INTERNATIONAL MONETARY FUND

Post-Pandemic Changes to Chile's Financial Markets

Chile

Tatsushi Okuda

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Post-Pandemic Changes to Chile's Financial Markets

Prepared by Tatsushi Okuda*

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February 2025

ABSTRACT: Pension fund withdrawals, rising public debt, and the Central Bank of Chile's pandemic liquidity injections have reshaped Chile's financial landscape. In the context of the diminished demand for local bonds, large non-financial corporations and the government relied more on foreign investors. Overall, Chile's financial depth has diminished, and markets have become more volatile and sensitive to shocks. Restoring pension funds as well as continuing to strengthen market resilience and crisis response capabilities are essential for ensuring future financial stability.

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January 16, 2025

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Prepared by Tatsushi Okuda (MCM).

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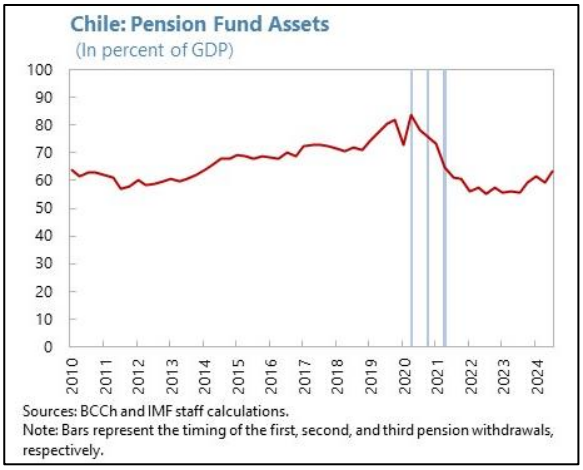
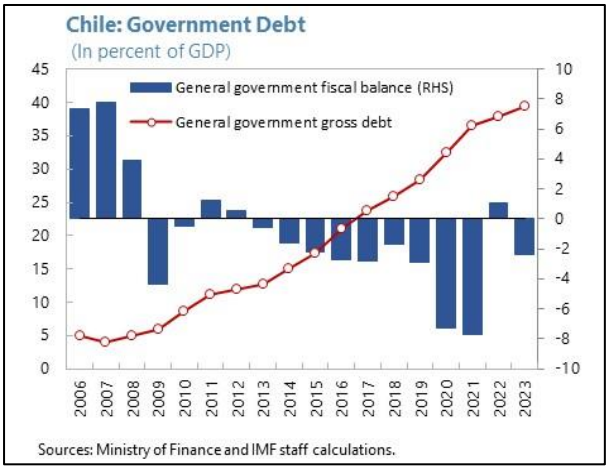
POST-PANDEMIC CHANGES TO CHILE'S FINANCIAL MARKETS[1]

Pension fund withdrawals, rising public debt, and the Banco Central de Chile's (BCCh) pandemic liquidity injections have reshaped Chile's financial landscape. In the context of the diminished demand for local bonds, large non-financial corporations and the government relied more on foreign investors. Overall, Chile's financial depth has diminished, and markets have become more volatile and sensitive to shocks. Restoring pension funds as well as continuing to strengthen market resilience and crisis response capabilities are essential for ensuring future financial stability.

A. Introduction

1. During the pandemic, the Chilean financial markets experienced several significant transformations. First, the size of pension funds significantly decreased, dropping from approximately 80 percent of GDP to less than 60 percent due to three rounds of pension fund withdrawals during the pandemic.[2] Second, the public debt-to-GDP ratio rose to about 40 percent of GDP. Third, the central bank injected substantial liquidity into the markets during the pandemic,[3] a measure that was unwound in April and July 2024.



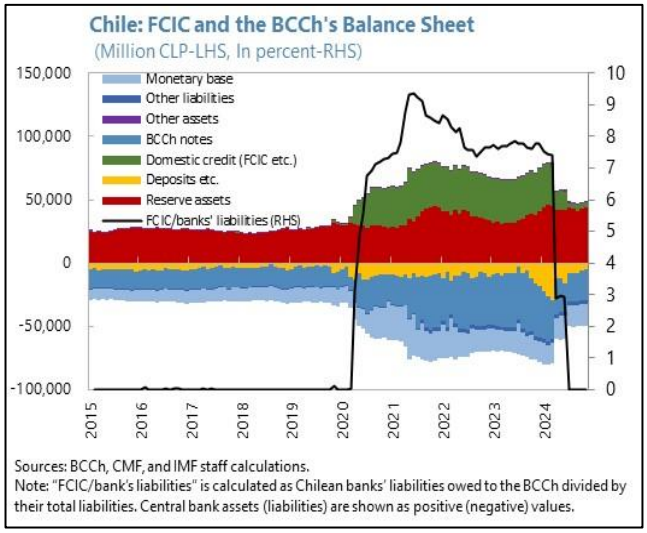


[1] Prepared by Tatsushi Okuda. The author would like to thank BCCh, CMF, and MoF staff for the helpful comments.

[2] The reduction of about 20 percent of GDP is comparable to pension contributions for about 9 years. For details on the pension fund withdrawals, see IMF (2021a) and IMF (2023). The Chilean financial market exhibited resilience to pandemic-related shocks, which occurred prior to the withdrawals, thanks to its high financial depth (see Chapter IV in the BCCh's 2020H2 FSR and IMF 2021b).

[3] In 2020-2021, the BCCh introduced three rounds of Facility of Credit Conditional on Lending Increase (FCIC), accepting commercial bank credits as collateral, which corresponded to about 8 percent of banks' total liabilities. Additionally, among other measures, to avoid disruptive impacts on asset prices from pension fund withdrawals, the BCCh implemented a cash purchase and forward sale program (CC-VP), temporary repo facilities for pension fund managers. For details of the BCCh's measures, see the BCCh's website for exceptional measures.

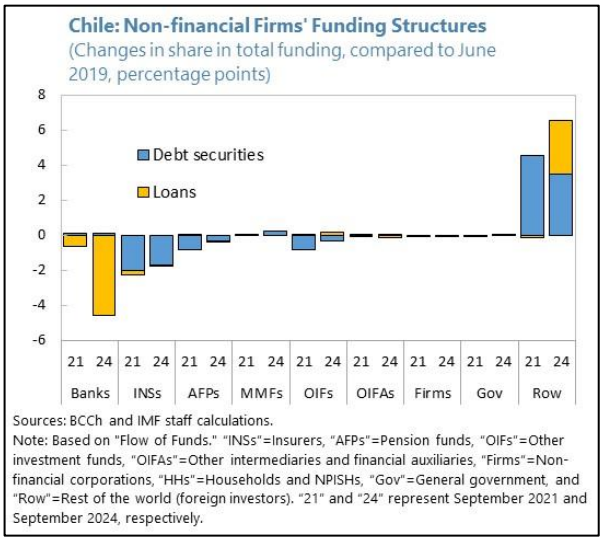
2. The diminished asset size of pension funds could significantly alter the landscape of the financial markets. The size of Chilean pension funds, relative to the size of the economy scale, is still larger than regional peers and comparable to OECD peers (Annex I). Chilean pension funds have played an important role in local financial markets as major long-term investors, holding significant shares in bond markets. This note analyses long-term implications of the pension fund withdrawals on financial markets, following earlier findings by the IMF (2023), which included a declined availability of long-term financing for the government and corporate sectors and a negative impact of pension fund withdrawals on local stock prices. Recent analysis by the BCCh showed that since end-2017, liquidity indicators in Latin America's fixed-income and equity markets have worsened, particularly in Chile, leading to a discussion on the effects of pension fund withdrawals (the BCCh's 2023H1 FSR).[4]



Sources: BCCh, CMF, and IMF staff calculations.
Note: "FCIC/bank's liabilities" is calculated as Chilean banks' liabilities owed to the BCCh divided by their total liabilities. Central bank assets (liabilities) are shown as positive (negative) values.

B. Changes in the Structure of Local Financial Markets

3. There was a shift toward foreign funding for non-financial corporates and the government. During the pandemic, non-financial firms relied more on foreign investors and less on banks, insurers, and pension funds for issuance of debt securities and funding via loans. Government debt holders have shifted from pension funds to banks and foreign investors during the pandemic, and this shift persisted until at least September 2024. This implies a dependence on foreign investors (on a stock basis) as well as a potential strengthening of the sovereign-bank nexus.[5]



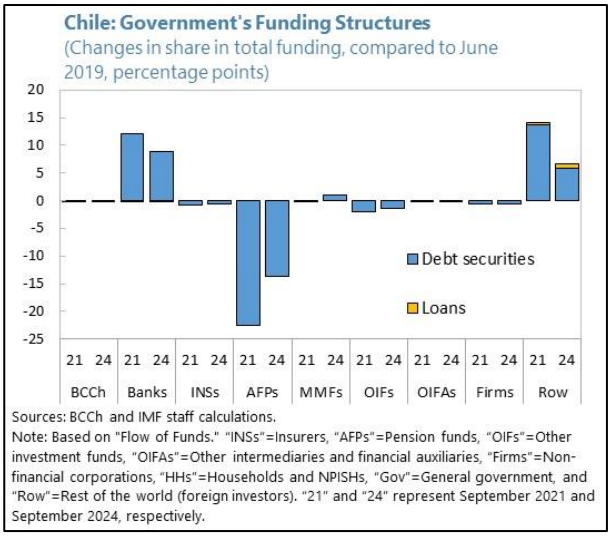
Sources: BCCh and IMF staff calculations.
Note: Based on "Flow of Funds." "INSs"=Insurers, "AFPs"=Pension funds, "OIFs"=Other investment funds, "OIFAs"=Other intermediaries and financial auxiliaries, "Firms"=Non-financial corporations, "HHs"=Households and NPISHs, "Gov"=General government, and "Row"=Rest of the world (foreign investors). "21" and "24" represent September 2021 and September 2024, respectively.

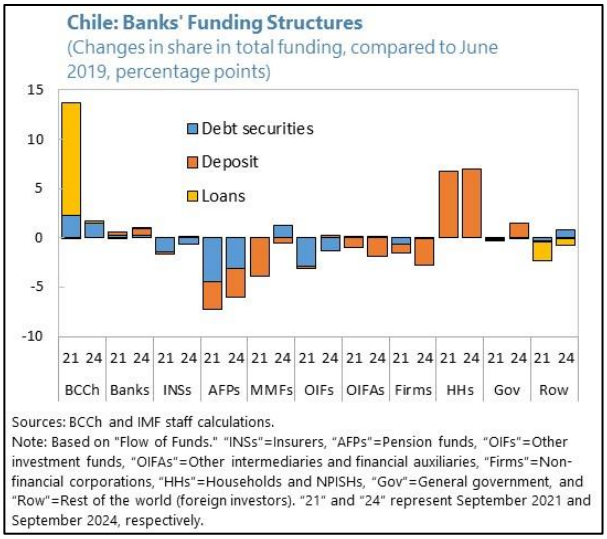
4. Banks have become more dependent on retail deposits and less on pension funds and money market fund deposits. Moreover, the share of bond funding for banks has

[4] See also Jara and Naudon (2024) on the implications of pension fund withdrawals for local financial markets.

[5] In this note, the term "sovereign-bank nexus" merely refers to the interconnectedness between banks and sovereigns, specifically banks' exposures to sovereign bonds, and does not include any assessments of the financial health of governments. The increase in banks' holdings of sovereign bonds is commonly observed in other emerging markets. For details, see IMF (2022).

decreased as the amount of bank bond funding has kept stable in the last couple of years, unable to increase in accordance with the increase in bank assets, primarily due to a reduction in the share of funding from pension funds.[6] Although loans from the BCCh increased during the pandemic, thanks to the FCIC, it have returned to pre-pandemic levels, as the FCIC was fully unwound in July 2024.[7]





An Increasing Reliance on Foreign Investors

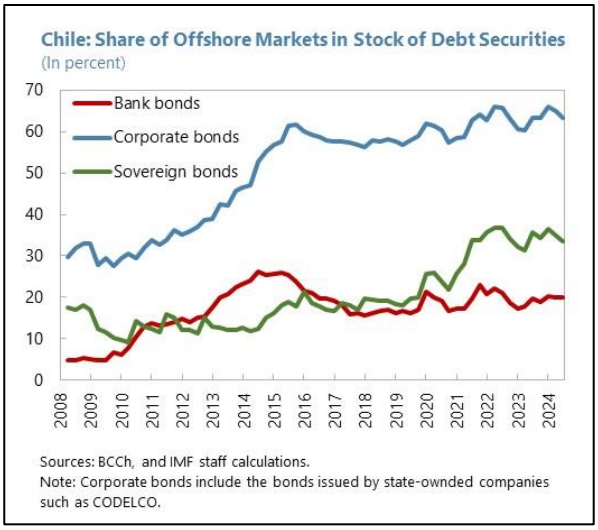
5. Issuance shifted to offshore markets, which increased exposures to external stress on a stock basis. This shift occurred, particularly for sovereign bonds and corporate bonds,[8] amid lower demand for local bonds, driven by pension fund withdrawals and a movement away from conservative funds (which mainly invest in local fixed-income assets) to other types of funds (see Annex 1).[9] However, in local markets, foreign investor participation has remained flat.

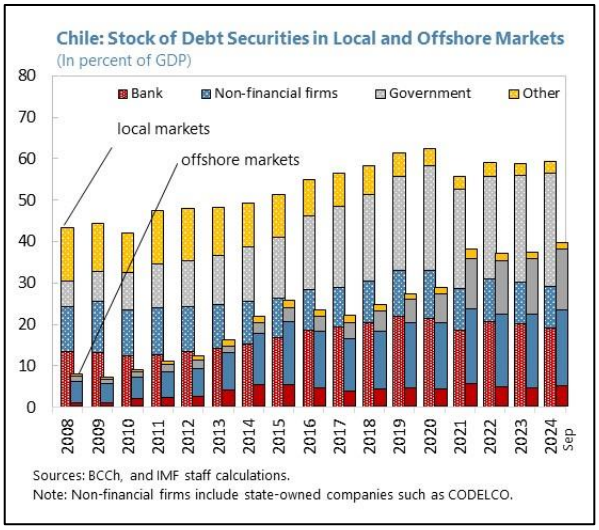
[6] A higher issuance of government debt in the local market (supply side factor) might have had an impact as well. The stagnation of the long-term credit demand (mortgages) also has reduced the necessity of bond funding for banks.

[7] Because of the accumulation of the liquid assets in advance, banks maintain their liquidity ratios (the Liquidity Coverage Ratios and the Net Stable Funding Ratios) above the regulatory minimums (the BCCh's 2024H2 FSR).

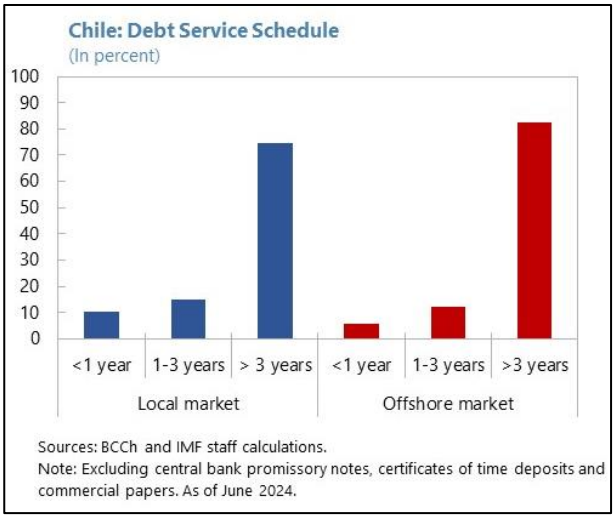
[8] This note refers to bonds issued by non-financial firms as "corporate bonds" and those issued by banks as "bank bonds."

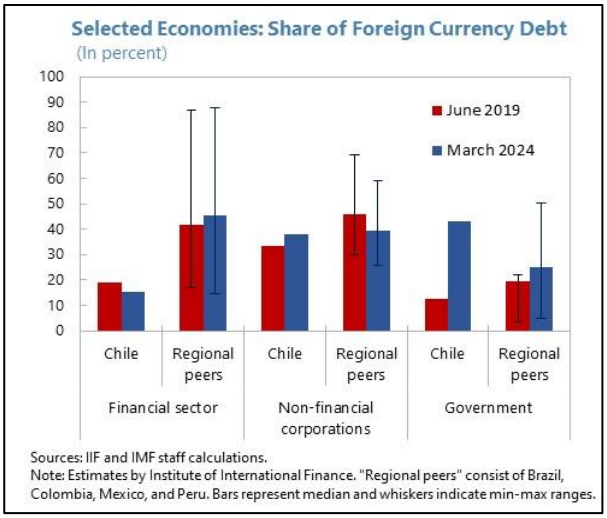
[9] The pre-pandemic rise appears to be in line with other emerging market economies given the lower cost of bond financing (Chang et al. 2017).





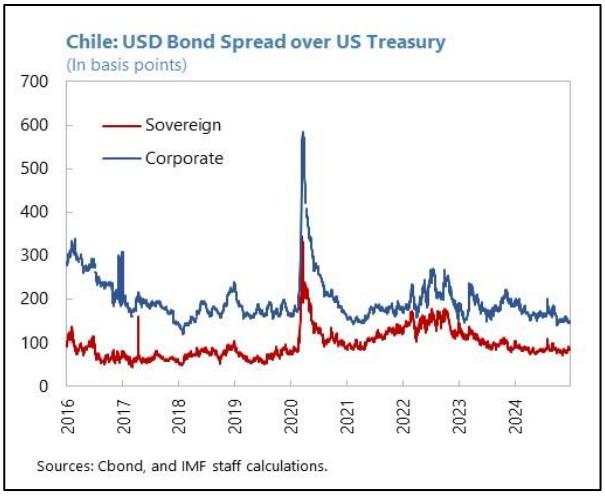
6. This shift does not pose an immediate risk. The overall redemption schedule of bonds issued in offshore markets appears to be diversified, similar to those issued in local markets. Financial and non-financial sectors have relatively low foreign-currency denominated debt, mainly issued by larger firms, which include state-owned firms and firms in mining and electricity, gas, and water sector. Dollar funding costs in US$-dominated bond markets were broadly stable, indicating that Chilean issuers have been viewed as sound. Similarly, dollar funding costs in local financial markets (onshore spreads) have been stable. Non-financial corporations' currency mismatch is generally limited, due to natural hedges from exporters and the use of derivatives,[10] and banks' currency mismatch is also restricted because of strict regulations on banks' foreign currency funding gaps (see the BCCh 2024H2 FSR).[11]





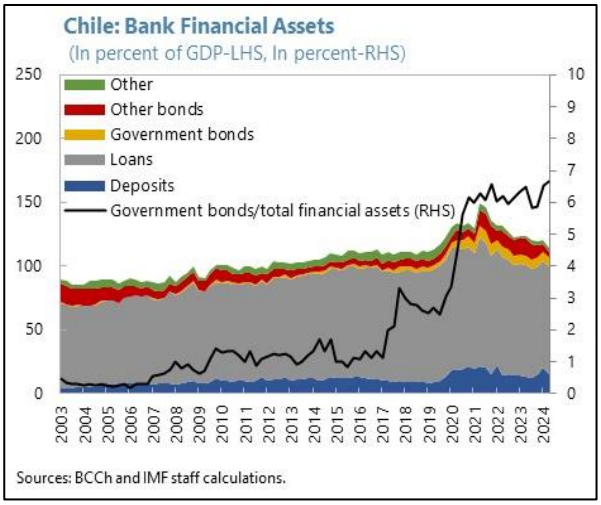
[10] Albagli et al. (2020) and Alfaro, Calani, and Varela (2021) highlight how Chilean firms have reduced foreign currency mismatch in their balance sheets.

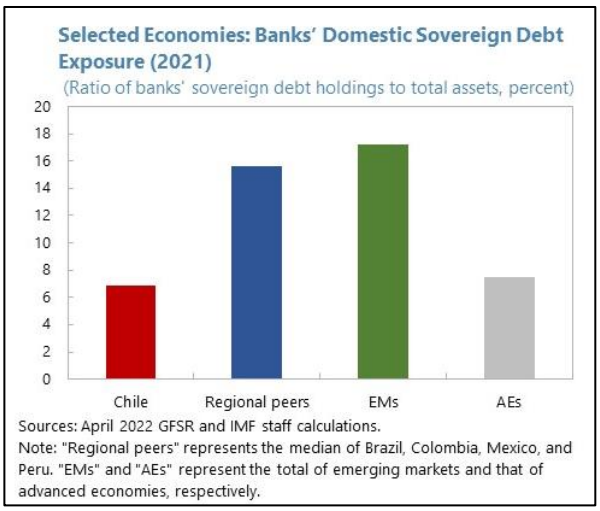
[11] For example, the total of all term mismatches for periods of up to 30 days cannot exceed the basic capital, taking into account only flows in foreign currency.



A Low but Rising Sovereign-Bank Nexus

7. The sovereign-bank nexus remains lower than regional peers but has increased since the pandemic. Since then, the share of government bonds in banks' total financial assets has doubled from about 3 to 6 percent, which now is similar to the median of advanced economies and significantly lower than that of regional peers and emerging markets. Banks' higher share of government security holdings may reflect two factors: fewer bankable credit activities and the implementation of liquidity requirements under Basel III regulations. For example, banks have been incentivized to hold sovereign bonds as high-quality liquid assets (HQLA) to bolster their Liquidity Coverage Ratios. The unwinding of the FCIC also temporarily motivated banks to increase their holdings of government bonds, as they were required to switch their collateral with the BCCh from illiquid assets (bank loans) to liquid assets (such as government bonds). This process was completed in July 2024.[12]

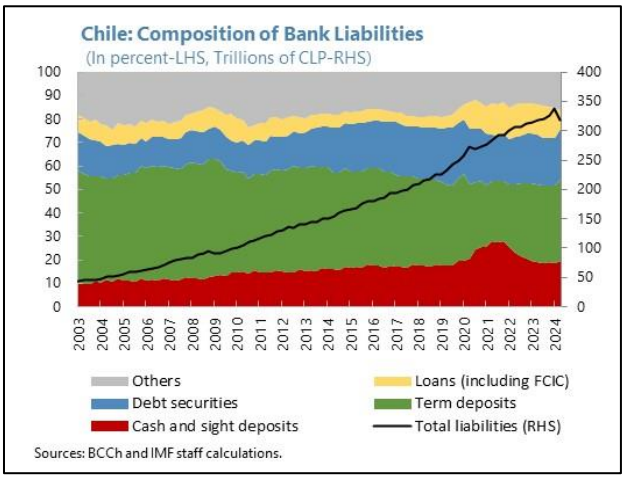


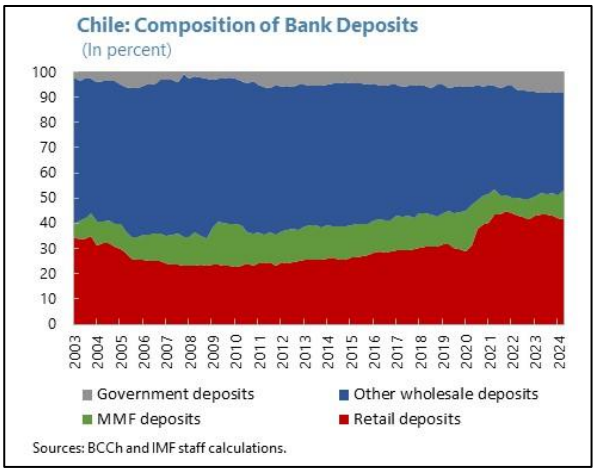


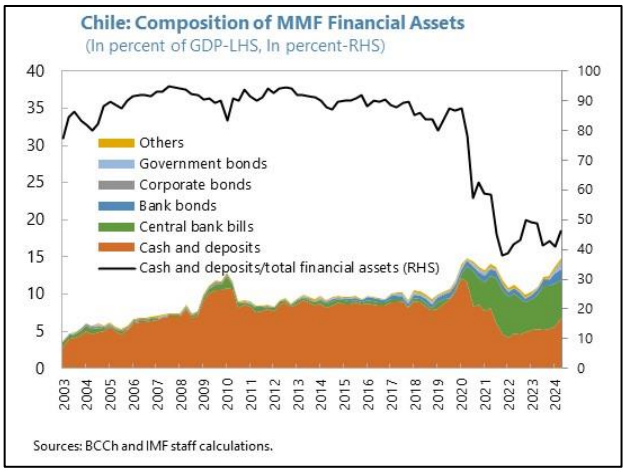
[12] In November 2022, the BCCh rolled out a collateral substitution program, which began in January 2023 and gradually standardized eligible collateral by replacing the collateral of the pledged credit portfolio with eligible financial instruments in the Central Securities Depository at a rate of 1/18 per month.

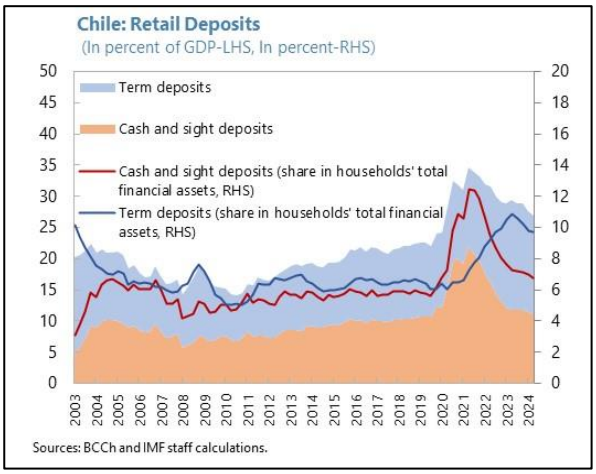
Banks' Narrowed Wholesale Funding

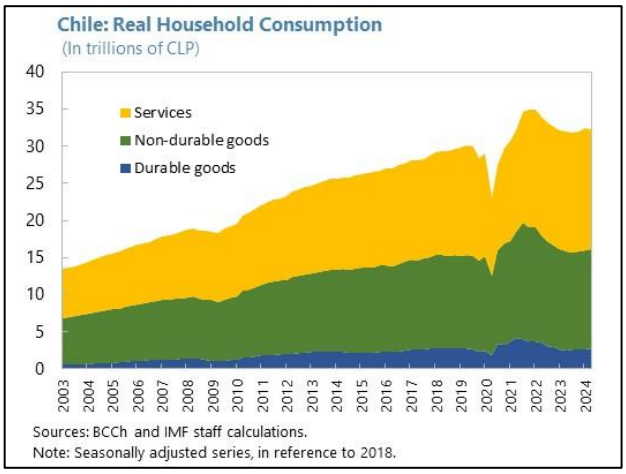
8. Banks' funding structures at instrument level has not significantly changed, while the sources of the deposits have shifted to retail deposits. The decrease in MMF (Money market fund) deposits had occurred as the depositors shifted their funds from bank deposits to central bank bills issued for the FCIC. Meanwhile, banks' funding structures are well-diversified and, at instrument level, have returned to a landscape similar to pre-pandemic levels, indicating that, for banks, this phenomenon is merely a shift of depositors from MMFs to households within a stable share of sight (short-term) deposits, and it has not affected their dependence on each funding instrument.[13]











[13] According to the BCCh's 2024H2 FSR, after the unwinding of the FCIC (as of September 2024), banks had shifted back to a funding structure similar to pre-pandemic one, with institutional investor funding recovering.

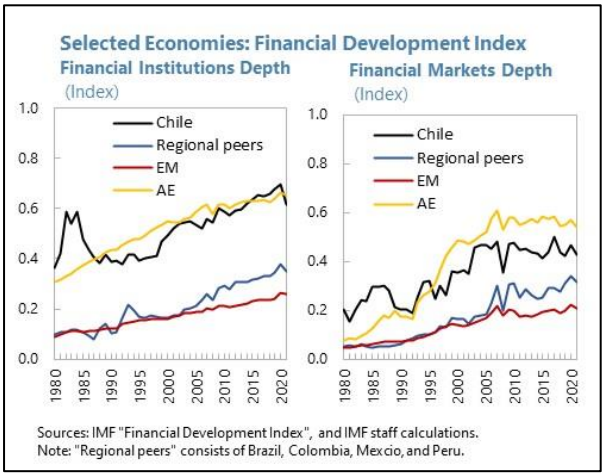
9. It is uncertain if the adjustment of retail deposit since the pension fund withdrawals is complete. While households' cash and sight deposits increased after the pension fund withdrawals (Madeira, 2022) they seem to have returned to pre-pandemic trends. The consumption boom and high-rate environments in 2022-2023 depleted much of the extra liquidity and shifted liquidity from sight to term deposits. Given that term deposits are still elevated, further adjustments of households' composition of their financial assets, might occur. It would likely depend on the interest rate development.

C. Financial Depth and Sensitivity of Financial Variables to Global Risk

Developments in the Financial Institutions and Markets Depth

10. The depth of financial institutions and markets in Chile was comparable to those in advanced economies pre-pandemic. The IMF's Financial Development Index[14] so far available until 2021, measures *financial institutions depth* in terms of (i) private sector credit to GDP, (ii) pension fund assets to GDP, (iii) mutual fund assets to GDP, and (iv) insurance premiums to GDP. It was comparable to the average of advanced economies, which is much higher than that of regional peers. Regarding *financial markets depth*, based on (i) stock market capitalization to GDP, (ii) stocks traded to GDP, (iii) international debt securities of governments to GDP, (iv) total debt securities of financial corporations to GDP, and (v) total debt securities of non-financial corporations to GDP, it was between the average levels of advanced economies and those of regional peers.

Indicators for Financial Institutions and Markets Depth
Financial Institutions Depth
Private sector credit to GDP
Pension fund assets to GDP
Mutual fund assets to GDP
Insurance premiums, life and non-life to GDP
Financial Markets Depth
Stock market capitalization to GDP
Stocks traded to GDP
International debt securities of government to GDP
Total debt securities of financial corporations to GDP
Total debt securities of nonfinancial corporations to GDP

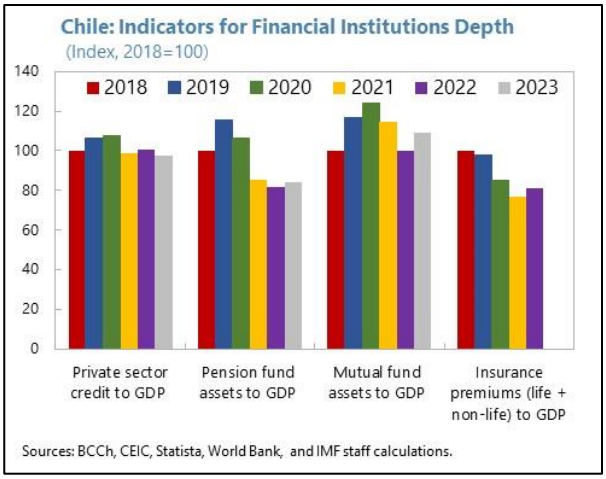


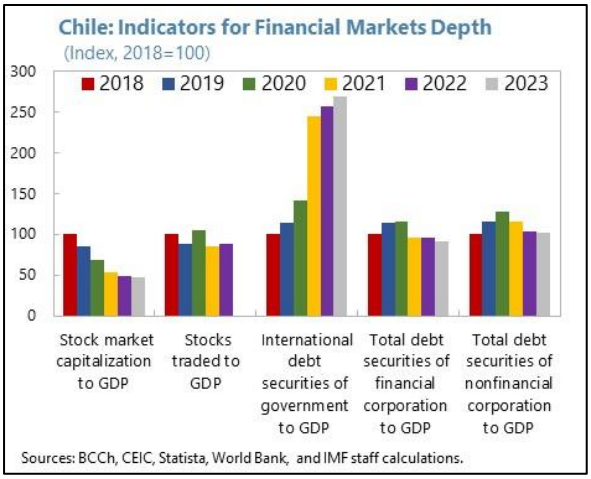
11. After the pension fund withdrawal, the depth of financial institutions declined in 2021, and the level has not recovered yet.[15] In 2021, *financial institutions depth* in Chile significantly declined. Based on the components of this indicator, it mainly reflected the decrease in pension

[14] For details on the methodology, see Svirydzenka (2016) and Sahay et al. (2015). A CMF report analyzes the trends and provides an international comparison of the depth of financial institutions and markets, using this index along with additional indicators, while not specifically focusing on the recent periods.

[15] Because the Financial Development Index does not publish the components of the financial institution depth and financial markets depth, the charts on the components of these depths are sourced from different database. The charts enable us to understand the factors behind the changes in depths and to infer the developments since 2022.

fund assets to GDP, which has not rebounded by 2023. Moreover, the other components of the financial institution depth have also declined and not fully recovered by 2023. Regarding *financial markets depth*, it declined similarly to trends observed in other countries in 2021. The components of this indicator indicate that this decline reflected modest decline in most indicators, while ratios of international debt securities of government to GDP having increased. As of 2023, these indicators have remained almost unchanged from 2021.





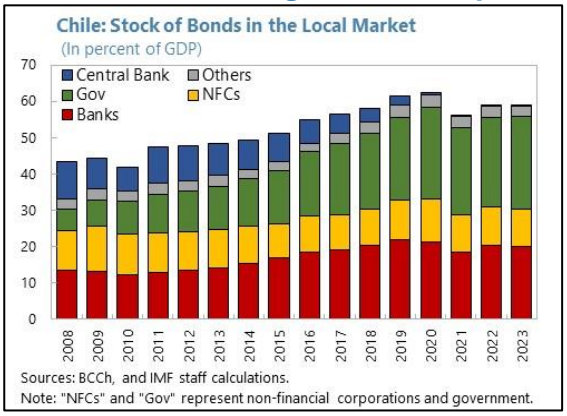
12. The developments in local financial markets since the pandemic suggest a shallower financial depth as well.[16] In the primary bond market, the stock of local bonds to GDP declined in 2021 and has since remained below pre-pandemic levels. Although the issuance of bank and corporate bonds appears to have returned to its pre-pandemic trend, driven by macro-financial conditions, no signs of pent-up issuance have been observed (see Box 1). Average maturity has moderately declined, and average interest rates have been increasing. In the secondary bond market, turnover has not yet returned to pre-pandemic levels, and corporate bond spreads remain higher than they were before the pandemic. The volatility (standard deviation) of corporate and bank bond spreads has stayed above the 2018 average, since 2019. This trend also somewhat holds for sovereign spreads. In the stock market, new issuance has stagnated, and market capitalization has declined.[17] This may have been partly due to the trend of stock market delisting (e.g., ownership takeovers) since the 2010s. Turnover, price-to-earnings (PER) ratios, and price-to-book (PBR) ratios are also lower than pre-pandemic levels. The deterioration of the market liquidity has been more significant for small cap firms.[18] While volatility in local equity markets has decreased from its peak during the pandemic, it is still higher than the 2018 average.

[16] The Chilean stock exchange plans to merge with the exchanges of Colombia and Peru. The goals are to attract global investors and increase market liquidity by incurring smaller fixed costs for accessing diversified portfolios through a unified trading platform with consistent rules and enabling USD transactions. This initiative aims to be more complete than Mercado Integrado Latinoamericano (MILA), which simply connected the trading platforms of Chile, Colombia, Mexico, and Peru without standardizing rules. The integration is planned to begin with equity markets and later extend to bond markets.

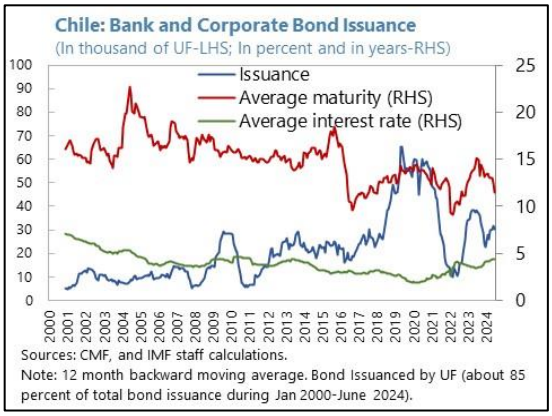
[17] This may have been partly due to the trend of stock market delisting (e.g., ownership takeovers) since the 2010s.

[18] The deterioration of the market liquidity has been more significant for small cap firms.

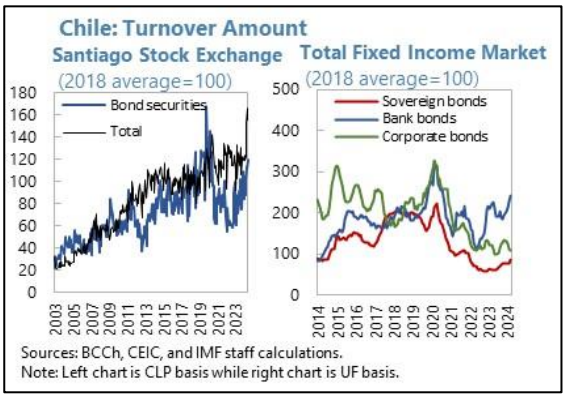
Figure 1. Developments in Local Financial Markets



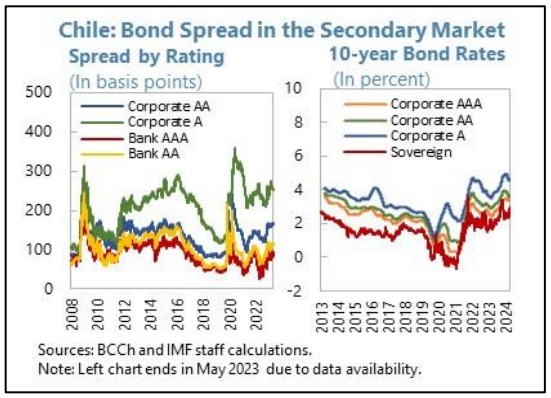
Sources: BCCh, and IMF staff calculations.
Note: "NFCs" and "Gov" represent non-financial corporations and government.



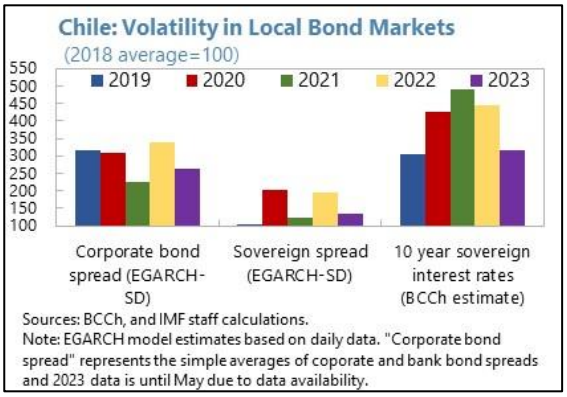
Sources: CMF, and IMF staff calculations.
Note: 12 month backward moving average. Bond Issuanced by UF (about 85 percent of total bond issuance during Jan 2000-June 2024).



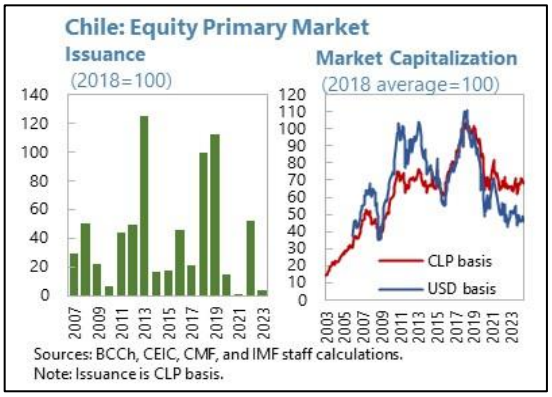
Sources: BCCh, CEIC, and IMF staff calculations.
Note: Left chart is CLP basis while right chart is UF basis.



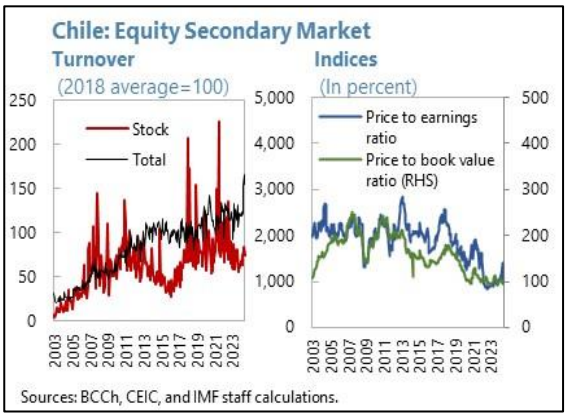
Sources: BCCh and IMF staff calculations.
Note: Left chart ends in May 2023 due to data availability.



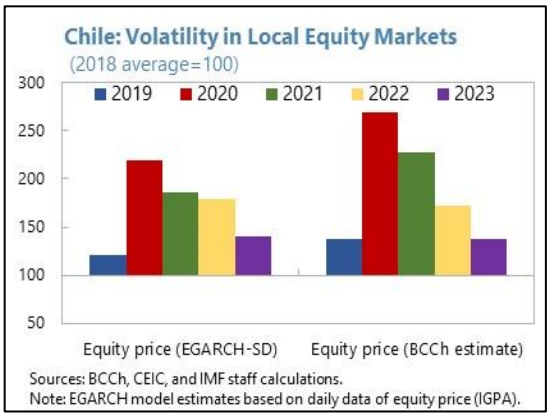
Sources: BCCh, and IMF staff calculations.
Note: EGARCH model estimates based on daily data. "Corporate bond spread" represents the simple averages of coporate and bank bond spreads and 2023 data is until May due to data availability.



Sources: BCCh, CEIC, CMF, and IMF staff calculations.
Note: Issuance is CLP basis.

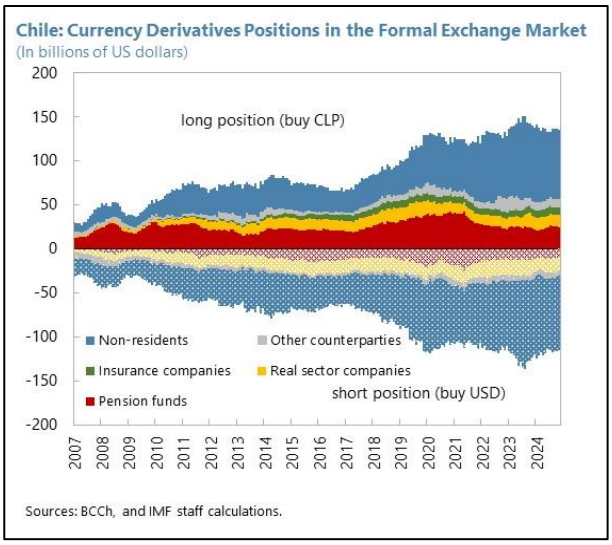


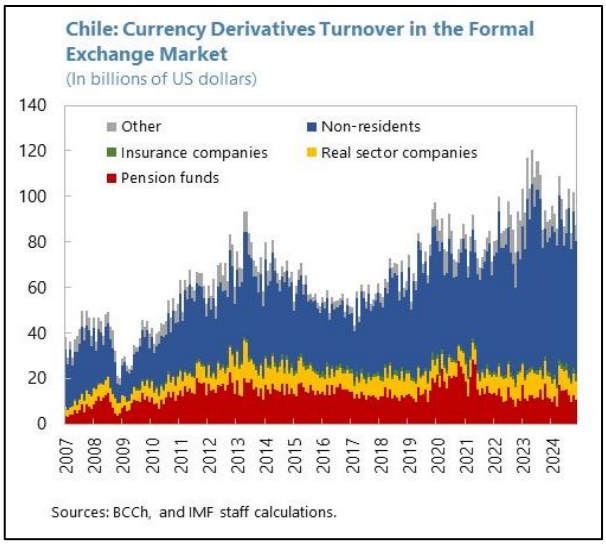
Sources: BCCh, CEIC, and IMF staff calculations.

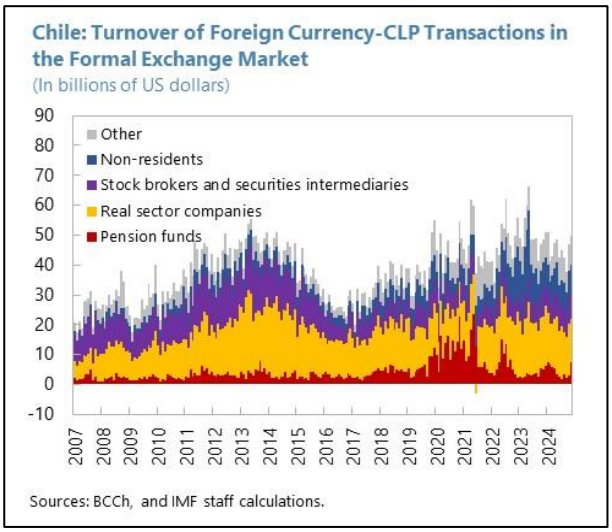


Sources: BCCh, CEIC, and IMF staff calculations.
Note: EGARCH model estimates based on daily data of equity price (IGPA).

13. In the foreign exchange market, the presence of non-residents has increased amid a declining presence of pension funds. The presence of pension funds in both gross currency derivative positions and turnover has declined, while that of foreign investors has significantly increased in both spot and derivative markets. Meanwhile, the volatility of exchange rates still is elevated, compared with the 2018 average. In this regard, the performance of pension funds as a natural offset to non-resident capital outflows has weakened. Pension fund investment rules impose strict limits on foreign investment (and hedging rules for foreign exchange risk). Consequently, in response to exchange rate movements, pension funds must rebalance their portfolios. As a result, pension funds act as shock absorbers, with this function being proportional to the transaction volume required and ultimately the size of the pension fund assets (IMF 2023). Increased volatility may imply a weakening of this cushioning mechanism.[19]







[19] An article titled "The Exchange Rate and Foreign Investment Limits for Pension Funds" and Box II.2 in the BCCh's 2007H2 FSR examine the impact of the limits on pension fund investment on the FX market. Box IV.1 in the BCCh's 2008H1 FSR discusses Chilean pension funds' exchange rate risk hedging.

Sensitivity of Local Financial Variables to Global Risk

14. One can assess empirically the implications of shallower financial depth on the resilience of financial markets against external stress. In particular, the responses of local financial variables to an increase in global financial stress are estimated using daily local projection models. Specifically, the following time series model is estimated:

$$y_{t+h} - y_{t-1} = \alpha_{t+h} + \beta_{t+h}\, GFS_t + \gamma_{t+h} X_{t-1} + \varepsilon_{t+h} \quad for\ h = 0, \dots, 10$$

where $y_{t+h} - y_{t-1}$ represents the cumulative daily changes of each financial variable from t-1 to t+h. The model is estimated separately for sovereign bond spreads, corporate bond spreads, equity prices, exchange rates, onshore spreads, and the local stress index for sovereign bond and exchange rate markets. The latter is constructed by the BCCh based on volatility, spreads, liquidity indicators, and flows in the market (the BCCh's 2020H2 FSR). The variable y_t on day t is the level, except for equity prices (log-level). α_{t+h} indicates the constant, GFS_t represens the global financial stress index, developed by the Office of Financial Research (OFR) in the U.S., and X_{t-1} consists of a set of control variables, specifically, the one period lag of dependent variable ($y_{t-1} - y_{t-2}$) and the lag of the global financial stress index (GFS_{t-1}). By including these variables, the impact of the past local financial conditions and the influence of the past global financial stresses are controlled, making the estimate of β_{t+h} the estimated cumulative response of the dependent variable to a (historical) one standard deviation increase in global financial stress from t-1 to t, where the increase is comparable to the bottom-peak of the index during the Euro debt crisis.[20] The sample period covers daily data from January 2000 to July 2024, or the longest available period within that timeframe, and the models are estimated separately for the responses before September 2019 and after October 2019, i.e. the separation of the sample periods are based on the start of the 2019 social unrest. The reason for this separation is that the social unrest is considered the initial event that affected the financial markets [21], in a series of events such as the Covid-19 pandemic and pension fund withdrawals, i.e., the starting point of regime changes in the local financial markets. This also allows us to use a larger number of observations for estimation with smaller samples (during and post-pandemic periods). In this regard, Annex III examines the robustness of the results with respect to the separation of the samples. The standard errors are corrected for heteroskedasticity and autocorrelation (HAC estimators). Then, the charts present the estimated responses along with 90 percent confidence intervals for a one standard deviation increase in global financial stress.

[20] The bottom peaks during the subprime mortgage crisis, the global financial crisis (GFC), the Euro debt crisis, and the pandemic are about 3, 5, 1, and 3 standard deviations of the index (from January 2000 to July 2024), respectively. In interpreting this estimate, it encompasses not only the direct impact of global financial stress but also the effects of the endogenous responses of other local financial variables on the dependent variable.

[21] The social unrest is considered to have deteriorated market sentiment, serving as a wake-up call for traditional investors who were previously comfortable investing in the domestic market to reallocate their assets toward global markets.

15. Local financial variables appear to have become more sensitive to global financial stress.[22] Compared to (pre-social unrest and) pre-pandemic periods, the responses have tended to increase in sovereign bond spreads, corporate bond spreads, equity prices, and exchange rates. In particular, the differences in sovereign bond spreads and equity prices are statistically significant at the 10 percent level. Additionally, responses in exchange rates have also increased compared to pre-pandemic periods, while the results for onshore spreads are mixed. As a result, the local financial market stress index has also been more strongly heightened in response to a one standard deviation increase in the global financial stress index. These results are broadly robust to different separation periods, sample periods for the pre-pandemic periods, and the number of lags for control variables (Annex III).

16. The authorities are taking steps to restore financial market depth, strengthen crisis response capabilities, and enhance the resilience of the markets. The proposed pension fund reform includes an increase in the pension contribution rate, specifically from 10 to 16 percent, and the authorities have recently imposed limits on frequent transfers between different types of funds, to reduce the need to hold excessive precautionary liquidity.[23] Furthermore, the Fintech Law allows for providing new financial products such as Mini-bonds.[24] As part of a resilience approach, the Financial Market Resilience Law is being implemented. The Law aims to increase the depth of the interbank repo market by providing legal certainty to market participants involved in repo operations, with the BCCh currently preparing regulations (2024H2 FSR). It also enables the BCCh to provide liquidity to non-bank financial entities, including systemic credit unions and financial market infrastructures, and establishes a framework under which the BCCh may exceptionally offer repos to the non-banks in the event of systemic financial stress. Furthermore, it enhances the CMF's regulatory powers to impose liquidity buffer requirements on mutual funds and intends to facilitate internationalization of the Chilean peso by simplifying the procedure for obtaining a Tax Identification Number for CLP accounts held by non-residents. Additionally, the BCCh is implementing a self-securitization scheme to increase the supply of collateral instruments for financial transactions. And the primary market maker system for sovereign bonds, aimed at enhancing liquidity in secondary markets, is currently in the implementation phase. Moreover, the current implementation of the Basel III capital and liquidity requirements, including the counter-cyclical capital buffers for banks (currently 0.5 percent of risk-weighted assets, with plans to gradually increase to a 1 percent neutral level), aims at strengthening the resilience of the financial sector by building buffers against market stress.

[22] This result, highlighting the correlation between shallower market depth and higher sensitivity to external stress, is consistent with the findings in Box I.1 of the BCCh's 2024H2 FSR, which indicate that funding costs (10-year interest rates) tend to rise in response to increasing geopolitical risks in countries with shallower market depths.

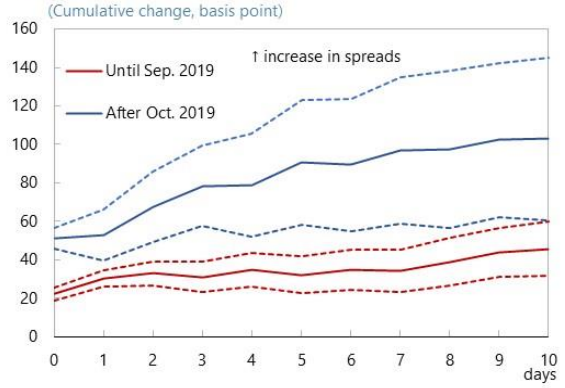
[23] Box V.1 in the BCCh's 2020H1 FSR highlights the risks associated with the impact of financial advisory services on significant pension fund movements and the increased preference of pension funds for liquid assets as a precautionary measure.

[24] Mini-bonds are unsecured bonds sold by companies to individuals or institutions, referred to as "mini" due to their smaller issue size compared to the minimum required for bonds in institutional capital markets.

Figure 2. Responses of Local Financial Variables to Global Financial Stress

Chile: Responses of Sovereign Bond Spread to Global Financial Stress Index

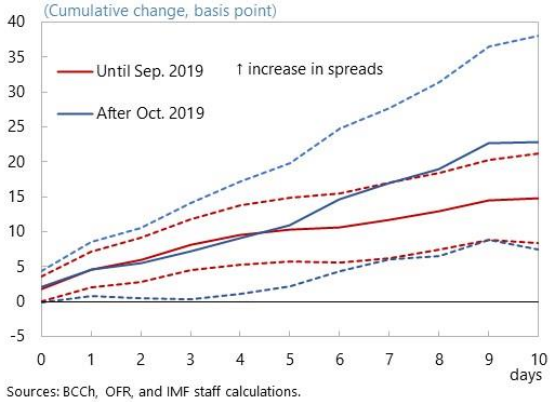
(Cumulative change, basis point)



Sources: BCCh, JP Morgan, OFR, and IMF staff calculations.
Note: The bold and dotted lines represent estimates and 10-90 percentiles, respectively, with standard errors based on HAC estimators. "Sovereign bond spread" refers to EMBI. The sample periods are January 2000 to July 2024.

Chile: Responses of Corporate Bond Spread to Global Financial Stress Index

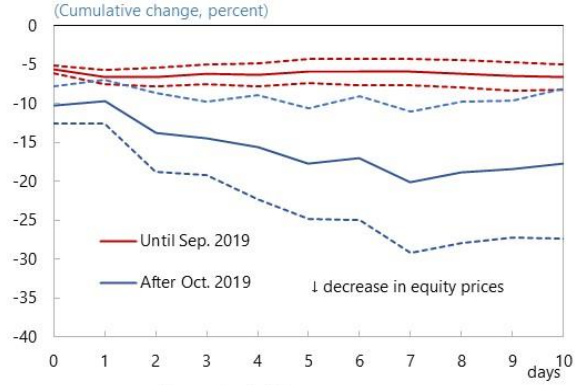
(Cumulative change, basis point)



Sources: BCCh, OFR, and IMF staff calculations.
Note: The bold and dotted lines represent estimates and 10-90 percentiles, respectively, with standard errors based on HAC estimators. The sample periods are January 2008 to May 2023 due to data limitations. "Corporate bond spread" is the simple average of AA and A bank and corporate bond spreads.

Chile: Responses of Equity Price to Global Financial Stress Index

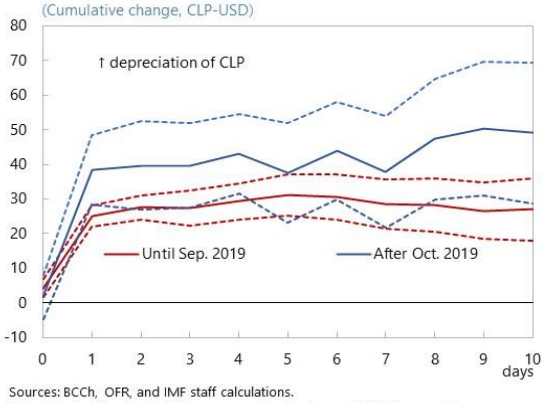
(Cumulative change, percent)



Sources: CEIC, OFR, and IMF staff calculations.
Note: The bold and dotted lines represent estimates and 10-90 percentiles, respectively, with standard errors based on HAC estimators. The sample periods are January 2000 to July 2024. "Equity price" represents the IGPA general index.

Chile: Responses of Exchange Rate to Global Financial Stress Index

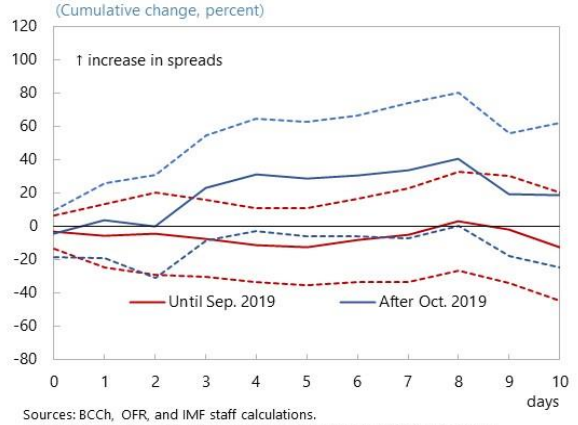
(Cumulative change, CLP-USD)



Sources: BCCh, OFR, and IMF staff calculations.
Note: The bold and dotted lines represent estimates and 10-90 percentiles, respectively, with standard errors based on HAC estimators. The sample periods are January 2000 to July 2024.

Chile: Responses of On Shore Spread to Global Financial Stress Index

(Cumulative change, percent)

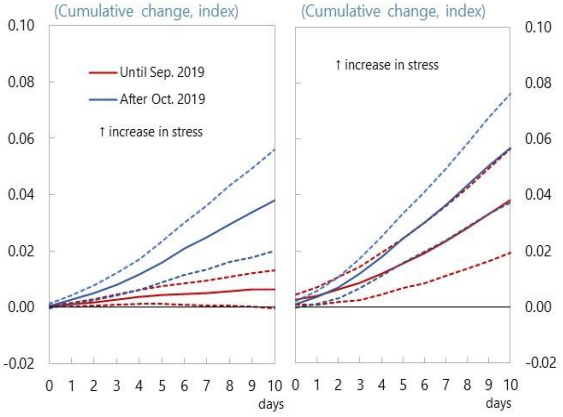


Sources: BCCh, OFR, and IMF staff calculations.
Note: The bold and dotted lines represent estimates and 10-90 percentiles, respectively, with standard errors based on HAC estimators. The sample periods are January 2000 to July 2024.

Chile: Responses of Local Stress Index to Global Financial Stress Index

Sovereign Bonds (Cumulative change, index)

Exchange Rate (Cumulative change, index)



Sources: BCCh, OFR, and IMF staff calculations.
Note: The bold and dotted lines represent estimates and 10-90 percentiles, respectively, with standard errors based on HAC estimators. The sample periods are January 2000 to July 2024.

Box 1. Sign-Restriction VAR Analysis on Bond Issuance

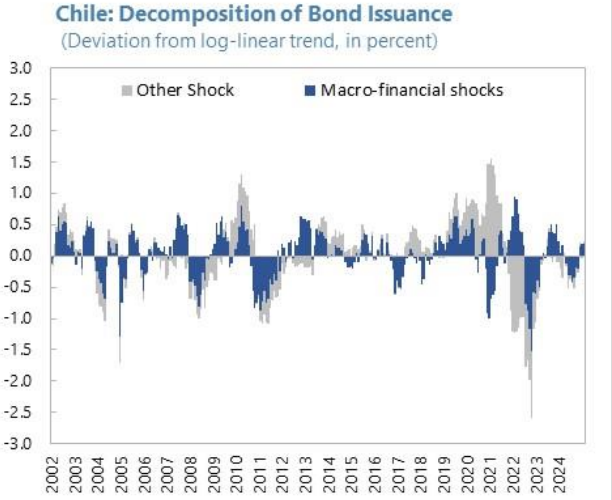
The factors influencing developments in bond issuance in the primary market can be disentangled in an empirical exercise. A historical decomposition of bond issuance using a Bayesian Vector Autoregression (VAR) model is conducted, with an identification strategy based on sign restrictions. Specifically, the deviation from the log-linear trend of the 12-month moving averages of the monthly total issuance of corporate and bank bonds in the Chilean capital market (percent) is analyzed.[1] The model includes three additional variables: GDP growth (year-on-year changes in IMACEC, percent), CPI inflation (year-on-year changes, percent), and the monetary policy rate (percent)[2], with four lags. Three types of shocks are identified: (i) a demand shock that positively affects GDP, inflation, the policy rate, and bond issuance; (ii) a supply shock that positively affects GDP and bond issuance but negatively affects inflation; and (iii) a monetary policy (MP) shock that negatively affects GDP, inflation, and bond issuance while positively affecting policy rates. It is assumed that GDP and bond issuance react with the same sign, as an increase in investment (GDP) leads to a greater supply of bonds. The remaining shocks capture a variety of factors, including the impact of diminished pension fund assets for both decreased demands and higher funding costs for issuers. The sample for estimation runs from January 2001 to June 2024.

Sign Restrictions for the Baysian VAR model

	GDP	Inflation	Policy Rate	Bond Issuance
Demand shock	+	+	+	+
Supply shock	+	-	?	+
MP shock	-	-	+	-
Other shocks	?	?	?	?

Note: "+" and "-" represent positve and negative responses, respectively. "?" indicate no restriction.

The estimation results suggest that pension fund withdrawals had a negative impact on bond issuance during the pandemic, with no sign of pent-up demand after that. "Macro-financial shocks" represents the net of the contributions of demand, supply, and monetary policy shocks. Although the macro-financial shocks in the bond issuance market explained most of the decline during the GFC, they could not account for the decrease in issuance after the pandemic. Since then, "other shock" has not contributed to bond issuance in either direction, which is consistent with the observation that pension fund assets relative to GDP have recovered only gradually, rather than strongly rebounding.



Sources: BCCh, and IMF staff calculations.
Note: Based on the estimated Bayesian VAR model with four period lags (sample periods Jan 2001- June 2024). Bond issuance in the UF.

1/ Given that issuances in Chilean pesos and US dollars are limited and quite volatile, this analysis focuses on debt denominated in UF, which accounts for approximately 85 percent of total issuance in the sample. The data is sourced from the CMF.

2/ While longer-term rates are more relevant to bond issuance, this analysis uses the monetary policy rate because identifying economic and monetary policy shocks based on sign restrictions is widely accepted in the macroeconomic literature, whereas identifying shocks to longer-term rates is more challenging. Note that when monetary policy rates are replaced with long-term (10-year) interest rates in UF terms, the estimation results for the contributions of the "macro-financial shocks" and "other shock" remain broadly unchanged.

D. Risk Assessment and Policy Recommendations

17. Pension fund withdrawals, higher public debt, and the BCCh's liquidity injections during the pandemic have reshaped the Chilean financial network. In the context of reduced demand for local bonds, large non-financial corporations and the government relied more on offshore markets and foreign investors for issuance during the pandemic. An increase in retail deposits from pension fund withdrawals and central bank liquidity narrowed banks' wholesale funding channels, such as MMF deposits and bank bonds. Additionally, banks' exposure to sovereign bonds has increased, but the sovereign-bank nexus remains lower than regional peers and part of the increase might be temporary as it was partly driven by the collateral switching for the FCIC unwinding process that ended in July 2024.

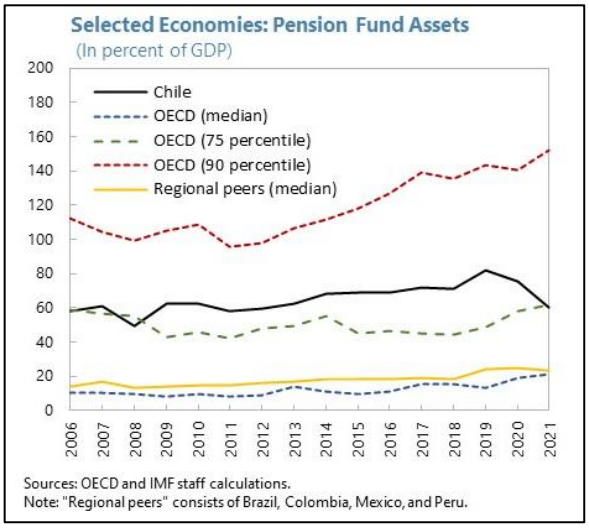
18. The dilution of local market depth following pension fund withdrawals has made the market more sensitive to external financial stress. Local financial variables are estimated to have become more responsive to global financial stress. The estimate is based on the entire period since late 2019 and does not account for variations in sensitivity over that time.

19. Restoring the size of pension funds and their ability to invest in relatively illiquid assets will help restore financial market depth and rebuild the resilience against external shocks. Further pension fund withdrawals should be avoided. The proposed increase in the pension contribution rate would help accelerate the rebuilding of market sizes. Moreover, recent regulatory changes imposing limits on frequent transfers between different fund types are a development that enhances pension funds' ability to invest in assets with lower liquidity.

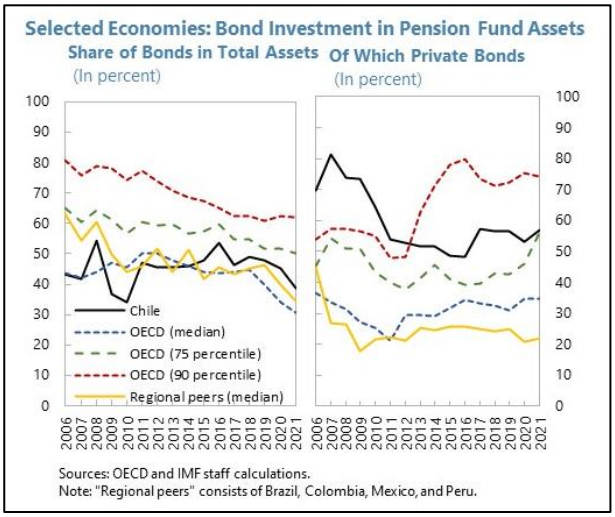
20. Given the heightened sensitivity, it is crucial to strengthen the market's resilience and the authorities' crisis response capabilities. It is particularly important to implement the Financial Market Resilience Law smoothly to develop the interbank repo market, enhance the BCCh's ability to respond to financial distress situations, and strengthen the mutual fund liquidity management framework. Facilitaing internationalization of Chilean peso through the implementation of the Law could also enhance the resilience by providing diverse counterparty options and deepening the Chilean peso's role in cross-border transactions to reduce dependence on foreign currency funding.

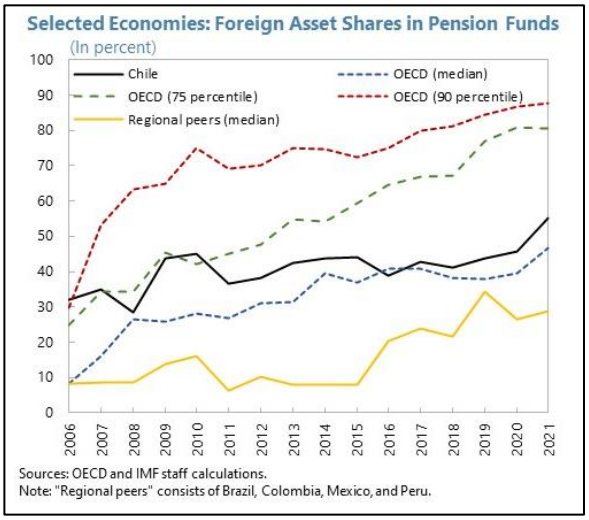
Annex I. Chilean Pension Funds

1. Chile has a large pension fund sector, although its size has recently declined. Until 2019, the ratio of pension fund assets to GDP was increasing, reaching around 80 percent, which is significantly higher than the median of regional and OECD peers (approximately 20 percent). However, following the pension fund withdrawals, this ratio has dropped to around 60 percent. While this level is still high, it is comparable to the 75th percentile of OECD peers.



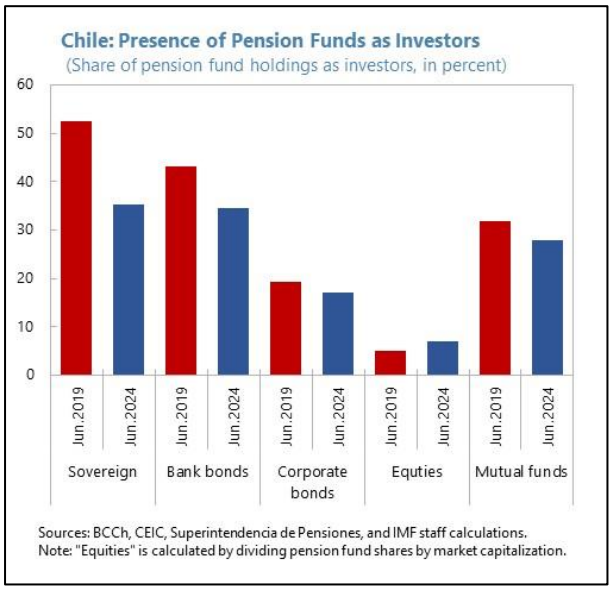
2. Chilean pension funds have primarily invested in private domestic bonds, although they have also been increasing their foreign investments.[1] The share of bonds in pension fund assets in Chile is similar to the regional and OECD medians, while the share of private bonds in total (public and private) bond investments has been higher than those medians. This indicates that Chilean pension funds have actively invested in private bonds compared to other countries. Meanwhile, the share of foreign assets in pension fund portfolios has steadily increased, in line with global trends. In terms of the level of this share, it is comparable to the median among OECD peers and significantly higher than that of regional peers.





[1] Since the creation of pension funds in 1981, investment rules have been progressively relaxed. Initially limited to fixed-income instruments, pension funds were later allowed to invest in equities, foreign assets, and other instruments including (domestic and foreign) alternative assets. Currently, Chilean pension funds can invest up to 80 percent abroad, with limits ranging from 5 to 80 percent depending on the fund profile. Pension funds were allowed to invest in alternative assets in 2016 and the investment limit have been increased (for detail, see Box IV.2 of the BCCh's 2024H1 FSR).

3. Chilean pension funds have a significant presence in various instruments within the local financial markets. These include sovereign bonds,[2] bank bonds, mutual funds, and corporate bonds, as pension funds favor long-term investments. They tend to buy-and-hold these securities. Before the pension fund withdrawals, pension funds held around half of the sovereign and bank bonds and about 20 percent of corporate bonds in the market. However, these shares declined following the withdrawals. Pension funds also have significant holdings in mutual fund investments, while their share in direct equity investments remains relatively limited.[3]



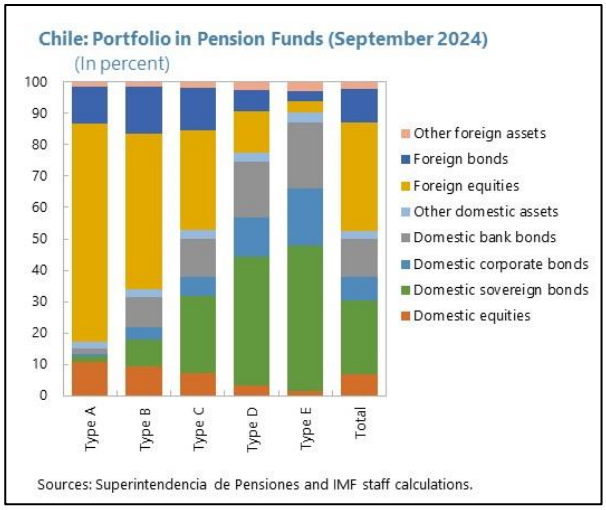
4. Chilean pension fund investors tend to shift investments across different fund types in response to macro-financial conditions, compelling pension funds to maintain adequate liquid assets to accommodate these shifts.[4] In Chile, the 2002 reform introduced five fund types (A–E) with varying exposure to variable-income assets. Specifically, type A funds primarily invest in foreign equities and are regarded as the riskiest, while type E funds mostly invest in domestic bonds and are considered the safest. A key feature of Chilean pension funds is their frequent shifts among these five types. For example, during financial distress events like the Global Financial Crisis and the pandemic, funds shifted from types A and B to types D and E, reflecting the risk aversion of pension holders. Conversely, in 2022, when bond investment performance was weak due to heightened interest rates, funds moved from types D and E to types A and B. These shifts, driven by a significant number of individual investors often guided by financial advisory firms,[5] have led pension funds to maintain ample liquidity, hampering their investment in illiquid assets. Recently, limits on these shifts have been introduced.

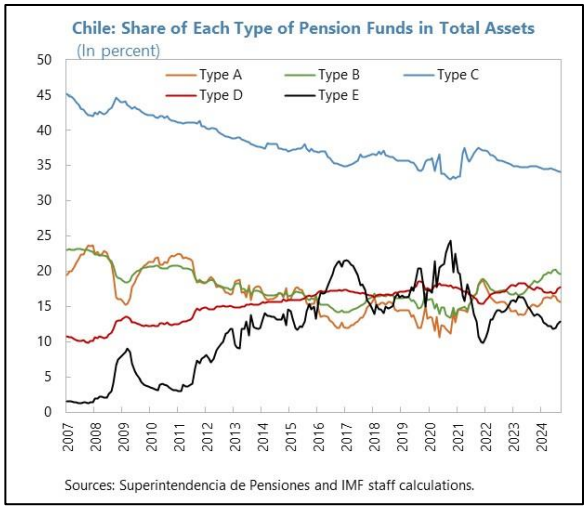
[2] Box II.1 in the BCCh's 2017H1 FSR explains the microstructure of sovereign bond market.

[3] Article in the BCCh's 2007H1 analyzes the impact of pension fund transactions on the local stock market.

[4] Box III.1 in the BCCh's 2009H2 FSR analyzes this issue and confirms that, during times of crisis, members' decisions to change funds do impact the pension funds' portfolio adjustments, while the overall portfolio adjustments continue to be determined by the decisions of the administrators.

[5] For details, see Da et al. (2016) and OECD (2020).





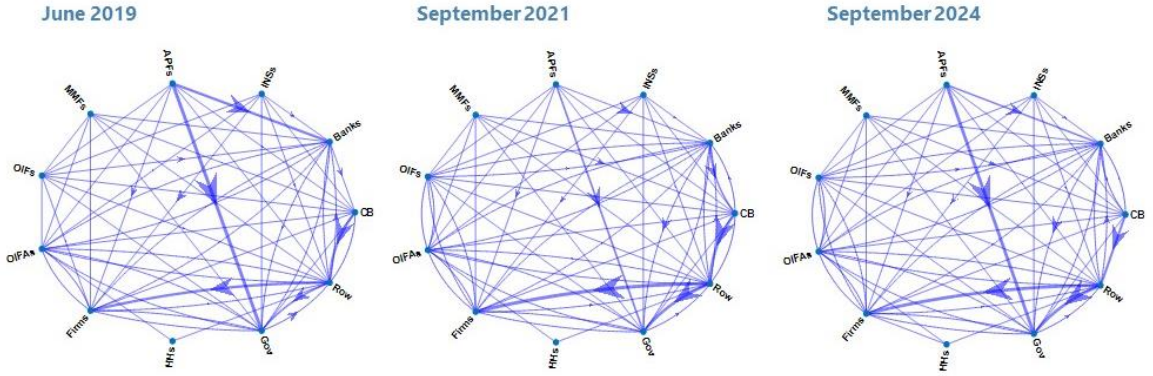
5. Pension funds' strategy to invest in longer duration has changed. After pension fund withdrawals, type E funds have lost prominence, while Chilean pension funds have recently actively used interest rate derivatives to increase in duration of their local fixed-income investments, amid smaller pension fund asset to GDP compared to the pre-pandemic. Specifically, pension funds hold long positions (receiving a fixed rate) in long-term interest rates and short positions in short-term interest rates (paying a variable rate).

Annex II. Network Analysis on Chilean Funding Structures

1. This Annex illustrates the changes in funding networks before, during, and after the pandemic, categorized by financial instrument.[1] The networks are depicted based on sector-level financial accounts, allowing for a better understanding of complex financial relationships across sectors. In terms of the chart structures, an arrow from A to B indicates that A provides liquidity to B. For debt securities and mutual funds, this means that A has purchased and holds B's debt securities or mutual fund shares. For deposits, A holds deposits with B, while in the case of loans, A has lent money to B. The thicker arrows represent stronger network links, specifically indicating the share of each network link in the total networks in terms of the monetary amount. While the observations align with Section B in the main text, the coverage of sectors is broader.

2. According to the network of debt securities, the main shifts relate to the role of pension fund and foreign investors. In particular, the liquidity provision from pension funds to the government, non-financial corporations, and banks has decreased, while liquidity provision from overseas to these sectors has increased. Moreover, the liquidity provision from other investment funds to banks and from insurers to non-financial firms has narrowed. During the pandemic, liquidity provision from the BCCh to banks increased via bank bonds purchase program (started in March 2020), and bank bonds reinvestment program (started in January 2021).[2]

Chile: Network of Debt Securities



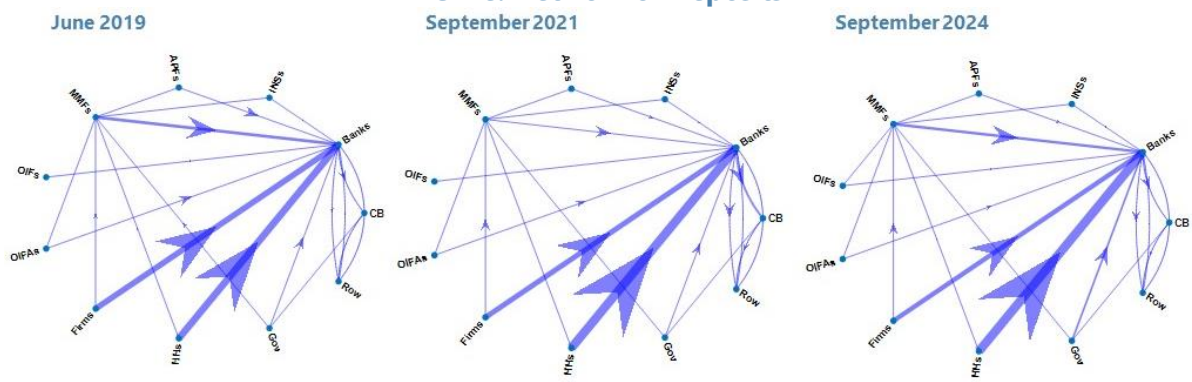
Sources: BCCh and IMF staff calculations.
Note: Based on "Flow of Funds." "INSs"=Insurers, "AFPs"=Pension funds, "OIFs"=Other investment funds, "OIFAs"=Other intermediaries and financial auxiliaries, "Firms"=Non-financial corporations, "HHs"=Households and NPISHs, "Gov"=General government, and "Row"=Rest of the world (foreign investors). Arrows indicate the direction from sources to recipients of funds. The thicker arrows represent stronger network links, specifically reflecting the share of each network link within total networks in terms of the monetary amount associated with debt securities.

3. The network of deposits indicates that households are now the primary providers of liquidity to banks. At the same time, money market funds and pension funds have become smaller liquidity providers. Additionally, while banks' deposits in the BCCh increased during the pandemic, probably mirroring the liquidity provision from the central bank such as FCIC and bank bonds

[1] Box IV.1 in the BCCh's 2021H1 FSR analyzes the interconnectedness between banks and NBFIs.

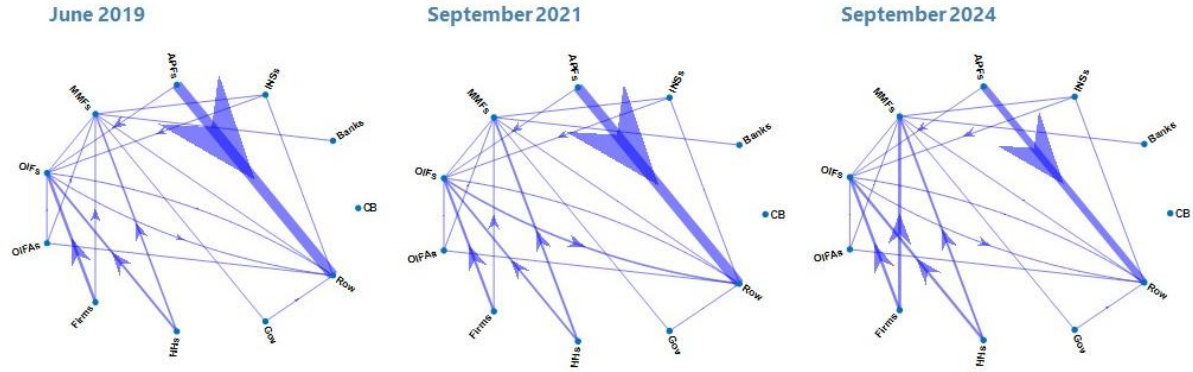
[2] For details, see exceptional measures.

purchase program, they have now decreased as part of the FCIC was unwound in April and July 2024.[3] Meanwhile, deposits from the government to banks have gradually increased since the pandemic.



Sources: BCCh and IMF staff calculations.
Note: Based on "Flow of Funds." "INSs"=Insurers, "AFPs"=Pension funds, "OIFs"=Other investment funds, "OIFAs"=Other intermediaries and financial auxiliaries, "Firms"=Non-financial corporations, "HHs"=Households and NPISHs, "Gov"=General government, and "Row"=Rest of the world (foreign investors). Arrows indicate the direction from sources to recipients of funds. The thicker arrows represent stronger network links, specifically reflecting the share of each network link within total networks in terms of the monetary amount associated with deposits.

4. The network of mutual fund investments reveals that the presence of pension funds in overseas markets has decreased, while liquidity provision from households and firms to mutual funds (MMFs and other mutual funds) has increased. Additionally, liquidity provision from other mutual funds to overseas markets has moderately increased.

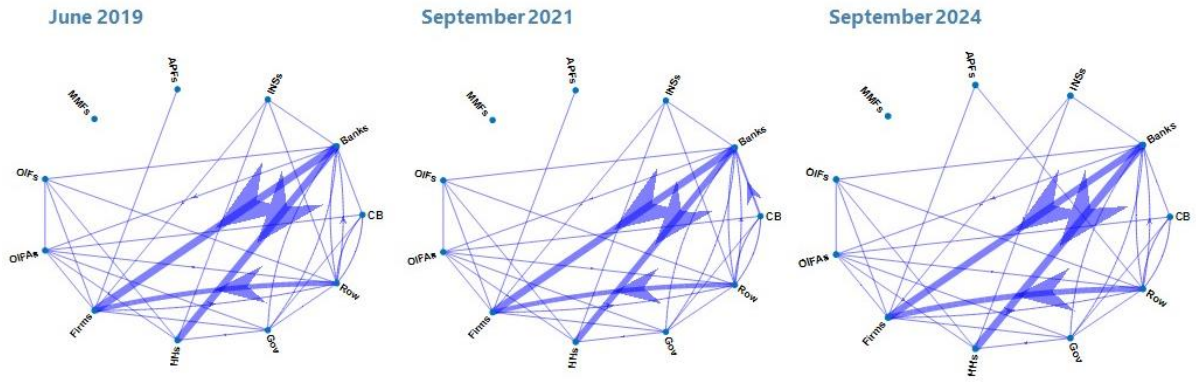


Sources: BCCh and IMF staff calculations.
Note: Based on "Flow of Funds." "INSs"=Insurers, "AFPs"=Pension funds, "OIFs"=Other investment funds, "OIFAs"=Other intermediaries and financial auxiliaries, "Firms"=Non-financial corporations, "HHs"=Households and NPISHs, "Gov"=General government, and "Row"=Rest of the world (foreign investors). Arrows indicate the direction from sources to recipients of funds. The thicker arrows represent stronger network links, specifically reflecting the share of each network link within total networks in terms of the monetary amount associated with mutual funds including MMFs.

[3] While the amount of central bank deposits from banks declined since 2021, it increased in the fourth quarter of 2023 and the first quarter of 2024, likely reflecting the banks' purchase of the liquidity deposits issued by the BCCh to facilitate repayment (announced in September 2023).

5. Finally, the network of loans indicates an increasing provision of liquidity from overseas to non-financial firms.[4] The loans from the BCCh to banks increased during the FCIC period but returned to pre-pandemic levels following the unwinding in April and July 2024.

Chile: Network of Loans



Sources: BCCh and IMF staff calculations.
Note: Based on "Flow of Funds." "INSs"=Insurers, "AFPs"=Pension funds, "OIFs"=Other investment funds, "OIFAs"=Other intermediaries and financial auxiliaries, "Firms"=Non-financial corporations, "HHs"=Households and NPISHs, "Gov"=General government, and "Row"=Rest of the world (foreign investors). Arrows indicate the direction from sources to recipients of funds. The thicker arrows represent stronger network links, specifically reflecting the share of each network link within total networks in terms of the monetary amount associated with loans.

[4] According to BIS locational banking statistics, loans from the United States, Spain, and Hong Kong SAR have increased from Q2 2019 to Q2 2024.

Annex III. Robustness of the Analysis on Sensitivity of Local Financial Variables to Global Risk

1. This Annex examines the robustness of the local projection analysis regarding the sensitivity of local financial variables to global financial stress in the main text. Specifically, this Annex explores the robustness from three perspectives. First, the separation period between pre-pandemic and during-and-post-pandemic periods. Although the results in the main text separate samples at the end of September 2019, to ensure a larger number of observations for estimation in the during-and-post-pandemic periods, other separation points are considered. Second, the estimation period for the pre-pandemic period. The analysis in the main text uses all available samples to ensure a sufficient number of observations, which might cause the estimation results to heavily depend on sensitivity from a long time ago (e.g., 15 years ago), such as sensitivity to the GFC. Therefore, this Annex estimates the sensitivity by focusing on more recent periods. Finally, the adequacy of control variables will be examined.

2. The results are broadly robust to different separation periods, sample periods for the pre-pandemic periods, and the number of lags for control variables. Specifically, results of the robustness checks are as follows.

- ***Separation of sample periods.*** If we separate the samples at the end of January, i.e., exactly before and after the pandemic, the results remain almost unchanged from those in the main text. Even if the samples are separated at the end of May 2020 (the first round of pension fund withdrawals), the results remain broadly robust, especially regarding exchange rates and equity prices, while the difference between the pre-pandemic and the during-and-post-pandemic periods become less striking for sovereign and corporate bond spreads. Note that, because the sample periods for the during-and-post-pandemic periods are only about four years long for corporate bonds and five years long for other variables, shifting the separation period to the end of May 2020 reduces the sample size by approximately 25 percent for corporate bonds and 20 percent for the other variables, respectively.

- ***Sample periods for pre-pandemic periods.*** If the sample period for the pre-pandemic period starts from 2014, the estimation results remain broadly unchanged or even become sharper. Specifically, the response of corporate bond spreads becomes significantly less sensitive in the pre-pandemic period, leading to a sizable difference in sensitivity between the pre-pandemic and the during- and post-pandemic periods. Moreover, the response of exchange rates becomes less persistent in the pre-pandemic period, resulting in a wider difference in sensitivity five days after the stress date. Consistent with this, the difference in the local stress index for exchange rates also widens.

- ***Control variables.*** The estimation results remain quite robust even when the number of lagged control variables is extended from one period to multiple periods, i.e. ($y_{t-2} - y_{t-3}$, $y_{t-3} - y_{t-4}$,…, GFS_{t-2}, GFS_{t-3},…) are added to X_{t-1}.

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