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MEXICO

FINANCIAL SYSTEM STABILITY ASSESSMENT

November 2022

This paper on Mexico was prepared by a staff team of the International Monetary Fund as background documentation for the periodic consultation with the member country. It is based on the information available at the time it was completed on July 2022.

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FINANCIAL SYSTEM STABILITY ASSESSMENT

November 2, 2022

KEY ISSUES

Context: Mexico has had a robust financial system for many years. Banks have maintained high capital and liquidity buffers. However, the system provides less finance to the real economy than in peers. Mexico has experienced significant real GDP fluctuations since the Peso crisis but no major credit boom-bust cycles, given strong policy frameworks that have been further enhanced since the 2016 FSAP. The economy has strong external trade and financial linkages. These have been an important channel for transmitting global shocks. The financial system has been resilient to the COVID-19 pandemic, reflecting a mix of resumption in mobility and support from domestic and global policies. Buffers in the financial system have increased further during the pandemic. The key risk confronting Mexico is the first sustained and ongoing tightening of global liquidity conditions since the Global Financial Crisis.

Findings: The financial system appears resilient to severe macrofinancial shocks. Under the adverse scenario, high initial capital and strong profitability help banks absorb most credit and market losses. Liquidity risks for banks and other financial institutions are expected to be well-contained. However, some areas—contingent credit lines and concentration—merit supervisory attention. System-wide liquidity risks appear contained, but global liquidity shocks could generate tail-risks. Conditions bear continued monitoring and high levels of short-term funding for some institutions merit a closer look. Risks from cyber and climate events are important additional concerns. Climate risk analysis, while uncertain, points to long-term adaptation needs.

Policy advice: The authorities have made progress in some areas. But the evolving risk environment flags the need for upgrading the financial sector oversight and crisis management frameworks to close previously identified gaps and address emerging challenges. Key actions include enhancing operational autonomy and ensuring sufficient resources for regulatory government agencies; strengthening legal protection for supervisors; ensuring effective consolidated supervision; upgrading risk-based supervision; reducing critical deficiencies and impediments in recovery plans and to resolvability; and enhancing the resolution regime and strengthening the Emergency Liquidity Assistance (ELA) framework. Cyber resilience of the financial system needs to be further enhanced. Expansion of the macroprudential toolkit should be considered. Efforts should continue to improve the effectiveness of the AML/CFT framework.

Approved By
May Khamis and Nigel Chalk

Prepared By
Monetary and Capital Markets Department

This report is based on the work of the Financial Sector Assessment Program (FSAP) mission that visited Mexico in March-April 2022 and June-July 2022. The FSAP findings were discussed with the authorities during the Article IV consultation mission in November 2022.

- The FSAP team was led by Vikram Haksar, International Monetary Fund (IMF), and Ilias Skamnelos, World Bank (WB), and included Heedon Kang (IMF) and Raquel Letelier (WB) as deputy mission chiefs; Atilla Arda, Carolina Claver, Xiaodan Ding, Federico Grinberg, Emran Islam, Padamja Khandelwal, Dimitrios Laliotis, Sujan Lamichhane, Istvan Mak, Priscilla Toffano, Adrian Wardzynski, Kevin Wiseman (all IMF), Jorge Cayazzo (IMF expert), Holti Banka, Michaela Dolk, Guilherme de Aguiar Falco, Matija Laco, Oliver Masetti, Rachel Chi Kiu Mok, Fredesvinda Fatima Montes, Graciela Miralles Murciego, Juan Ortiz, Carlos Piñerúa, and Martijn Regelink (all WB). The team also thanks Lilly Siblesz de Doldan, Hugo Tuesta, and Laila Azoor for valuable support and inputs.
- The mission met with senior officials at the Ministry of Finance and Public Credit, Banxico (Central Bank), and regulatory and supervisory agencies. It also met with representatives from private and development financial institutions, and market participants.
- FSAPs assess the stability of the financial system as a whole and not that of individual institutions. They are intended to help countries identify key sources of systemic risk in the financial sector and implement policies to enhance its resilience to shocks and contagion. Certain categories of risk affecting financial institutions, such as operational or legal risk, or risk related to fraud, are not covered in FSAPs.
- Mexico is deemed by the Fund to have a systemically important financial sector (see PR21/143), and the stability assessment under this FSAP is part of bilateral surveillance under Article IV of the Fund's Articles of Agreement.
- This report was prepared by Heedon Kang, with contributions from the Mexico FSAP team.

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Glossary

AML/CFT	Anti-Money Laundering/Combating the Financing of Terrorism
Banxico	*Banco de México* (Central Bank)
BCP	Basel Core Principles for Effective Banking Supervision
BIS	Bank for International Settlements
CBDC	Central Bank Digital Currency
CEB	*Comité de Estabilidad Bancaria* (Banking Stability Committee)
CESF	*Consejo de Estabilidad del Sistema Financiero* (Financial System Stability Council)
CEFER	*Calificación de entidades financieras con enfoque en riesgos* (Risk-based Rating System)
CNBV	*Comisión Nacional Bancaria y de Valores* (National Banking and Securities Commission)
CNSF	*Comisión Nacional de Seguros y Fianzas* (National Insurance and Sureties Commission)
CoDi	Cobro Digital
CONDUSEF	*Comisión Nacional para la Protección y Defensa de los Usuarios de Servicios Financieros* (National Commission for Financial Services Consumer Protection)
CONSAR	*Comisión Nacional del Sistema de Ahorro para el Retiro* (National Commission for Savings for Retirement)
COVID	Coronavirus Disease
CPs	Core Principles for Effective Deposit Insurance Systems
CPMI	Committee on Payments and Market Infrastructures
CRLB	*Comité de Regulación de Liquidez Bancaria* (Banking Liquidity Regulation Committee)
DAR	Detailed Assessment Report
DB	Development Bank
DFI	Development Finance Institution
DFS	Digital Financial Services
D-SIB	Domestic Systemically Important Bank
e-KYC	Electronic Know Your Customer
EDF	Expected Default Frequency
ELA	Emergency Liquidity Assistance
EM	Emerging Market
ESG	Environmental, Social and Governance
FHC	Financial Holding Company
FLAO	*Facilidad de Liquidez Adicional Ordinaria* (Additional Ordinary Liquidity Facility)
FATF	Financial Action Task Force
FMI	Financial Market Infrastructure
FOVI	Fondo de Operación y Financiamiento Bancario a la Vivienda (Fund for Housing Operation and Finance).
FSAP	Financial Sector Assessment Program
FSI	Financial Soundness Indicator
FSR	Financial Stability Report
FX	Foreign Exchange
GDP	Gross Domestic Product

GFSR	Global Financial Stability Report
HQLA	High Quality Liquid Assets
IADI	International Association of Deposit Insurers
ICAAP	Internal Capital Adequacy Assessment Process
ICT	Information Communication Technologies
IFRS	International Financial Reporting Standard
IMF	International Monetary Fund
IOSCO	International Organization of Securities Commissions
IPAB	*Instituto para la Protección al Ahorro Bancario* (Bank Deposit Insurance and Resolution Agency)
LCR	Liquidity Coverage Ratio
LRAF	Ley para Regular las Agrupaciones Financieras (Financial Groups Law)
MCM	Monetary and Capital Markets Department, IMF
MER	Mutual Evaluation Report
MFAs	Mexican Financial Authorities
MoU	Memorandum of Understanding
MXN	Mexican Peso
NBFI	Non-Bank Financial Institution
NFC	Non-Financial Corporations
NGFS	Network for Greening the Financial System
NPL	Non-performing Loans
NSFR	Net Stable Funding Ratio
P&A	Purchase and Assumption
PD	Probability of Default
PFMI	Principles for Financial Market Infrastructures
PIT	Point-in-Time
RCP	Representative Concentration Pathway
RWA	Risk Weighted Asset
SAT	*Servicio de Administración Tributaria* (Tax Service Administration)
SHCP	*Secretaría de Hacienda y Crédito Público* (Ministry of Finance and Public Credit)
SME	Small and Medium Size Enterprise
SRP	Supervisory Review Process
SPEI	*Sistema de Pagos Electrónicos Interbancarios* (Interbank Electronic Payment System)
STeM	Stress Test Matrix
ST	Stress Test
TLAC	Total Loss Absorbing Capacity
TOBA	Temporary Open Bank Assistance
VASP	Virtual Asset Service Providers
WB	World Bank
WEO	World Economic Outlook

EXECUTIVE SUMMARY

1. Mexico has a robust financial system but a low level of financial inclusion. It has weathered the COVID-19 pandemic well, reflecting resumption in mobility and support from domestic and global policies. Systemic vulnerabilities appear broadly contained; the financial system is emerging from the pandemic with higher capital buffers, lower private sector leverage, and no sign of stretched asset prices. But it provides less finance to the real economy than its peers. Digital finance, although still embryonic, holds the promise of increasing financial access.

2. The key risk confronting Mexico is the first sustained tightening of global financial conditions since the Global Financial Crisis (GFC), combined with low growth and high inflation. Mexico is highly integrated with global financial markets with a strong presence of non-resident investors in the financial sector and capital markets. A disorderly tightening in global liquidity could weaken activity and drive system-wide liquidity stress. These risks could be accentuated by risks from cyber events and structural transitions, i.e., climate change.

3. The financial system appears resilient to severe macrofinancial shocks, but some areas for attention arise.

- Under the adverse scenario, high initial capital and strong profitability help banks absorb most of credit and market losses. Liquidity risks for banks are expected to be well-contained. However, some areas—loan concentration, contingent credit lines, and large holdings of sovereign debt securities—merit supervisory attention in some cases. Corporate debt-at-risk would rise under stress, but risks to the financial system are contained by low leverage.
- System-wide liquidity risks appear contained, with commercial banks well-placed to provide liquidity to other financial institutions during periods of stress. Moreover, the authorities have demonstrated the effectiveness of their toolkit to support systemic liquidity during the pandemic. But new global liquidity shocks could generate tail-risks. Conditions bear continued monitoring and high levels of short-term wholesale funding of development banks deserve further consideration, though risks are attenuated by their liabilities guaranteed by the sovereign.
- Risks from cyber and climate events are important additional concerns. Climate risk analysis, while highly uncertain, points to potentially material risks from transition and physical risk exposures over the medium term, as in other parts of the world. Uncertainty over the magnitude and timing of these risks points to the need for further refinement of risk analysis to inform policy.

4. Financial sector policies have been strengthened in recent years, but further steps are necessary. Good progress includes rolling out critical Basel reforms, improving supervisory techniques and methodologies, building cybersecurity capacity, and enhancing recovery and resolution planning of commercial banks. The Mexican financial authorities (MFAs) introduced the Total Loss Absorbing Capacity (TLAC) requirements for domestic systemically important banks (D-SIBs). They have also approved measures to boost financial access (e.g., the 2018 Fintech Law). However, some 2016 FSAP recommendations remain outstanding (Appendix I). Given the cyclical and structural transitions, the financial sector oversight and crisis management framework should be upgraded:

- ***Autonomy and resources***. Strengthening the autonomy of regulatory government agencies and the legal protection of supervisors is critical. The vacancies on the Board of the Bank Deposit Insurance and Resolution Agency (IPAB) should be filled swiftly. The evolving risk environment points to the need for enhanced resources and skills within the MFAs.
- ***Supervision and regulation.*** The 2014 Financial Groups Law was an important step forward, but the framework for and application of consolidated supervision needs significant enhancement. The banking regulator (CNBV) could improve supervisory techniques by simplifying the risk-based rating system (CEFER) and using more principle-rather than rule-based methodologies. The Sustainable Finance Committee could support integration of climate risks into prudential supervision and introduction of disclosure requirements for firms and investors. The MFAs could publish a strategy for macroprudential policy and expand the macroprudential toolkit.
- ***Digitalization and cybersecurity***. Banxico and CNBV have made significant progress in strengthening the cyber resilience of the financial system but need to make further enhancements on strategy, oversight, and information sharing. Continued careful consideration in the design phases of Banxico's central bank digital currency (CBDC) project will be needed. Generalized adoption of foreign stablecoins seems unlikely at this stage and the risks are mitigated by the robust policy framework.
- ***Systemic liquidity and crisis management.*** Banxico's liquidity management demonstrated flexibility and resilience during the pandemic. The ELA framework could be enhanced by setting a minimum threshold for its interest rate and improving the encumbrance process of credit claims. Recovery and resolution plans are now in place for all commercial banks. Yet, further enhancements are necessary, including removing impediments to banks' resolvability, reconsidering the use of temporary open bank assistance (TOBA), eliminating barriers to the effective use of the purchase and assumption (P&A) and bridge bank tools, and expanding the resolution regime's remit to financial holding companies.
- ***Financial integrity***. The authorities will need to complete implementation of the 2018 AML/CFT recommendations.

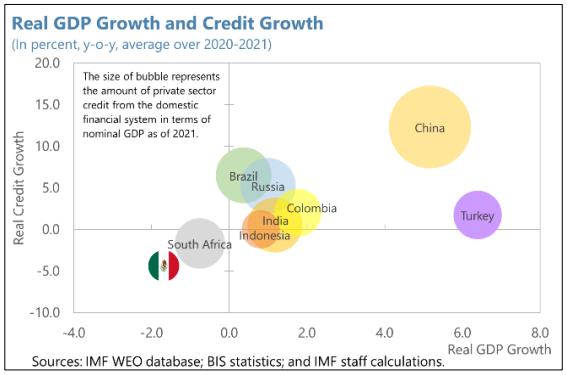
5. Increasing competition particularly through fintech, reforming the role of the state, and stimulating markets for green finance will be instrumental in promoting financial access and depth.

- **Competition and fintech.** Fintech's pro-competitive impact can be amplified by broadening regulated fintech activities and full implementation of the open finance framework. Banxico's e-KYC efforts could catalyze the adoption of Digital ID.
- **Role of the state.** Development banks can be more impactful in addressing market failures and advancing developmental priorities. They should prioritize the use of guarantees and second-tier lending rather than the first-tier direct lending.
- **Green finance.** The financial sector should play a bigger role in reaching Mexico's climate goals. The authorities could establish a climate finance strategy and introduce a green taxonomy. Development financial institutions could be given more ambitious climate finance targets to deepen green markets.

Table 1. Mexico: FSAP Key Recommendations	
Key Recommendations	**Time[1]**
Cross-Cutting Themes	
Enhance the autonomy of regulatory government agencies and legal protection of supervisors (¶31)	NT
Assess and enhance the organizational structure and resource needs of individual agencies (¶32)	NT
Enhance the oversight of the Interbank Electronic Payment System (SPEI) relative to the PFMI and cybersecurity (¶34)	NT
Systemic Risk Analysis	
Monitor the dynamics of contingent credit lines and portfolio concentration closely and use Pillar 2 requirements to address relevant risks, as needed (¶27)	NT
Expand the liquidity stress test framework; incorporate in the Supervisory Review Process to inform Pillar 2 requirements for banks (¶27)	MT
Financial Sector Oversight	
Develop and publish a macroprudential policy strategy (¶35)	NT
Consider expanding the macroprudential toolkit with limits on loan-to-value and debt-service-to-income ratios (¶37)	MT
Ensure effective consolidated supervision of financial holding companies (¶40)	MT
Refine the risk-based supervisory methodology (CEFER) to effectively assess banks' adherence to adequate risk management practices (¶42)	NT
Continue developing the cybersecurity strategy for the financial system; improve cybersecurity regulatory and supervisory practices (¶44)	NT
Improve cyber response and recovery capabilities; conduct market-wide cyber crisis simulation exercises (¶44)	MT
Issue supervisory guidance on climate-related risk management, governance, and business strategies; introduce disclosure requirements of climate and ESG information (¶46-47)	NT
Financial Integrity	
Implement the remaining 2018 Mutual Evaluation Report recommendations (¶50-51)	NT
Systemic Liquidity and Crisis Management	
Review the liquidity risk mitigation framework for development banks (¶52)	NT
Explore options to enhance the ELA framework (¶55)	NT
Further strengthen mechanisms to ensure the credibility and feasibility of banks' financial contingency arrangements while preserving resolvability and cost-effective resolutions (¶57)	C
Introduce statutory bail-in powers and eliminate barriers to the effective use of the P&A and bridge bank tools (¶57)	MT
Shorten the resolution planning cycle for D-SIBs and midsize banks, and eliminate impediments to banks' resolvability (¶58)	C
Financial Development Issues	
Broaden the scope of regulated fintech activities; finalize the implementation of open finance (¶61-62)	NT
Establish a national climate finance strategy; set ambitious climate finance targets for development financial institutions (¶64)	MT
1/ C: continuous, I: immediate (less than one year), NT: short term (1–2 years), and MT: medium term (3–5 years).	

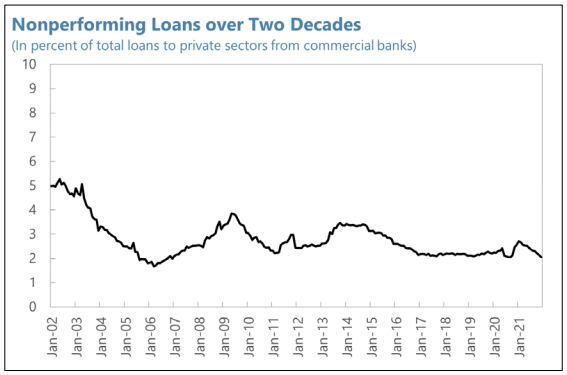
BACKGROUND

6. Mexico is gradually recovering from the economic effects of the pandemic (Table 2). The economy contracted by 8.1 percent in 2020 (Figure 1). While growth bounced back to 4.8 percent in 2021, cumulative output growth and credit growth during 2020-2021 were weaker than other emerging markets (EMs) (Text Chart).



7. The impact of the pandemic on the financial system has been contained. Mexico experienced capital outflows and a sharp exchange rate depreciation during the pandemic (Figure 2). But the overall spreads of risky financial assets have been low and market functioning has been orderly, reflecting also the authorities' effective policy responses (Table 3). Banxico cut interest rates by 300 basis points to aid the economy and established facilities to support market functioning. CNBV issued regulatory support measures, encouraging loan payment deferral and dividend payout restrictions.[1] Fiscal stimulus was modest, but Mexico benefited from sizable fiscal policy spillovers from the U.S. (Gourinchas and others, 2021).

8. Private leverage remains low, but some concerns emerge. Mexico has experienced no prominent credit boom-bust cycle since the Peso crisis (Text Chart and Figure 3). Private sector leverage and debt service burden remain low, compared to EM peers. However, investor sentiment towards Mexico has softened since 2016.



9. Downside risks loom large. Although Mexico has limited direct exposure to Russia and Ukraine, rising commodity prices has pushed inflation up, well above Banxico's target (Figure 1). Banxico has raised the policy rate by 525 basis points since June 2021. Amid the rising inflation and worse-than-anticipated slowdown in the U.S. and globally, Mexico, like other EMs, faces the first sustained tightening of global financial conditions since the GFC and a difficult trade-off in managing risks to inflation and growth (i.e., stagflation) (see the accompanying Article IV staff report). New COVID-19 variants remain a wildcard.

10. Mexico faces two structural transitions, raising risks and opportunities. The use of digital financial services, though still embryonic, is picking up and holds the promise of increasing financial access.[2] But this could generate new risks from cyberattacks and new forms of foreign and domestic

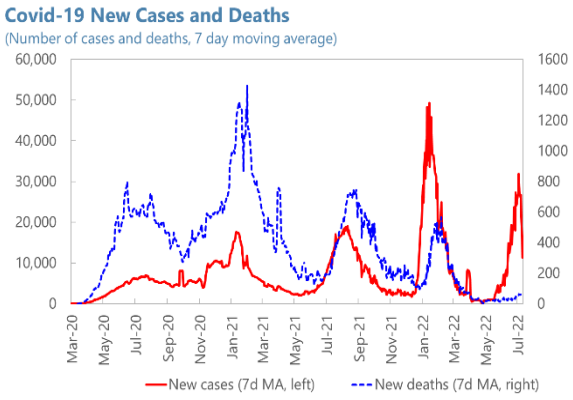
[1] CNBV used the flexibility embedded in the Basel framework to alleviate the pandemic's impact on banks.

[2] Internet banking users have increased 2.5 times from 33 million in 2016 to 84 million in 2020.

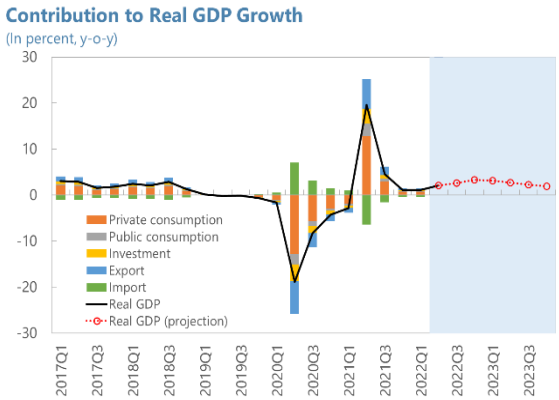
digital monies. Policies to support the transition to a lower carbon economy could affect earnings in carbon-intensive industries and banks that lend to them. Rising climate physical risk could impact the financial sector. Opportunities also arise from green finance.

Figure 1. Mexico: Macroeconomic Developments

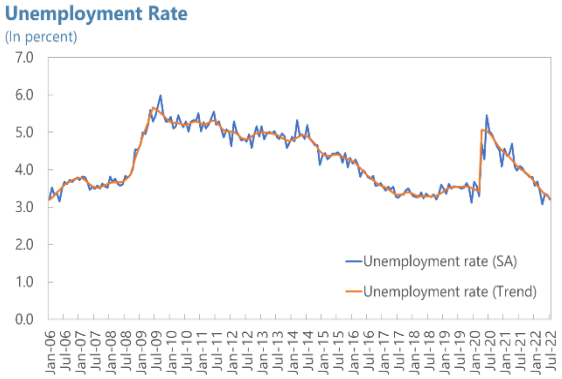
COVID-19 cases peaked in early 2022 with the spread of the Omicron variant.



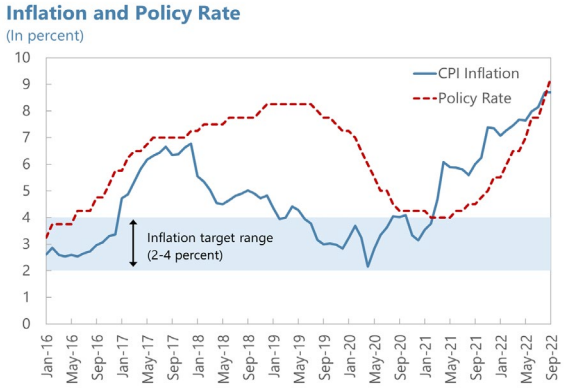
Activity fell sharply during COVID; the economic recovery has been sluggish in recent quarters.



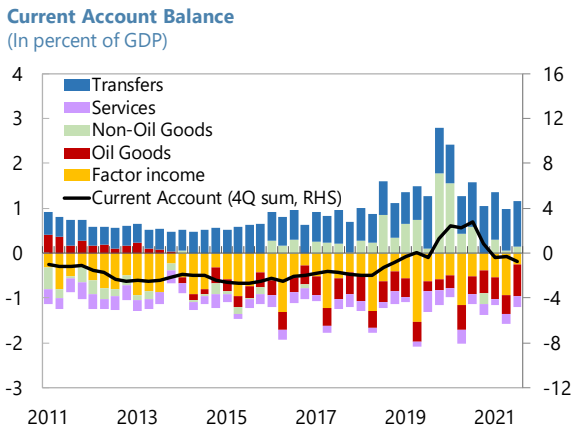
The unemployment rate has normalized after a sharp spike at the onset of the COVID outbreak.



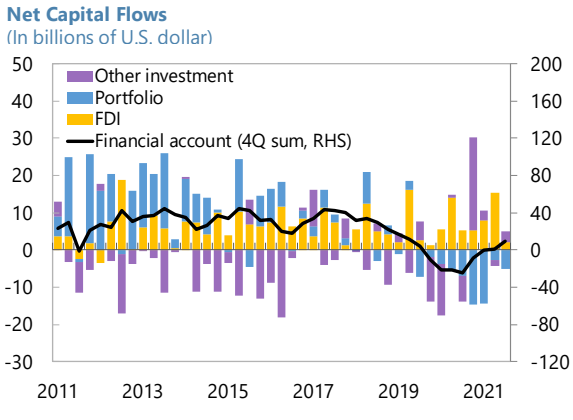
Inflation has risen well above the central bank's target range and is likely to persist for some time.



The current account has tipped back into deficit …



… while portfolio outflows continue, offset by improved FDI.

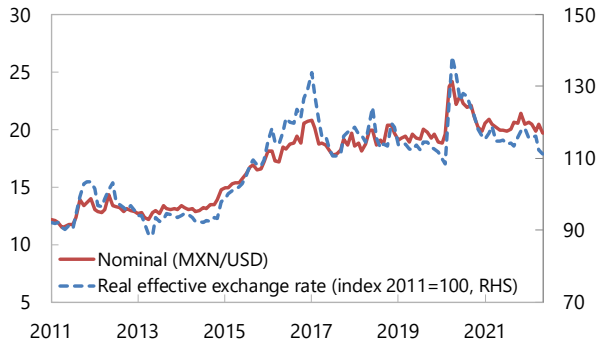


Sources: Bloomberg; BIS; Oxford University; Haver Analytics; SHCP; Banxico; and IMF staff calculation.

Figure 2. Mexico: Financial Market Developments

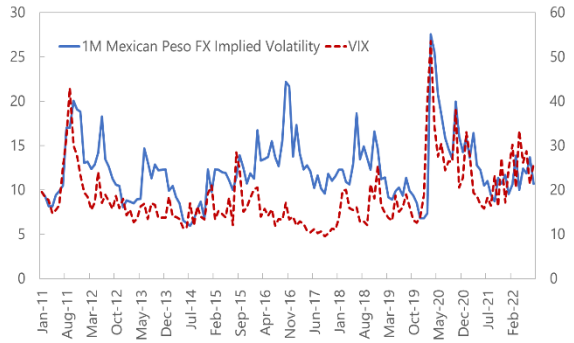
The peso depreciated sharply in April 2020 but has since returned to its pre-pandemic range,

Exchange Rate
(As of July, 2022)



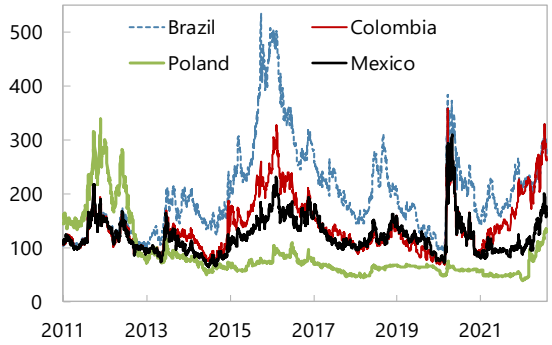
... and has closely followed the level of stress in the global financial market during the pandemic.

Foreign Exchange Volatility and VIX
(Points)



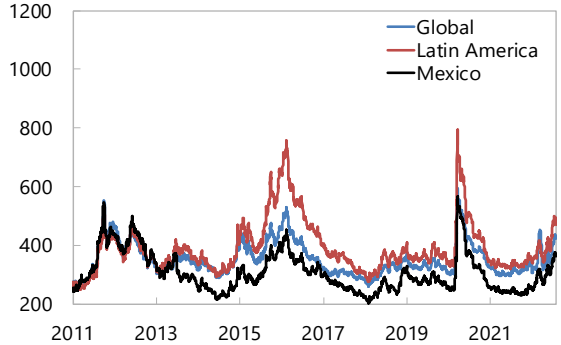
Sovereign credit spreads remain low compared to peers, but have significantly risen recently

Sovereign Risk Spreads
(5Y CDS spread, in basis points; as of August 02, 2022)



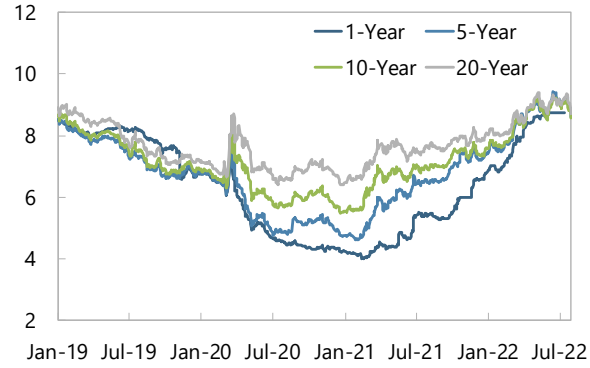
...with a similar pattern for corporate debt.

Corporate Risk Spread
(CEMBI spread, in basis points; as of August 02, 2022)



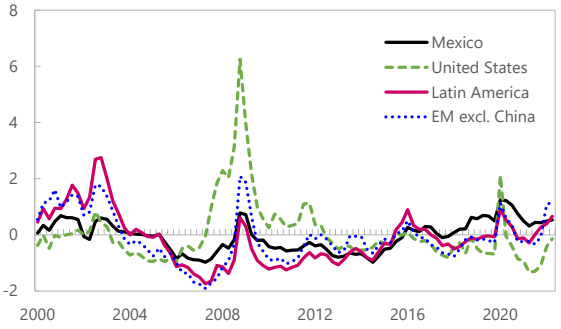
The yield curve has shifted up and flattened in the face of inflation concerns.

Local Government Bonds Yields
(In percent; as of August, 2022)



Financial conditions have tightened moderately with the recent hikes in interest rates, but less than in peers.

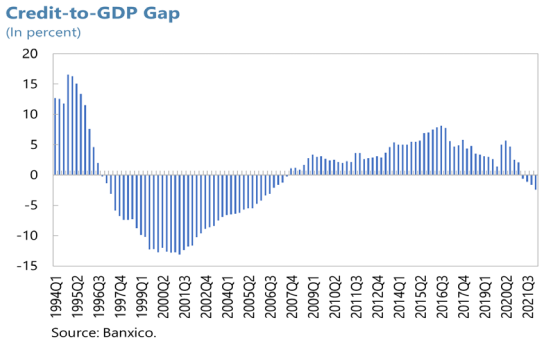
Financial Conditions Index
(Deviations from mean)



Sources: Bloomberg; Haver Analytics; National Authorities; and IMF staff estimates.

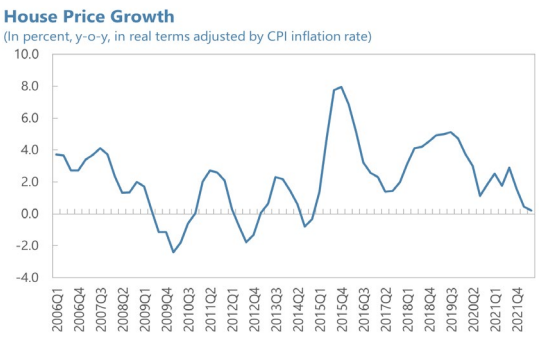
Figure 3. Mexico and Selected Countries: Private Sector Leverage and Debt Service

Credit developments are currently subdued …

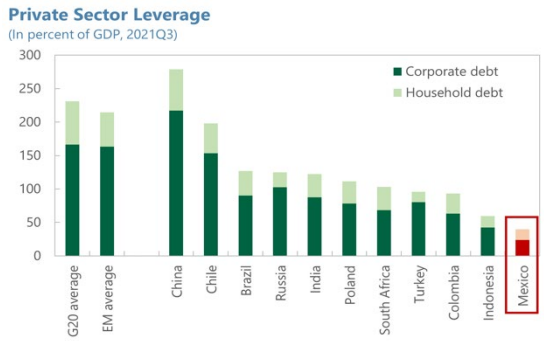


Source: Banxico.

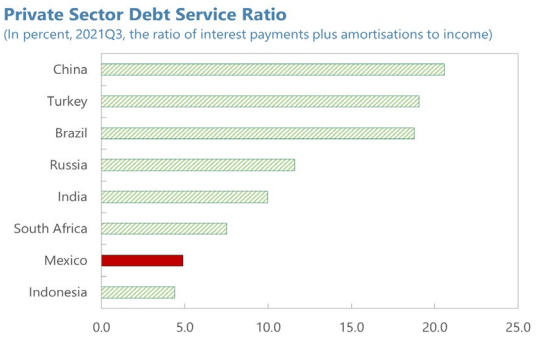
… as is real house price growth.



Private sector leverage is low, compared to EM peers.



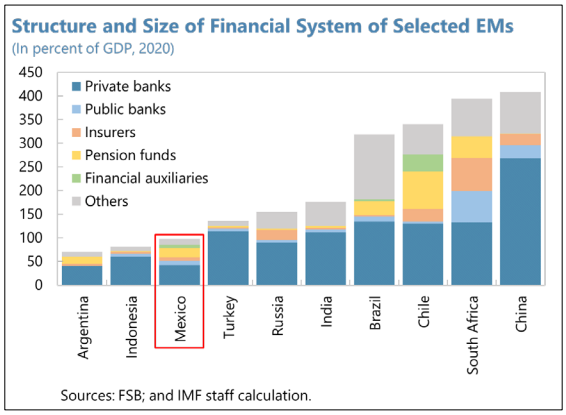
Debt service costs are also low by international standards.



Sources: BIS; and IMF staff calculation.

FINANCIAL SYSTEM STRUCTURE

11. Mexico's financial system is relatively small, with banks playing a leading role. The system, with assets of about 100 percent of GDP, is smaller than EM peers (Text Chart) and has not grown much in size and complexity since the 2016 FSAP (Table 4). The banking sector accounts for more than half of the system, while pension funds and insurers account for about 20 and 8 percent, respectively. The financial system is structured around financial holding companies (FHCs). All six D-SIBs are fully owned by FHCs and play a leading role within the conglomerates.



Sources: FSB; and IMF staff calculation.

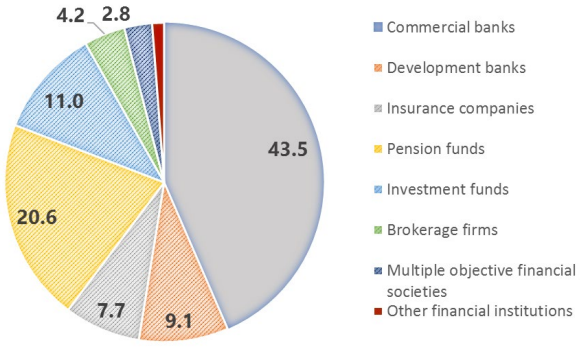
12. The banking sector is highly concentrated with a strong presence of foreign subsidiaries. Mexico has 50 commercial banks. Six D-SIBs comprise ¾ of total banking sector assets (Figure 4). Five D-SIBs are foreign subsidiaries, generating a large share of the parent groups' profits (Table 5). Six development banks (DBs) (9 percent of financial system assets) fill market gaps by providing finance to long-term projects (e.g., infrastructures), small and medium-sized enterprises (SMEs), exporters, housing, and low-income populations. DBs generally depend on wholesale funding with only two small DBs accepting some deposits.

Figure 4. Mexico: Financial and Banking Sector Assets

The banking sector dominates the financial system…

Share of Financial Sector Assets

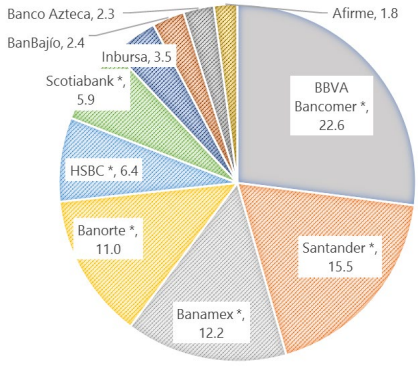
(In percent of total financial sector assets)



… and is dominated by D-SIBs.

Share of Banking Sector Assets

(In percent of top 10 commercial bank assets)



Sources: Banxico; CNBV; and IMF staff calculation.
Note: "*" in the right chart indicates the six D-SIBs in Mexico.

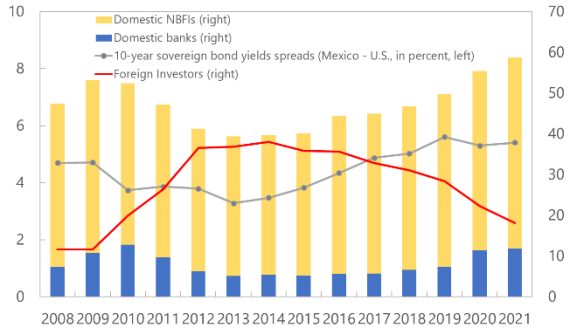
13. Non-bank financial institutions (NBFIs) are typically long-term investors. Pension funds are the main institutional investors, followed by investment funds and insurers (Table 4). Their assets have increased since the last FSAP, with investments mostly concentrated in sovereign debt securities.

14. Mexico is highly integrated with global financial markets. Foreign investors hold about one-sixth of the outstanding local currency government bonds (Text Chart) though their share has been declining in the last years. The Mexican peso (MXN) is widely used as a proxy for EM currencies. Trading volumes of MXN on major exchanges are significantly higher than most other EM currencies.[3] This proxy trade gives MXN a high correlation (or beta) with global risk shocks.

15. Capital markets are of modest size, relative to EM peers. Outstanding domestic debt securities and stock market capitalization amounted to 46 and 31 percent of GDP at end-2021. Apart from the sovereign, the use of capital markets for firm financing is limited (Text Chart).

Holdings of Sovereign Debt Securities

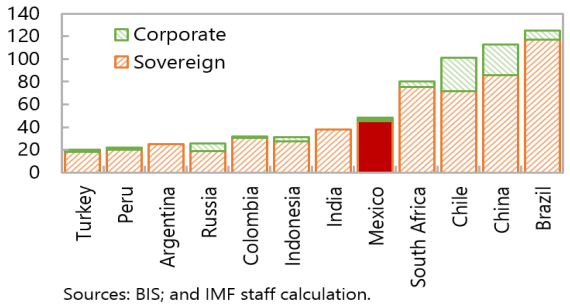
(In percent of total outstanding balance)



Sources: Banxico; and IMF staff calculation.

Outstanding Domestic Debt Securities

(In percent of GDP, 2021Q3)



Sources: BIS; and IMF staff calculation.

[3] https://www.cmegroup.com/market-data/volume-open-interest/fx-volume.html

SYSTEMIC VULNERABILITIES

16. The financial system is emerging from the pandemic with higher capital buffers and no sign of stretched asset values and credit froth. Systemic vulnerability indicators are at generally low and declining levels (Figure 5). However, uncertainty over bank asset quality and other weak pockets exist.

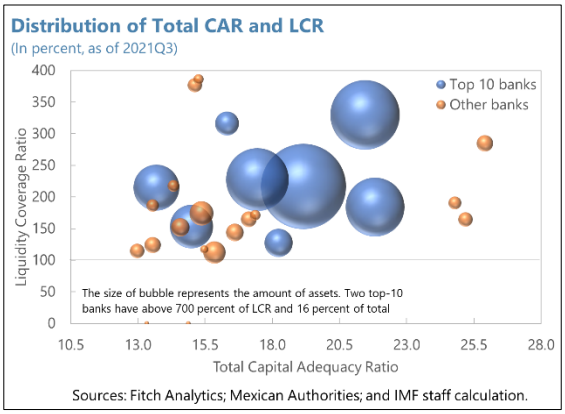
Figure 5. Mexico: Systemic Vulnerability Heatmap

Standard indicators of systemic vulnerabilities do not flag particular concerns at this point in the cycle.

Sectors	Indicators	2018 Q1	2018 Q2	2018 Q3	2018 Q4	2019 Q1	2019 Q2	2019 Q3	2019 Q4	2020 Q1	2020 Q2	2020 Q3	2020 Q4	2021 Q1	2021 Q2	2021 Q3
Economy-wide	Change in private sector credit-to-GDP ratio															
	Credit-to-GDP gap															
	Real growth of credit to private sector															
Banking Sector	Regulatory capital-to-risk-weighted assets ratio															
	Capital-to-assets (inverse leverage) ratio															
	NPLs share in total loans															
	Return on assets															
	Loans-to-deposits ratio															
	Liquid assets-to-total asset ratio															
	FX share in total liabilities															
Corporate Sector	Real growth of bank loans to corporates															
	Share of short-term debt in external debt															
	External debt amortization-to-GDP ratio															
	3-year ahead cumulative probability of default of listed corporates															
Household Sector	Real growth of bank loans to households															
	Real house price growth															
	Mortgage loan-to-value ratio															
	Mortgage payment-to-income ratio															
Public Sector	General government gross financing requirement															
	Non-resident share in sovereign debt securities															
	Domestic government bond yield volatility (daily, bps)															
Financial Markets	FX market volatility (daily, annualized)															
	FX risk spread (bps)															
	Stock market returns (real, yoy)															
	Stock market volatility (daily, annualized)															

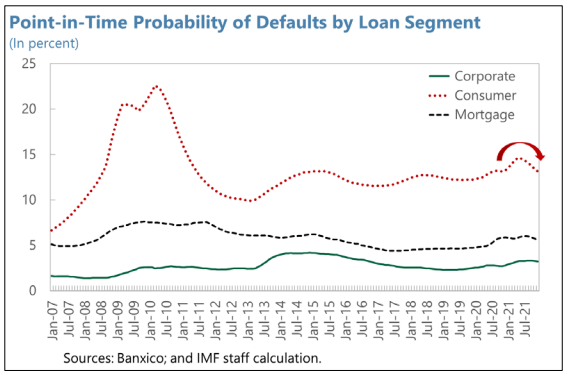
Sources: IMF Systemic Risk Tracker; Fitch Ratings; Banxico; and IMF staff calculation.
Note: The darker the color, the higher the vulnerability, compared to each indicator's historical performance during 1995Q1 – 2021Q3. Some indicators have a short dataspan; for example, mortgage loan-to-value ratio is only available after 2015Q1.

- **Banks' capital buffers have risen in recent years.** Despite some heterogeneity (Text Chart), the aggregate capital adequacy ratio in the banking sector increased to 19.5 percent at end-2021 (Table 6), comparing well with EM peers (Figure 8). The leverage ratio stood at about 12 percent. The higher capital level reflects high profitability and pandemic-linked suspension of dividend payouts.



Sources: Fitch Analytics; Mexican Authorities; and IMF staff calculation.

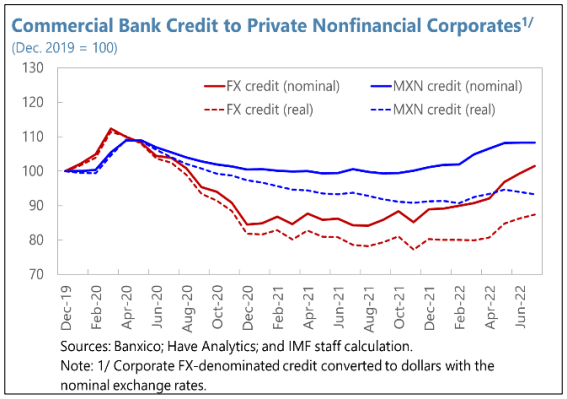
- **Credit risk appears moderate.** At about 2 percent since the last FSAP, aggregate NPLs remain low in absolute terms and relative to EM peers (Table 6, Figure 6). Banks' point-in-time probability of default (PIT PD) suggests that COVID scarring has been contained so far (Text Chart). While most pandemic-affected deferred loans are performing, they need continued close monitoring (Table 7).



- **The banking sector maintains ample liquidity buffers.** The aggregate Liquidity Coverage Ratio (LCR) and Net Stable Funding Ratio (NSFR) were above 200 and 120 percent at end-2021, respectively. But some smaller banks have lower buffers than D-SIBs.[4]

- **Some NBFIs and DBs depend on wholesale funding, making them susceptible to funding shocks.** They use the repo market to manage short-term liquidity and funding operations. DBs have concentrated funding sources, securing more than 30 and 34 percent of their funding from bond issuance and repo operations, respectively (Figure 7). While the sovereign backstops DBs' capitalization and guarantees their liabilities, market concerns over refinancing and repricing of global debt securities might increase funding pressures on them in tail risk events.

- **Mexican corporate fundamentals are strong in international comparison with pre-pandemic and pandemic declines recently starting to reverse.** The corporate sector has low leverage and debt service burden compared to EM peers. Balance sheets and cash flows had weakened since the last FSAP, with further damage in contact-intensive industries during the pandemic, before rebounding in 2021 (Figure 8). Loans to private NFCs began to pick up late last year in nominal terms but remain below the pre-pandemic levels in real terms (Text Chart).



- **Households have low leverage, and housing market risks are small.** House price growth has been moderate in recent years (Figure 3), and household credit, including mortgage lending, is low in absolute terms and compared to EM peers. The weighted average mortgage loan-to-value and payment-to-income ratios have been stable at around 72 and 28 percent, with a small variance in recent years (Figure 5).

[4] Some smaller banks operate with LCR closer to the regulatory minimum due to their business models.

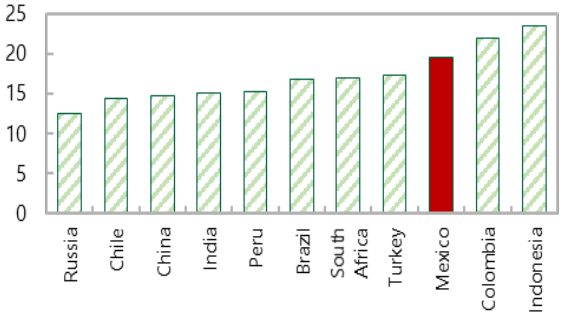
Figure 6. Mexico and Selected Countries: Financial Soundness Indicators

(As of 2022Q1 or the latest available)

Mexican banks' capital ratios compare well with EM peers.

Regulatory Capital to Risk-weighted Assets

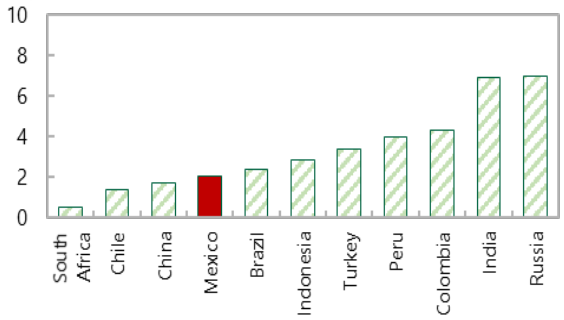
(In percent of risk weighted assets)



Credit risk remains moderate and …

Nonperforming Loans to Total Loans

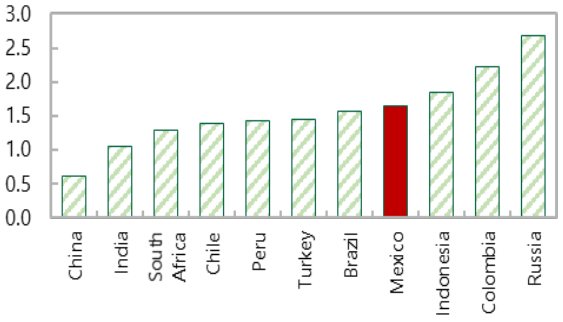
(In percent of total loans)



… banks enjoy high profitability,

Return on Assets

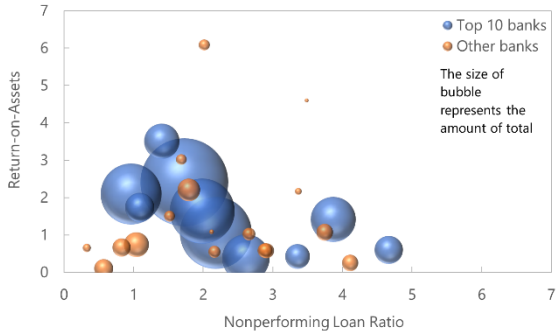
(In percent)



… despite some heterogeneity among banks in Mexico.

Distribution of NPL Ratio and ROA

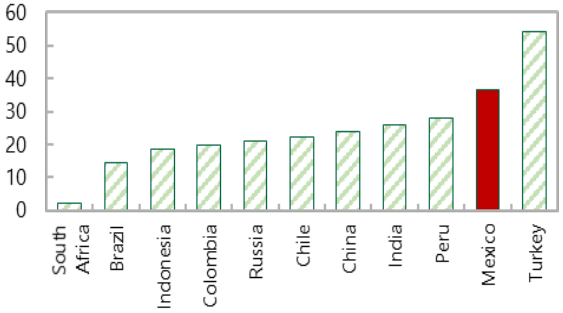
(In percent, as of 2021Q4)



Liquid assets account for a large part of total assets but …

Liquid Assets to Total Assets

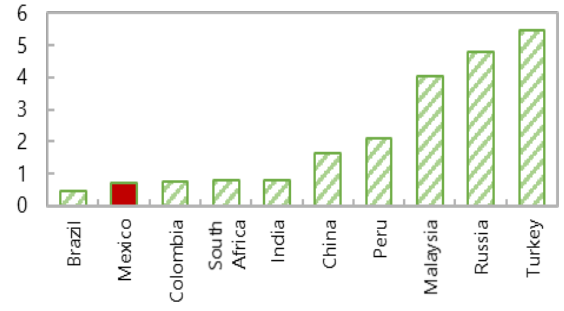
(In percent)



… net open foreign exchange (FX) positions are small.

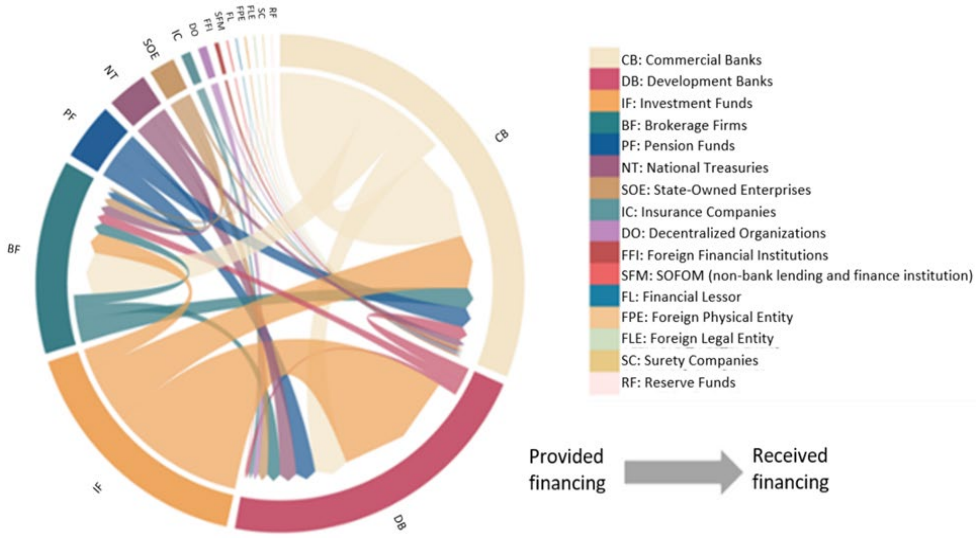
Net Open FX Position to Capital

(In percent)



Sources: Mexican financial authorities; Fitch Analytics; and IMF Financial Soundness Indicator Database.
Note: Comparing financial soundness indicators needs caution, given the differences in regulatory support during the pandemic across countries.

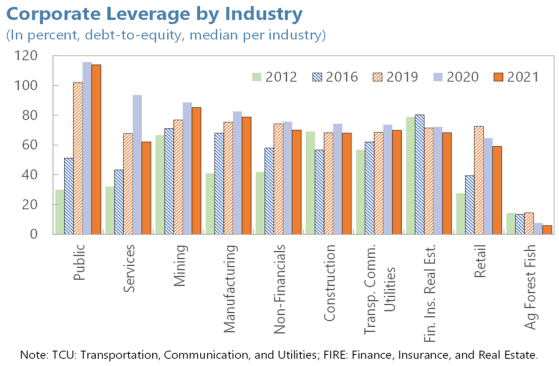
Figure 7. Mexico: Repo Market Structure



Source: Banxico.
Note: The thickness of the arrow represents the amount in repos since January 2020.

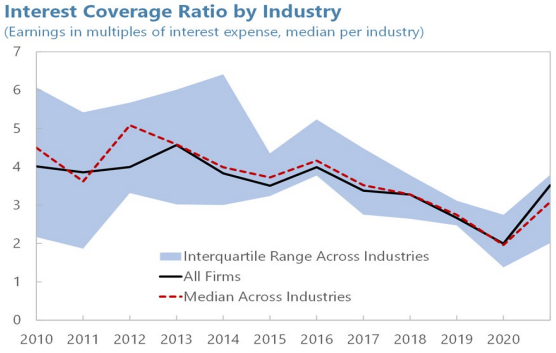
Figure 8. Mexico: Nonfinancial Corporate Sector Performance[1/]

Rising debt of Mexican firms had accompanied by …

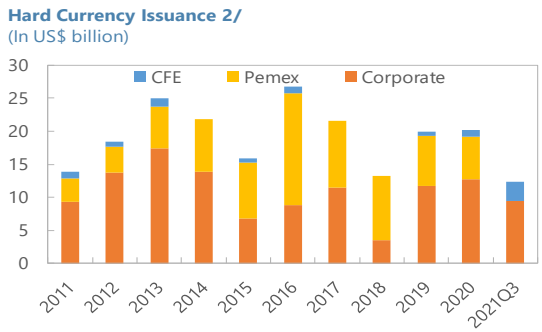


Note: TCU: Transportation, Communication, and Utilities; FIRE: Finance, Insurance, and Real Estate.

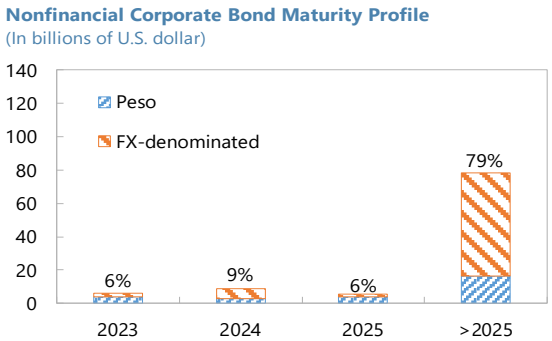
… a deteriorating capacity to repay since 2016, but this trend started reversing in 2021.



Mexican NFCs have issued peso and FX-denominated debt securities offshore ….



… mainly long-term bonds.



Sources: Bloomberg; Haver Analytics; Mexican Authorities; Worldscope; and IMF staff calculation.
Note: 1/ The top charts exclude Pemex and CFE, while the bottom charts include them.
2/ Totals exclude any hard currency issuance in local markets.

SYSTEMIC RISKS AND FINANCIAL SECTOR RESILIENCE

17. The FSAP assessed systemic resilience, including system-wide liquidity and climate risks. In addition to the standard set of approaches, i.e., bank stress tests, corporate sector exercise, and contagion analysis (Figure 9), novel approaches were developed to probe system-wide liquidity risk and the risks related to climate change and financial digitalization. They are underpinned by a baseline and an adverse scenario. The stress test scenario horizon spans 2022–2024, starting with the data at end-2021. The baseline scenario is aligned with the IMF projections as of June 2022.

18. The adverse scenario entails low growth and high inflation in major economies and significant stress in global financial markets. It considers a combination of the first three external risks in the Risk Assessment Matrix (Appendix II). Shocks that drive inflation up (e.g., supply chain disruptions and commodity price surges, triggered by the war in Ukraine and COVID variants) would lead to a de-anchoring of inflation expectations in the U.S. and Fed policy rate hikes at a faster clip than in the baseline (Figure 10). Investors' reassessment of market fundamentals would lead to a widespread risk-off event in the global financial markets, causing sharp currency depreciation, a rise in sovereign and corporate spreads, liquidity strains, and negative macrofinancial feedbacks (Table 8).[5]

A. Standard Assessment of Systemic Risks

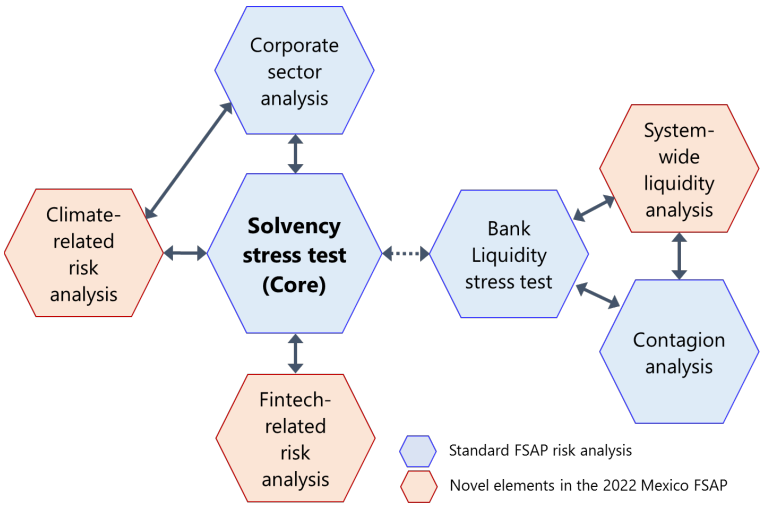
19. The banking system is broadly resilient to severe external shocks. The solvency stress tests suggest that most banks have ample capital buffers relative to hurdles. Aggregate capital shortfalls in the adverse scenario are relatively small (less than 0.4 percent of GDP). The top 10 banks' capital adequacy ratio declines by 4.7 percentage points to 14.5 percent by 2022, comfortably above the minimum requirements, despite some dispersion among banks due to the diversity of business models (Figure 11). Two key drivers underpinning capital depletion are market losses due to the pronounced rise in interest rates and credit spreads, and credit losses due to asset quality deterioration.[6] Net interest income continues to contribute positively to capital given the solid net interest margins of Mexican banks under a higher interest rate environment, although at a more moderate level compared to the baseline. MXN depreciation has limited impact reflecting banks' very small net open FX positions and insignificant effects on corporate PDs in the credit risk model estimation.

20. However, some risks could arise from exposure to contingent credit lines and from large holdings of debt securities. Contingent credit lines are substantial (about 2.7 trillion pesos and 10 percent of GDP in May 2022) and unevenly distributed among banks. Although about 90 percent of the credit lines are revocable, they could negatively affect banks' capital positions if contemporaneously triggered in a tail-risk event (Figure 11). A higher-than-anticipated rise in interest rates (+150 bps) would also have considerable effects via mark-to-market losses on debt securities, leading the top-10 banks' capitalization to decline by 2.4 percentage points by 2022, though the likely effects would be attenuated by hedging that the FSAP is unable to model.

[5] FSAPs typically use severe but plausible scenarios further in the tail of the historical distribution of macrofinancial variables, compared to AIV consultations, as FSAPs focus on systemic risk mitigation (Adrian and others, 2020).

[6] Note that the non-recognition of hedging impact assumption tends to amplify market revaluation losses.

Figure 9. Mexico: Components of Systemic Risk Analysis

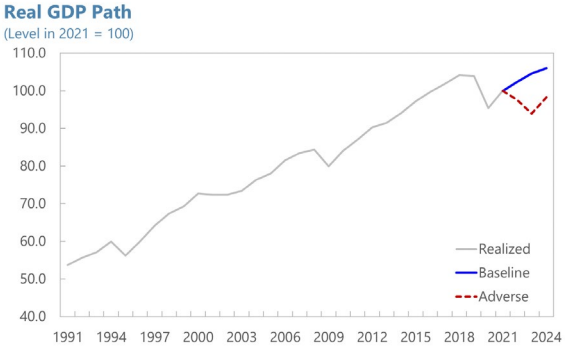


- **Bank solvency tests.** The FSAP team conducted top-down solvency stress tests (STs) for the top 10 banks, representing about 84 percent of assets of the commercial banking system, using 2021Q4 as the cut-off date and under a static balance sheet assumption. The team also conducted sensitivity analyses to examine the impact of a partial triggering of off-balance sheet contingent credit lines and the impact of a higher interest rate shock. See Appendix III for the detailed methodology.
- **Risk analysis of NBFIs and development banks.** CNBV conducted a separate exercise to assess credit and market risks of development banks and the twenty largest NBFIs under the adverse scenario. The results are summarized in Annex I.
- **Bank liquidity tests.** A cash flow liquidity ST is conducted together with an LCR test for all 50 commercial banks. The team also assessed the evolution of the Net Stable Funding Ratio (NSFR).
- **Contagion analysis.** The FSAP has estimated counterparty and funding risks through domestic and cross-border contagion channels with confidential intercompany bilateral exposures among banks and NBFIs and BIS International Banking Statistics.
- **Corporate sector analysis.** The analysis assesses the potential impact of aggregate shocks on NFCs' vulnerabilities, focusing on listed firms due to the availability of high-quality data. But the team has extrapolated to a larger set of companies using machine learning techniques.
- **System-wide liquidity analysis.** The analysis examines the risk that many financial institutions would simultaneously face liquidity stress through interconnectedness in the entire financial system against the following four relevant and correlated shocks for Mexico: global tightening of monetary policy triggering (i) capital outflows resulting in sales of Mexican sovereign and corporate bonds and (ii) a drawdown of credit and liquidity lines of corporates with domestic banks; (iii) deposit outflows via wholesale deposit run-offs; and (iv) redemption shocks triggering liquidity strains on investment funds, development banks, and commercial banks (Section IV. B).
- **Climate risk analysis.** The analysis assesses potential pressure points due to physical climate shocks (e.g., tropical cyclones and flood events) and the transition to a low-carbon economy (Section IV. C).
- **Fintech-related risk analysis.** The potential impacts of penetration of new forms of digital payments to the financial system are assessed as a layer of the bank solvency STs (Section IV. D).

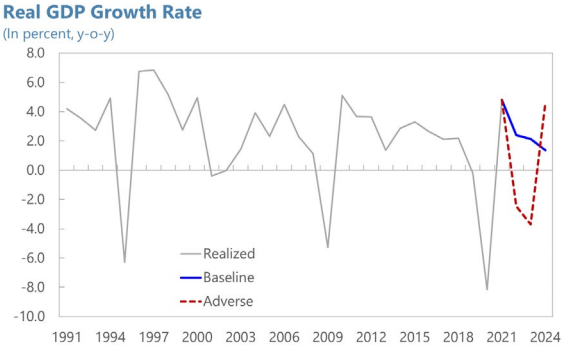
Source: IMF staff.
Note: Arrow show linkages across components of the systemic risk analysis.

Figure 10. Mexico: FSAP Stress Test Scenarios

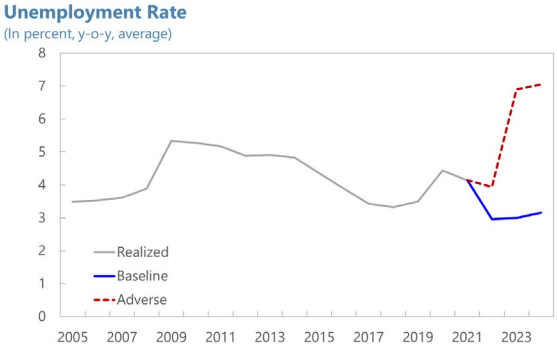
Shocks to global financial condition would drive a sharp output contraction in Mexico, …



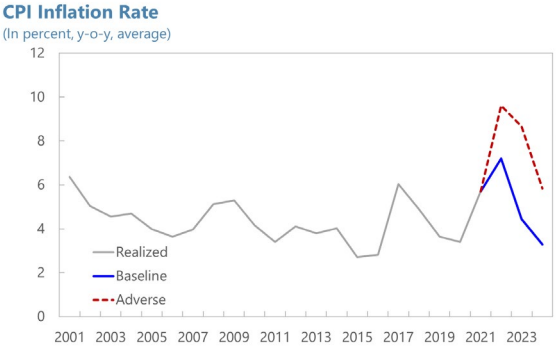
… causing a severe recession in line with a 2¼ standard deviation shock to output growth, …



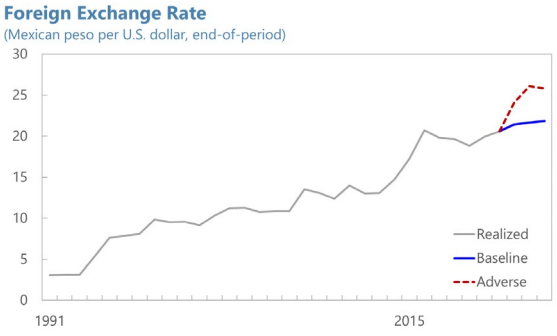
… a sharp rise in unemployment, …



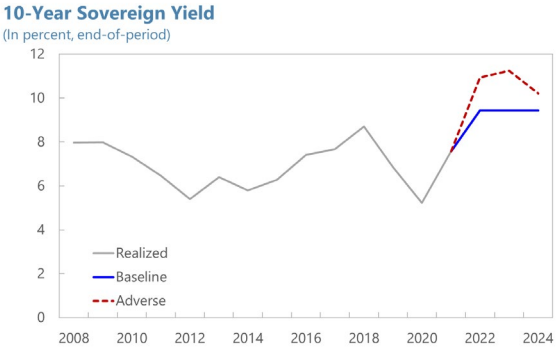
… a high inflation that Mexico has not experienced since the 1994 financial crisis, and …



… a sharp currency depreciation.



Long term yields would be sustained at 11 percent on average during 2022-23

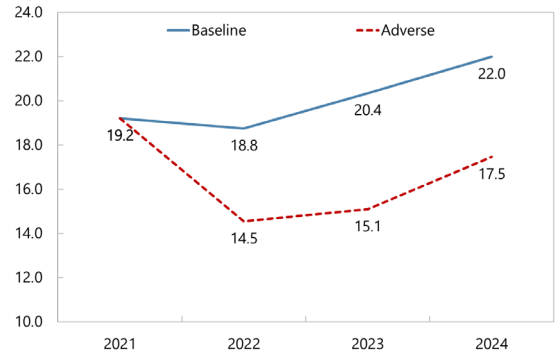


Source: IMF staff.

Figure 11. Mexico: Bank Solvency Stress Test Results

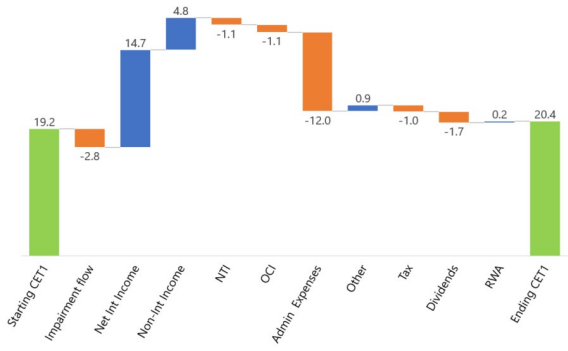
The banking sector has sufficient buffers in both scenarios, despite the sharp revaluation of bond portfolios.

Solvency Stress Test: CAR- Baseline and Adverse
(In percent)



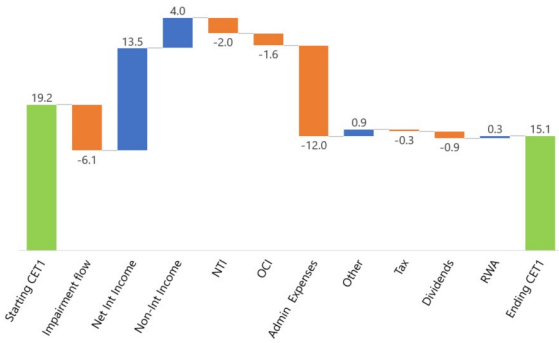
Solid profitability and internal capital generation capacity help banks counterbalance losses from market risk….

Impact Attribution to Capital - Baseline 2023
(In percent)



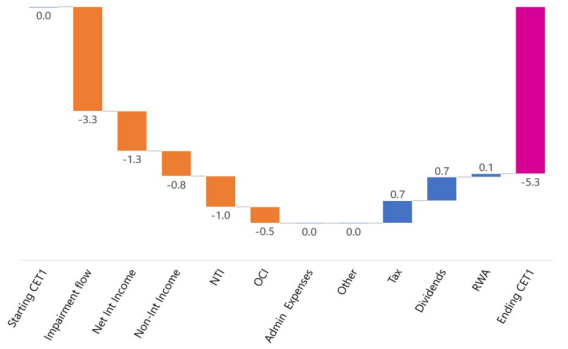
…while loan impairments and Fair Value portfolio losses drive the impact in the adverse scenario.

Impact Attribution to Capital - Adverse 2023
(In percent)



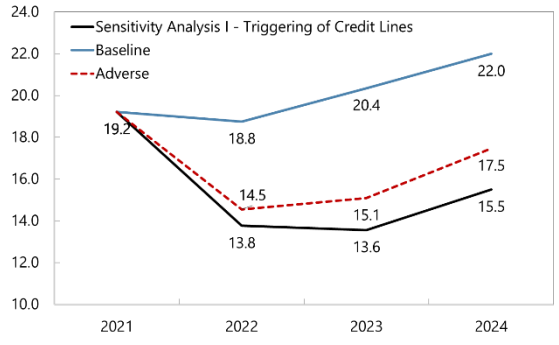
Loan impairments and a moderate net interest income impact drive the difference between two scenarios.

Impact Attribution to Capital - Delta Baseline vs. Adverse 2023
(In percent)



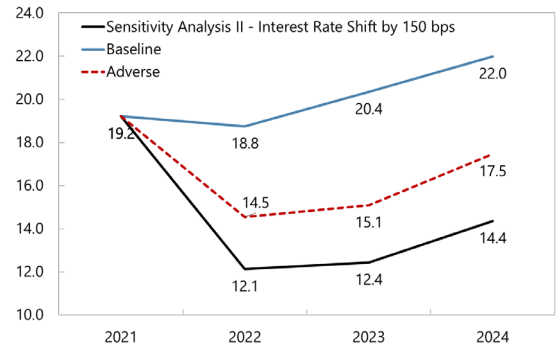
Triggering of contingent credit lines can be a challenge for some banks …

Solvency Stress Test: CAR- Sensitivity Analysis I
(In percent)



… while interest rate shifts could further reduce capital buffers.

Solvency Stress Test: CAR- Sensitivity Analysis II
(In percent)



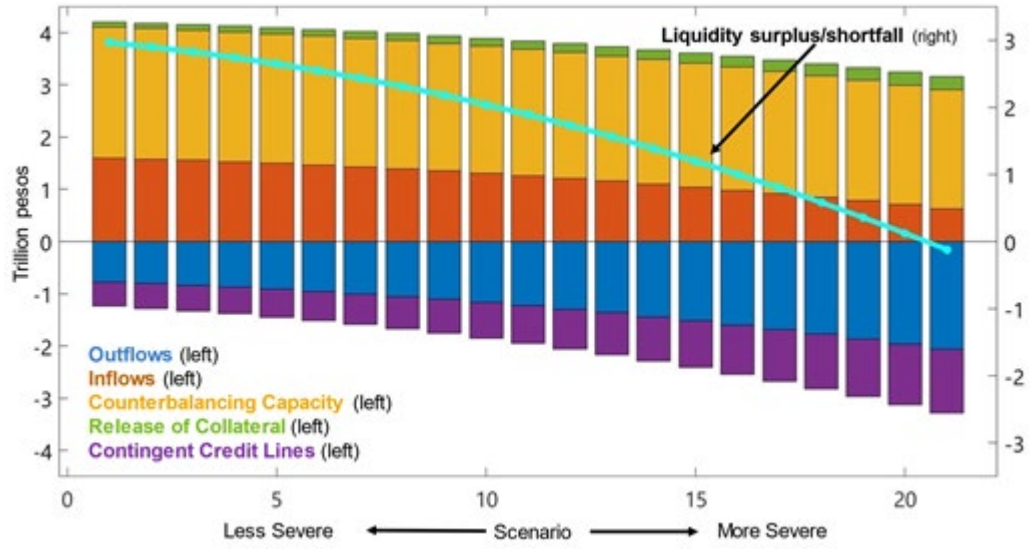
Source: IMF staff calculation.

21. Overall liquidity conditions in the banking sector are robust, but some smaller banks could face risks. The aggregate LCR stood at 225 percent in December 2021, with all commercial banks above the 100 percent regulatory minimum. Most systemic banks, starting from high LCRs, are well-positioned to manage short-term liquidity pressures. But institutions with low LCR starting points and large exposure to wholesale deposits, particularly some smaller banks, would breach the threshold under severe stress (Table 9). The cashflow analysis supports these results. Aggregate liquidity shortfalls would occur only in an extreme scenario and amount to about 1 percent of banking sector assets when liquidity shortfalls of some banks are netted out with surpluses of others (Figure 12). Moreover, the shortfalls are manageable, given Banxico's capacity to support the system during stress events.

22. Two potential problems, related to banks' short-term liquidity management, should be monitored closely. First, contingent credit lines could be withdrawn quickly or simultaneously under stress. Second, part of the retail deposits from high net-worth individuals in search of higher yields could potentially behave like wholesale deposits and be more prone to outflows, though more granular data would be needed to assess this in depth.

Figure 12. Mexico: Bank Cash Flow Analysis Results[1/, 2/]

Liquidity shortfalls are limited even under a severe scenario



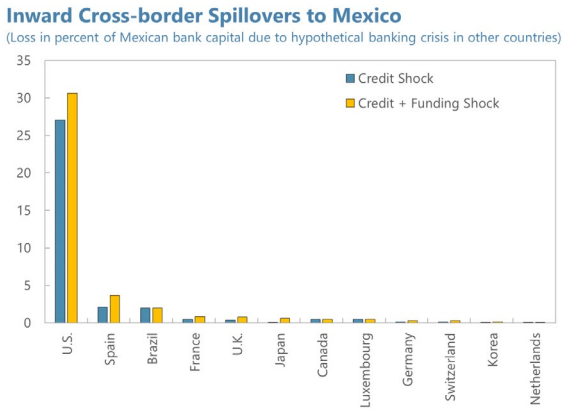
Source: IMF staff calculation.
1/ This chart shows the liquidity surplus/shortfall in the right y-axis for the banking sector with the contribution of the different flows. In the most severe scenario, the banking sector faces liquidity shortfalls equal to 0.1 trillion pesos (1 percent of total assets in the sector).
2/ The parameters for the cash flow analysis scenarios are in Appendix IV.

23. The potential for contagion through cross-border bank exposures or domestic networks appears limited. Mexico would face inward spillovers from a hypothetical banking crisis in the U.S. (Figure 13). But Mexican banks play a limited role as shock originators or transmitters to other countries. The domestic interconnectedness analysis with bilateral exposures among banks and

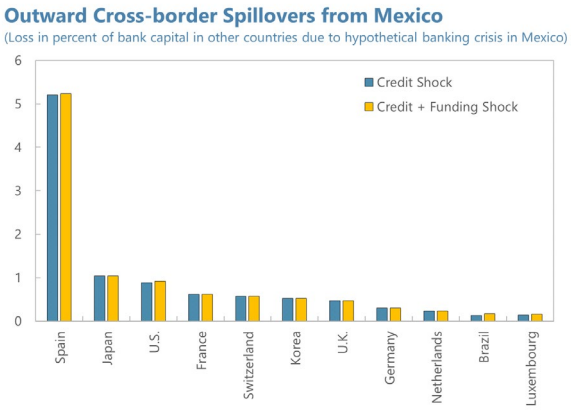
NBFIs suggests limited contagion effects. Domestic contagion would result from the failure of development banks, although such failures are very unlikely given DB's sovereign backstop.

Figure 13. Mexico: Results from Cross-border and Domestic Contagion Analysis

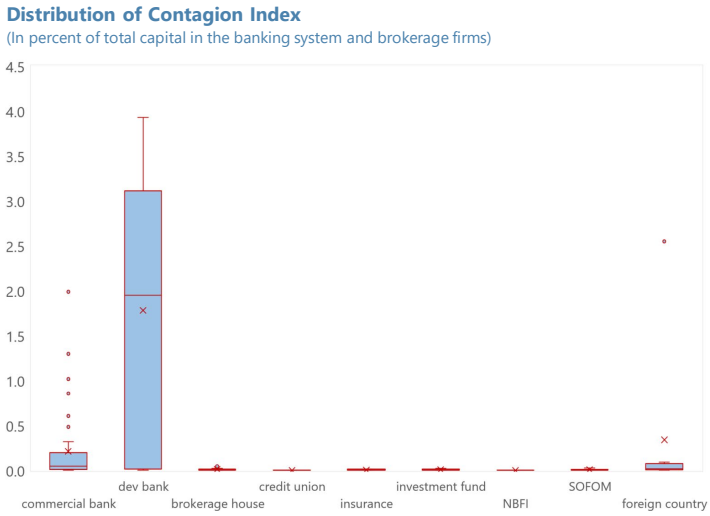
Cross-border contagion of a banking crisis into Mexico mirrors strong regional ties with the U.S. and Spain.



Mexico plays a limited role as a shock transmitter to banks in other countries.



Hypothetical failure of a financial institution causes limited cascade effects in the Mexican financial system, except some development banks and commercial banks.



Sources: Banxico; BIS Locational Banking Statistics; and IMF staff calculation.
Note: Contagion index shows the aggregate capital impairment in the banking system and brokerage houses due to a hypothetical failure of a financial institution, similar to the concept of outward spillovers. Note that total regulatory capital data are only available for commercial banks, development banks, and brokerage firms.

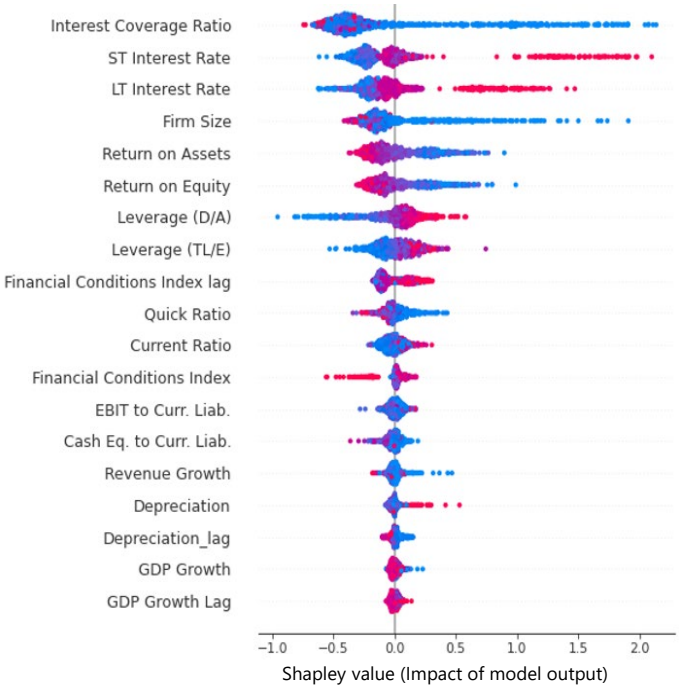
24. Corporate debt-at-risk would rise under the adverse scenario, but the impacts on the financial system are limited due to low leverage. Using conventional econometric modeling, aggregate corporate PIT PDs almost double from a low level during the outer years of the adverse scenario.[7] Complementary corporate sector analysis substantiates these estimates, using firm-level expected default frequencies (EDFs). The analysis finds that Mexican firms, outside the well-known

[7] Corporate PIT PD would rise from 2.3 percent in 2021 to 4.1 percent in 2024 in the bank solvency STs.

set of publicly listed firms, would face heightened default risks under the adverse scenario. Firms that are more highly levered and have poorer liquidity conditions would have difficulty in a high-interest rate and low-growth environment (Figure 14). However, they tend to be smaller, so the implications for the banking sector would be limited. The analysis reconfirms that FX depreciation plays an insignificant role in affecting Mexican corporate EDFs.[8]

Figure 14. Mexico: Shapley Value from Random Forest Estimation with Corporate EDFs[1/, 2/]

The random forest estimation, which performed best in out-of-sample testing, finds that lower interest coverage ratios, higher interest rates, smaller firms, weaker profitability, and higher leverage ratios contribute to higher EDFs in the Mexican corporate sector.[3/]



Sources: Capital IQ; Moody's KMV; and IMF staff calculations.
1/ The Shapley value is the average marginal contributions of an observation for that variable to the overall risk assessment. Marginal contributions are averaged over all possible subsets of variables.
2/ Pemex is not included in the estimation. See the TN on Systemic Risk Analysis and Stress Test for the detailed information of the coverage of Mexican firms in the corporate sector analysis.
3/ Firms with low (high) value of an indicator are colored in blue (red).

B. System-Wide Liquidity Analysis

25. A novel approach is developed to examine the risk that multiple financial institutions face liquidity stress simultaneously. As shown in Figure 15, Mexico's financial intermediaries are closely interconnected to each other via direct lending, debt crossholdings, repo exposures, and exposures to common assets (e.g., government bonds), exposing them to repricing risks associated with fluctuations in interest rates and spreads. The analysis seeks to assess the interconnectedness and resilience of the entire financial system (by contrast with the bank liquidity stress tests discussed

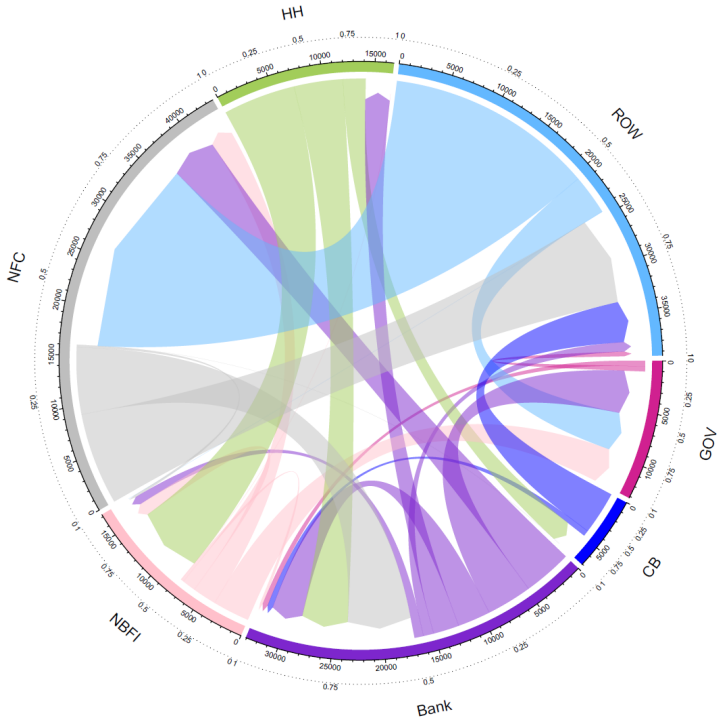
[8] Mexican corporates with international activities manage FX risks with natural and financial hedges.

in ¶16) from a liquidity perspective to simulated shocks to capital flows, liquidity demand from corporates, and deposits outflows (see Figure 9). The simulations use aggregate institution level data to generate post-shock liquidity positions for banks and investment funds (see Appendix III for details).

Figure 15. Mexico: Cross-Sectoral Interlinkage

(In billions of Mexican pesos, 2021, asset claims)

Mexico's financial intermediaries are exposed to common assets (i.e., sovereign debt securities) and counterparty risk via direct lending and repo operations, and NFCs are exposed to offshore refinancing risks



- HH=household,
- NFC=non-financial corporation,
- NBFI=non-bank financial institution,
- CB=central bank,
- Bank=commercial and development banks
- GOV=general government.
- ROW = rest of world

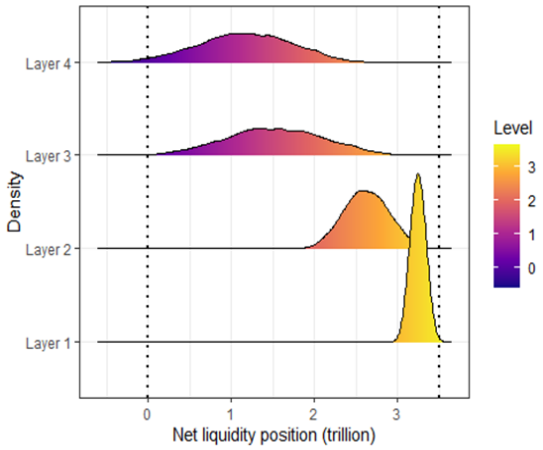
Sources: IMF Balance Sheet Approach Matrix; and IMF staff.
Note: The direction of an arrow shows exposures from a fund provider to a receiver.

26. The aggregate analysis suggests that system-wide liquidity would remain resilient, with commercial banks effectively backstopping the liquidity needs of other entities. Even in the most severe case, commercial banks show only small liquidity shortfalls upon the triggering of contingent credit lines and wholesale deposits' outflows (Figure 16). They can in principle act as a shock absorber for the system by providing liquidity to other entities through repo transactions, assuming liquidity requirements are lowered (as during the pandemic) and no underlying change in their liquidity preference. However, in the aggregate framework, were commercial banks or entities such as investment funds to change liquidity preference or face binding liquidity constraints during tail-risk events, this could lead to a deterioration in the liquidity positions of other entities and materialization of larger system-wide liquidity stress, absent liquidity provision by the MFAs.

Figure 16. Mexico: Results from System-Wide Liquidity Analysis

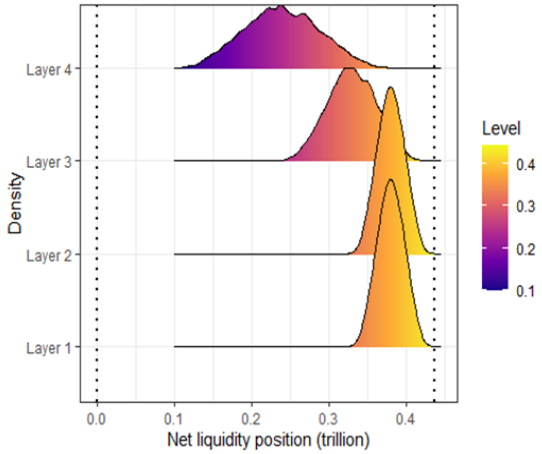
The banking sector acts as a shock absorber by providing liquidity to other sectors through repo transactions

Commercial Banks



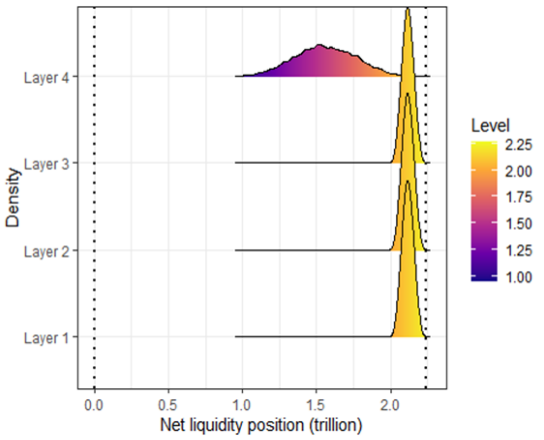
Development banks as a single agent can withstand significant liquidity outflows…

Development Banks



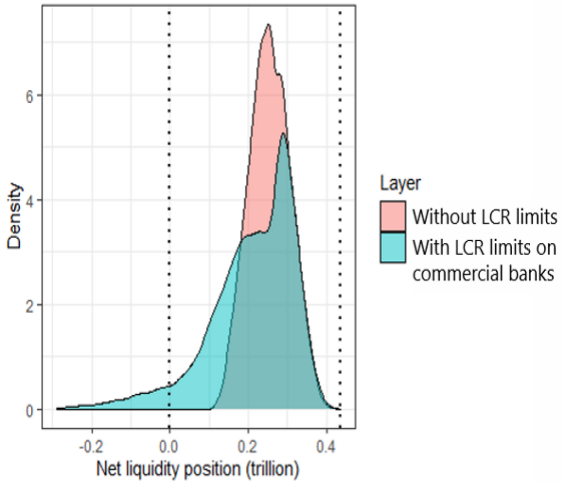
Investment fund industry as a whole is also resilient against liquidity shocks with HQLAs in the form of cash and other unencumbered assets, and…

Investment Funds



… they could benefit from participating in the repo market, instead of selling their liquid assets at higher discounted rate.

Development Banks



Sources: Banxico; and IMF staff calculation.

Note: Shock (layer) 1 denotes sale of Mexican sovereign and corporate bonds. Shock 2 denotes triggering of domestic bank credit and liquidity lines of corporates. Shock 3 denotes capital outflows via wholesale and retail deposit run-off. Shock 4 denotes redemption shocks and other forms of short-term funding stress triggering liquidity strains on investment funds, development banks, and commercial banks. For the first three figures, right dash line refers to starting point net liquidity position, left dash line refers to zero net liquidity position. The layers are cumulative, bottom-to-top.

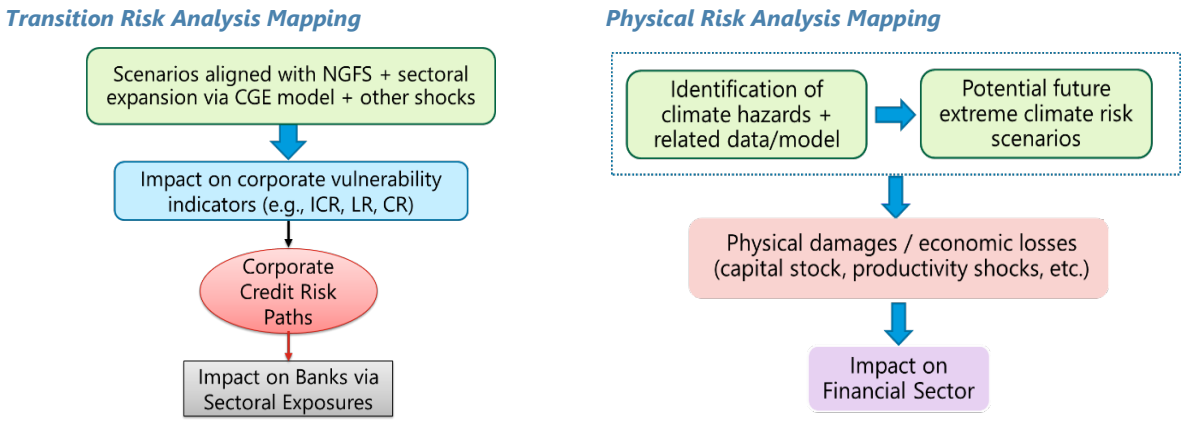
C. Climate-Related Risk Analysis

27. The FSAP has piloted analysis of the potential impact of transition and physical risks for the financial sector. Both analyses rely on scenario-based approaches, as described in Figure 17.

Figure 17. Mexico: Climate Risk Analysis Framework

Under above-mentioned scenarios, firm-level vulnerability indicators are projected, aggregated into sectoral PD paths, and then translated into banks' PD paths, using the FSAP solvency stress test method.

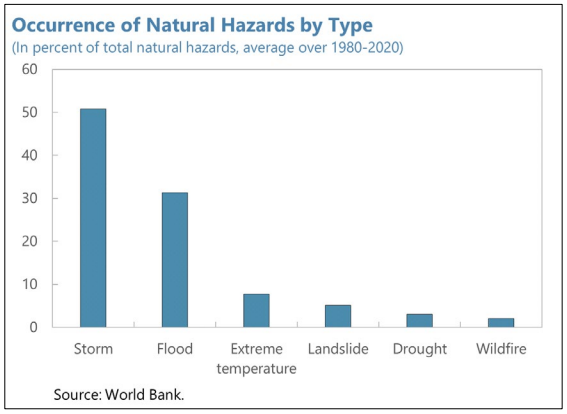
Estimated direct damages to capital stock at the geographical level and indirect shocks to total factor productivity were translated into climate-augmented paths of macrofinancial variables, and then mapped into impacts on bank balance sheets and capital ratios.



Sources: OECD; World Bank; and IMF and WB staff.

- **Transition risk.** Besides a baseline scenario (so-called "current policies"), two other 5-year scenarios are explored, motivated by the NGFS scenarios: (i) global action (reflecting the notion of orderly transition) and (ii) delayed-uncertain action (reflecting increased uncertainty with delayed, disorderly transition at the global level). Also, a novel stochastic jump-diffusion model of corporate spreads is used to assess the impact of a sudden large shift in the market's risk assessment under the delayed-uncertain scenario.

- **Physical risk.** The physical risk analysis focuses on floods and tropical cyclones (Text Chart). It also extends the analysis beyond individual climate events to look at extreme season scenarios over a three-year horizon, comprised of a series of severe floods and tropical cyclones, reflecting historical and potential future climate conditions corresponding to representative concentration pathways (RCP) 4.5 and RCP8.5.[9]



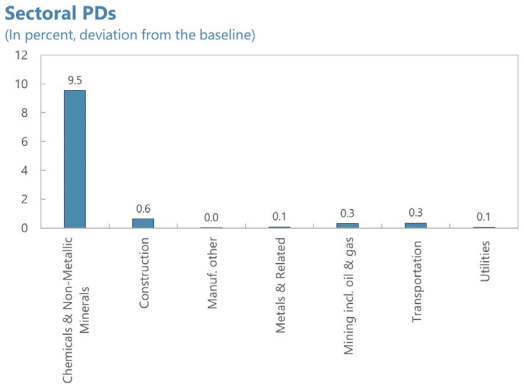
28. The transition risk analysis finds heterogeneous impacts across industries and banks. Under the global action scenario, NFCs are modestly affected, except chemicals and non-metallic segments of the manufacturing sector (Figure 18). The cumulative impacts on bank capital ratios would amount to about 0.4 percentage points by 2026. Such impacts would be heterogeneous

[9] Droughts and chronic risks are also relevant. However, droughts were not associated with large economic damages in historical data, though this may change in the future with climate change. The data and modelling requirements for assessing chronic risks remain a significant challenge and these hazards were outside the scope of this FSAP.

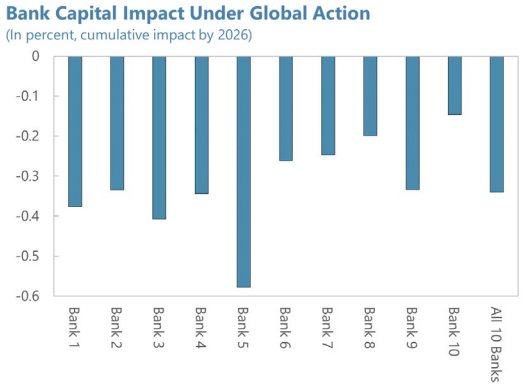
across banks, depending on their sectoral exposures. Under the global delayed-uncertain scenario, the tail of the distribution of corporate PDs and bank capital ratios gets fatter. This analysis supports the case for an early transition to a low-carbon economy at the global level to mitigate the tail risk of large, sudden, necessary actions in the future.

Figure 18. Mexico: Results from Transition Risk Analysis[1/]

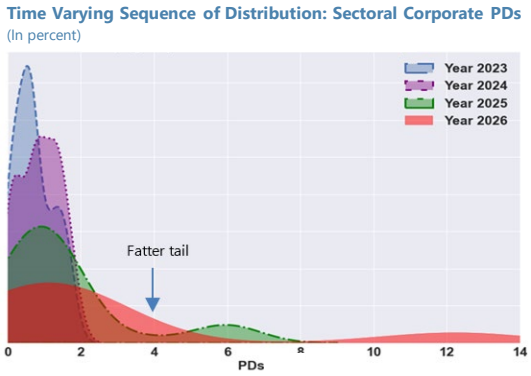
Credit risk is generally modest in the global action scenario, barring the chemicals and hydrocarbon sectors…



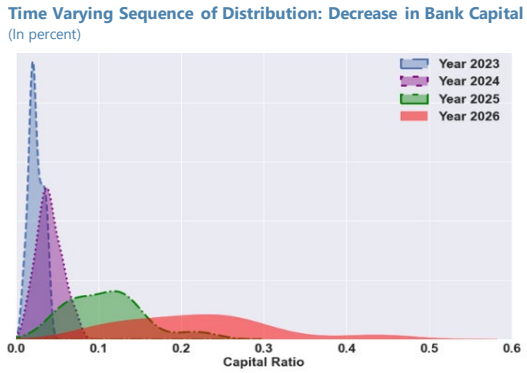
… and the impact on bank capital is also contained under global action.



Tail risk across sectors increases under the delayed-uncertain scenario…



…and the tail risk on bank capital also increases substantially.

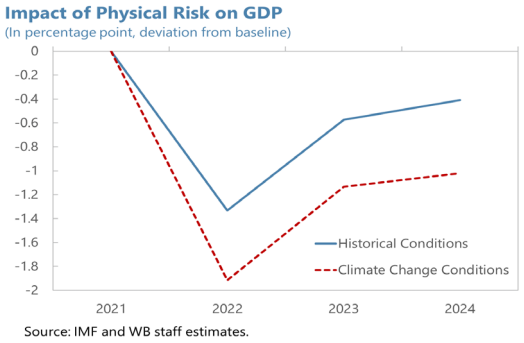


Sources: Banxico; and IMF and WB staff calculation.
1/ These estimates should be interpreted with caution, given a range of climate data, model limitations, and the uncertainties associated with quantifying effects of complex risks associated with climate risk.

29. The physical risk analysis is subject to high uncertainty but suggests that climate hazards would not likely generate systemic financial stress in the near term. Floods and tropical cyclones may substantially impact on livelihoods and wellbeing, particularly in the regions hit by the disasters. Data and models are subject to major uncertainty and gaps, but overall, the currently estimated impacts would not generate systemic financial stress despite a substantial impact on growth. Under the extreme RCP8.5 scenario, the estimated physical capital stock damage would translate into two percentage points deviation of GDP growth from the baseline in 2022, with the impact remaining persistent, and the banking sector's capital ratio would decline by about 1.2 percentage points from the baseline solvency ST results (Figure 19).

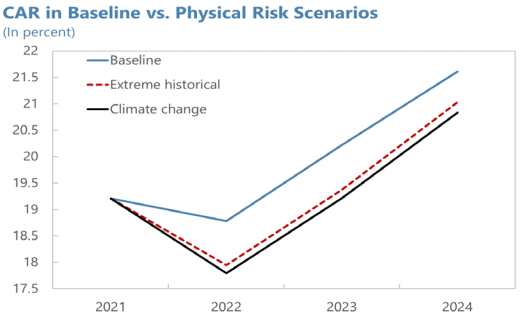
Figure 19. Mexico: Results from Physical Risk Analysis[1/]

Under the extreme physical hazards, impact on GDP…



Source: IMF and WB staff estimates.

…and capital ratios of top 10 banks are modest.



Source: IMF and WB staff estimates.

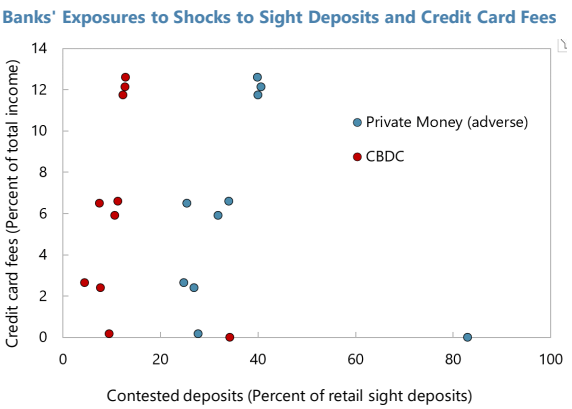
Sources: Banxico; and IMF and WB staff calculation.
1/ These estimates should be interpreted with caution, given a range of climate data, model limitations, and the uncertainties associated with quantifying effects of complex risks associated with climate risk.

D. Fintech-Related Risk Analysis

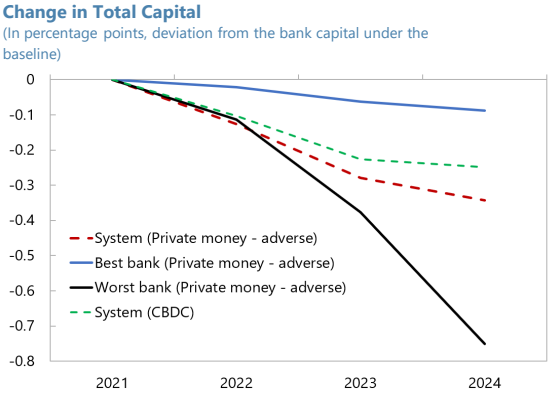
30. The aggregate impact on financial stability of new forms of digital money currently seems limited, but differences in bank business models suggests heterogeneity of risks. The FSAP team has conducted a hypothetical sensitivity analysis in which banks experience an erosion of net interest income and non-interest income (from payments services) due to the penetration of new forms of digital payments (see Appendix III for methodological details).[10] In the most adverse scenario, the banking sector's capital ratios would drop by 34 basis points over two years relative to the baseline solvency ST results (Figure 20). Banks that rely more on retail sight deposits and credit card fee income could see their capital ratios decline up to 75 basis points over such a time frame. Were CBDC introduction to become a source of pressure on bank margins, putting a cap on the size of CBDC accounts could mitigate the impact on banks.

Figure 20. Mexico: Results from Fintech-Related Risk Analysis

Reliance on retail sight deposits and credit card fees differ across banks



Potential impact of digital money penetration would vary considerably across banks.



Sources: Banxico; and IMF staff calculation.

[10] Due to data availability constraints, income from payments is proxied by income from credit cards.

E. Recommendations

31. The authorities' framework to assess systemic liquidity stress is broadly in line with that of many major central banks, but there is scope for enhancement. The ST framework would benefit from adding a comprehensive cash flow analysis and advancing on developing a system-wide liquidity analysis. Banxico could monitor the dynamics of contingent credit lines and assess the relevant risks together with CNBV.

32. Pillar 2 requirements could be deployed to contain potential risks identified by the systemic risk analysis. CNBV could use its authority to impose capital add-ons based on the Internal Capital Adequacy Assessment Process (ICAAP), which has yet to occur, to address issues such as concentration risk, interest rate risk in the banking book, and gaps in risk management practices that are indicated by stress tests. The liquidity analysis could also be used in the Supervisory Review Process (SRP) to inform Pillar 2 requirements for both commercial and development banks.

33. The MFAs collect a wealth of data to support systemic risk analysis; efforts for further improvement should be continued. The current data available to the MFAs are wide-ranging. Further effort could help. Banxico and Tax Service Administration (SAT) could collaborate to share anonymized household and corporate income data. Also, closing data gaps in regulatory reporting—mainly IFRS9 implementation and banks' internal ratings-based approach parameters—would be useful. A complete set of sectoral financial accounts (e.g., consistent balance sheet breakdown of NBFIs) and bilateral exposures would help conduct the system-wide liquidity analysis. Effort is also needed to improve firm-level disclosure of carbon footprints in both listed and unlisted Mexican firms.

CROSS-CUTTING THEMES

34. There are multiple financial authorities with distinct mandates in Mexico. They include the Ministry of Finance and Public Credit (SHCP), Banxico, IPAB, and four supervisors (CNBV, the National Insurance and Sureties Commission (CNSF), the National Commission for Savings for Retirement (CONSAR), and the National Commission for Financial Services Consumer Protection (CONDUSEF)). Banxico has institutional autonomy defined in the constitution. IPAB and CONDUSEF have some autonomy regarding their finances as decentralized entities. The other supervisors report to SHCP as deconcentrated entities (see Annex II).

35. This institutional architecture offers opportunities for interagency coordination and the flow of information. The authorities collaborated effectively in addressing financial market turmoil during the pandemic—including managing the failure of two small banks—via existing coordination arrangements reflecting interlocking boards across agencies and a variety of coordinating committees and councils (see Annex II).

36. Strengthening further the autonomy of regulatory and supervisory agencies would enhance the credibility and impact of the financial oversight and the financial safety net. Lack

of independence is the most common challenge faced by supervisors in many emerging market and other jurisdictions (Dordevic and others, 2021). In Mexico, fundamental advances here would require difficult changes to foundational legislation underpinning government organization ("Parastatal Entities Law"). As such, the FSAP team also suggests considering the following issues:

- **Progress on strengthening the independence and legal protection of supervisors is needed.** Regulatory and supervisory agencies do not have budget autonomy (except Banxico) with their budgets determined by SHCP. The head of CNBV is appointed by the finance minister for an undefined term and can be removed from office for reasons not specified in law. The law does not protect supervisors adequately while discharging their duties in good faith. While lawsuits against supervisors have not been frequent, the lack of legal protection undermines conditions for effective supervision. This protection is critical in the Mexican context, where each supervisory conduct and measure should be described in the law.

- **Filling the vacancies for independent members on the IPAB Board should be given the highest priority.** Four independent members, appointed by the president, hold a majority on the IPAB Board. Three of these positions have been vacant for some time and need to be filled swiftly. The safeguards for the autonomy of IPAB's executive management should be strengthened by introducing a set term of appointment and more objective grounds for dismissal.

37. The organizational structure and resource needs of individual agencies would benefit from updated evaluation. The urgency is highlighted by the recent significant reduction in their operating budget (except Banxico), resulting in staff turnover and loss of experience. The FSAP recommends a strategic review of the organizational structure and resources of relevant agencies to make necessary adjustments to address existing and emerging challenges. The FSAP welcomes the ongoing evaluation in IPAB as a good example.

38. Interagency collaboration could also be further enhanced especially on emerging risks. The MFAs could regularly conduct table-top crisis simulation exercises with a range of extreme but plausible scenarios, including fast-fail resolutions of systemic and medium-size banks, their concurrent failure, and cyber crises. The authorities could also explore options to pool resources and expertise across institutions to mitigate resource constraints and develop new analysis of cyber and climate-related risks.

39. New risks have emerged on the Financial Market Infrastructure (FMI) landscape since the 2016 FSAP, and it is important to enhance the oversight of the Interbank Electronic Payment System (SPEI). Cyber risk has intensified worldwide. Other challenges include the emergent use of instant payments, the possible interaction with distributed ledger technology, and stablecoin arrangements. This increasingly complex risk landscape accentuates the need for effective, continuous FMI oversight. A full assessment of the FMI oversight is not included in the scope of the 2022 FSAP, but a focused review of the oversight function of the SPEI payment system finds that Banxico could enhance the SPEI oversight approach by establishing a formal oversight function independent from the SPEI operators and addressing any gaps identified through the CPMI-IOSCO PFMI implementation monitoring exercise (see Box 1).

Box 1. Oversight of the Interbank Electronic Payment System (SPEI)

Mexico's FMIs have previously been assessed by CPMI-IOSCO and past FSAPs, and a full assessment of these is not included in the scope of the 2022 FSAP. According to the CPMI-IOSCO Level 1 assessment and update in July 2018, measures were fully implemented for adopting legislation, regulations, and policies for the 24 Principles for Financial Market Infrastructures (PFMI) and four of the five authorities' responsibilities. The authorities observed or broadly observed most of the responsibilities, and partly observed the application of the principles for FMIs for central counterparties, as of November 2015. The systemically important payment system (SPEI) was also assessed during the 2016 and 2006 FSAPs in detail.

However, as new risks have emerged on the FMI landscape, it is important to enhance the oversight of the SPEI payment system relative to the PFMI and cybersecurity. While the SPEI operators in Banxico have taken significant steps in strengthening the cyber resilience of the SPEI, there are improvements that can be made to strengthen the overall oversight approach, including for cybersecurity, to bring it in line with CPMI-IOSCO's expectations, as set out in its Responsibilities A-E.

- **Banxico could establish a more thorough oversight function for the SPEI system.** It could conduct risk assessments against the PFMIs applicable to payment systems and its supplemental guidance on a continuous basis. The oversight function would benefit from having sufficient resources and independence from the SPEI operators. Banxico could establish a structured oversight approach and methodology after reviewing oversight models and approaches by other central banks to help inform their own optimal model.
- **Banxico could improve transparency.** Banxico disclosed its responses to the CPSS-IOSCO Disclosure framework for FMIs in March 2016. However, it should, at a minimum, review its responses to the disclosure framework and disclose publicly its responses every two years to ensure continued accuracy and usefulness.
- **Banxico could address the gaps identified through the CPMI-IOSCO PFMI implementation monitoring exercise.** This specifically relates to the implementation by Banxico of a timebound work plan for the SPEI payment system to fully observe all the principles of the PFMI.
- **Banxico could conduct periodic self-assessments of its observance of the responsibilities of the PFMI, i.e., Responsibilities A-E.** It should aim to self-assess how effectively authorities fulfill their responsibilities as regulators, supervisors, and overseers.

FINANCIAL SECTOR OVERSIGHT

A. Macroprudential Framework

40. The authorities could develop and publish a macroprudential policy strategy. Complementing the Central Bank's high-quality Financial Stability Report and other guidance issued by the CESF, the strategy can describe policy objectives, a list of instruments, decision-making processes, interagency coordination mechanisms, and the importance of retaining discretion when calibrating instruments based on a set of quantitative indicators and expert judgement. International experience shows that a formal strategy can boost the communication and traction of macroprudential policies, improve accountability, counter potential inaction bias, enhance policy

coordination across regulatory and supervisory agencies, and strengthen credibility and effectiveness (IMF, 2014; CGFS, 2016). [11]

41. A rich set of macroprudential tools has helped build resilience. Capital and liquidity tools and D-SIB buffers were introduced in line with Basel requirements (Table 11). A core funding ratio in FX has been effective for banks to manage FX risks. Measures to reduce vulnerabilities from exposures to related parties or liquidity risks in investment funds (e.g., swing pricing, redemption fees) are in place.

42. The authorities could consider expanding the toolkit and enhancing its time-varying use. Plans for finalizing and publishing a guideline for the countercyclical capital buffer (CCyB) are welcome and action at the current early stage of the financial cycle would be helpful. Indeed, with no evidence of credit and housing booms, introducing limits on loan-to-value and debt-service-to-income ratios could be considered as a medium-term agenda to build the resilience of the financial system preemptively.

B. Banking Regulation and Supervision

43. The authorities have made considerable progress in strengthening banking regulation and supervision. CNBV has operationalized the ICAAP and the SRP (though ¶27 notes the need for enhancements), and the operational risk management framework has significantly improved. Prospects for issuing amended regulations on large exposures in 2022 are important. The amendment will include new definitions and limits for "common risk" and "related parties," and it is critical that they follow Basel III standards and best international practices (see Appendix Table 1 for the summary compliance with Basel Core Principles).

44. Some financial conglomerates operating in Mexico are outside CNBV's consolidated supervision. A financial conglomerate can voluntarily request SHCP for legal authorization to operate as a financial group in Mexico. While most financial conglomerates operate as authorized financial groups, seven have not requested the SHCP authorization at the time of the FSAP assessment and are not subject to the CNBV's consolidated supervision.

45. The legal and regulatory framework should be amended to enhance consolidated supervision. The issuance of the 2014 Financial Groups Law (LRAF) was an important step toward a legal framework for consolidated supervision, but it does not empower CNBV to impose prudential measures on financial conglomerates at the group level.[12] An amendment is needed to provide CNBV with powers to (i) apply a comprehensive set of prudential requirements on financial groups as a whole, (ii) enforce consolidated supervision on all de-facto financial conglomerates in Mexico, and (iii) impose discretionary powers to oversight all relevant entities of financial groups, including those not declared during the authorization and those operating abroad.

[11] Good examples include the Czech Republic, Euro Area, Ireland, New Zealand, and South Africa.

[12] Each financial institution (e.g., bank, insurer, and pension fund) is supervised by a separate regulatory and supervisory agency (e.g., CNBV, CNSF, CONSAR) in Mexico.

46. CNBV has invested heavily in upgrading its supervisory framework towards a more risk-based supervisory approach. CNBV reshaped the risk-based rating methodology (CEFER) in November 2015. Supervisory tools have also been standardized and centralized, aiming at streamlining procedures and optimizing resources.

47. Further efforts are needed to strengthen the risk-based supervisory approach. The CEFER quantitative methodology to determine inherent risks needs to be simplified. Greater use of flexibility and application of expert judgment throughout the supervisory cycle needs to be implemented, as opposed to a formal check-list approach. This will need the set-up of internal supervisory routines to support the development expert judgment among supervisors to better assess banks' risk management practices. There are also important synergies between strengthening legal protection and improving risk-based supervision; the former will allow incentivize supervisors to further apply their judgment and discretion to emerging risks.

C. Cybersecurity Regulation and Supervision

48. Financial digitalization accentuates cyber risk, requiring careful countermeasures. Interdependencies within and beyond the financial system make Mexico vulnerable to evolving cyber threats. Thus, the CESF has recognized cyber as a risk with the potential to impact financial stability.

49. Banxico and CNBV have made significant progress in enhancing the financial system's cyber resilience but need further enhancement. Banxico has improved its cybersecurity controls, incident response framework, threat intelligence function, and security measures of participants that connect to its infrastructure. CNBV has built a dedicated cybersecurity supervision unit and designed a cyber supervision methodology.

- **Banxico and CNBV need to deepen their cybersecurity strategy for the financial system.** The purpose is to specify how to identify, manage, and reduce cyber risk effectively. The cyber strategy should outline how coordination and cooperation occur among public and private stakeholders and other jurisdictions.
- **Cyber risk regulation and supervisory practice need further improvements.** CNBV is encouraged to issue regulations or enforceable guidance on Information Communication Technologies (ICT) and cybersecurity to all its supervised financial institutions, not only banks. It could also conduct on-site ICT/cybersecurity inspections and improve off-site supervision. The cyber supervision unit should be given sufficient resources to discharge its responsibilities.
- **Banxico should strengthen the cybersecurity oversight of FMIs.** Intensive cybersecurity training of overseers, together with a comprehensive oversight approach and tools and leveraging the cyber strategy, will increase the capabilities and effectiveness of the FMI oversight function. Banxico could also set clear regulatory requirements for all the FMIs under its mandate.
- **Banxico and CNBV would benefit from developing a cyber map of the financial system.** Cyber mapping will help identify operational and technological interconnectedness (e.g., critical nodes, transmission channels, and critical service providers).

- **Mexico would benefit from improving its public and private platforms for cyber threat intelligence and information sharing.** By exchanging cyber information and intelligence, financial entities can improve their defensive capabilities, threat detection techniques, and mitigation strategies. Banxico could work with the financial sector to develop an industry-wide cyber information and intelligence sharing initiative.

- **The authorities could improve the implementation processes around *the Bases of Coordination*.**[13] The Bases of Coordination need to be translated into operational structures, policies, and procedures, with clear leadership by Banxico and CNBV. They could also propose working with the General Attorney's office to raise awareness of the importance of effective cyber incident investigations and develop guidance for financial entities on how to store, handle, and administer evidence to facilitate investigations.

D. Oversight of Climate-Related Risks

50. The authorities have taken initial steps to advance the climate agenda, but financial institutions are generally at an early stage of managing climate-related risks. The CESF launched the Sustainable Finance Committee to coordinate climate-related policies and green finance practices. Banxico plays an important role in driving the climate risk agenda, for example, by actively participating in international fora and building awareness on climate risks in the financial system.[14] However, financial institutions are at an early stage of integrating climate issues into their governance frameworks, corporate strategies, risk management, and disclosure practices, reflecting the complexities of assessing these risks and the limited supervisory guidance by regulators.

51. The authorities could lay the ground for integrating climate risks into prudential supervision of banks, insurers, and pension funds. They could leverage the Basel Committee on Banking Supervision's Principles for the Effective Management and Supervision of Climate-related Financial Risks, published in June 2022. Insurers are already required to cover natural catastrophe risk management. Moving forward, CNSF could follow recommendations by the International Association of Insurance Supervisors to develop further guidance to cover climate risks in governance, risk management, business strategy and disclosure practices. Similarly, CONSAR has issued mandatory guidance for retirement funds and could update it over time with more detailed supervisory guidance.

52. Market transparency should be enhanced by introducing disclosure requirements for firms and investors. The lack of credible climate information is a key barrier to climate risk assessment and management and sustainable finance practices in Mexico, as in most other jurisdictions. To address this challenge, CNBV could move ahead with introducing disclosure standards of climate and ESG information for issuers and asset managers, while including such disclosure for firms in accounting standards.

[13] The Bases of Coordination is a formal agreement signed by public and private stakeholders to improve coordination and cooperation within the financial sector in cybersecurity.

[14] Banxico created a directorate in charge of these topics in 2021 and published climate risk analysis in recent FSRs.

E. Digital Money and CBDC

53. Risks of "digital dollarization" arise in principle, but generalized adoption of foreign stablecoins seems unlikely given robust policy and regulatory frameworks in Mexico. Reflecting legislation and regulatory measures, crypto-asset activities do not appear to have a material penetration in Mexico. Strong links with the U.S. and a large informal sector could increase the risk of eventually adopting foreign CBDC or stablecoins. However, such risks are mitigated by the strong and highly credible policy framework and very low level of dollarization in Mexico.

54. Banxico has a deep understanding of issues regarding its CBDC project but would benefit from preparing a risk management framework and conducting cost-benefit analysis. Banxico aims to foster financial inclusion and payments digitalization with its Payments Strategy and CBDC project. The complexity of issues with CBDC place a high premium on collaboration within Banxico and with all stakeholders, and on allocating enough resources at each phase of the project. Design choices should ensure that new business models based on CBDC are sustainable and that risks to the financial system are contained. Banxico could also continue to evaluate if there are alternatives (e.g., private digital monies) to achieve policy objectives at lower costs.

F. Financial Integrity (AML/CFT)

55. Mexico has progressed in addressing most of the technical deficiencies identified in the 2018 AML/CFT Mutual Assessment Report (MER).[15] The legal framework applicable to the financial sector has been strengthened for customer due diligence, identification and verification of beneficial owners and politically exposed persons, new technologies, and wire transfers. Legal deficiencies, however, remain in the non-financial sector regarding reporting suspicious activities, verification of beneficial ownership, and the obligation to apply a risk-based approach.[16]

56. Efforts should continue to improve the effectiveness of the AML/CFT framework. Cognizant of the risks posed by shell companies in Mexico, the National Risk Assessment should be complemented with a comprehensive analysis of risks associated with different types of legal persons. The authorities need to ensure the availability of beneficial ownership information by establishing a beneficial ownership register as planned, strengthen AML/CFT consolidated supervision, and ensure adequate allocation of resources to AML/CFT supervision. Effective, proportionate, and dissuasive sanctions should be consistently applied, including by empowering CNBV to revoke a banking license upon AML/CFT breaches. SAT should step up its supervisory activities and ensure its resources are commensurate with the wide range of supervised professions and businesses. Improvements are also needed in money laundering investigations, including parallel investigations of tax and organized crimes and corruption. The authorities need to enhance monitoring of financial integrity risks from fintech and virtual assets. They should continue monitoring and properly supervising Virtual Asset Service Providers by enforcing registration requirements and customer due diligence obligations.

[15] Follow-up reports published in June 2021 and May 2022 concluded that Mexico has made good progress in most of the technical compliance deficiencies identified in the MER, where several re-ratings and upgrades were adopted.

[16] A draft law addressing these issues is currently pending before Senate.

SYSTEMIC LIQUIDITY MANAGEMENT, FINANCIAL SAFETY NET AND CRISIS PREPAREDNESS

A. Systemic Liquidity Management

57. Mexican money markets are well-regulated and function efficiently, but liquidity risk management of NBFIs and DBs could be improved. The efficient functioning of money markets is supported by the marginal level of interbank unsecured transactions, commercial banks' full compliance with the LCR, and the depth of the repo market. The OTC repo market is bilateral with predominantly government or IPAB debt securities as collaterals. However, development banks are not subject to liquidity regulation (Appendix IV). Some DBs have a significant reliance on short-term funding with low levels of unencumbered HQLAs. While the government backstops their capitalization and explicitly guarantees their liabilities, DBs might contribute to system-wide liquidity risk in severe tail risk scenarios (Section IV. B). As such it would be useful to strengthen their liquidity monitoring and reporting and leverage their internal risk committees to take stock of their risk profile and contribution to systemic risk and consider appropriate action. NBFI's limited ability to lend securities via repos, despite the relaxation in the pandemic, may constrain their risk management activity. As such, addressing remaining impediments to NBFIs' more balanced participation in the repo market could be considered.

58. Banxico's mid-corridor operating framework fully supports the efficient pricing and distribution of liquidity. Banks have certainty about day-to-day liquidity conditions and can access a collateralized intraday facility and an overdraft as backstops. The collateral policy provides a sufficient volume of securities to efficiently implement monetary policy, while the high quality and liquid nature of the securities minimizes the risks to Banxico's balance sheet.

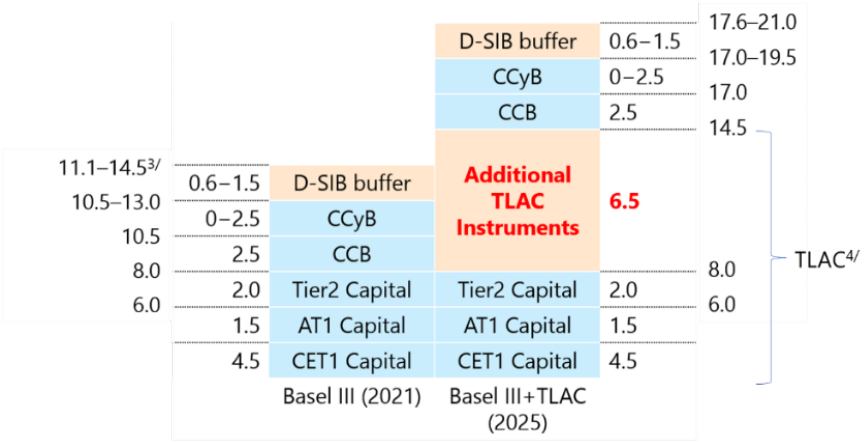
59. Liquidity management demonstrated flexibility and resilience during the COVID-19 financial market turmoil. The functioning of financial markets was restored after a short period of stress. Most measures were not fully utilized but were effective in restoring market functioning due to their strong signaling effects and Banxico's liquidity support was essential in enabling local market participants to absorb the large amounts of government bonds sold by foreign investors. The COVID support measures (e.g., funding for lending facility) helped resolve the practical challenges of accepting credit claims as collateral. They had several design features that provide valuable lessons for future market support programs: (i) the programs were price-based facilities and served as effective backstops; (ii) Banxico deployed targeted operations to support market participants in the key securities markets by providing them funding liquidity in well-calibrated amounts and against good collateral with appropriate haircuts; (iii) risk transfer to Banxico remained completely controlled with very limited direct intervention; and (iv) exit strategies were provided by construction as most facilities were term repo or swap transactions. During the pandemic, Banxico utilized the Fed's USD swapline and has a few other means to provide USD funding to the financial system, such as NDF, other credit facilities (e.g., the FCL arrangement with the IMF) and own FX reserves.

60. Banxico's ELA framework would benefit from some enhancements. Banxico's ELA framework has a sound legal foundation and a comprehensive internal policy. The framework provides broad flexibility to Banxico's Governing Board; it can adjust ELA parameters (e.g., collateral, term, and rate) if credit institutions could pose systemic risks. However, some elements of the framework could be enhanced. First, while credit claims are eligible as collateral, encumbrance of credit claims is time-consuming and should be accelerated to be consistent with the emergency nature of the activity. Second, the ELA policy should set clear boundaries for flexibility in the decision-making process. The policy document should clarify that ELA decisions are based on a forward-looking assessment of the applicant's solvency. While the ELA framework mitigates moral hazard by requiring the pledging of the shares of the institution, forbidding dividend payments and restricting operations, the policy should contain a binding minimum threshold for the ELA interest rate as is common with most major central banks.[17]

B. Financial Safety Net and Crisis Preparedness

61. The authorities have strengthened the financial safety net since the last FSAP and need to continue and accelerate enhancements.[18] Recovery and resolution plans are in place for all commercial banks, and D-SIBs are required to increase their loss absorbency (Figure 21). The authorities progressed preparations for using the bridge bank tool, signed cooperation agreements with all major home jurisdictions of the Mexican systemic banks, clarified the emergency lending facilities including to banks in resolution, and improved the depositor payout process.

Figure 21. Mexico: TLAC Requirements[1, 2/]
(In percent of RWAs)



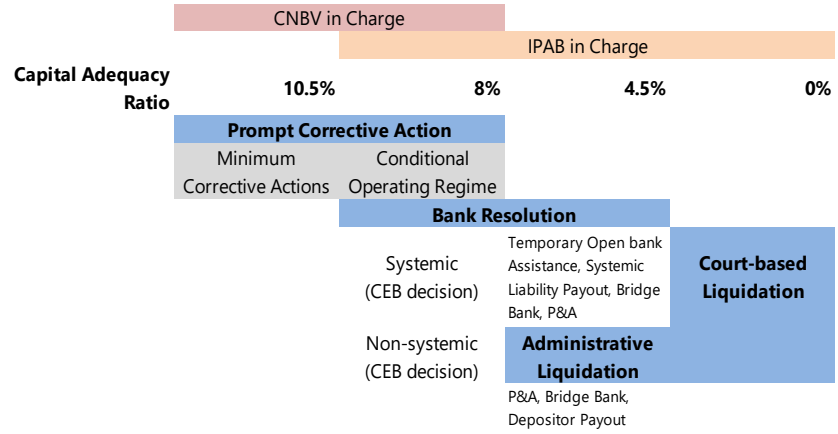
Source: IMF staff.
1/ CCB: Capital Conservation Buffer, AT1: Additional Tier 1; CET1: Core Equity Tier 1.
2/ All commercial banks must meet capital requirements in blue; D-SIBs must meet also D-SIB buffer and TLAC requirement.
3/ The CCyB rate is currently zero; the highest minimum capital requirement ratio is 12 percent of RWAs.
4/ 14.5 percent of RWAs (or 6.75 percent of total assets used to calculate leverage ratios).

[17] For example, Bank of Canada, Banco Central de Chile, European Central Bank, and Bank of Japan.

[18] The FSAP assessment does not include deposit insurance related to e-wallets and fintech-related activities.

62. Further enhancement of the resolution regime will enhance financial stability and give the MFAs more flexibility and reduce the costs of resolution measures. The regime includes a range of resolution options, including administrative liquidation (Figure 22). Bail-in powers are the missing component and should be introduced while appropriately protecting creditors; the creditor hierarchy should be revised to make the newly introduced TLAC requirements more effective. Furthermore, the authorities should trigger resolution when they deem a bank nonviable instead of waiting for certain quantitative thresholds to be met. Moreover, the authorities should remove barriers to the effective use of two critical resolution tools: P&A transactions; and bridge banks. A (partial) P&A transaction with a bridge bank—likely preceded by bail-in—will need to become the primary resolution strategy for systemic banks instead of TOBA, which is a potentially costly tool and should be reconsidered when the authorities introduce further improvements to the resolution framework. Lastly, a recovery and resolution regime for financial holding companies should be adopted. This would address build-in contagion risk and reduce the risk of concurrently applying diverging liquidation procedures for distressed group members.[19]

Figure 22. Mexico: Bank Intervention Continuum



Source: Mexican financial authorities.

63. As the authorities have been operationalizing important past reforms to the recovery and resolution framework, deficiencies in banks' recovery plans and impediments to their resolvability need solving. To ensure timely and cost-effective resolutions, it is imperative to ensure the credibility and feasibility of banks' financial contingency arrangements, to reduce the time horizon over which they are executed, and to be conservative in approving successive plans. IPAB does not have the power to remove impediments to banks' resolvability, such as changes in banks' business practices, structure, or organization, to reduce the complexity and cost of resolution, and to ensure that critical functions can be segregated legally and operationally. Thus, it should continue to identify impediments to resolvability and measures to mitigate these impediments—while shortening the resolution planning cycle for systemic and mid-size banks—and clearly

[19] A resolution regime for FHCs would have two key advantages: (i) undertaking resolution at the parent level without affecting the operating companies; and (ii) giving the supervision and resolution authorities the power to force continuity of intragroup services (e.g., for data support).

articulate and discuss with banks the resolution capabilities that they should develop to effectively support their orderly resolution as planned by the resolution authority. While awaiting statutory powers for IPAB to remove impediments to banks' resolvability, CNBV should actively support this process.

64. The authorities should continue to increase the deposit insurance fund for an effective and prompt response to the concurrent failures of larger banks. Despite the legacy debt from the Peso crisis, IPAB has built a fund that could cover the resolution and payout of most smaller banks. The deposit insurance fund is projected to reach 3.4 percent of insured deposits in 2027 and 5.1 percent in 2032, which would position it better for the concurrent failure of several of the largest non-systemic banks. This process could be expedited by relieving IPAB from the 1990s' legacy debt. Furthermore, IPAB's backup funding should be operationalized, and public awareness of deposit insurance needs to be increased.

FINANCIAL SECTOR DEVELOPMENT

65. Access to financial services remain moderate, and competition pressures are limited in parts of the retail and SME markets. About half of adults reported having an account at a financial institution in 2021, up from 44 percent in 2015, but those with primary education experience low access and use level (Figure 23). Access to credit is also subdued, particularly in rural areas and for small and micro enterprises. Although card and digital/mobile wallet payments are expanding, cash remains the primary payment method. Large banks derive advantages from vertical integration and financial conglomerate structures, making it difficult for smaller banks to compete. Customers also appear insensitive to price differentials, despite limited formal switching costs.

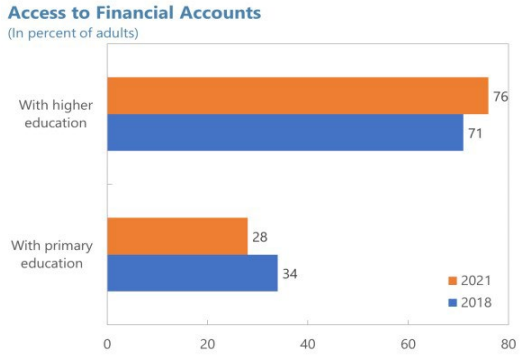
66. Digital Financial Services (DFS) holds the promise to promote financial access, but the authorities need to address some obstacles. The National Council for Financial Inclusion and its coordination mechanism could be conducive to boost the DFS agenda, but DFS efforts could leverage more active coordination with an expanded set of public agencies (e.g., National Institute of Transparency, Access to Information and Protection of Personal Data) and private sector entities (e.g., fintech companies). The MFAs could consider expanding the use of Cobro Digital (CoDi) to P2P, P2G, e-commerce, utility bill, and public transportation payments.[20] Finally, Banxico's e-KYC efforts could catalyze the adoption of Digital ID.

67. Refinements to the regulatory framework for fintech and swift implementation of open finance could promote competition from new players and technologies. The authorities could broaden the scope of permissible products and services under the 2018 Fintech Law. A swift implementation and finalization of open finance would be an important step in promoting client mobility and fostering competition. Some regulatory and technical requirements, such as strict rules for contracting and operating banking agents (*comisionistas*), could be reviewed and simplified without diluting necessary safeguards to ensure financial stability.

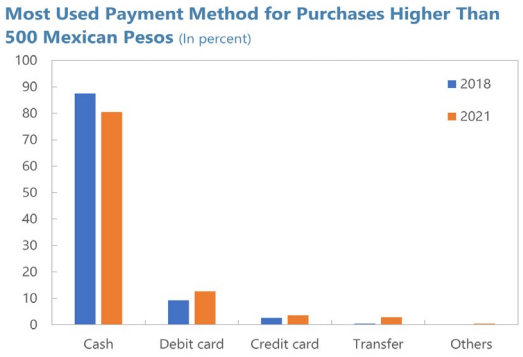
[20] Banxico introduced CoDi in 2019 as a free-of-charge service that utilizes QR codes for point-of-sale payments and internet/mobile channels for remote transactions. SPEI participants were mandated to offer CoDi to their customers and, despite 18.3 million registered accounts, there were only 1.2 million transactions by June 2022.

Figure 23. Mexico: Financial Inclusion and Competition

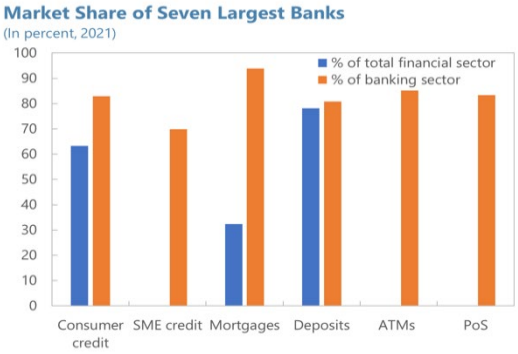
Access to financial account is low among those with lower education.



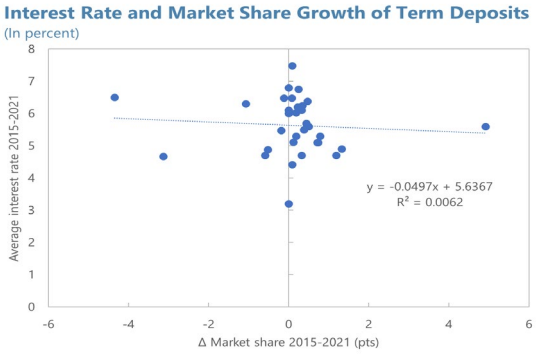
Cash continues to be the main payment method, despite the expansion of other types of payments.



Large banks maintain a prominent role across most retail market segments and key infrastructure.



Customer mobility is low as clients appear insensitive to price differentials.



Sources: CNBV; Encuesta Nacional de Inclusión Financiera (ENIF); and World Bank Global Findex Database.

68. Development financial institutions (DFIs) play an important role in the financial sector but can be more impactful.[21] They should prioritize using guarantees and second-tier lending to advance developmental priorities, making efficient use of their capital. The "aprovechamiento" (fees from DBs against the explicit government guarantee) could be revised to become more transparent. In addition, the authorities should pay attention to the strategy for Banco del Bienestar, whereby social objectives should be complemented with competitive neutrality and preservation of capital. Also, the authorities should pay attention to Infonavit's high NPLs, as it plays a major role in the Mexican mortgage market.

69. The authorities should explore ways to stimulate markets for green finance. The financial sector could play an important role in providing the financing required to reach Mexico's climate goals. The authorities should establish a climate finance strategy and introduce a green taxonomy. DFIs could be given more ambitious climate finance targets to deepen green markets.

[21] Development financial institutions include development banks, development funds, and development trusts.

AUTHORITIES' VIEWS

70. The authorities welcomed the FSAP's positive assessment of the continued resilience of the financial system and strong financial policy frameworks. They appreciated the FSAP team's comprehensive assessment and found the engagement useful to bring an additional perspective to their risk analysis, explore emerging issues, and discuss the evolution of their financial sector policy frameworks. While the authorities expressed some reservations on a few of the FSAP recommendations, they indicated their intent to consider all of them and agreed to publish the FSSA.

71. The authorities broadly agreed with the systemic risk assessment. They concurred that the Mexican financial system is robust and resilient to plausible future adverse shocks. As Mexico's financial sector continues to face new challenges and grow in size, complexity, and interconnectedness, the authorities underscored their commitment to monitoring and containing emerging systemic risks in the context of their risk-based prudential oversight. They share the view that the policy framework performed well during the pandemic shock and are considering further analysis of potential system-wide liquidity risks, as new global shocks emerge. They agreed to consider the recommendation to further evaluate liquidity risk management in development banks, although they see it as a non-pressing issue, given that these entities are fully backed by the sovereign, thereby substantially reducing this risk. The climate risk analysis was useful but points to the need for further work given the high level of uncertainties ahead.

72. The authorities welcomed the assessment of the regulatory and supervisory framework which has supported positive outcomes on resilience. They flagged that the financial system had weathered well the COVID-19 shock, reflecting in part the agile policy responses during the pandemic, building on the good progress in strengthening financial sector policies. They note that the institutional arrangements supporting autonomy of the regulatory agencies are defined in organic legislation and the track record shows that supervisors and regulators operate with a high level of independence. They intend to continue to develop the risk-based supervisory framework and plan to issue an amended regulation on large exposures in 2022. The authorities also take note of the recommendations to improve the de jure application of the consolidated supervision framework, however, they noted that all D-SIBs provide regular information to the supervisors on a consolidated basis and each regulatory agency has powers over different entities (e.g., bank, insurer, and pension fund) that comprise a financial group, which *de facto* reduces the gap to consolidated supervision. They are committed to boosting cyber resilience and will continue to evaluate new areas, such as climate and fintech, including in the context of their digital payments strategy that is focused on promoting financial inclusion.

73. The authorities also welcomed the positive assessment of the liquidity management framework and progress on strengthening the crisis management and resolution frameworks. They have invested heavily in developing a globally state of the art liquidity management framework that was effectively deployed by Banxico to help contain risks during the massive pandemic shock. They have made advances with implementation of the new Basel standards, including the TLAC

requirement. They viewed that their track-record of managing the few instances of failure in smaller financial institutions has shown that the framework works well, but are mindful of the need to keep constantly improving and updating matters given the evolving dynamics of the financial sector landscape.

Table 2. Mexico: Selected Economic and Financial Indicators

I. Social and Demographic Indicators

GDP per capita (U.S. dollars, 2021)	10,061.5	Poverty headcount ratio (% of population, 2020) 1/	43.9
Population (millions, 2021)	129.0	Income share of highest 20 perc. / lowest 20 perc. (2020)	9.1
Life expectancy at birth (years, 2020)	75.1	Adult literacy rate (2019)	95.4
Infant mortality rate (per thousand, 2020)	11.8	Gross primary education enrollment rate (2020) 2/	104.7

II. Economic Indicators

	2018	2019	2020	2021	Proj. 2022	2023
	(Annual percentage change, unless otherwise indicated)					
National accounts (in real terms)						
GDP	2.2	-0.2	-8.1	4.8	2.1	1.2
Consumption	2.6	0.0	-8.8	6.4	5.1	0.4
Private	2.6	0.4	-10.3	7.5	6.1	0.2
Public	2.9	-1.8	-0.2	1.0	-0.5	1.6
Investment	0.4	-5.3	-19.0	10.8	3.8	1.5
Fixed	0.8	-4.7	-17.7	9.5	4.5	1.5
Private	1.2	-3.1	-19.2	10.1	5.1	1.6
Public	-1.3	-14.5	-7.5	5.8	0.8	1.2
Inventories 3/	-0.1	-0.2	-0.4	0.2	-0.1	0.0
Exports of goods and services	6.0	1.5	-7.3	6.9	6.9	-0.5
Imports of goods and services	6.4	-0.7	-13.8	13.6	5.4	0.5
GDP per capita	1.1	-1.2	-8.9	3.8	1.2	0.3
External sector						
External current account balance (in percent of GDP)	-2.0	-0.3	2.5	-0.4	-1.2	-1.2
Exports of goods, f.o.b. 4/	10.1	2.2	-9.4	18.6	13.3	0.5
Export volume	6.3	1.2	-4.7	5.2	6.2	-0.5
Imports of goods, f.o.b. 4/	10.4	-2.0	-15.9	32.0	15.4	-0.1
Import volume	6.3	-0.8	-12.6	13.7	5.2	0.5
Net capital inflows (in percent of GDP)	-2.6	-1.5	0.9	-0.9	-1.1	-1.3
Terms of trade (improvement +)	-0.4	2.2	-1.2	-2.9	-2.8	1.6
Gross international reserves (in billions of U.S. dollars)	176.4	183.0	199.1	207.7	205.7	207.4
Exchange rates						
Real effective exchange rate (CPI based, IFS)						
(average, appreciation +)	0.1	3.3	-7.6	5.9	...	...
Nominal exchange rate (MXN/USD)						
(end of period, appreciation +)	0.5	4.3	-5.9	-3.2	...	...
Employment and inflation						
Consumer prices (end-of-period)	4.8	2.8	3.2	7.4	8.5	4.8
Core consumer prices (end-of-period)	3.7	3.6	3.8	5.9	8.4	5.3
Formal sector employment, IMSS-insured workers (average)	4.1	2.3	-2.5	1.9	...	...
National unemployment rate (annual average)	3.3	3.5	4.4	4.1	3.4	3.7
Unit labor costs: manufacturing (real terms, average)	3.6	4.2	9.8	-9.1	...	...
Money and credit						
Financial system credit to non-financial private sector 5/	8.9	3.0	1.5	0.8	10.7	8.7
Broad money	4.5	4.7	13.4	9.5	10.0	6.9
Public sector finances (in percent of GDP) 6/						
General government revenue	23.5	23.6	24.2	23.3	24.6	24.4
General government expenditure	25.7	26.0	28.6	27.1	28.4	28.5
Overall fiscal balance	-2.2	-2.3	-4.4	-3.8	-3.8	-4.1
Gross public sector debt	53.6	53.3	60.1	57.6	56.8	58.7
Memorandum items						
Nominal GDP (billions of pesos)	23,524.4	24,445.7	23,415.6	26,306.7	28,843.5	30,552.0
Output gap (in percent of potential GDP)	0.8	-1.0	-4.7	-2.0	-0.6	-1.2

Sources: World Bank Development Indicators; Banxico; SHCP; CONEVAL; National Institute of Statistics and Geography; National Council of Population; and IMF staff estimates.
1/ CONEVAL uses a multi-dimensional approach to measuring poverty based on a "social deprivation index," which considers the level of income; education; access to health services; to social security; to food; and quality, size, and access to basic services in the dwelling.
2/ Percent of population enrolled in primary school regardless of age as a share of the population of official primary education age.
3/ Contribution to growth. Excludes statistical discrepancy.
4/ Excludes goods procured in ports by carriers.
5/ Includes domestic credit by banks, nonbank intermediaries, and social housing funds.
6/ Data exclude state and local governments and include state-owned enterprises and development banks.

Table 3. Mexico: Monetary and Financial Sector Responses During the COVID-19 Crisis

Monetary Policy Decisions

Decisions	Details
• Policy rate cut	Seven times from March 2020 through May 2021, 300 basis points in total.
• Policy rate hike	Ten times since June 2021, 525 basis points so far.

Central Bank Facilities During the COVID-19 Crisis

(In billions of Mexican peso)

Type of Support	Envelope (A)	Disbursed (B)	Percent (B/A)	Expiration date
Liquidity support				
• Government securities term repurchase window	150	465	310	Sep. 2021
• Reduction of the Monetary Regulatory Deposit	50	50	100	Nov 2020
• Temporary securities swap window	50	63	126	Sep. 2021
• Swap of government securities	100	15	15	Feb. 2021
• Corporate Securities Repurchase Facility	100	45	45	Sep. 2021
Credit support				
• Provision of resources to banking institutions to channel credit to MSMEs and individuals affected by the COVID-19 pandemic	250	14	6	Sep. 2021
• Collateralized financing facility for commercial banks with corporate loans to finance MSMEs	100	40	40	Sep. 2021
Total	800	692	86	
Total (percent of GDP)	3.1	2.7		

Other Financial Sector Measures

Policy Description
Liquidity Support
• FX swap line with the U.S. Fed by December 2021 and the FCL arrangement with the IMF in November 2021.
• FX Hedging auction program (USD NDF auctions).
• Temporary flexibilities on liquidity requirements for banks. In general terms the flexibilities i) allowed banking institutions to consider as liquid assets, those eligible as such as of February 28 2020, before the markets reflected the COVID-19 outbreak impact; ii) excluded from the calculations of the Look Back Approach the information of margin calls or valuation changes occurred during March 2020; iii) temporary halt to the application of certain corrective measures displayed when the institutions report a LCR below the minimum regulatory requirement; iv) an extraordinary classification for LCR scenarios based upon a combination of average and minimum LCRs that allow for the use of the liquidity buffer; and v) LCRs below the minimum regulatory requirement were not considered a breach of the liquidity framework, thus economic sanctions were not applicable. The liquidity flexibilities were gradually undrawn by February 2022.
Credit and Capital Support
• Special Account Criteria (SAC) to help creditors provide temporary deferral of payments of principal and/or interest to performing loans in March 2020 for up to four months with the possibility of extending it for two additional months, six months in the case of micro-credits, or up to eighteen months in the case of credits directed to the agricultural and rural sectors by July 2020.
• Credit restructuring measure after the expiration of SAC to help creditors restructure deferred loans and increase the probability of payment.
• Use of bank's capital conservation buffer up to 50 percent of the buffer, without impairing the minimum regulatory requirement by December 2021.
• Restriction on paying dividends, carrying out share buy-backs, or conducting any other mechanism aimed at remunerating shareholders, which was relaxed in April 2021 to allow the remuneration up to 25 percent of the results in 2019, 2020 and 2021 with banks' regulatory capital being above 13 percent after the remuneration.
• Relief on the minimum credit card payment by January 2021.

Sources: Mexican authorities; and IMF staff.

Table 4. Mexico: Structure of Financial System

	2016				2021			
		Total Assets				Total Assets		
	Number	In billions of Mexican pesos	In percent of finacial sector assets	In percent of GDP	Number	In billions of Mexican pesos	In percent of finacial sector assets	In percent of GDP
Commercial banks	47	8,668	48.1	43.1	50	11,078	43.8	42.2
Domestic banks	32	2,803	15.5	13.9	30	3,643	14.4	13.9
Foreign subsidiaries	15	5,865	32.5	29.1	20	7,435	29.4	28.3
D-SIBs	7	6,879	38.1	34.2	6	8,099	32.0	30.8
Domestic D-SIB	2	1,440	8.0	7.2	1	1,236	4.9	4.7
Five foreign D-SIBs	5	5,439	30.2	27.0	5	6,863	27.2	26.1
Development banks	6	1,796	10.0	8.9	6	2,279	9.0	8.7
Pension funds (Siefores)	73	2,754	15.3	13.7	117	5,236	20.7	19.9
Investment funds (Fondos de inversión)	578	2,047	11.4	10.2	613	2,795	11.1	10.6
Insurance and Surety (Seguros y fianzas)	115	1,358	7.5	6.7	113	2,005	7.9	7.6
Brokerage firms (Casas de bolsa)	36	486	2.7	2.4	36	862	3.4	3.3
Multiple objective finance companies (Sofomes)	1704	721	4.0	3.6	1129	709	2.8	2.7
Regulated sofomes	52	389	2.2	1.9	43	257	1.0	1.0
Unregulated sofomes	1652	332	1.8	1.6	1086	452	1.8	1.7
Cooperatives (Socaps)	151	118	0.7	0.6	153	212	0.8	0.8
Microfinance savings and loan entities (Sofipos)	43	31	0.2	0.2	37	35.6	0.1	0.1
Credit unions	85	55	0.3	0.3	77	59	0.2	0.2
Total	2,845	18,034	100.0	89.6	2,337	25,271	100.0	96.2
Memo:								
Financial holding companies (FHCs)	10	6,546	36.3	32.5	15	8,798	34.8	33.5
Largest four FHCs	4	5,434	30.1	27.0	4	6,707	26.5	25.5
Development agencies	4	1,418	7.9	7.0	4	2,199	8.7	8.4
FND[1/]	1	58	0.3	0.3	1	51	0.2	0.2
Infonavit[2/]	1	1,182	6.6	5.9	1	1,882	7.4	7.2
Fovissste[3/]	1	159	0.9	0.8	1	233	0.9	0.9
Infonacot[4/]	1	19	0.1	0.1	1	33	0.1	0.1
Development trusts	3	170	0.9	0.8	3	227	0.9	0.9
FOVI[5/]	1	21	0.1	0.1	1	17	0.1	0.1
FIRA[5/]	1	144	0.8	0.7	1	204	0.8	0.8
FIFOMI[6/]	1	5	0.0	0.0	1	6	0.0	0.0

Sources: Mexican authorities; and IMF staff calculation.
1/ FND: Financiera Nacional de Desarrollo Agropecuario, Rural, Forestal y Pesquero.
2/ Infonavit: Instituto del Fondo Nacional de la Vivienda para los Trabajadores. The total assets are in the constant term for 2016.
3/ Fovissste: Fondo de la Vivienda del Instituto de la Seguridad y Servicios Sociales de los Trabajadores del Estado.
4/ Infonacot: Instituto del Fondo Nacional para el Consumo de los Trabajadores.
5/ FOVI: Fondo de Operación y Financiamiento Bancario de la Vivienda.
6/ FIRA: Fideicomisos Instituidos en Relación con la Agricultura.
7/ FIFOMI: Fideicomiso de Fomento Minero.

Table 5. Mexico: Foreign D-SIBs' Contribution to the Group's Profits

(In percent, 2020)

Foreign D-SIBs	Total Assets		Parent Banks	Home Country	Share of Total Assets in Mexico	Share of Gross Income from Mexico	Share of Net Profit from Mexico	Share of Employees in Mexico
	(In billions of Mexican pesos)	(In billions of U.S. Dollars)			(In percent)			
BBVA Mexico	2,443.40	122.9	BBVA	Spain	14.7	30.5	44.6	29.8
Santander Mexico	1,855.80	93.4	Banco Santander	Spain	5.3	8.2	11.2	11.3
Citibanamex	1,357.10	68.3	Citi	U.S.	3.7	8.5	n/a	n/a
HSBC Mexico	780	39.3	HSBC	U.K.	1.7	4.4	-2.1	n/a
Scotiabank Mexico	638.2	32.1	Scotiabank	Canada	5.1	7.6	5.1	n/a

Sources: BBVA; Santander; Citi Group; HSBC; Scotiabank; and IMF staff calculation.

Table 6. Mexico: Financial Soundness Indicators

(In percent, latest)

	2016	2017	2018	2019	2020	2021	2022 Q2
Capital Adequacy							
Regulatory capital to risk-weighted assets	14.9	15.6	15.9	16.0	17.7	19.5	18.7
Regulatory Tier 1 capital to risk-weighted assets	13.2	14.2	14.2	14.4	16.1	18.1	17.3
Capital to assets	9.9	10.4	10.7	11.0	10.7	11.8	10.8
Asset Quality							
Nonperforming loans to total gross loans	2.1	2.1	2.1	2.1	2.4	2.0	2.3
Provisions to Nonperforming loans	157.1	154.9	152.4	146.2	160.1	160.5	143.4
Earnings and Profitability							
Return on assets	1.7	2.0	2.2	2.2	1.2	2.1	1.9
Return on equity	16.3	19.6	20.9	20.5	11.7	18.6	17.4
Interest margin to gross income	73.8	73.3	74.5	74.3	76.0	72.7	76.0
Trading income to total income	4.4	5.0	4.5	5.8	5.5	6.7	9.4
Liquidity							
Liquid assets to total assets	31.4	32.0	31.6	31.1	35.7	36.3	38.5
Liquid assets to short-term liabilities	42.4	42.2	42.3	40.8	48.0	47.0	49.8
Customer deposits to total loans, excluding interbank loans	88.9	91.4	89.3	90.7	100.2	105.2	99.5
Net open position in foreign exchange to capital	0.8	1.1	1.2	2.9	1.8	0.1	2.2

Sources: Mexican authorities; and IMF Financial Soundness Indicator.

Table 7. Mexico: Commercial Bank Loans Under Deferred Loan Category

Amount of Total Commercial Bank Loans and Loans Under Deferred Loan Category

(In millions of Mexican pesos, at the end of 2021)

	Total	Commercial	Consumer	Mortgage
Total bank loans 1/	5,459,257	2,560,732	837,478	1,118,610
Bank loans benefitted from loan deferral program	1,067,334	499,978	243,083	324,273
Amount of loans voluntarily reduced by banks	358,674	272,226	26,421	60,027
Amount of loans under deferred loan category	708,660	227,752	216,662	264,246
- Performing	553,424	166,428	156,518	232,478
- Restructured	121,024	51,895	48,048	21,081
- Nonperforming	34,212	9,429	12,096	12,687

Share of Loans Under Deferred Loan Category

(In percent of total commercial bank loans, at the end of 2021)

	Total	Commercial	Consumer	Mortgage
Bank loans benefitted from loan deferral program	19.6	19.5	29.0	29.0
Amount of loans voluntarily reduced by banks	6.6	10.6	3.2	5.4
Amount of loans under deferred loan category	13.0	8.9	25.9	23.6
- Performing	10.1	6.5	18.7	20.8
- Restructured	2.2	2.0	5.7	1.9
- Nonperforming	0.6	0.4	1.4	1.1

Performance of Loans Under Deferred Loan Category

(In percent of total loans under deferred loan category, at the end of 2021)

	Total	Commercial	Consumer	Mortgage
Amount of loans under deferred loan category	100.0	100.0	100.0	100.0
- Performing	78.1	73.1	72.2	88.0
- Restructured	17.1	22.8	22.2	8.0
- Nonperforming	4.8	4.1	5.6	4.8

Sources: Banxico; CNBV; and IMF staff calculation.
1/ The official name of the deferred loan category is Special Accounting Criteria. CNBV issued accounting flexibilities for credit institutions that helped to provide payment facilities to clients who had taken commercial, consumer, and housing loans. In general terms, the payment facilities consisted of the partial or total deferral of principal and interest payments for up to 4 months, with a possibility of extending it for two additional months. Credits were eligible for this support program provided they were fully performing as of March 31, 2020.

Table 8. Mexico: FSAP Stress Test Scenarios

	2021	2022	2023	2024
Real GDP (2021=100)				
Baseline	100.0	102.4	104.6	106.0
Adverse	100.0	97.5	93.9	98.3
Real GDP Growth Rate (In percent, y-o-y)				
Baseline	4.8	2.4	2.2	1.4
Adverse	4.8	-2.5	-3.7	4.6
CPI Inflation Rate (In percent, y-o-y)				
Baseline	5.7	7.2	4.4	3.3
Adverse	5.7	9.6	8.7	5.8
Exchange Rate (Mexican peso per U.S. dollar, end of period)				
Baseline	20.6	21.4	21.6	21.9
Adverse	20.6	24.1	26.1	25.8
Policy Rate (In percent, year averages except 2021)				
Baseline	5.5	7.9	9.1	8.1
Adverse	5.5	9.4	10.1	6.9
10-Year Sovereign Bond Yield (In percent, year averages except 2021)				
Baseline	8.0	9.4	9.4	9.4
Adverse	8.0	10.9	11.2	10.2
Equity Prices (2021=100)				
Baseline	100.0	106.7	113.3	119.7
Adverse	100.0	90.3	78.1	76.0
Price of Commodities (energy/oil, 2016 = 100)				
Baseline	184.4	346.5	262.4	224.1
Adverse	184.4	443.9	258.8	191.9

Source: IMF staff calculation.

Table 9. Mexico: Bank Liquidity Stress Test Results

		System-level
Regulatory Scenario[1/]	Aggregate LCR (In percent)	225
	Number of Banks with LCR<100	0
Retail Shock[2/]	Aggregate LCR (In percent)	157
	Number of Banks with LCR<100	6
Wholesale Shock[3/]	Aggregate LCR (In percent)	128
	Number of Banks with LCR<100	13

Source: IMF staff calculation.
Note: 1/ In the regulatory scenario, the LCR is computed by using the regulatory run-off and haircut rates.
2/ In the retail shock scenario, run-off rates on retail deposits are increased above the regulatory rates.
3/ In the wholesale shock scenario, run-off rates on wholesale deposits are increase above the regulatory rates.

Table 10. Mexico and Selected Countries: Existing Macroprudential Instruments

Country	Brazil	China	Colombia	India	Mexico	Russia	South Africa
Broad-Based Tools							
Countercyclical capital buffer	yes	yes	no	yes	**yes**	yes	yes
Positive countercyclical capital buffer	no	no	no	no	**no**	no	no
Capital conservation buffer	yes	yes	yes	yes	**yes**	yes	yes
Limit on leverage ratio	yes	yes	yes	yes	**yes**	yes	yes
Forward-looking loan loss provisioning requirement	yes	yes	yes	no	**yes**	yes	yes
Cap on credit growth	no	no	no	no	**no**	no	no
Household Sector Tools							
Household sector capital requirements	yes	no	no	yes	**yes**	yes	no
Cap on loan-to-value ratio	yes	yes	yes	yes	**no**	no	no
Cap on debt-service-to-income ratio	no	yes	yes	no	**no**	no	no
Restrictions on unsecured loans	no	no	no	no	**no**	no	no
Corporate Sector Tools							
Corporate sector capital requirements	yes	no	no	yes	**yes**	yes	no
Cap on loan-to-value ratio for CRE	no	yes	no	no	**no**	no	no
Liquidity Tools							
Liquidity Coverage Ratio	yes	yes	yes	yes	**yes**	yes	yes
• Differentiated by currency[1/]	no	no	yes	yes	**no**	no	no
Net Stable Funding Ratio	yes	yes	yes	no	**yes**	yes	yes
Reserve requirements for macroprudential purposes	yes	yes	no	no	**no**	yes	no
• Differentiated by currency	no	yes	no	no	**no**	yes	no
Limits on foreign exchange positions	yes	yes	yes	yes	**yes**	yes	yes
Net foreign exchange positions	yes	yes	yes	yes	**yes**	yes	yes
Structural Tools							
Capital surcharges for G-SIFIs or D-SIFIs	yes	yes	yes	yes	**yes**	yes	yes
Limits on the size of exposures between financial institutions	no	yes	yes	yes	**yes**	yes	no
Measures to mitigate risks from financial institutions' exposures to sovereigns	no	yes	no	no	**yes**	no	no

Source: IMF staff.

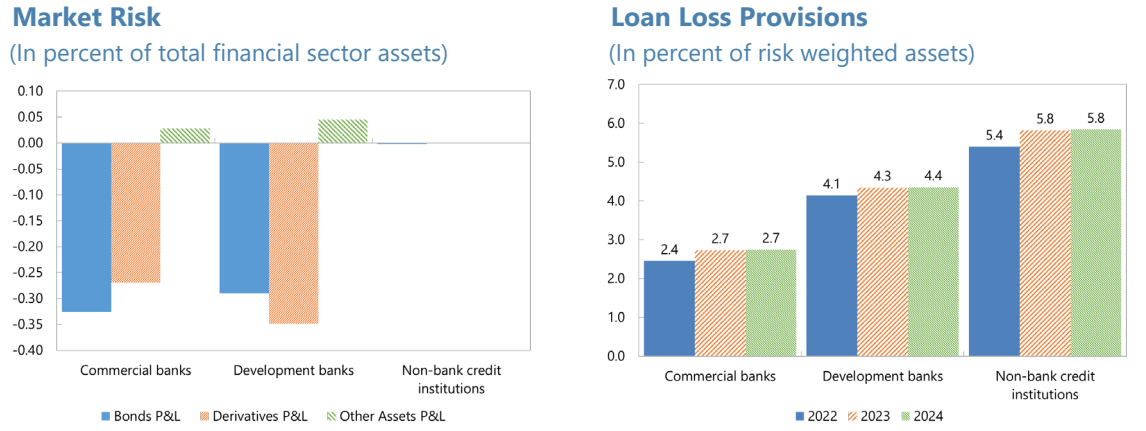
Note: 1/ there is no LCR requirement by currency but LCR by currency is monitored.

Annex I. Credit and Market Risks in Development Banks and Top Twenty Nonbank Credit Institutions

CNBV has analyzed credit and market risks for all commercial banks, development banks, and non-bank credit institutions under the FSAP adverse scenario.[1] This collaboration has allowed the FSAP to partially expand the solvency stress tests (Section IV. A) by assessing the impact on credit and market risk for all six development banks and the twenty largest non-bank credit institutions.

The results show that the impact of market and credit risks is limited under the adverse scenario. Market risk is contained and driven mainly by the revaluation of bonds and the impact on P&L from derivatives' exposures for both commercial and development banks (Figure 24). Non-bank credit institutions do not have material market risk exposures in their portfolio. Reflecting the different credit quality of the loan portfolios, credit losses under the adverse scenario would be higher for development banks and non-bank credit institutions than commercial banks.

Figure 1. Mexico: Market and Credit Risks for Commercial Banks, Development banks, and Large NBFIs



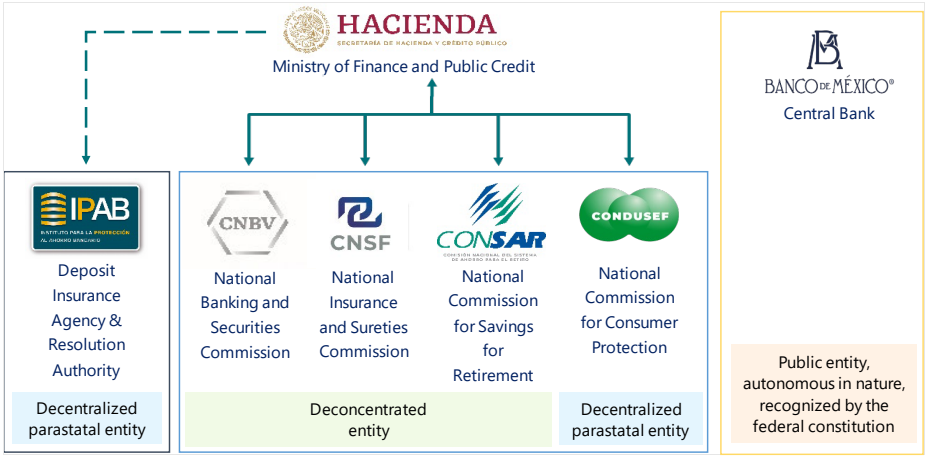
Sources: CNBV; and IMF staff calculation.

[1] Nonbank credit institutions include non-deposit taking credit providers, not insurance companies, pension and investment funds.

Annex II. Organization of the MFAs

Figure 1. Mexico: Institutional Structure of Financial Authorities

Legal Structure



Interlocking Board Membership

Authority	Members of the Board
HACIENDA	**Ministry of Finance and Public Credit**
BANCO DE MÉXICO	**Central Bank Board:** 5 members HACIENDA **Additional 2 Non-voting members:** Minister of Finance and Deputy Minister of Finance
CNBV	**Banking & Securities Commission Board:** 13 members HACIENDA 5 members; BANCO DE MÉXICO 3 members; CNBV 3 members; CONSAR 1 member; CNSF 1 member
IPAB	**Deposit Insurance Agency & Resolution Authority:** 7 members HACIENDA 1 member; BANCO DE MÉXICO 1 member; CNBV 1 member; 4 independent members

Sources: Mexican authorities; and IMF staff.

- **Interlocking boards.** CNBV's Board consists of ex officio officials, with five out of 13 members appointed by SHCP (Figure 25). IPAB's Board comprises three ex officio officials—the finance minister (chair), the Banxico governor, and the CNBV president—and four independent members. The finance minister and deputy finance minister are not members of Banxico's Governing Board but may participate in its sessions without a vote. SHCP does not have a Board.

- **The Financial System Stability Council (CESF).** The CESF has an explicit, formal mandate to promote the stability of the financial system. It comprises nine voting members: the finance minister (Chair) and the deputy minister; the Banxico governor and two deputy governors; the heads of three supervisors (CNBV, CNSF, CONSAR); and the chief executive of IPAB. It makes formal recommendations, coupled with a de facto comply-or-explain mechanism, to mitigate systemic risks over the medium term. Although there is a formal voting arrangement, CESF's recommendations have been decided by consensus and fully implemented by the members. Banxico plays a strong role as its secretariat. The CESF communicates through quarterly press releases and an annual report, separately from Banxico's Financial Stability Report (FSR).

- **The Banking Stability Committee (CEB).** The CEB is a platform where the authorities decide on the systemicness of a failing bank and, should a determination of systemic impact be made, the extent to which liabilities be protected in resolution. It determines the resolution options and gives direction to their use by IPAB. It comprises eight voting members: the finance minister (Chair) and the deputy minister; the Banxico governor and a deputy governor appointed by the governor; the CNBV president and the vice president overseeing CNBV; and the chief executive of IPAB and an IPAB board member.

- **The Banking Liquidity Regulation Committee (CRLB).** The CRLB is a committee composed of SHCP, Banxico, and CNBV, to dictate the guidelines to establish the liquidity requirements for commercial banks and any amendments to the requirements. At the beginning of the COVID-19 shock, the CRLB met to establish temporary general exceptions to the Liquidity Provisions.

Appendix I. Implementation Status of Key Recommendations in the 2016 FSSA

Key Recommendations	Timeframe	Status
Institutional Arrangements and Governance		
Integrate all prudential supervision aimed at the safety and soundness of financial institutions, in one Prudential Supervisor, covering banks, securities, insurance firms, pension funds and other financial institutions.	MT	**Not implemented**. The organizational architecture for financial system oversight remains as it was in 2016. The authorities consider there is no need to change the current supervisory architecture, since coordination and cooperation arrangements in place among authorities, reinforced by the oversight of the Financial System Stability Council (CESF), are effective for financial stability purposes. The CESF makes formal recommendations, coupled with a de facto comply-or-explain mechanism.
Amend relevant laws to (a) clearly establish financial stability as the primary objective for the new supervisor, other objectives (e.g., development) are secondary and should be narrowly defined; and (b) strengthen the governance of the supervisor and IPAB (e.g., composition of governing boards and the appointment and dismissal of senior personnel) and ensure their supervisory and budgetary independence.	MT	**Not implemented**. Full political and budgetary autonomy are still missing. The institutional governance arrangements remains as it was in 2016, thus supervisors´ budgets are still determined by SHCP. Likewise, the heads of the Commissions are appointed by the Executive Branch, via the Minister of Finance. For IPAB, the Banks Savings Protection Law establishes that the Government Board has the power and duty to appoint, upon proposal of at least two of its directors, the Institute's Executive Secretary.
Financial Stability Policy Framework		
Establish more clearly the status of the CESF as the preeminent voice of its members regarding the assessment of financial stability risks.	ST	**Partially implemented.** The macroprudential mandate is shared among various agencies, including the Ministry of Finance and Public Credit, Banxico, regulatory and supervisory agencies, and IPAB. They coordinate in the macroprudential issues within the Financial System Stability Council (CESF). The CESF makes formal recommendations, coupled with a de facto comply-or-explain mechanism. The CESF communicates its coordinated risk assessments and policy intentions through quarterly press releases and an annual report on the stability of the financial system
Financial Sector Oversight		
Adopt a consolidated supervision framework that corrects for legal gaps on CNBV's ability to perform consolidated supervision and strengthen the regulatory reporting framework for related party lending.	ST	**Not Implemented.** Although some efforts to better understand financial groups´ activities and risks have been introduced, the current legal and regulatory framework falls short of creating conditions for effective consolidated supervision.
The corporate governance of development banks should be revised in line with international best practices in some key areas such as the composition of board members and mechanisms for the election of CEOs.	ST	**Not reviewed.**

Key Recommendations	Timeframe	Status
The definitions of "common risk" and "related party" should be enhanced, including explicit definition of "economic dependency" in exposures to corporations, provision for grouping loans that are collateralized by the same collateral, and explicit references to persons who, while not having a quantitative relationship with other borrowers, exercise significant control over them.	ST	**Not yet Implemented.** Amended regulations on large exposures have been delayed due to the COVID-19 outbreak and are expected to be issued by the second half of 2022. The revised regulation would include new definitions and revised limits for "common risk" and "related party" in accordance with Basel III standards and best practices.
Review the role of Banxico in determining certain capital requirements. CNBV, as the agency charged with the prudential supervision of banks, should assume sole responsibility for such function.	MT	**Not yet Implemented.** The authorities argue that all capital requirements fall under the CNBV domain. We need to better understand the recommendation. Banxico and CNBV are finalizing the guideline for countercyclical capital buffers.
Streamline the regulation and supervision of "other financial institutions" to facilitate and promote consolidation and integration.	MT	**Not reviewed.**
Deposit Insurance, Crisis Management, and Resolution		
Transfer the legacy debt at IPAB to the sovereign balance sheet.	MT	**Not Implemented.** The legacy debt continues to weigh heavily on IPAB finances: each year 75 percent of banks' contributions to IPAB are allocated to repay this debt. This debt is projected to be fully repaid in 2069. While IPAB has not set a formal target ratio for the FPAB, it is projected to stand at around 3.4 percent of insured deposits in 2027 and 5.1 percent in 2032. The modalities for IPAB borrowing from Banxico have not been worked out.
Adopt legislation removing bail out options for shareholders and subordinated debt holders of systemic banks.	NT	**Implemented.** IPAB has adopted internal procedures for the "Establishment, organization and operation of commercial banks by IPAB (Bridge Bank)," setting out the model corporate charter and model contracts for asset and liability transfers, and the provision of services; IPAB has also developed methodologies for valuations for purposes of a bridge bank. The ex-ante incorporation of a bridge bank without using it in the near term would be costly. IPAB's 2016 systemic bank resolution simulation covered using bridge banks.
Develop formal contingency plans and simulation exercises to deal with a systemic crisis.	MT	**Partially Implemented.** While the MFAs individually undertake simulation exercises, there are no system-wide contingency plans, and no collective simulation exercise for a systemic event was undertaken since 2011. Preparations for an interagency crisis simulation were well advanced when it had to be postponed due to the COVID-19 outbreak. This exercise will test the MFAs' response to a cybersecurity incident and the resulting financial fallout.
Development Banks		
Revise the strategy and objectives for development banks targets to include	ST	**Implemented.** SHCP published the National Development Financing Program 2020-2024

Key Recommendations	Timeframe	Status
indicators of financial inclusion and private sector crowding-in, eliminating quantitative targets.		(PRONAFIDE 2020-2024) in the Official Gazette of the Federation (DOF), including a component aimed at generating greater financial inclusion through development banking. The Program aligns development banks' priority objectives, strategies, lines of action and indicators to the pillars indicated in PRONAFIDE, thereby addressing financial inclusion, among other issues that they considered important for the attention of their target markets.
Pensions		
Increase the contribution rates to fully funded pension schemes to ensure higher replacement rates and reduce fiscal risk.	ST	**Implemented.** The Mexican government has introduced several changes to guarantee higher replacement rates for Mexicans during retirement. One of the most important changes recently introduced was to increase the total contribution from 6.5 percent to 15 percent mainly through an increase in the employer's contribution and to establish in the Constitution a non-contributory pension, granting universal economic support to all older adults. The latter means that all Mexicans automatically receive a pension when they reach sixty-five years old, which constitutes a social protection floor that guarantees a higher replacement rate for workers who contribute to their pension, as well as for those who do not.
Small and Medium-size Enterprise Finance		
Create a credit registry to increase financial information available to lenders.	MT	**Not implemented.** There are three private credit bureaus which play an effective role in providing credit information to lenders. Regulated financial entities must report information to at least one of them, but non-regulated ones and commercial firms may also do so. Information is also sent by some public service or fiscal authorities (Federal Electricity Commission and the Tax Administration Service). Regulated entities include commercial banks, development banks, insurance institutions, surety institutions, public trusts, credit unions, savings and loans institutions, non-bank banks, microfinance companies, etc. While data may be fragmented in each credit bureau's database, credit reports include consolidated data from all registries.

Appendix II. Risk Assessment Matrix

Sources of risks	Relative likelihood	Impact and transmission channels
Commodity price shocks due to the Russia's war in Ukraine and geopolitical tensions Commodity prices are volatile and trend up amid supply constraints and the Russia's war in Ukraine, keeping inflationary pressure upward.	**High**	**Medium** • Pressure on inflation and inflation expectations due to rising energy and food prices. • Deterioration of current account, exchange rate pressure and purchase power. • Prompting Banxico to tighten policies faster than anticipated, causing an increase in funding costs.
De-anchoring of inflation expectations and stagflation and abrupt global slowdown or recession Worsening supply-demand imbalances, higher commodity prices and higher nominal wage growth lead to persistently higher inflation and/or inflation expectations, prompting central banks to tighten policies faster than anticipated, resulting in a hard landing globally, housing market correction, and a stronger U.S. dollar.	**Medium**	**High** • Rising the U.S. interest rates pressuring sovereign and corporate funding costs. • A reassessment of market fundamentals causing a widespread risk-off event in the global financial markets, capital outflows from Mexico, currency depreciation, and liquidity stress. • Financing difficulties to the sovereign, resulting in higher sovereign credit spreads and material mark-to-market revaluation and associated losses. • Higher funding cost leading to sharp deterioration of financial condition of corporate borrowers and associated credit quality. • A wave of bankruptcies and devaluation of debt securities eroding bank capital buffers. • Transmission of the hard landing to Mexico through reduced external demand and remittances.
Local COVID-19 outbreaks of lethal and highly contagious variants Rapidly increasing hospitalizations and deaths due to low vaccine protection or vaccine-resistant variants force more social distancing and/or new lockdowns.	**Medium**	**Medium** • Renewed costly containment efforts, including broad-based lockdowns resulting in economic contraction, financial market turmoil, high unemployment, and corporate distress. • A reassessment of growth prospects, triggering capital outflows, financial tightening, notable currency depreciations. • Extended supply chain disruptions and inflationary pressures.
Increasing frequency and severity of climate events Natural disasters can lead to severe physical damages and losses to the economy in terms of capital stock destructions, productivity losses, business interruption, and affect the financial sector.	**Medium**	**Medium** • Economic damages from frequent and severe climate events, e.g., tropical cyclones/hurricanes, floods. • Deterioration of financial conditions of households and corporates leading to large credit losses in the financial sector, amplified by productivity losses and collateral devaluations. • The global and domestic decarbonization efforts to mitigate the impact of climate change, leading to side-effects, i.e., transition risks to the financial sector depending on the global/domestic policy ambitions and degree of exposures to the carbon intensive firms and industries.
Cyberthreats	**Medium**	**Medium** • Cyber-attacks on critical infrastructure and interconnected financial systems that trigger systemic financial instability or widely disrupt socio-economic activities and remote work arrangements.

Source: IMF staff.

Appendix III. Stress Testing Matrix (STeM)

Domain		Top-down Stress Test by FSAP Team—Assumptions
Banking Sector: Solvency Risk		
1. Institutional Perimeter	Institutions included	• All D-SIBs (6 banks) and other important banks (4 additional mid-tier commercial banks for top-down (TD) ST at the highest level of consolidation.
	Market share	• For the 10 commercial banks within scope, approximately 84 percent of banking sector assets.
	Data Source and Baseline Date	• Banxico's regulatory returns and supervisory data. • Historical data on bank parameters based on Banxico's statistical data warehouse. • Balance sheet and financial statement data available in the public domain. • Moody's Analytics: CreditEdge data on corporate default probabilities. • Data as of December 2021 (cut-off). End-2019 data might also be used for comparisons and sensitivity analysis purposes. • Scope of financial consolidation: group-wide at the domestic level.
2. Channels of Risk Propagation	Methodology	• Balance sheet approach. • Projections of key balance sheet, income statement and capital account items. • Static balance sheet assumption. • Credit risk, market risk, net interest income and non-interest income projections are produced for all banks within scope for two scenarios: baseline and macro adverse. • Granular projections of credit risk parameters are performed, including probabilities of default (PDs) losses given default (LGDs) for each asset class. • Five different loan segments are used: corporates, mortgages, financials, government, and consumer credit. Segmentation is based on current prudential rules and availability of historical data for the estimation of satellite models. PD PIT satellites are based on historical data series of PDs for the system and by individual bank. LGD PiTs were produced for each loan segment by applying the Frye-Jakobs method. • Net interest income is projected based on its sensitivity to macrofinancial conditions for both reference rates and effective spread margins across all interest rate sensitive asset and liability segments. Liability reference and margin rate shocks are linked to the macroeconomic scenario and econometric models are used to estimate pass-through rates for both asset and liability sides together with scenario anchored assumptions. • The impact on P&L and OCI due to FVTPL and FVOCI positions is also estimated as part of the market risk impact. Market risk is based on the estimation of FV and OCI impact on the securities portfolios. The impact of the scenario on mutual fund, equity and FX exposures will also be measured. • Net fee and commission income are stressed based on its historical volatility in combination with haircuts based on a conservative methodology reflecting the conditions prevailing the scenario narrative.

Domain		Top-down Stress Test by FSAP Team—Assumptions
		• Operational expenses over total assets are kept at the same level as in 2021 (cut-off). • RWAs are adjusted to reflect changes in the quality of credit exposures.

	Satellite models for macro-financial linkages	• Several satellite model estimation alternatives are explored:
		  ○ PD PIT models for each segment based on country aggregate historical PD time series and scenario translation of bank-specific starting points in the distance to default space. Bayesian Model Averaging (BMA) techniques are used to control for model uncertainty,
		  ○ Panel PD PIT econometric estimation models on bank-specific historical PD PIT time series using BMA techniques to control for model uncertainty,
		  ○ Moody's EDF data series may also be explored for the calibration of econometric satellites for the corporate segments.
		• Cross-sector country proxies could also be used for the projection of parameters where a direct calibration is not feasible due to data constraints (e.g., governments and financials may be proxied using corporate PD paths).

	Stress test horizon	• Three years (2022 Q1 – 2024 Q4).
3. Tail Shocks	Scenario analysis	• Based on two macroeconomic and financial scenarios (baseline and macro adverse). • The scenarios specify key macrofinancial variables (e.g., real GDP growth, inflation rate, unemployment rates, exchange rates, equity prices, house prices, interest rates and credit growth) for Mexico, as well as global variables (e.g., oil and other commodity prices). • The baseline scenario is based on April 2022 World Economic Outlook (WEO) projections. • The macro adverse scenario is calibrated using the Global Macrofinancial Model (GFM) model and it assumes the materialization of the systemic risks highlighted in the RAM. The adverse scenario features a protracted global COVID-19 pandemic and supply-side disruptions that lead to higher inflation. The scenario assumes that supply-side disruptions and higher commodity prices continue to weigh on the global economy, which brings out a difficult trade-off between output and inflation for policymakers. Inflation in major economies including the U.S. surprises on the upside, and the Fed tightens monetary policy faster than expected, by about one percentage point within the first year. Higher U.S. interest rates and tighter financial conditions globally trigger capital outflows, depreciations, and higher long-term interest rates in emerging markets. The domestic layer introduces additional confidence shocks that applies downward pressure on domestic demand with subdued consumption and investment aggravating the sharp correction on both real estate and equity prices. These losses, most of which are absorbed by the banking system, subsequently curtail banks' profitability, and prompt a broad-based tightening in the interbank market, echoing market concerns towards banks' financial soundness. Finally, monetary policy is assumed to maintain its accommodative stance under the domestic layer and short-term interest rates are assumed to decrease towards the 4 percent effective lower bound. • In terms of severity, the adverse scenario features a deviation of Mexico real GDP from its baseline of 11.3 percent by 2023, with a 2.3

Domain		Top-down Stress Test by FSAP Team—Assumptions
		Standard Deviation move in two-year cumulative real GDP growth rate, a 6.3 percent increase in unemployment rate from its baseline.
	Sensitivity analysis	• The impact of triggering credit lines to NFCs and financial entities will be covered by targeted sensitivity analysis. • A more pronounced interest rate shift will also be captured by the solvency sensitivity analysis. • A partial credit and market risk analysis exercise on Development banks and the twenty largest credit-providing NBFIs are attempted to increase the coverage of the solvency analysis. The FSAP adverse macroeconomic scenario is used to produce top-down estimates for PDs and LGDs for these entities using CNBV's TD models and infrastructure. Market risk impact will also be simulated using data and models developed internally at CNBV.
4. Risks and Buffers	Risks/factors assessed	• Credit risk captures all on-balance/off-balance sheet exposures at amortized cost by regulatory exposure sector. Exposures are largely domestic; therefore, no scenarios and parameter paths would be required for geographies outside Mexico. • Market risk is reflected in valuation effects of FVTPL and FVOCI positions, as well as net open financial positions (i.e., equities, funds, and inflation-linked instruments exposures). Scenario-based Interest rate curves are used to infer reference interest rate changes. The adverse macro scenario is further augmented to include financial variables that are needed to produce accurate projections for fair value positions (like corporate spread rate shock or bank issued bonds spread shock). • Net interest income is affected by projecting effective interest rates by asset/liability class. Policy rates and wholesale/interbank rates will directly follow the macroeconomic scenario paths and a panel econometric approach will be used to define the velocity of passthrough rates to all remaining asset and liability segments. • Shocks to non-interest income are simulated to capture varying degrees of market-sensitive components of non-interest income. • Projected RWA densities are also capturing a twofold impact: deterioration of credit quality and partial/full unwinding of relevant policy support measures.
	Behavioral adjustments	• Under the static balance sheet assumption exposures remain constant and do not evolve in accordance with credit growth assumptions of scenarios. • For NII, maturing assets/liabilities are assumed to be replaced by instruments of the same type, maturity but at current rates. • There is no recognized interest on non-performing exposures. • If banks' capital falls below regulatory requirements, no prompt corrective action is assumed. • Banks are assumed to pay 30 percent of their profits as tax. Dividend payout ratio is assumed to be the maximum of 40 percent or the payout ratio of the cut-off year unless the capital conservation buffer falls below 2.5 percent.
5. Regulatory and Market Based Standards and Parameters	Calibration of risk parameters	• Currently the banking system is regulated under a full Basel III prudential framework. • Accounting provisions are set by CNBV regulations (IFRS 9 was only implemented in January 2022 and CNBV has the mandate to set requirements for the accounting loan loss provisioning). In this context

Domain		Top-down Stress Test by FSAP Team—Assumptions
		the stress test analysis will follow regulatory definitions of PDs and LGDs where applicable. • Currently credit exposure portfolios are under the Standardized (STA) and the Advanced Internal Rating Based (A-IRB) regulatory approach. • Risk-weighted asset densities are either assumed to remain constant for STA portfolios and following the PD PIT path (making use of a smoothening factor for the TTC effect).
	Regulatory/ accounting and market-based standards	• In the baseline, hurdle rates include the regulatory minimum (CET1: 4.5 percent, Tier1: 6 percent, Total Capital: 8 percent) and any applicable capital buffers (CCB, D-SIB surcharge, P2R). D-SIB charge ranges from 0.6 percent to 1.5 percent for the banks within scope. • In the adverse scenario, the regulatory minimum (including D-SIB surcharge and P2R) is assumed to be the hurdle rate, as banks can draw down the CCB. Note that D-SIB surcharge is not considered as a buffer in Mexico. • Hurdle rates are based on the CET1, Tier1, and Total Capital ratios.
6. Reporting Format for Results	Output presentation	• System-wide evolution of aggregate CET1 and capital ratios. • Distribution of banks' capital positions • Contribution to key drivers to system-wide net income and capital position, including differences between the baseline scenario and the adverse scenario. • Share of institutions with capital below the hurdle rates.
Banking Sector: Liquidity Risk		
1. Institutional Perimeter	Institutions included	• The fifty commercial banks in Mexico at the highest level of consolidation.
	Market share	• 100 percent of commercial banking sector assets.
	Data and baseline date	• Banxico's regulatory reports monitoring the Liquidity Coverage Ratio and the Net Stable Funding Ratio and the additional (synthetically constructed) monitoring report capturing liquidity contractual maturity ladder. • Data as of December 2021; December 2019 data will also be used to highlight the impacts of the pandemic on liquidity positions of banks. • Scope of financial consolidation: group-wide at the highest level.
2. Channels of Risk Propagation	Methodology	• The exercise is based on three types of tests—LCR test, cash-flow analysis and NSFR test. • The LCR test is in line with the standard Banxico (and Basel compliant) monitoring tool, featuring total consolidated liquidity and liquidity in significant currencies (mainly USD). • A set of scenarios for LCR outflows and HQLA haircuts is used to produce stressed LCR ratios (by currency and at the consolidated level). • For the LCR test, the stress test horizon is 30 days. • The cash-flow analysis analyzes the net cash balance (as a proxy of banks' resiliency to liquidity stress events), accounting for available unencumbered assets, contractual cash inflows and outflows, and behavioral flows. • For the cash-flow analysis, a range of scenarios featuring funding run-off rates, liquid assets haircuts and assumptions on inflows and outflows of increased severity for different durations of liquidity stress are explored (a stress-horizon of 3 months is used as the central

Domain		Top-down Stress Test by FSAP Team—Assumptions
		assumption). Positive counterbalancing capacity post-scenario implies bank resiliency, negative is an indication of positive bank liquidity stress. • For the cash-flow analysis, asset haircuts reflect two components: (i) shocks to interest rates and asset prices as captured the macrofinancial scenarios; and (ii) additional haircuts required by counterparties to accept specific assets as collateral for secured funding transactions. • The NSFR became a binding requirement for Mexican banks in March 2022. For monitoring purposes, banks have been reporting NSFR calculations to competent authorities since 2017.
3. Risks and Buffers	Risks	• Funding liquidity risk is reflected in funding run-off rates and asset roll-over rates, the latter providing cash inflows related to non-renewal of maturing assets. • Market liquidity risk is reflected in asset haircuts, which could be influenced by market movements, potential fire sales and collateral supply considerations.
	Behavioral adjustments	• Liquidity from the central bank's emergency lending assistance (ELA) is not considered. • Inflows from maturing loans are ignored (cash-flow analysis, after a certain level of scenario severity) capturing a systemic liquidity stress scenario vs a bank-idiosyncratic one. • The cash-flow analysis may consider some behavioral assumptions about a counterparty's ability or willingness to transact based on banks' solvency and liquidity conditions.
4. Tail shocks	Scenario analysis	• For the LCR test, 12 scenarios are considered as a combination of: (i) three scenarios on liquid assets shocks (regulatory, mild, and severe), and ii) four scenarios on liability outflows; regulatory, one reflecting retail outflows, one reflecting higher wholesale outflows, and one combining the retail and wholesale outflows. • For the cash-flow analysis, a series of scenarios are considered, with a range from mild to severely adverse liquidity conditions. The cash-flow analysis considers both funding and market liquidity risks.
5. Regulatory and Market-Based Standards and Parameters	Calibration of risk parameters	• LCR tests are based on regulatory and stress parameters. • Cash-flow analysis may incorporate relevant second-round effects. • Stress funding run-off rates, asset roll-over rates, and asset haircuts are calibrated based on empirical evidence and relevant international experiences.
	Regulatory/accounting and market-based standards	• LCR per Basel III; the hurdle at 100 percent. • Net cash balance for the cash-flow analysis; to pass, a non-negative net cash balance is required, where the balance reflects net funding outflows and counterbalancing capacity. • NSFR per Basel III; the hurdle at 100 percent.
6. Reporting Format for Results	Output presentation	• Changes in the system-wide liquidity position, including important drivers for cash outflows, cash inflows and counterbalancing capacity. • Distribution of banks' liquidity positions. • Number of institutions with LCR/NSFR below 100 percent and/or negative net cash balance. • Amount of liquidity shortfalls, including by currencies.
7. Sensitivity Analysis	Output presentation	• The analysis would cover policy support measures and will identify how such measures have impacted regulatory liquidity metrics.

Domain		Top-down Stress Test by FSAP Team—Assumptions
		• As a natural result, the analysis will also assess how the gradual measure unwinding will have affect liquidity positions of banks.
8. Infrastructure	Infrastructure used	• For the LCR test, Banxico's infrastructure to run the scenario developed by IMF staff and Banxico's Liquidity at Risk tests. For cash flow analysis, fully comprehensive infrastructure developed by IMF staff using Banxico's regulatory reports as a data repository. MATLAB and Excel based.
Climate Change: Physical Risk		
1. Institutional Perimeter	Institutions included	• Same set as in solvency stress test (10 largest commercial banks).
	Data and baseline date	• Sectoral exposure breakdown Source: Supervisory data • Data as of December 2021 (cut-off)
2. Channels of Risk Propagation	Methodology	• Climate scenario around tropical cyclones and/or floods based on history repeating and/or identification of future acute events reflecting climate change (subject to data/model availability), generating estimation of direct economic losses and damages, i.e., the physical capital damage rates (provided by the WB FSAP team). • The adverse physical risk via capital damage rates is used as a layer of shock in a DSGE macro model. This also leads to persistent productivity shocks with additional considerations of investment adjustments costs and/or investment specific technological shocks, • The underlying DSGE model is used to calibrate a full macroeconomic scenario.
3. Risks and Buffers	Risks	• Credit channel risks are assumed (revised PD paths). All other channels are assumed to remain unaffected. • Scenario dependent capital projections are produced based on the physical risk shock dependent PD paths.
	Buffers	• Banks' own capital
5. Reporting Format for Results	Output presentation	• Delta PDs at the bank and system-wide level for corporate credit exposures. • System-wide capital path projection under the physical risk scenarios (partial analysis, assuming only corporate credit risk, to be finalized). • Comparison with the central baseline scenario. • Bank-level capital impact and shortfalls.
Climate Change: Transition Risk		
1. Institutional Perimeter	Institutions included	• Same set as in solvency stress test (10 largest commercial banks).
	Data and baseline date	• Sectoral exposure breakdown Source: Supervisory data • Firm-specific emission: from Urgentem. • Firm balance sheets: DataStream and Capital IQ. • Firm-specific historical default rates: Moody's firm-level EDFs.
2. Channels of Risk Propagation	Methodology	• Firm balance sheet stress approach. • Step 1 (Bridge equation): establishing a relationship between firm-specific default rates and three firm level balance sheet indicators reflecting viability, liquidity, and solvency conditions (interest coverage ratio, current ratio and leverage ratio called vulnerability indicators). Firm sample restricted to listed companies with available historical default rate estimates.

Domain		Top-down Stress Test by FSAP Team—Assumptions
		• Step 2: Scenario dependent carbon prices and sectoral paths applied to firms' balance sheets. Multi-year projections for balance sheet and profit components (forward-looking interest coverage ratio, current ratios, and leverage ratios) estimated via micro-simulations. Additional shocks, such as a sudden/unexpected large shift in market's risk assessment are explored. • Step 3: Elasticities from Step 1 are used to infer stressed default rates (using forward looking metrics from Step 2) for the sample of firms. • Step 4: Weighted sectoral aggregates scenario dependent PDs are produced by aggregating firm level default rates and using total outstanding debt as weights. • Step 5: Bank level sectoral corporate exposure breakdown is used to produce delta PDs using baseline and adverse default rates from Step 4. • Step 6: Stressed delta PDs (reflecting transition risk) are fed to the standard solvency ST machinery to produce capital projections.
	Satellite models for macro-financial linkages	• Bridge equation linking defaults rates to firm level vulnerability indicators: a fixed effects panel regression on historical firm level default rates; additional stochastic model to be explored for other shocks.
	Horizon	• One to five years: multi-year projection of balance sheet dynamics and vulnerability indicators under transition scenarios.
3. Tail Shocks	Scenario analysis	• Based on transition risk scenarios anchored to NGFS scenario categories and augmented to obtain sectoral output pathways via CGE model. • Hot house world/business as usual is baseline with 1-2 adverse scenarios aligned to orderly and/or disorderly NGFS categories.
3. Risks and Buffers	Risks	• Credit channel risks. All other channels are assumed to remain unaffected. • Delta PDs relative to the baseline by bank is the envisaged outcome of the analysis.
5. Reporting Format for Results	Output presentation	• Delta PDs by sector, by bank and (weighted) system-wide average. • Bank-level capital impact and shortfalls (optional).
Financial System: Contagion Risk		
1. Institutional Perimeter	Institutions included	• All commercial and development banks, brokerage houses, investment and pension funds and the largest credit providing NBFIs (subject to data availability) in Mexico, at the highest level of consolidation
	Market share	• Almost the entire system in terms of asset coverage
	Data and baseline date	• Source: Supervisory data and ad-hoc data request • Data as of December 2021 (random day cut-off, to avoid window dressing effects) • BIS consolidated banking statistics, data as of end-Sept 2021
2. Channels of Risk Propagation	Methodology	• Interbank and cross-border network model by Espinosa-Vega and Solé (2010)
3. Risks and Buffers	Risks	• Credit and funding losses related to interbank/inter-entity cross-exposures (and cross-border banking exposures)

Domain		Top-down Stress Test by FSAP Team—Assumptions
	Buffers	• Banks' and brokerage houses' own capital buffers, other entities are not assumed to default in the simulation (internal loss absorption)
4. Tail shocks	Size of the shock	• Pure contagion: default of individual institutions • Several types of cross-entity exposures considered: secured, unsecured, crossholdings of debt instruments, settlement exposures. Different LGDs might be used, depending on exposure type. • Simulation of multiple concurrent defaults may also be examined.
6. Reporting Format for Results	Output presentation	• Contagion and vulnerability indicators • System-wide capital shortfall • Bank-level capital shortfall • Number of undercapitalized and/or failed institutions, and their shares of assets in the system • Evolution and direction of spillovers.
Financial System: System-Wide Liquidity (SWL) Analysis		
1. Institutional Perimeter	Entities included	• Most economic agent type present in the financial system: ○ Central Bank ○ Government ○ Commercial Banks ○ State-owned banks ○ Investment Funds ○ NFCs ○ Households ○ Foreign investors
	Data and baseline date	• Ad-hoc data request template provided by the FSAP team to Banxico, capturing: ○ Available collateral (encumbered and unencumbered) by asset class, remaining maturity bucket and eligibility for CB operations ○ Existing collateralized funding and margin positions for all agents ○ Composition of the most important segments of B/S assets and liabilities by agent type, as well as bilateral exposure between agents informed by who-to-whom holdings. • Data as of December 2021, at the aggregate B/S level and on a best effort basis. • Scope of financial consolidation: group-wide at the highest level
2. Channels of Risk Propagation	Methodology	• The analysis is conducted at the aggregated B/S data for each type of economic agent. • For each scenario, the liquidity counterbalancing capacity for each type of economic agent is measured, in response to direct shocks (funding and market) and after considering second round effects due to calls on available collateral for existing funding and margin positions. • Shocks are generated based on correlated distributions (copula) with flexibility of adjusting ranges of the distributions and correlation factors between distributions to reflect different level of severity. • Cash and unencumbered collateral are considered as accessible liquidity buffers. • Pecking order of the utilization of liquid assets: 1. Cash and equivalences 2. Short term assets including short term paper and outstanding reverse repos 3. Repos using unencumbered assets • Willingness and capacity to roll-over existing funding positions across agents are assessed after measuring liquidity excess or shortfalls.

Domain		Top-down Stress Test by FSAP Team—Assumptions
		• The resilience of the system (and of individual agents) is assessed based on the net liquidity distribution across the number of simulated scenarios (shortfall probability density). • Agents will be classified in accordance with their liquidity shortfall propensity and with respect to their contribution to the overall system-wide resiliency or vulnerability. • Existing counterbalancing capacity of unencumbered collateral is measured against severe tail events as the point in the distribution that would force Banxico to increase the perimeter of eligible collateral.
3. Risks and Buffers	Risks	• Funding liquidity risk is reflected in funding run-off rates, capital outflows, share redemption and offshore switching. • Market liquidity risk is reflected in asset haircuts, influenced by market movements, potential fire sales and collateral supply considerations.
	Buffers	• Available unencumbered collateral (CB eligible and non-eligible), cash position and capacity to absorb pressure in all market segments considered (sovereign, repo, and derivatives markets, etc.)
4. Behavioral Assumptions	Behavioral adjustments	• Liquidity from the central bank's emergency lending assistance (ELA) or any other increase in the perimeter of eligible collateral or eligible counterparts is not considered. • Pecking order in the way agents with excess (insufficient) liquidity decide to (not) roll-over funding positions may be important. • Binding liquidity requirements (LCR constraints) can be switched on/off.
5. Tail shocks	Scenario analysis	• The analysis narrative would entail the simulation of a material number of scenarios consisting of a series of random (but correlated) layers of shocks: ○ Sovereign market repricing shocks due to capital outflows and risk premia reassessment ○ Drawdown of existing credit and liquidity facilities by NFCs due to global tightening funding conditions ○ Run-offs on wholesale and retail deposits and switch to offshore accounts due to rebalancing of funding requirements ○ Investment Fund redemption shocks and associated short-term funding stress (e.g., via the repo market) ○ FX depreciation and shocks attributed to the shortage of sufficient FX reserves (implemented but muted) ○ Shocks attributed to dislocated derivatives markets and margin requirements and derivative basis shocks (implemented but muted)
6. Sensitivity analysis	Shock severity and policy experiment	• Single factor sensitivity analysis by increasing of correlation factor between shock parameters • Mute repo or pull back other short-term funding (deposits or short-term paper) from commercial banks to other agents as commercial banks reach liquidity regulatory threshold (e.g., LCR) • Allow expanded access of investment fund to repo market to assess benefit of repo participation
7. Regulatory and Market-Based Standards and Parameters	Regulatory Standards	• LCR and other liquidity constraints are not used for the identification of bank pass/failure since the analysis is performed at the aggregate level (not entity specific).

Domain		Top-down Stress Test by FSAP Team—Assumptions
8. Reporting Format for Results	Output presentation	• Probability distribution of excess/shortfall for the system and by agent type • Impact attribution by agent type in the overall resiliency or vulnerability • Shortfall thresholds for different agents • Contribution of each layer of shocks to the overall liquidity shortfalls
9. Infrastructure		• Fully comprehensive and novel infrastructure developed by IMF staff using the ad-hoc data request as a data repository. MATLAB based.
Banking Sector: Transition Risk with Digital Money		
1. Institutional Perimeter	Institutions included	• All D-SIBs (6 banks) and other important banks (4 additional mid-tier commercial banks for top-down ST at the highest level of consolidation.
	Market share	• For the 10 commercial banks within scope, approximately 84 percent of banking sector assets.
	Data Source	• Banxico's regulatory returns and supervisory data.
2. Channels of Risk Propagation	Methodology	• Balance sheet approach. • Projections of key balance sheet, income statement and capital account items. • Static balance sheet assumption. • Non-interest income and interest expense projections are produced for all banks within scope. • Non-interest income is shocked by a fall of in income from payment fees, due to more competition from new forms of payments that contest markets and force banks to compress fees. Given lack of granularity in the data, income from payments fees is proxied by credit cards income from merchants and users. Given the lack of variability in the historical data, the shock is calibrated in a similar order of magnitude than a similar analysis done for the U.K. FSAP. • Interest expense increases as banks must increase remuneration to offset competition from new forms of payment that compete with sight deposits. The shock is calibrated to be the mid-point from two theoretical models with different assumptions in terms of banks' market power and households' preferences.
	Stress test horizon	• Three years (2022 Q1 – 2024 Q4).
	Scenario analysis	• Based on two scenarios: private digital money and CBDC. • In both scenarios banks lose 20 percent of income from credit card fees at the end of the projection. • In the private money scenario, banks have to increase the remuneration of retail sight deposits (here defined as below 1 million Mexican pesos) by 50 basis points at the end of the projection. • In the CBDC scenario, banks must increase the remuneration of a smaller retail sight deposit as CBDC is assumed to be designed with a cap of 21000 Mexican pesos per account. The increase in remuneration is also 50 basis points at the end of the projection. • All shocks are phased-in as 30 percent in the 2022, 70 percent in 2023, and a full impact in 2024.
3. Results	Output presentation	• System-wide evolution of aggregate Core Equity Tier 1 and capital ratios relative to the baseline solvency stress test.

Appendix IV. Cash Flow Analysis Scenario Parameters

Segment Name	Type	Value Min	Value Max	Collateralization
Liabilities resulting from securities issued (if not treated as retail deposits)	Outflows			
Unsecured bonds due	Outflows	0	1	1
Regulated covered bonds	Outflows	0	1	1
Securitizations due	Outflows	0	1	1
Other	Outflows	0	1	1
Liabilities resulting from secured lending and capital market driven transactions collateralized by:	Outflows			
Level 1 tradable assets	Outflows			
Level 1 excluding covered bonds	Outflows	0.1	0.3	1.02
Level 1 central bank	Outflows			
Level 1 (CQS 1)	Outflows	0	0.3	1.02
Level 1 (CQS2, CQS3)	Outflows	0.1	0.5	1.02
Level 1 (CQS4+)	Outflows	0.2	0.5	1.02
Level 1 covered bonds (CQS1)	Outflows	0.2	0.5	1.02
Level 2A tradable assets	Outflows	0.2	0.5	1.02
Level 2A corporate bonds (CQS1)	Outflows			
Level 2A covered bonds (CQS1, CQS2)	Outflows	0.2	0.5	1.02
Level 2A public sector (CQS1, CQS2)	Outflows	0.2	0.5	1.02
Level 2B tradable assets	Outflows			
Level 2B ABS (CQS1)	Outflows	0.2	0.5	1.05
Level 2B covered bonds (CQS1-6)	Outflows	0.2	0.5	1.05
Level 2B: corporate bonds (CQ1-3)	Outflows	0.2	0.5	1.05
Level 2B shares	Outflows	0.35	1	1.5
Level 2B public sector (CQS 3-5)	Outflows	0.35	1	1.5
Other tradable assets	Outflows	0.35	1	1.5
Other assets	Outflows	0.35	1	1.5
Liabilities not reported in 1.2, resulting from deposits received (excluding deposits received as collateral)	Outflows			
Stable retail deposits	Outflows	0.05	0.1	1
Other retail deposits	Outflows	0.1	0.2	1
Operational deposits	Outflows	0.05	0.25	1
Non-operational deposits from credit institutions	Outflows	0.2	1	1
Non-operational deposits from other financial customers	Outflows	0.2	1	1
Non-operational deposits from central banks	Outflows	0	0.25	1
Non-operational deposits from non-financial corporates	Outflows	0.2	0.4	1
Non-operational deposits from other counterparties	Outflows	0.2	0.4	1
FX-swaps maturing	Outflows	0	0	1
Derivatives amount payables other than those reported in 1.4	Outflows	0	0	1
Other outflows	Outflows	0	0	1
Total outflows	Outflows			
Monies due from secured lending and capital market driven transactions collateralized by:	Inflows			
Level 1 tradable assets	Inflows			
Level 1 excluding covered bonds	Inflows	0.1	0.3	1.02
Level 1 central bank	Inflows			
Level 1 (CQS 1)	Inflows	0	0.3	1.02
Level 1 (CQS2, CQS3)	Inflows	0.1	0.5	1.02
Level 1 (CQS4+)	Inflows	0.2	0.5	1.02
Level 1 covered bonds (CQS1)	Inflows	0.2	0.5	1.02
Level 2A tradable assets	Inflows	0.2	0.5	1.05
Level 2A corporate bonds (CQS1)	Inflows			
Level 2A covered bonds (CQS1, CQS2)	Inflows	0.2	0.5	1.05
Level 2A public sector (CQS1, CQS2)	Inflows	0.2	0.5	1.05
Level 2B tradable assets	Inflows			
Level 2B ABS (CQS1)	Inflows	0.2	0.5	1.05

Segment Name	Type	Value Min	Value Max	Collateralization
Level 2B covered bonds (CQS1-6)	Inflows	0.2	0.5	1.05
Level 2B: corporate bonds (CQ1-3)	Inflows	0.2	0.5	1.05
Level 2B shares	Inflows	0.35	1	1.5
Level 2B public sector (CQS 3-5)	Inflows	0.35	1	1.5
Other tradable assets	Inflows	0.35	1	1.5
Other assets	Inflows	0.35	1	1.5
Monies due not reported in 2.1 resulting from loans and advances granted to:	Inflows			
Retail customers	Inflows	0	1	1
Non-financial corporates	Inflows	0	1	1
Credit institutions	Inflows	0	1	1
Other financial customers	Inflows	0	1	1
Central banks	Inflows	0	1	1
Other counterparties	Inflows	0	1	1
FX-swaps maturing	Inflows	0	1	1
Derivatives amount receivables other than those reported in 2.3	Inflows	0	1	1
Paper in own portfolio maturing	Inflows	0	1	1
Other inflows	Inflows	0	1	1
Withdrawable central bank reserves	CBL	0	0	1
Level 1 tradable assets	CBL			
Level 1 excluding covered bonds	CBL	0	0.1	1
Level 1 central bank	CBL			
Level 1 (CQS 1)	CBL	0	0.1	1
Level 1 (CQS2, CQS3)	CBL	0	0.1	1
Level 1 (CQS4+)	CBL	0	0.1	1
Level 1 covered bonds (CQS1)	CBL	0	0.2	1
Level 2A tradable assets	CBL	0.05	0.2	1
Level 2A corporate bonds (CQS1)	CBL	0.05	0.2	1
Level 2A covered bonds (CQS 1, CQS2)	CBL			
Level 2A public sector (CQS1, CQS2)	CBL	0.05	0.2	1
Level 2B tradable assets	CBL	0.1	0.2	1
Level 2B ABS (CQS1)	CBL	0.1	0.2	1
Level 2B covered bonds (CQS1-6)	CBL			
Level 2B corporate bonds (CQ1-3)	CBL	0.1	0.2	1
Level 2B shares	CBL	0.1	0.2	1
Level 2B public sector (CQS 3-5)	CBL	0.1	0.2	1
Other tradable assets	CBL	0.1	0.2	1
Central government (CQS1)	CBL			
Central government (CQS 2 & 3)	CBL	0	0.2	1
Shares	CBL	0	0.2	1
Covered bonds	CBL	0	0.2	1
ABS	CBL	0	0.2	1
Other tradable assets	CBL	0	0.2	1
Non tradable assets eligible for central banks	CBL	0	0.2	1
Undrawn committed facilities received	CBL			
Level 1 facilities	CBL	0.8	1	1
Level 2B restricted use facilities	CBL	0.8	1	1
Level 2B IPS facilities	CBL	0.8	1	1
Other facilities	CBL			
From intragroup counterparties	CBL	1	1	1
From other counterparties	CBL	1	1	1
Outflows from committed facilities	Contingencies			
Committed credit facilities	Contingencies			
Considered as Level 2B by the receiver	Contingencies	0.15	0.3	1
Other	Contingencies	0.15	0.4	1
Liquidity facilities	Contingencies	0.5	1	1
Outflows due to downgrade triggers	Contingencies	0.5	1	1