***
	(2.57)	(2.73)	(2.47)	(2.48)	(2.63)	(2.84)	(2.66)	(2.83)
Growth in assets$_{t-1}$		0.029						0.077
		(0.53)						(0.72)
Capital adequacy ratio$_{t-1}$			0.20***					−2.56
			(2.69)					(-1.62)
NPL ratio$_{t-1}$				7.05**				0.99
				(2.11)				(0.28)
Liquidity ratio$_{t-1}$					0.11			−0.84
					(0.41)			(-1.61)
ROAA$_{t-1}$						−8.55**		−42.7**
						(-2.33)		(-2.28)
Non − interest income share$_{t-1}$							−3.83	7.96
							(-0.70)	(0.96)
Constant	−801.6***	−901.8***	−610.2**	−1187.5**	−813.5***	−856.8***	−805.9***	−1141.0**
	(-2.88)	(-2.97)	(-2.17)	(-2.08)	(-2.96)	(-3.16)	(-2.98)	(-1.99)
Bank fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
Year fixed effects	Y	Y	Y	Y	Y	Y	Y	Y
N	1431	1267	1324	825	1430	1429	1431	742
R-sq	0.12	0.15	0.12	0.19	0.12	0.13	0.12	0.25
adj. R-sq	0.11	0.14	0.11	0.18	0.11	0.12	0.11	0.23

In addition, we repeat the above analysis on two sub-periods following the global financial crisis, i.e., 2009-2017 and 2018-2021, to investigate the changes of the risk drivers after 2018 due to the introduction of the "New Asset Management Regulations". These regulations aimed at addressing key risks in shadow banking, reducing regulatory arbitrage, and enhancing overall financial stability. The results from the two sub-periods highlight a significant evolution in the key drivers of systemic risk over the time. Before 2018,

[41] See Appendix 1 for the list of banks in the regression.
[42] To deal with outliers, we eliminate top (bottom) 1 % of observations for NCOI in each regression.

systemic risk is predominantly driven by bank size, capital buffer, and profitability, with larger banks playing a more crucial role in banking stability. However, after 2018, marked by the introduction of the "New Asset Management Regulations", asset quality emerges as a more critical factor in driving systemic risk. The diminished significance of bank size, capital buffer, and profitability reveals a structural change in the banking sector following stricter regulatory measures, which suggests the increasingly importance of small and medium-sized banks for the stability of the banking system. Appendix 3 provides more details.

5.3. Cross-sectional dimension: systemic important banks

Systemically important banks are more linked with other banks, which are at the center of the systemic risk contagion network. In short, the systemic importance of a bank depends on the number of banks with connection and the connectedness tightness. Therefore, the systemic importance of bank i is defined as:

$$NCOI_t^i = \sum_{j=1}^{N_t} CM_t^{neg}(i,j) \tag{5}$$

where t is the time; N_t is the number of sample banks at time t; $CM_t^{neg}(i,j)$ is the element in (i,j) of the co-occurrence matrix CM_t^{neg} at t, which only considers negative news; $NCOI_t^i$ is the systemic importance of bank i at time t. We use $NCOI_t^i$ to distinguish $NCOI_t$ of a single bank from the whole banking system.

Table 4

Ranking of systemic importance of banks during 2000–2021. The color of the cell corresponds to bank types: red for state-owned banks, orange for joint stock banks, yellow for city commercial banks, green for rural small and medium-sized banks, blue for foreign banks, and dark blue for private banks.

Rank	2000–2007	2008	2009–2012	2013	2014	2015	2016–2019	2020–2021
1	B2	B0	B0	B2	B2	B0	B0	B0
2	B0	B2	B2	B0	B0	B2	B2	B3
3	B3	B3	B3	B3	B1	B1	B3	B2
4	B1	B8	B1	B1	B3	B3	B1	B1
5	B8	B1	B4	B8	B8	B4	B8	B8
6	B4	B4	B8	B10	B4	B8	B4	B4
7	B10	B13	B10	B4	B13	B13	B6	B5
8	B9	B9	B13	B13	B10	B6	B9	B13
9	B11	B6	B7	B12	B12	B10	B10	B12
10	B13	B10	B9	B9	B9	B9	B13	B6
11	B7	B18	B6	B7	B6	B12	B12	B9
12	B52	B52	B18	B6	B7	B7	B7	B7
13	B6	B11	B11	B18	B18	B18	B53	B10
14	B18	B54	B137	B11	B137	B54	B52	B137
15	B650	B7	B54	B106	B11	B11	B11	B53
16	B14	B137	B52	B54	B54	B137	B137	B52
17	B54	B650	B12	B52	B53	B5	B5	B144
18	B137	B26	B14	B137	B52	B53	B54	B11
19	B649	B106	B57	B14	B5	B142	B18	B14
20	B12	B5	B5	B67	B14	B14	B16	B142
21	B106	B14	B106	B53	B17	B16	B57	B67
22	B19	B78	B53	B5	B57	B52	B14	B57
23	B124	B16	B50	B97	B106	B67	B142	B16
24	B17	B57	B136	B57	B67	B17	B118	B251
25	B16	B101	B67	B136	B97	B57	B88	B18
26	B94	B19	B650	B63	B50	B50	B93	B54
27	B96	B15	B63	B107	B35	B106	B67	B74
28	B74	B67	B107	B516	B15	B35	B107	B107
29	B67	B12	B94	B525	B167	B150	B17	B140
30	B107	B251	B516	B35	B16	B74	B15	B15
31	B620	B72	B35	B142	B36	B36	B516	B93
32	B141	B49	B15	B118	B144	B97	B35	B106
33	B666	B107	B74	B144	B118	B15	B19	B464
34	B53	B50	B19	B31	B107	B151	B36	B58
35	B63	B127	B144	B464	B142	B20	B106	B516
36	B105	B167	B613	B36	B283	B149	B70	B17
37	B251	B613	B251	B15	B19	B144	B124	B127
38	B659	B614	B96	B50	B80	B152	B464	B55
39	B5	B62	B97	B19	B516	B88	B50	B87
40	B93	B63	B16	B96	B74	B251	B140	B124

Following Brownlees and Engle (2017) on the effectiveness of risk measurement, we verify whether NCOI_i^t are effective in the spatial dimension in terms of identifying systemically important banks. The Financial Stability Board (FSB) identifies systemically important banks on five dimensions, such as cross-border activities, scale, relevance, substitutability, and complexity. Therefore, an ideal systemic risk indicator should capture the above five factors in the identification of the systemic importance of banks.

However, we only discuss the effectiveness of risk indicator from the dimensions of scale and relevance[43] due to limited data availability. For example, if the systemic importance of a bank with a large asset is higher than that of a small bank, it suggests that the risk indicator is valid in the spatial dimension.

$NCOI_t^i$ has included the systemic importance of interconnection. Although the construction of $NCOI$ does not contain the size of banks, the identification of systemically important banks based on $NCOI_t^i$ can reflect the factor of scale. We integrate the ranking of the systemic importance of banks in each year and divides the top 40 banks into 3 groups. Table 4 shows that $NCOI_t^i$ have a clear pattern. Although the scale factor is not included in the indicator construction, $NCOI_t^i$ is still able to capture the scale feature, which shows that *Industrial and Commercial Bank of China*, *Agricultural Bank of China*, *Bank of China*, *China Construction Bank*, *Bank of Communications*, and *China Merchants Bank* are ranked in the top of systemic importance. The second tier of banks ranked in top 7-20 are joint stock banks and a few large city commercial banks. The third tier of banks ranked 21 to 40 mainly consist of small and medium-sized banks such as city commercial banks, rural small and medium-sized banks, foreign banks and private banks.

Table 5
Structural parameters of regressions in each period. This table presents the estimates of structural parameters in Eq. (8) and Eq. (9). For computing the Diebold-Yilmaz spillover matrix, we utilize a 12-week-ahead forecast error variance decomposition. Significance: ***, 0.01; **, 0.05; *, 0.10.

Time	β_{dy}	β_{dcovar}
2017 Q4	0.24***	−0.08**
2018 Q1	−0.08	0.53***
2018 Q2	0.01	0.13***
2018 Q3	0.15**	1.05***
2018 Q4	−0.01	0.67***
2019 Q1	0.12	1.01***
2019 Q2	0.03	0.10
2019 Q3	0.04	0.71***
2019 Q4	0.11**	−0.09
2020 Q1	0.18***	0.58***
2020 Q2	0.59***	0.67***

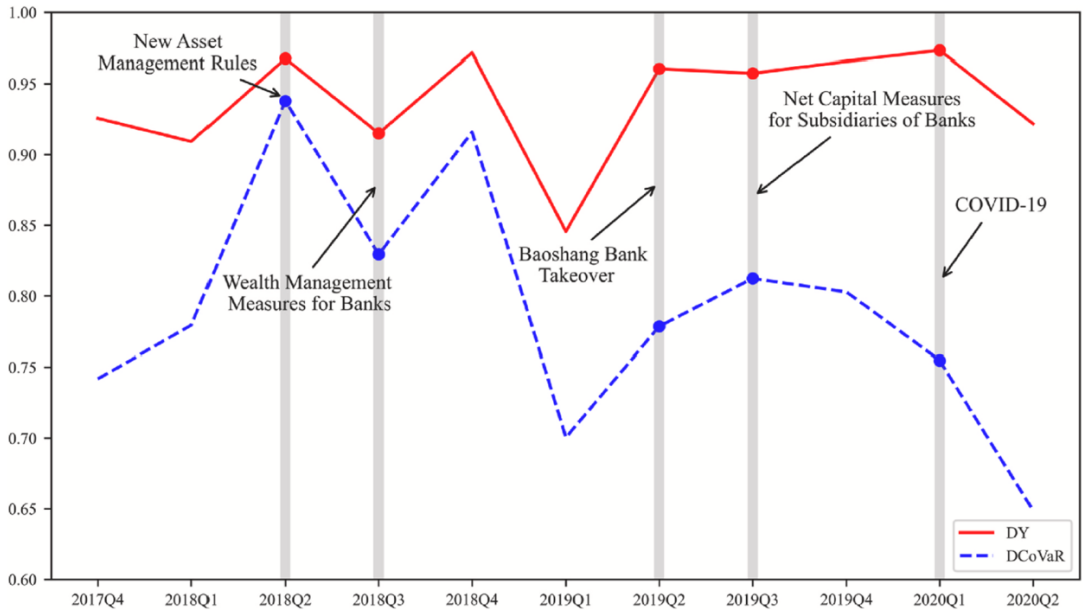


Figure. 15. Adjusted R-squared of regressions in each period.

In contrast with state-owned and joint stock banks, the rankings of small and medium-sized banks are quite unstable. *Bank of Jinzhou* (B36) and Baoshang Bank (B144, reorganized into *Mengshang Bank* since

[43] Actually, several theories support the view that large and complex banks contribute to systemic risk. One explanation is that large banks tend to take wide-range risks in business activities and rely more on short-term debt, resulting in more vulnerabilities to generalized liquidity shocks and market failures such as liquidity shortages and fire sales (Boot & Ratnovski, 2016; Greenwood et al., 2015; Shleifer & Vishny, 2010). Another explanation is that large banks' moral hazard behavior making them engage more in high-risky activities because of their expectation on government bailouts (Farhi & Tirole, 2012). Moreover, Laeven and Levine (2007) point out that large banks' risks also derive from awful corporate governance faced with their complex business activities.

2020), which shows up as high-risk banks with an increasing ranking of systemic importance as early as 2013, and continues to climb up the rankings before their risk events during 2016 and 2019. It is also true for *Evergrowing Bank* (B17, with chaotic operations and tight liquidity from 2016 to 2019) and *Bohai Bank* (B15, violations of regulatory rules in 2010 and the associated sanctions). It substantiates the varying systemic importance of small and medium-sized banks, which suggests the necessity of covering small and medium banks in the supervision of systemic risk in the country.

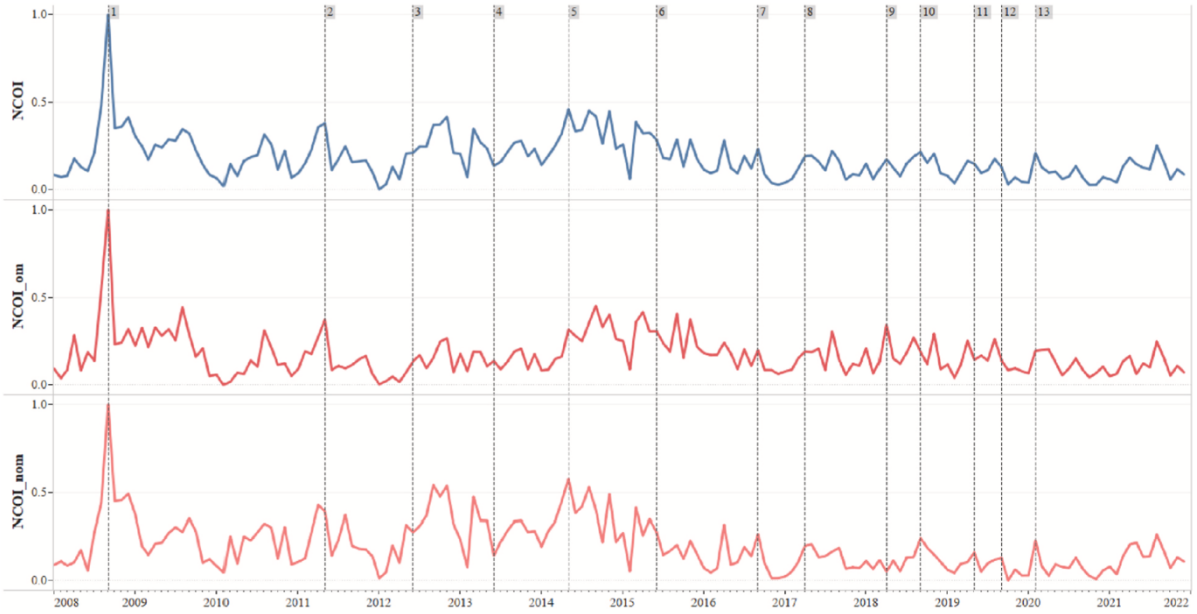


Figure. 16. $NCOI_t$ based on news reports from various types of media.

5.4. Cross-sectional dimension: systemic risk spillovers

In order to substantiate the validity of risk indicator $NCOI$ in the spatial dimension, we use panel regression to investigate whether the co-occurrence matrix can explain the risk spillover matrix of traditional risk measurement, such as Diebold-Yilmaz (DY) pairwise spillover index, denoted by Sg_ij,t(H) with a forecast horizon of H steps, and ΔCoVaR, which reflects the connection bank risks with the stock price data of banks[44].

Both $S^g_{ij,}(H)$ and $\Delta CoVaR_t(i,j)$ are directional, i.e., the spillover from bank i to bank j does not equal the one from bank j to bank i, and both matrixes are asymmetric. The risk spillover based on the co-occurrence in negative news, $CM^{neg}_t(i,j)$, is directionless, i.e., co-occurrence matrix $CM^{neg}_t(i,j)$ is a symmetric matrix. Therefore, we should transform DY matrix and $\Delta CoVaR$ matrix into symmetric ones. The elements of DY matrix and $\Delta CoVaR$ matrix at (i, j) are defined as:

$$DY_t(i,j) = 0.5z \times S^g_{ij,}(H) \tag{6}$$

$$DCoVaR_t(i,j) = 0.5(\Delta CoVaR_t(i,j) + \Delta CoVaR_t(j,i)) \tag{7}$$

where $S^g_{ij,}(H)$ and $CoVaR_t(i,j)$ are the risk spillover of bank i to bankj at time t based on Diebold-Yilmaz variance decomposition, and $\Delta CoVaR$ method.

Thus, we have the following panel regression equations:

$$DY_t(i,j) = \alpha_{1,q} + \beta_{dy,q} \times CM^{neg}_t(i,j) + \beta_{con1,q} \times DY_{t-1}(i,j) + \varepsilon_1 \tag{8}$$

[44] Diebold-Yilmaz spillover index quantifies the interconnectedness among financial institutions. It is derived from a forecast error variance decomposition of a vector autoregressive (VAR) model: $X_t = v + \sum_{i=1}^{p} \phi_i X_{t-i} + \varepsilon_t$.Using H-step-ahead forecasts, the i-th variable's contribution to the j-th variable's forecast error variance is $\theta^g_{ij}(H) = \frac{\sigma_{ii}^{-1} \sum_{h=0}^{H-1} (e_i A_h \sum e_j)^2}{\sum_{h=0}^{H-1} (e_i A_h \sum e_j)}$. For more details about these notations, please see Diebold and Yilmaz (2009). The pairwise directional connectedness is defined as $S^g_{ij}(H) = \tilde{\theta}^g_{ji}(H) = \frac{\theta^g_{ij}(H)}{\sum_{h=0}^{H-1} \theta^g_{ij}(H)}$, which measures bank i's spillover effect to bank j.

$$DCoVaR_t(i,j) = \alpha_{2,q} + \beta_{dcovar,q} \times CM_t^{neg}(i,j) + \beta_{con2,q} \times DCoVaR_{t-1}(i,j) + \varepsilon_2 \quad (9)$$

where $CM_t^{neg}(i,j)$ is the co-occurrence index of bank i and bank j in negative news; t is the observation month; q is the quarter that month t belongs to, and $\beta_{con2,q}$ controls the historical trend of traditional indexes. We estimate the above equations for the three months of each quarter, which yields time-varying parameters in terms of quarter. We choose 19 listed banks in the sample due to data availability[45] over Oct 2017-Jun 2020[46]. For the risk spillover matrices CM_t^{neg}, DY_t and $DCoVaR_t$ of monthly frequency in each quarter, we estimate the regression parameters one by one in Eq. (8) and Eq. (9).

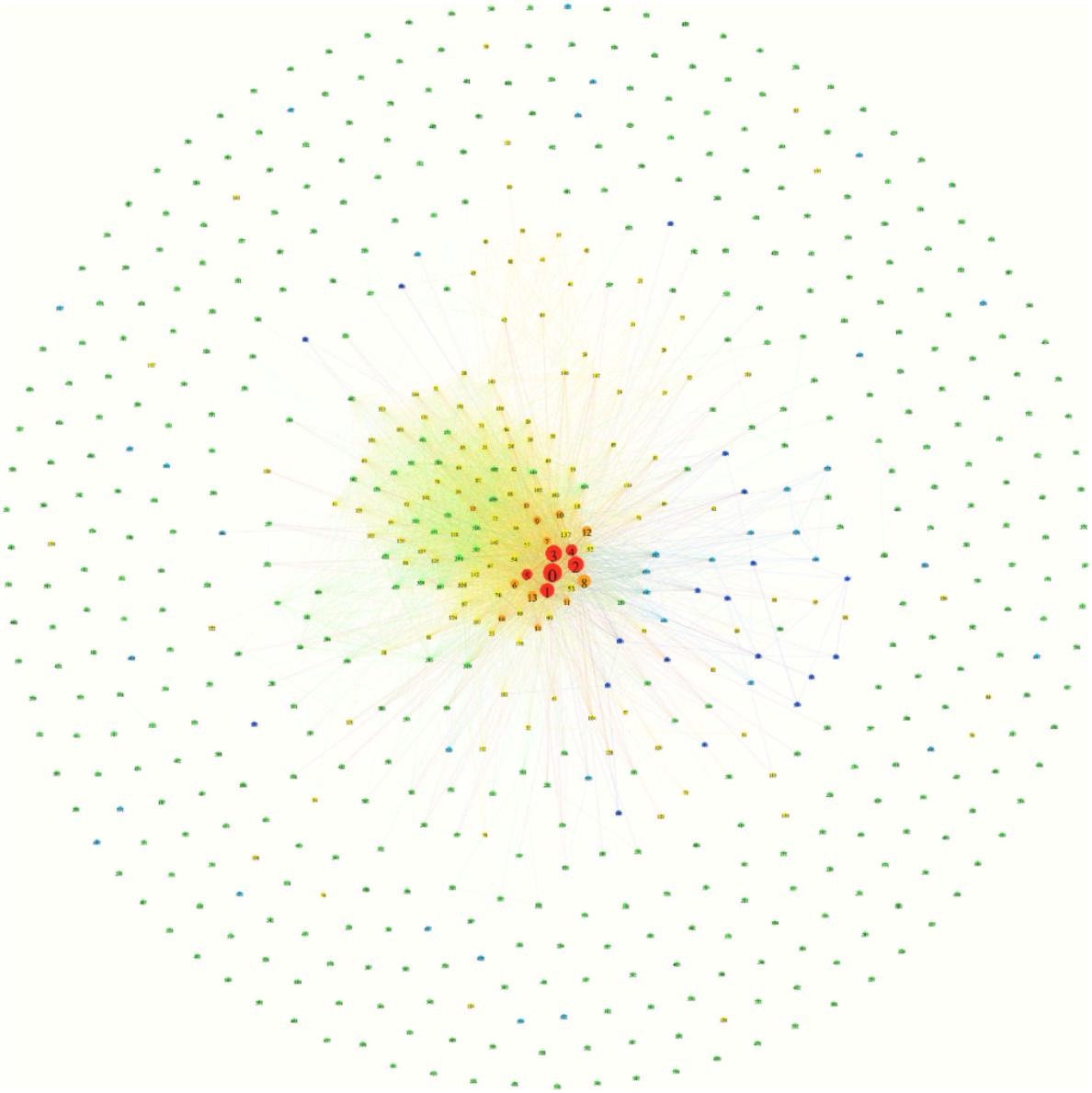


Figure. 17. Bank network in China in 2021 (constructed using official media reports).

Table 5 shows regression results when we employ a 12-week-ahead forecast error variance decomposition for computing the Diebold-Yilmaz spillover index[47]. The structural parameters (β) are predominantly positive, with half of them significant at the 1% level. The adjusted R-squared ($\tilde{R}^2$) for each period exceeds 0.65, indicating that there is no discernible deviation in trends between traditional systemic risk indicators and the proposed indicator, $NCOI$. Notably, $\tilde{R}^2$ reaches local peaks during five key events highlighted in Fig. 15, which further substantiates the consistency between $NCOI$ and traditional indicators. Interestingly,

[45] The sample banks include B0, B1, B2, B3, B4, B6, B7, B8, B9, B10, B11, B12, B13, B18, B53, B54, B118, B137 and B259.
[46] After 2020, the impact of the pandemic in China has been greatly alleviated without other severe shocks, so June 2020 is set as the end of our time frame here.
[47] The result is robust the selection of the forecast horizon. In Appendix 4, we repeat the spillover index computation and the corresponding regression analysis for 2-week and 4-week ahead forecasts and find similar results.

$\tilde{R}^2$ in the regression of DY spillover matrix is consistently higher than that of ΔCoVaR. It can be attributed to a distinct conceptual focus of two measures: DY spillover index evaluates the overall degree of network interdependence among financial institutions, while $\Delta CoVaR$ captures pairwise spillovers under tail-dependent stress scenarios relying on an exogenous quantile threshold. Unlike $\Delta CoVaR$, DY spillover index does not depend on predefined thresholds and is more suitable to capture broader and systemic interdependencies during both normal and stressed periods. This characteristic aligns closely with $NCOI$'s design, which accesses systemic risk by analyzing co-occurrence patterns in negative news, encompassing both direct and indirect contagion pathways. $NCOI$ is relatively effective in detecting indirect interconnectedness that arises from external common factors, such as policy changes and operational linkages that are not restricted to extreme tail events. Fig.15 shows that $NCOI$ aligns more closely with DY spillover index during the stress periods of 2017-2020 with heightened regulatory interventions and broader financial and operational disruptions, which similarly captures system-wide interdependence in contrast to $\Delta CoVaR$. This distinction underscores the broader applicability of $NCOI$ in assessing systemic risk under various market conditions.

6. Discussions on media bias

Text analysis of media reports may suffer from the media bias, especially the independence of official media reporting. Most of these criticisms focus on the lag of information release and the authenticity of the content. You et al. (2018) show that the government may deliberately delay the release of information on negative events for political purposes. Piotroski et al. (2017) and Borochin & Cu (2018) show that the official media disclose less information about firms' operation and management, and report more positive news than negative news. For example, the Yingangxia accounting fraud event was first exposed by market-oriented media rather than the official media.

As nearly 40 percent of the news data comes from the official media, it is necessary to examine whether the media bias affect the risk identification of $NCOI_t$. Fig. 16 shows that $NCOI_t$ is based on news reports from all media, official media and non-official media. Although the peak of official media is not as significant as that of non-official media during the two risk events of credit crunch in the inter-bank market and the stock market crash, the fluctuation of official media is similar with non-official media during the global financial crisis. It indicates that the reports of official media also have certain information value. In addition, $NCOI_t$ of official media, i.e., $NCOI_{om,t}$ in Fig. 16, shows higher volatility than non-official media, i.e., $NCOI_{nom,t}$, when the "New Asset Management Regulations" was introduced in April 2018, and around the takeover of *Baoshang Bank* by the *People's Bank of China* in May 2019. It suggests that official media may have advantage in the collection and dissemination of government related information, which coincides with Piotroski et al. (2020).

It is not easy to judge the merits of official media versus non-official media. Even though the official media may report negative events with bias (such as events 4 and 5), $NCOI_t$ based on the reports of multi-source news media can still provide a decent measurement of the systemic risk.

To further substantiate the robustness of our results on the media category, we extract news data exclusively from official media sources and construct the bank co-occurrence network with the methodology in Section 4.1. Comparing Fig. 17 with Fig. 6, we find that the basic structure of bank co-occurrence network does not exhibit significant differences due to different categories of news media, which still presents a "core-periphery" topology. Specifically, the center of the network is predominantly composed of large state-owned banks such as Industrial and Commercial Bank of China (B0), Agricultural Bank of China (B1), and Bank of China (B2). Banks surrounding the center are joint-stock banks like China Merchants Bank (B8), Ping An Bank (B12), and Industrial Bank (B13), while the outer layer consists of city commercial banks, rural small and medium-sized banks, and private banks. In terms of node centrality, there is a gradual decline from large state-owned banks to joint-stock banks, and then to small and medium-sized banks, with many rural small and medium-sized banks even remaining isolated within the network.

The co-occurrence network serves as a visual representation of co-occurrence matrix, which forms a foundational basis for the risk indicator proposed in this paper. Thus, the high similarity between Figs. 17 and 6 further illustrates the robustness of our findings. Fig. 6 displays the results by applying equal weighting to news information from all media sources. In contrast, Fig. 17 reflects the results by assigning a weight of 1 to information from official media and a weight of 0 to information from non-official media. It suggests that even if we assume the existence of media bias and apply specific weighting schemes to the information from official and non-official media, the outcomes can still be derived from linear operations on co-occurrence matrices associated with Figs. 17 and 6. Given the structural consistency between these figures,

the application of any relative weighting scheme across different media types is unlikely to impact our main findings.

7. Conclusion

The regulation of systemic risk is a priority for the financial stability in China. We show that a text analysis of news can serve as a tool to monitor the systemic risk of banks in the country. In contrast to traditional risk indicators based on market and transaction data, we establish a more comprehensive bank network to capture the systemic risk. We use co-occurrence analysis to capture inter-bank relation from news texts, and apply the sentiment analysis to identify negative shocks, while we combine both to construct a co-occurrence index based on negative news. We substantiate the effectiveness of the risk indicator from the time and spatial dimensions.

The co-occurrence index based on negative news is a real-time risk indicator, which is built on the sentiment index and co-occurrence index. News text sentiment can capture the occurrence of negative shocks, which can reveal the multi-level connection between banks. Therefore, co-occurrence index based on negative news can capture the two driving factors of systemic risk, i.e., negative shock and amplification. News co-occurrence can capture the inter-bank connection better than the traditional risk measures based on the market data and business transactions.

In the static connection network, state-owned banks are located at the center of the network and have the most tight connectedness with other banks in the network. Joint stock banks are tightly connected with state-owned banks and some city commercial banks. A large number of small and medium-sized banks are distributed in the periphery of the network. We find that before the occurrence of risk events, interconnections among small and medium-sized banks are mainly concentrated among a few banks, and most banks have few connections. However, most banks will have certain connections with some other banks after the occurrence of risk events.

The risk spillover of small and medium-sized banks is rising recently in China, which necessitates a timely risk monitoring system for these banks that are not covered by traditional systemic risk indicators. Banks exhibit large fluctuations in the ranking of systemic importance around risk events of Baoshang Bank, *Bank of Jinzhou* and Bohai Bank. The systemic risk of the Chinese banking sector is mainly dominated by state-owned banks and joint stock banks before 2013, while small and medium-sized banks have become main drivers afterwards. The systemic risk indicator based on news sentiment and co-occurrence analysis provides a simple and feasible tool for regulatory authorities, especially for the small and medium-sized banks that receive less attention from the regulatory authorities

CRediT Authorship contribution statement

Yi Fang: Conceptualization, Methodology, Funding acquisition. **Hao Lin:** Data, Software, Writing. **Liping Lu:** Re-writing, Reviewing, Supervision.

Declarations of competing interest

None.

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Data availability

Data will be made available on request.

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