CHILE

TECHNICAL ASSISTANCE REPORT– FISCAL CONSIDERATIONS IN MANAGING STABILIZATION FUNDS

July 2023

This technical assistance report on Chile was prepared by a staff team of the International Monetary Fund. It is based on the information available at the time it was completed in June 2023.

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Fiscal Considerations in Managing Stabilization Funds

June 2023

Prepared By

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ABBREVIATIONS AND ACRONYMS

AFC	Fiscal Advisory Council
BCC	Central Bank of Chile
BCRP	Central Bank of Peru
CFA	Autonomous Fiscal Council (*Consejo Fiscal Autónomo)*
CG	Central Government
ESSF / FEES (Spanish)	Economic and Social Stabilization Fund
DIPRES	Budget Directorate (*Dirección de Presupuestos)*
FAD	Fiscal Affairs Department
FAE	Colombia Savings and Stabilization Fund
FAEP	Colombia Oil Savings and Stabilization Fund
FAR	Regional Support Fund, Chile
FCL	Flexible Credit Line
FEF	Peru Fiscal Stabilization Fund
FEIEF	Mexico Federal Entities Revenues Stabilization Fund
FEIP	Mexico Budget Revenues Stabilization Fund
FMP	Mexican Petroleum Fund
FRL	Fiscal Responsibility Law
GFC	Global Financial Crisis
GFSM	Government Finance Statistics Manual
GPFG	Norway Government Pension Fund Global
IFP	Public Finance Report *(Informe de Gestión Financiera del Estado)*
MFU	Macro Fiscal Unit
MoF / MoH (Spanish)	Ministry of Finance / *Ministerio de Hacienda*
MTFF	Medium-Term Fiscal Framework
NFPS	Nonfinancial Public Sector
OATP	Other assets of the Public Treasury
PPPs	Public-Private Partnerships
PRF	Pension Reserve Fund
SALM	Sovereign Asset and Liability Management
SWF	Sovereign wealth funds
TAC	Fund for Diagnosis and High Cost Treatment
VAR	Vector autoregression
WEO	World Economic Outlook

PREFACE

In response to a request from the Minister of Finance, a Fiscal Affairs Department (FAD) mission conducted hybrid discussions from March 17-23, 2023 to provide technical advice on (i) international experience on the use of stabilization funds in the context of fiscal rules, (ii) identifying macroeconomic tail risks facing Chile and discussing its fiscal implications, and (iii) estimating a prudent buffer in the stabilization fund to account for tail risks. The mission was led by W. Raphael Lam and comprised Yongquan Cao, Andresa Lagerborg, and Alessandro Scipioni (all FAD).

At the Ministry of Finance (MoF), the mission held discussions with Ms. Carola Moreno, Mr. Andrés Sansone, Mr. Francisco Vergara and their team. The mission also met with Mr. Jorge Rodríguez and Mr. David Chernin of the Autonomous Fiscal Council (*Consejo Fiscal Autónomo,* CFA), Mr. José De Gregorio, Mr. Rodrigo Valdés, Mr. Rodrigo Caputo, Mr. Felix Ordonez, and Members of the Finance Committee of the Sovereign Wealth Fund in Chile.

The mission expresses its gratitude for the excellent cooperation it received from all government officials and for the candid discussions. Particular thanks are due to Carola Moreno, Andrés Sansone, Francisco Vergara, and Maria José Díaz of the Ministry of Finance for their insights and excellent cooperation before and during the mission. The mission also received administrative support and research assistance from Claudia Díaz Saldías, Andre Vásquez, and Victoria Haver (all FAD).

EXECUTIVE SUMMARY

Chile's strong fiscal framework has served the country well. The fiscal rule has helped insulate the budgets from volatility in resource prices and economic activity. The sovereign wealth fund (SWF)—the Economic and Social Stabilization Fund (ESSF) and the Pension Reserve Fund (PRF)—was established to encourage savings over time and has provided buffers for stabilizing the economy. During the pandemic, Chile has appropriately used the ESSF to provide swift and impactful support to protect people. Recent efforts to upgrade the fiscal framework—adopt a medium-term fiscal path, formalize a prudent debt ceiling, and introduce an escape clause—can further safeguard fiscal sustainability.

Cross-country experience shows that an adequate buffer in stabilization fund can facilitate governments' response to shocks. Evidence from other countries suggests that rigid mechanisms for accumulation or withdrawal from stabilization funds could lead to sub-optimal risk and liquidity management. In that context, Chile should continue to maintain flexibility on the in/outflows of the stabilization fund, which will help respond to fiscal needs in times of crises. The investment policy of Chile's SWF should continue to align with its objectives and be integrated to the sovereign asset-liability management strategy. Periodic review of investment strategies, accounting for the government risk preference and investment horizon, is appropriate.

Rebuilding fiscal buffers in a holistic framework can help Chile better manage tail risks. Chile's very strong economic fundamentals and institutions have contributed to the resilience of the economy. Nonetheless, it continues to face macro tail risks—events with low probability but severe adverse impact—including a significant global slowdown and tightening of global financial conditions, severe terms of trade shocks, major natural disasters, and rising social discontents and political gridlocks. These tail events could trigger an abrupt rise in fiscal needs and/or constrain the ability to access capital markets, suggesting a need to have a holistic framework to manage these tail risks, considering the overall policy mix. Building fiscal buffers by reducing structural deficits gradually can help foster economic resilience. In that context, Chile should advance in strengthening fiscal risk management.

Our quantitative models suggest that keeping debt well below the current prudent ceiling on central government gross debt at 45 percent of GDP is appropriate. This complements the structural balance rule and gives space for governments to respond to adverse shocks without undermining medium-term debt sustainability. Additional fiscal buffers may be required given the uncertainty surrounding the safe debt level and the desire to stay resilient in tail events. The prudent buffers will depend on the size and persistence of the shocks, the risk tolerance of the society, and the counter-cyclical fiscal responses during crises.

The government can reduce public debt to give space for future borrowing in adverse times or accumulate liquid assets to rebuild fiscal buffers. Maintaining certain liquid assets can be optimal in face of tail risks because borrowing costs could rise sharply amid a tightening of global financing conditions. The use of assets in the stabilization fund provides time to recalibrate, and if needed, implement appropriate fiscal responses to ensure macro stability.

Illustrative simulations suggest a liquid asset in the ESSF equivalent to 5-7 percent of GDP can help mitigate liquidity needs stemming from tail risks. Nonetheless, self-insurance in liquid assets entails opportunity costs and involves a social choice. In designing the composition of fiscal buffers, an integrated asset-liability framework can optimize different risk-mitigation instruments.

Fiscal efforts to achieve a broadly balanced fiscal position are an important way to rebuild buffers. A gradual adjustment to reduce structural deficits over the medium term can help accumulate liquid assets in the ESSF, while stabilizing debt below the prudent debt ceiling. Stronger than expected revenues (including from natural resources) can be saved. The government should avoid borrowing more debt at high interest rates to save assets in the stabilization fund. Overall, the pace of building buffers should be tailored to economic conditions.

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Table of Key Recommendations

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Report	Main Recommendations	Short- (ST) or Medium-term (MT)
Section II	• Continue to maintain a high degree of flexibility on the in/outflows with the ESSF.	ST
	• Continue to align the investment policies of SWF with its objectives and pursue its integration to the sovereign asset-liability management strategy.	ST
	• Conduct periodic review of investment strategies, accounting for the government's risk preference and investment horizon.	MT
Section III	• Continue to strengthen fiscal risk management such as developing an integrated sovereign asset and liability management framework.	ST
Section IV	• Rebuild fiscal buffers over the medium term by gradual fiscal efforts; adjust the pace according to the risk tolerance of the society and the nature of shocks; avoid accumulating liquidity buffers through borrowings.	MT
	• Apply an integrated asset-liability management to consider jointly the gross debt level and the size of prudent liquidity buffers of ESSF.	ST
	○ Maintain the current prudent ceiling on central government gross debt at 45 percent of GDP. Avoid setting dual anchors on government debt ceiling and a floor on stabilization fund in the Fiscal Responsibility Law.	ST
	○ Given the current debt level and the expected fiscal adjustments, a prudent range of liquidity buffers in the ESSF of 5-7 percent of GDP over the medium term can help respond to adverse shocks.	MT

Note: 'Short-term' indicates the recommendations can be completed by end-2023, while 'medium-term' indicates recommendations to be implemented over the next 2-3 years.

I. INTRODUCTION

1.   **Chile is undergoing a necessary transition towards sustainable growth in a difficult external environment.** During the pandemic, the authorities adopted multi-pronged policy responses, including drawing down the stabilization funds, to protect people (Figure 1). The effective and sizable policy response has helped the economy to recover quickly from the fallout of the pandemic, but macroeconomic imbalances built up. The authorities have tightened monetary and fiscal policies to preserve macroeconomic stability and rebuild buffers.

2.   **The government has taken strong efforts in upgrading the fiscal frameworks.** It has enhanced the structural balance rule, adopted a medium-term fiscal path, introduced a prudent debt ceiling, and disclosed the sensitivity of fiscal projections to macro shocks (IMF 2023). It has also refined the investment strategy of the sovereign wealth funds. Further enhancement to strengthen the analysis of government balance sheet and fiscal risks, as well as broaden the role of the Autonomous Fiscal Council (AFC) would be welcome.

3.   **Chile will need to rebuild fiscal buffers gradually as it faces downside risks.** During the pandemic, the government used sovereign wealth funds to finance additional expenditure (Figure 2). Looking forward, there is a need to rebuild buffers for future shocks, including macro tail risks—events with low probability but high impact. These risks include a sharp and significant deterioration of terms of trade in commodity prices and major natural disasters (e.g., the major earthquake in 2010). Domestic risks stem mostly from high inflation and social discontent over high prices or slow social progress. Very strong economic fundamentals and institutions underpin Chile's resilience. In addition, the Flexible Credit Line (FCL) arrangement provides additional precautionary external buffers and insurance against tail risks.

4.   **The report provides an overview of international experience on stabilization funds and estimates the size of prudent buffers for Chile.** It will discuss key macroeconomic tail events facing Chile and their fiscal implications, including the possibility of a rise in spending needs and a disruption in market access to meet financing needs. The discussion will inform ways to manage such risks. The report then uses quantitative tools to assess the prudent public debt level and size of stabilization funds, which will inform efforts to build fiscal buffers.

Figure 1. Recent Fiscal Developments in Chile (Percent of GDP)
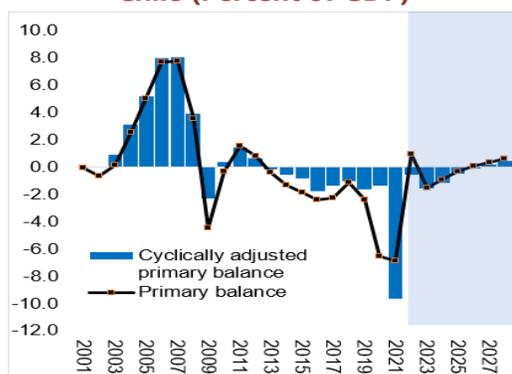
Figure 2. Sovereign Wealth Fund in Chile (Percent of GDP)
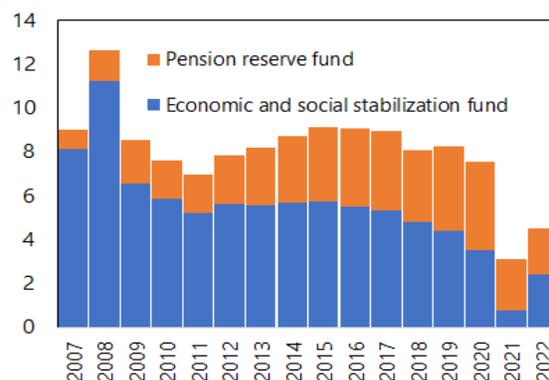
Sources: National authorities, Haver, IMF World Economic Outlook, and IMF staff calculations.

II. INTERNATIONAL EXPERIENCE IN STABILIZATION FUNDS

A.   Background: Chile Economic Stabilization Funds

5.   Chile has already implemented sovereign wealth funds as part of the fiscal framework. The Economic and Social Stabilization fund is used to accumulate funds during good times and use the funds when the budget is in deficit (Box 1), based on a structural balance rule, which was strengthened recently to include a debt ceiling to strengthen fiscal sustainability (Annex I). Furthermore, the funds' governance and assets management strategy match high standards practices. However, the fund assets declined significantly during the pandemic, calling for new measures to replenish them to face future crises, to avoid going back to a path of gradual diminution of the funds' resources, as was the case already in the years preceding the pandemic.

Box 1. Sovereign Wealth Funds in Chile

Chile maintains two types of funds in its sovereign wealth fund. It consists of a stabilization fund to insulate the budget from volatile commodity prices, as well as a saving fund that seeks to accumulate resources on a longer time-horizon.

- *Economic and Social Stabilization Fund (ESSF)*. The purpose of the ESSF is to finance fiscal deficits and to stabilize primary expenditures arising from low growth and/or low copper prices. The ESSF can be used for debt service and contributions to the PRF. Essentially, assets in the ESSF can help reduce the need for issuing debt by financing the budget shortfall originated from economic downturns and volatile natural resource prices. At the end of 2022, the ESSF showed a balance of USD 7.5 billion (2.4 percent of GDP).

- *The Pension Reserve Fund (PRF)* was created to support the State guarantee for pension and disability solidarity benefits. Following the approval of the Universal Guaranteed Pension in 2022 (Law n.21.419 from 2022), the PRF complements the funding of fiscal obligations from the Universal Guaranteed Pension and the disability solidarity pillar. The PRF balance reached USD 6.5 billion (2.1 percent of GDP) as of end-2022.

A new fund, dedicated to natural disasters, was recently created in 2022 with the project law (Indications 116-370) that modified the 2006 Fiscal Responsibility Law (FRL). The Fund for Natural Disasters (FODEN) has the objective to finance expenses and fiscal initiatives related to natural disasters. The fund will receive contributions from the sale of assets, cash surpluses from the Public Treasury, and from the ESSF, up to a total amount of USD 1 billion (0.3 percent of 2022 GDP).

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6.   During the pandemic, the government appropriately utilized the stabilization fund to provide fiscal support. In 2020-21, withdrawals from ESSF totaled USD 10.2 billion to help finance the sizable support households and firms, under the Economic Emergency Plan (in compliance with decree 21.225/2020). The government also used USD 3 billion from the PRF to support the solidarity pillar of pension for vulnerable households. Annual contributions to the PRF were temporarily suspended during 2020-21. The withdrawals of assets from the ESSF and PRF, together with the temporary suspension of contributions, allowed the government to

flexibly provide support and finance deficits (Figures 3 and 4). In light of the economic recovery in 2022, budget transfers of USD 6 billion to the ESSF and USD 0.5 billion to the PRF were made (the latter in compliance with the requirement of 0.2 percent of GDP under the FRL).

Figure 3. Fiscal Balances and Public Debt (in percent of GDP or potential GDP)

Government debt to GDP, left scale
Overall deficits to GDP, right scale
Cyclically adjusted primary balance (percent of potential GDP)
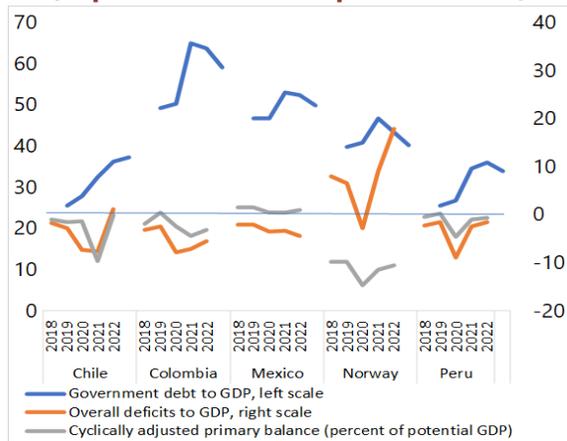
Figure 4. Sovereign Wealth Funds, 2018-22 (in USD million)
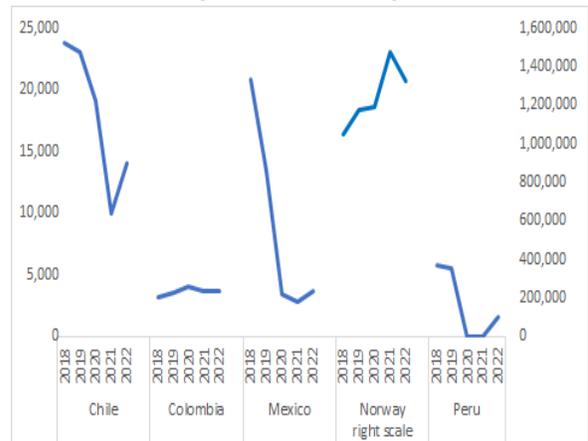
Sources: IMF World Economic Outlook database.

7.   Provisions for contributions to and withdrawals from the funds are well established in the law, and those for the ESSF are closely linked to the fiscal rules (Law n. 20.128 from 2006).

- For the PRF, it receives a minimum annual contribution of 0.2 percent of GDP of the previous year, according to the FRL. Additional contributions to the PRF are possible if the effective fiscal surplus is high, with a maximum contribution of 0.5 percent of GDP in the previous year. This aims at endowing the PRF with increasing reserves over time, with an overall cap set at 900 million *Unidad de Fomento* (approximately 39 billion USD). On the uses of funds in the PRF, the FRL stipulates that the funds are earmarked to the solidarity spending on pensions. Since 2022, funds withdrawals shall not exceed 0.1 percent of previous year GDP.

- The in/outflows of the ESSF are more flexible and adhere to international best practices (similar to Norway; see below). The funds can be used to finance the budget deficit, to complement fiscal revenues to finance public expenditures, and to service public debt or contribute to the PRF.[1] However, persistent deficits during 2015-19 have contributed to a gradual decline in ESSF assets even before the pandemic. On the inflows to the ESSF, any positive balance in the budget after deducting the PRF contributions and the payment of public debt and advances made the year before will be transferred to the ESSF, with the year-end balance carried forward to next year. The ESSF is closely linked to the structural balance

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[1] Article 4 of the Ministry of Finance Decree DFL 1 of 2006 (Decreto con Fuerza de Ley 1).

fiscal rules.[2] By having flexibility on the use of ESSF to finance budget deficits, Chile's fiscal rules appropriately set the operational limits on fiscal aggregates to promote fiscal discipline rather than restricting the means of financing (inflows to or outflows from the ESSF) (Ossowski and Halland 2016).

- Resources in the newly established disaster risk fund FODEN can be only used when the government declares a state of emergency that the natural disaster costs represent at least 0.5 percent of total budget expenses of the current year. Resources will be exclusively used to finance expenses derived from the event, and possible insurance premiums or hedging subscribed by Chile against natural disasters.

8.   The Ministry of Finance has the primary responsibility in managing the SWFs. Under the FRL, the Minister has the authority to decide how the funds are invested: directly by the Treasury (part of Ministry of Finance), or by the Central Bank of Chile (BCCh) or private asset managers. At present, the SWFs are managed by the central bank and private asset managers under an investment policy and framework established in the Fiscal Responsibility Law. A Financial Committee acts as an external advisory board to provide advice on the long-term investment policy of the SWFs. The ESSF and PRF governance and disclosures match high standards, with regular publications of reports. The authorities recently undertook a review of the ESSF investment strategy.

9.   The asset allocations between the ESSF and the PRF are different, considering their different objectives and investment horizons. Considering the liquidity needs, the ESSF requires investing in low-risk highly liquid instruments. The primary emphasis is on liquidity for easy access to funds at short notice. The fund is mainly invested in sovereign (or multilateral agencies) bonds. In contrast, the PRF has a longer investment horizon, considering the fund acts more like a saving fund, such that its assets are invested in equities but with a conservative approach including a majority of investments in highly-rated issuers. During 2020-22, returns on the SWF in Chile were subject to large volatility and experienced negative returns as in SWFs of other countries.

10.   It would be important to preserve the key stabilization role of the ESSF and its strong links to the fiscal rule and further improvements can help rebuild buffers. The ESSF is closely linked to the structural budget balance rule and has followed international best practices to have a flexible inflow and outflow mechanisms. Otherwise, rigid restrictions may complicate the operations in the SWF, making it less flexible for the government to respond swiftly and adequately in times of crises. This is particularly important when restrictions on the contribution are in the form of a fixed amount or percentage of revenues or output independent

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[2] Under the structural balance rule, cyclically-adjusted government revenues are considered to determine budget expenditures. Consequently, fiscal spending is detached from cyclical fluctuations in the copper prices and economy, in which the volatile copper prices generate large volatility of fiscal revenues. The FRL requires the government to announce its targets for the structural budget balance for the next four years. If the country registers a structural deficit, the ESSF funds can be withdrawn to cover budget expenditures provided the structural balance rule is complied.

of economic conditions. At the same time, despite the compliance with the structural budget balance rule relative to the last established limit for most of the years over the last decade and a half, government debt continued to rise while assets in SWFs declined gradually, raising the question if the structural balance targets had imparted sufficient constraint on fiscal policy.

B. Relevant International Experience on Stabilization and Saving Funds

11.   Experience from other countries provides insights on the role and size of stabilization funds in the context of fiscal rules. Four country cases—Colombia, Mexico, Norway, and Peru—are particularly relevant because they are commodity exporters and adopt fiscal rules. Three of them are from the same region and share similar economic and political constraints. Consequently, other countries have set up sovereign wealth funds, such as Saudi Arabia, Kazakhstan, Russia, and Azerbaijan, each with large assets under management (relative to their GDP), or commodity exporters in Sub-Sahara Africa, where fiscal institutions are less developed. These were excluded from this brief overview on stabilization funds.[3]

12.   The discussion focuses on several aspects of sovereign wealth funds and fiscal stabilization. Our focus is on the linkages of stabilization funds with the budgets in a rules-based fiscal framework. There are other types of sovereign wealth funds such as those established for development, economic diversification, or intergenerational equity purposes. In that regard, this section focuses on a few aspects, such as the in/out flows mechanism between the fund and the government budgets, linkages with the fiscal rules, purposes of the funds and the extent to which they contributed to fiscal stabilization, and investment allocations (Table 1).

Norway

13.   Norway has a sovereign wealth fund comprising two separate investment funds. The objective of the Government Pension Fund is to save current revenues for future pension benefits. Thus, fiscal sustainability and budget revenues stabilization are not the only objectives of this fund, which aims at building wealth for future generations. The most renowned of the two investment funds is the Government Pension Fund Global (GPFG) which has accumulated over the years a total wealth of almost USD 1.3 trillion, equivalent to 256 percent of GDP as of end-2022. This intergenerational fund preserves revenues of oil resources that might deplete eventually in the future. The other fund is the Government Pension Fund Norway (GPFN), which saves surpluses of the national insurance scheme and its assets reached USD 32.7 billion, or 6 percent of 2022 GDP.

14.   All the State's net oil revenues in Norway from the budget enter the GPFG, which finances flexibly the non-oil budget deficit without rigid in/outflow rules between the fund and the budgets. This desirable feature is similar to the arrangement in Chile. Norway has consistently sustained budget surpluses over the last two decades (except for 2020), with net inflows to the

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[3] The report does not include Mongolia as a case study, although it is a commodity exporter and has adopted fiscal rules on the structural deficit and debt level similar to Chile's fiscal rules because Mongolia faces challenges in the implementation and compliance of its fiscal rules.

GPFG accumulating over time. Norway's structural balance rule requires the nonoil structural deficit to reflect the long-run expected return of the GPFG (at 3 percent since 2017).[4] While budget surpluses have contributed to this accumulation of funds along the years, it is important to note that the GPFG investment policy and high share of equity in the asset allocation (around 70% of total portfolio) has generated more than 50 percent of the current wealth of the Fund.

Mexico

15. **Mexico integrates three funds to insulate budget revenues from the volatility of oil prices and economic activity.** In addition to the stabilization purpose, one fund also acts as a reserve fund. If government revenues are below the projections in the initial budget, stabilization funds can be withdrawn to compensate for the shortfall.

- *The Mexican Petroleum Fund (FMP)* receives all government revenues derived from oil production-sharing contracts, oil licenses and royalties. The legislation (Law on Budget and Fiscal Responsibility 2006) stipulates that the FMP must transfer each year to the Federal Treasury an amount equivalent to 4.7 percent of GDP to cover budget expenses. The FMP also transfers funds to the two other stabilization funds in predetermined amount and to cover several minor expenses. Any remaining amount is saved in the reserve fund of the FMP. In 2022, the FMP received about USD 33 billion oil revenues (or 2.6 percent of GDP)[5], which was transferred to the Federal Treasury (the threshold of 4.7 percent of GDP has rarely been reached) and the other two funds. The reserve fund balance was USD 1.2 billion (0.1 percent of GDP) as of end 2022.

- *The Budget Revenues Stabilization Fund (FEIP)* compensates the reduction in oil and non-oil tax revenues to maintain an adequate level of expenditure in the federal budget. Following a recent revision of regulations, the funding sources increased from four to six, namely transfers from the FMP (equivalent to 2.2 percent of estimated government oil revenues), 65 percent of the excess oil revenues if any (after all the expenses associated to oil revenues were completed), a share of the net profit of the Central Bank if any, a share of net profit from oil hedging derivatives made by the Federal Treasury, and income from government financial assets and profits recorded from debt service operations. The FEIP can be withdrawn to finance the government budget deficit. The Fund balance was USD 1.3 billion at end-2022 (0.1 percent of GDP).

- *The Federal Entities Revenues Stabilization Fund (FEIEF)* has an objective to compensate for a possible drop in the federal entities revenues and, thereby, support local governments finances. The main source of funding is the transfer from the FMP (0.8 percent of estimated

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[4] The fiscal rule on budget balance requires the non-oil structural deficit of the central government to reflect the expected return of the Government Pension Fund Global (GPFG), which was estimated to be 3 percent in the long run (previously 4 percent before 2017). The fiscal guidelines allow deviations from the rule over the business cycle in both directions. Hence, large movements in the values of the fund are smoothed over several years, based on a forward-looking assessment of the real rate of return in GPFG.

[5] The amount did not include the national oil company revenues, PEMEX, of USD 43.5 billion.

oil revenues). In that context, the FEIEF works as a stabilization fund similar to the FEIP. Its balance was USD 1.08 billion at end-2022 (0.1 percent of GDP).

16.   The Mexican federal government has a budget balance rule and an expenditure ceiling. The limit on structural current expenditure (primary current expenditure excluding automatic stabilizers on pension benefits) must be projected for the next five years (Article 16 of 2006 Fiscal Responsibility Law). However, the rules were not sufficient to contain the persistent deficits in the last decade and, therefore, the stabilization funds were continuously weakened, as mentioned in the previous paragraph.

17.   During the pandemic, fiscal support was modest and stabilization funds were withdrawn, leaving limited balances in the funds. Oil revenues received by the FMP fell to USD 10 billion in 2020 and USD 18 billion in 2021 (0.9 and 1.4 percent of GDP, respectively). Resources in all three stabilization funds were tapped to finance the budget deficits. The FEIP declined from USD 8.4 billion in 2019 (0.7 percent of GDP) to 476 million in 2020, while the balance of the FEIEF fell from USD 3.76 billion to 1.75 billion in the same period. The reserve fund of the FMP remains stable over time because its purpose is to act as a cash buffer for the FMP operations and not to finance deficits. The stabilization funds were not fully sufficient to cover additional expenditures during the pandemic, partly because of the overall deficits in years prior to the pandemic had already led to a gradual withdrawal from those funds (Figures 3 and 4).

18.   Assets in the FMP are held in a Trust Fund managed by the Central Bank under a conservative investment policy set by the MoF. The assets are mostly in foreign sovereign bills/bonds (81 percent), with the rest on high credit ratings corporate bonds (10 percent) and inflation-linked instruments (Table 1).

Peru

19.   Peru's Fiscal Stabilization Fund (FEF) aims at ensuring fiscal balance or surplus in the medium-term.[6] The objective of the fund is to accumulate fiscal surpluses and allow only moderate, non-recurring fiscal deficits in periods of low growth. Thus, the fund shares similarities with Chile's ESSF in objectives, but Peru's fund resources are restrictive in its uses, primarily to cover the targeted programs for alleviating poverty and debt amortization. The contribution and withdrawal mechanism is more rigid: if current revenues in the budget decrease by more than 0.3 percent of GDP compared to the 3-year moving average, the transfer to the budget is limited up to 40 percent of the FEF balance. Contributions to the FEF come from budget surpluses, and two prescribed transfers (at 10 percent of value) related to government assets sales and initial proceeds from granting mining licenses.

20.   Peru has multiple fiscal rules, setting limits on the budget balance and a ceiling on expenditure and debt. Although the Fiscal Responsibility and Transparency law (law 30009, 2013) authorizes a maximum deficit of 1 percent of GDP, the persistent deficits have led to a

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[6] The Law 27245 on fiscal prudence and transparency (2006) creates the FEF and sets as a general principle the State must ensure budget equilibrium or surplus.

gradual depletion of the FEF. The FEF registered an extraordinary outflow during the pandemic (about USD 5.5 billion) for emergency expenditure and almost depleted its balances (Emergency Decree n.051-2020). Consequently, the government had to borrow to replenish the FEF balance to its current level at 0.6 percent of GDP in 2022.

21.   The Central Bank of Peru (BCRP) manages the FEF in line with a conservative investment policy set by the Ministry of Finance. Considering the purposes of the FEF and its relatively low balance, short-term highly-liquid assets (term deposits in USD with a maturity of less than 2 months) constitute almost all (99 percent) of the asset allocation (Table 1).

Colombia

22.   Colombia maintains several sovereign wealth funds, each with different objectives and sources of funding. Three main funds experienced significant financial difficulties during the pandemic and one of them was liquidated in 2020.

   a. *The Fund of Savings and Fiscal and Macroeconomic Stabilization.* It is a budget account to foster macro-fiscal stabilization (Article 15 in Law 1473 of 2011). Resources come from budget surpluses, investment returns, and extraordinary contributions determined by the government. The fund can be withdrawn (subject to a limit) for debt amortization, counter-cyclical or extraordinary expenses.[7] In any case, withdrawals cannot exceed 10 percent of the fund balance in the previous year.

   b. *The Savings and Stabilization Fund (FAE)* is governed by the law on the Royalties General System (Law 1530 of 2012). It receives royalties from non-renewable resources and directs to regions to smooth their investment. When actual savings are higher than budgeted, the difference is transferred to the FAE up to a maximum difference of 30 percent. If savings are lower than budget amount, funds can be withdrawn up to 10 percent of the balance in the previous year. Assets in FAE reached USD 3.6 billion (1.1 percent of GDP) in 2022 and have been managed by the Central Bank and private asset managers with investment in foreign sovereign and corporate bonds.

   c. *The Oil Savings and Stabilization Fund (FAEP).* It has an objective to smooth oil revenues in the budget by (i) transferring the excess revenues (compared to a long-term structural oil prices determined by a panel of experts); or (ii) withdrawing resources in the FAE to the budget if oil prices are below the estimated long-term price. Considering Colombia's recurrent deficits in the last decade, the FAEP was liquidated during the pandemic.

23.   Fiscal rules in Colombia consist of a structural primary balance target and a debt anchor. The objective of the fiscal rule is to ensure fiscal sustainability by maintaining a prudent

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[7] The law specifies that the government can execute expenditure programs, as a countercyclical policy, when the projected growth in a year is less than two percentage points or will be below the long-run real economic growth rate, provided that a negative output gap is also projected.

debt level at 55 percent of GDP and limiting the structural primary deficit.[8] Higher debt implies tighter structural primary balance.

24.   During the pandemic, the government suspended the fiscal rule and utilized the liquid assets. In the years preceding the pandemic, Colombia registered recurrent deficits, which contributed to a rising debt ratio. The Colombian sovereign funds were drawn down and one of the funds was liquidated (Figures 3 and 4).

Table 1. International Experience of Stabilization and Saving Funds in the Context of Fiscal Rules

Country and Name of the Sovereign Wealth Funds	Size (USD mn; percent of GDP in parentheses)		Type of Funds	Purposes or Objectives	Fiscal Rules and Fiscal Anchors and Targets	Withdrawal rules/mechanism	Accumulation mechanism
	Pre-pandemic (end -2019)	Latest (end-2022)					
Chile							
Economic and Social Stabilization Fund (ESSF)	12,233 (4.4)	7,514 (2.4)	Stabilizatio n Fund	Created to finance fiscal deficits arising from low growth and/or low copper prices with the aim to stabilize primary expenditures.	· *Structural budget balance rule* with structural balance targets over the medium term. · *Debt rule* with a prudent debt ceiling at 45 percent of GDP.	Flexible. Resources can be used at any time to complement fiscal revenues to finance public expenditures; for amortization of public debt; financing the annual contributions to the PRF	Receives any positive remaining balance after deducting the PRF contributions from the budget surplus, net of the amortization of public debt and estimated advance made in the previous year.
Pension Reserve Fund (PRF)	10,812 (3.9)	6,475 (2.1)	Saving Fund	Established to back the state guarantee for pension and disability solidarity benefits. Since 2022, used for funding obligations from the Universal Guaranteed Pension and Disability.		Withdrawals from PRF cannot exceed 0.1 percent of the previous year GDP	Receives a minimum annual contribution of 0.2 percent of previous year GDP; if the overall fiscal surplus exceeds 0.2 percent of GDP, the PRF receives a contribution equivalent to the surplus, up to a maximum of 0.5 percent of GDP.
Colombia							
Fund of Savings and Fiscal and Macroeconomic Stabilization	n.a.	n.a.	Budget Account	Contribute to the fiscal and macroeconomic stability of the country. Fiscal stabilization objective, by countercyclical spending in case of deficit and savings in case of surpluses	· A *structural primary balance rule*; target set for the next five years; · A new *debt rule* with a debt limit of 71 percent of GDP and a medium-term debt anchor at 55 percent of GDP.	In case of budget deficit, a withdrawal amount of maximum 10% of the previous year Fund balance at 31 December is authorized	Possible to transfer anytime budget surpluses; Income from the Fund are automatically kept in the Fund; Ad-hoc extraordinary funds anytime
Savings and Stabilization Fund (FAE)	3,576 (1.1)	3,628 (1.1)	Saving Fund	Save non-renewable resources revenues destined to the regions which have a limited capacity to spend and, thereby, stabilize investments over time.		If savings are lower than budget savings, withdrawals are authorized up to 10% of previous year Fund balance.	If savings are higher than budget savings, contributions to the Fund are authorized up to maximum of 30% of the difference.
Mexico							
Mexican Petroleum Fund (FMP)	1,191 (0.1)	1,218 (0.1)	Reserve Fund	Save excess of oil revenues in good times for difficult fiscal years	· A *budget balance rule* with an anchor of a balanced budget. · An *expenditure rule* sets the ceiling on the structural current expenditures.	The reserve fund can be used to complete required outflows when oil revenues are not sufficient	Receives government oil revenues and channels the funds to the budget and other funds. If inflows are higher than outflows, difference is kept in the reserve fund
Budget Revenues Stabilization Fund (FEIP)	8,401 (0.7)	1,342 (0.1)	Stabilizatio n Fund	Created to stabilize oil and non-oil tax revenues of the Government and, therefore, maintain an adequate level of budget expenditure.		If oil and non-oil revenues are below the budgeted revenues	The main source is the transfer from FMP but can receive shares of the excessive oil revenue, profit from central bank operations and treasury debt operations
Federal Entities Revenues Stabilization Fund (FEIEF)	3,764 (0.3)	1,081 (0.1)	Stabilizatio n Fund	Compensate for a possible drop in the federal entities revenues due to a drop in government revenues		When federal entities revenues are below budgeted revenues	The main source is the transfer from FMP
Norway							
Government Pension Fund Global (GPFG)	1,145,882 (283)	1,291,392 (256)	Saving Fund	Intergenerational Fund. Build financial wealth for future generations	· A *structural budget balance rule* that sets the anchor on the nonoil structural balance.	Flexible; budget deficits are financed through withdrawals from the fund. The fiscal discipline is enforced through fiscal rules on structural balance.	Budget surplus are automatically transferred to the fund.
Government Pension Fund Norway (GPFN)	30,669 (7.6)	32,729 (6.5)	Saving Fund	Saving Fund from surplus of the national insurance scheme		Deficits from the national insurance scheme are financed through withdrawals from the fund.	Surplus from the national insurance scheme are automatically transferred to the fund.
Peru							
Fiscal Stabilization Fund (FEF)	5,472 (2.4)	1,506 (0.6)	Stabilizatio n Fund	Ensure fiscal balance or surplus in the medium term, by accumulating fiscal surpluses in favorable periods and by allowing moderate and non-recurring fiscal deficits in periods of lower growth.	· A *budget balance rule*; · An *expenditure rule* limit; · A *debt rule* that sets a medium-term anchor.	If current revenues decrease more than 0,3% of GDP (compared to a 3-year average) but not more than 40% of Fund balance; If the amount accumulated in the Fund cross 4% of GDP, the excess can be used for debt amortization; In extraordinary situations	Budget surplus can be transferred to the Fund; 10% cash of government assets sales in case of asset sale; 10% cash of initial payment for licenses in case of new license

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[8] The fiscal rule was modified in 2021 (Title V of the Law n. 2155 of 2021). Net debt refers to gross debt minus financial assets. The formula linking the structural net primary balance to the debt anchor is the following: $SNPB = 0.2 + 0.1 (DN_{t-1} - 55)$ if $D_{t-1} < 70$ or 1.8 if $DN_{t-1} > 70$. The structural net primary balance refers to the net primary balance (the budget balance excluding interest payments and interest income) excluding the effect of one-off transactions, oil cycle and economic cycle. The law stipulates that the government must define minimum targets for the structural net primary balance for the next four years, which must be respected regardless of debt level.

Country and Name of the Sovereign Wealth Funds	Size (USD mn; percent of GDP in parentheses)		Activities Financed by the Funds	Asset allocation	Fund managers	Asset returns 2022 [1]	Operations during the pandemic
	Pre-pandemic (end -2019)	Latest (end-2022)					
Chile							
Economic and Social Stabilization Fund (ESSF)	12,233 (4.4)	7,514 (2.4)	· Finance budget deficit · Amortize public debt · Cover contributions to the PRF	96% sovereign bonds; 4% inflation-linked bonds.	Central Bank of Chile	-11.4%	Withdrawal of US$4,090 million in 2020 and US$6,197 million in 2021 to help finance the national budget, complied with the Economic Emergency Plan, and financed the external debt service.
Pension Reserve Fund (PRF)	10,812 (3.9)	6,475 (2.1)	Finance the solidarity pension benefits	34% sovereign bonds 30% equities 13% corporate bonds 8% inflation-linked bonds 15% others	Central Bank of Chile and private asset managers	-16.0%	Increased withdrawals from the PRF in 2020 and 2021 to fund the expenditures associated with the Solidarity Pillar. A total of US$2,960 million was withdrawn from the PRF in 2021. Temporary suspension of contributions to the PRF in 2020 and 2021.
Colombia							
Fund of Savings and Fiscal and Macroeconomic Stabilization	n.a.	n.a.	· Debt amortization · Extraordinary expenditures · Countercyclical expenses				Information not publicly available.
Savings and Stabilization Fund (FAE)	3,576 (1.1)	3,628 (1.1)	Regions and Public entities investments	53% sovereign bonds 34% corporate bonds 9% equities 4% Others	Banrep and private asset managers	-12.5%	A total amount of approximately US$ 400 million was withdrawn
Mexico							
Mexican Petroleum Fund (FMP)	1,191 (0.1)	1,218 (0.1)	· Transfer to budget for expenses · Transfer to FEIP · Transfer to FEIEF · Other minor expenses	81% sovereign bonds 10% corporate bonds 9% others	Trust Fund managed by the Banco Mexico	-4.3%	The reserve fund acts as a cash buffer for the FMP operations. This buffer is relatively stable over time.
Budget Revenues Stabilization Fund (FEIP)	8,401 (0.7)	1,342 (0.1)	Finance budget deficit	Excess liquidity held in deposits	TESOFE	N/A	FEIP was drawn down to finance expenditures during the pandemic (from a balance of USD 8.4 billion in 2019 to USD 476 million in 2020).
Federal Entities Revenues Stabilization Fund (FEIEF)	3,764 (0.3)	1,081 (0.1)	Support local government finances	Excess liquidity held in deposits	TESOFE	N/A	FEIEF resources were reduced to half of the closing balance of 2019 and used to support local government finances.
Norway							
Government Pension Fund Global (GPFG)	1,145,882 (283)	1,291,392 (256)	Saving current revenues for future pensions benefits	Approximately: 70% equity 25% bonds; 4% real estate 1% green infrastructure	Norges Bank Investment Management	-14.1%	Withdrawal of US$31,701 million in 2020 and US$13,839 million in 2021 to finance budget deficit.
Government Pension Fund Norway (GPFN)	30,669 (7.6)	32,729 (6.5)		60% equity; 40% fixed income (only in Scandinavian region).	Folketry-gdfondet	-5.4%	
Peru							
Fiscal Stabilization Fund (FEF)	5,472 (2.4)	1,506 (0.6)	· Finance budget deficit but resources have to be used primarily to cover the costs of targeted programs aimed at alleviating poverty · Debt amortization	More than 99% of the assets of the FEF are invested in term deposits in the BCRP between 31 - 60 days (in USD)	BCRP	2.8%	In 2020, FEF was completely emptied (US$5.4 billions) due to an extraordinary situation (COVID-19). A budget transfer was made to the FEF in 2022 (US$ 1.49 billions).

Sources: National authorities and IMF staff compilations.

Note: [1] Figures for asset returns are based on national authorities' publications and are not directly comparable across countries given potential differences in valuation methodologies. Moreover, asset returns may not account for changes in exchange rate. For example, annual asset returns in Chile and Peru are expressed in terms of US dollar, while asset returns in Norway are based on a basket of currencies in the asset portfolio.

C. Lessons on Stabilization Funds from International Experience

25.   Lessons from international experience suggests that a strong commitment to fiscal discipline is needed for SWFs to work well. International experience shows that countries running recurrent, large budget deficits often draw down their funds. In many cases, insufficient fiscal discipline eventually depletes the fund and governments resort to borrowing to maintain a modest fund balance. Ideally, fiscal discipline is imposed directly at the budget level with well-designed fiscal rules or medium-term fiscal frameworks (MTFFs), while funds help save for the future or stabilize spending during adverse shocks. Funds should not try to 'discipline' spending by forcibly removing resources from the budget. They should be well integrated to the budget process. They should foster transparency and public understanding without imposing rigidities or potential inefficiencies on asset-liability management.

26.   The accumulation and withdrawal mechanisms of stabilization funds should not have rigid rules. Imposing a rigid mechanism such as a fixed annual amount or a constant percentage of receipts to transfer to or withdraw from the stabilization fund will often interfere with optimal risk and liquidity management. For example, a rigid rule that requires a fixed amount of contributions to the fund would force the government to borrow to save even when there is a budget deficit. Transfers to a stabilization fund should be under a flexible mechanism, such as transferring the amount exceeding the structural budget balance under the fiscal rule (Norway, Chile). This will allow the government to accumulate automatically during good times and use the funds to attenuate the adverse impact on budget in difficult times. However, the flexibility should not be misused to finance regular spending within a fiscal year based on short-term fiscal cash requirements beyond macroeconomic stabilization. It is therefore important to ensure the in/outflow mechanism of the stabilization funds to align with the fiscal rules and be integrated with the fiscal policy framework. The desired size of liquidity buffers can be estimated based on a risk-based approach where the government considers the level of buffers that is adequate to protect spending and avoid abrupt cuts during adverse shocks.

27.   To allow for an optimal response to crises, governments should build in a high degree of flexibility in the use of stabilization funds, alongside with a well-defined escape clause in the fiscal rules. A key lesson from the COVID-19 pandemic is that countries should have adequate means and buffers to respond to extraordinary adversity. In the context of fiscal rules, governments should allow a temporary suspension—ideally through an activation of escape clause—of fiscal rules during crises. They can establish clear guidance on the escape clause and a credible path to return to compliance with the rules under a correction mechanism. At the same time, governments should have the flexibility to use stabilization funds, otherwise they may be forced to cut spending abruptly or borrow at times when it is very costly. While flexible use of funds could risk political abuse of the use of resources, these risks can be limited by strengthening the governance and accountability of the in/outflow mechanisms of the funds.

Although some flexibility is necessary, some forward guidance on the use of funds would help avoid market perceptions that the state intervenes in market activity.[9]

28.   The investment policy of the SWF should correspond to their objectives and align to the government's asset-liability management. On the one hand, for funds with main objectives to stabilize budget spending, assets would need to be liquid and quickly available for transfers to the budget. Hence, their investment policy should focus on financial instruments with a high credit quality and liquidity, such as foreign sovereign bonds and short-term repos and deposits. On the other hand, in the case of funds established for the purposes of savings or intergenerational equity, the investment policy can have a longer horizon and consider broader asset classes (including equities or financial instruments linked to real estates) to benefit from higher expected returns and greater diversification. In both cases, investing in foreign assets is preferred, in order not to amplify the volatility of natural resources and the overall economy and not to pose stress to the domestic financial system. Lessons from international experience also show that asset management in SWFs would benefit from autonomy. Fund managers must have clear directives from the government on investment objectives and the investment strategy to be pursued (including eligible assets, strategic asset allocation, and limits on exposure to specific risks), which should be expressly disclosed in the fund's investment policy and align with the Treasury's broader asset and liability management strategy.

D.   Recommendations

- Continue to maintain flexibility on the in/outflows with the ESSF, which can facilitate the implementation of fiscal rules.
- Continue to align the investment policies of Chile's SWF with its objectives and pursue its integration to the sovereign asset-liability management strategy. As the SWF gradually accumulates assets, periodic review of investment strategies, accounting for the government risk preference and investment horizon, will be appropriate.

III. MACRO TAIL RISKS FACING CHILE

A. Key Tail Risks and Macro-Fiscal Implications

29.   Identifying tail risks is important to calibrate prudent fiscal buffers and manage fiscal risks. This is because tail events—with low probability but high impact—could trigger large fiscal needs and an abrupt disruption in the country's access to or cost of financing.

30.   Chile has encountered some significant adverse shocks, both from the external and domestic sides. Severe events included the global financial crisis in 2008-10, volatile commodity cycles (surge between 2004 and 2013 and its reversal since 2014), and as recently the COVID-19

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[9] Similarly, ad-hoc sales of commodities licenses or government assets to replenish a sovereign fund without a predefined strategy could be perceived by markets as a state intervention to manipulate the markets and could be costly for the government.

pandemic. In last century, Chile also experienced a sharp deterioration of growth, a surge in interest rates and accompanied exchange depreciation during the Latin American crisis in the early 1980s and in the aftermath of the Asian Financial Crisis in 1998-99. On the domestic front, Chile had encountered major natural disasters, such as the 2010 earthquake, and a political turmoil in late 2019.

31.   Chile's very strong economic fundamentals and institutions have contributed to the resilience of the economy, although the country continues to face some tail risks. Government debt in Chile has remained below 40 percent of GDP, with strong credit ratings and lower spreads than other emerging markets even conditional on debt levels. Nonetheless, Chile continues to face some macroeconomic tail risks. These risks often trigger an abrupt rise in fiscal needs for more than one year and/or a temporary surge in spreads and a sharp depreciation of exchange rates for about 2-10 months (sometimes even more prolonged), thereby constraining the ability to rollover external debt in financial markets. We discuss several of them (not meant to be exhaustive), highlighting the macro-fiscal implications.

- *A significant global slowdown and tightening of global financial conditions.* Global or idiosyncratic risk factors combine to trigger a synchronized sharp global slowdown, with recessions in some countries, which could bring adverse spillovers to Chile through trade and financial channels, as seen during the Great Recession (Figures 5 and 6). At present, a miscalibration of monetary policy by major central banks could de-anchor inflation expectations and lead to a volatile financing condition. Sharp swings in real interest rates and risk premia amid global slowdowns could trigger insolvencies of financial institutions, causing market dislocations and adverse cross-border spillovers. Fiscal needs would rise to mitigate the growth slowdown, while the debt ratio and borrowing costs would surge amid tightening global financial conditions and capital outflows from a flight to quality.

- *Severe terms of trade shocks from commodities.* Major swings in terms of trade related to natural resources had occurred in Chile (Figure 5). Chile's structural balance rule aims to shield the budgets from volatility in commodity prices. But these episodes of deterioration in the terms of trade were highly correlated with global growth. For example, mining revenue fell abruptly by over 2 percentage points of GDP during the global financial crisis. Looking forward, a succession of demand fluctuations (e.g., decline in China's potential growth) and supply disruptions could lead to recurrent commodity price volatility, which could have (persistently) negative implications for revenues and output, adding pressures on fiscal balances.[10]


[10] Chile's two largest sources of volatility of government revenue are the business cycle (which determines non-mining tax revenue) and swings in the price of copper (which determines mining tax revenue). For this reason, its structural balance rule aims to correct for deviations from trend GDP output, and the cyclical variations of the international copper prices from its medium-term trend.

Figure 5. Copper Prices and Natural Resource Revenues
(US cents per pound, left scale; percent of GDP, right scale)
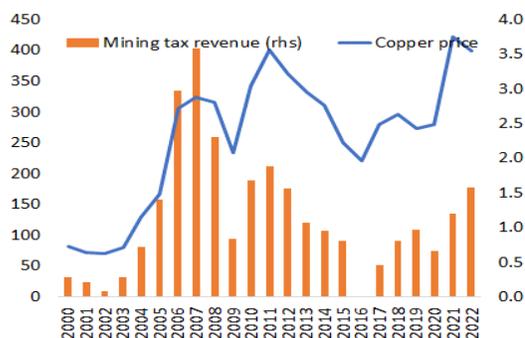
Sources: IMF staff estimates.

Figure 6. Global Uncertainty and Spreads
(Sovereign spreads, left scale basis points; exchange rate, left scale peso/USD; uncertainty index, right scale)
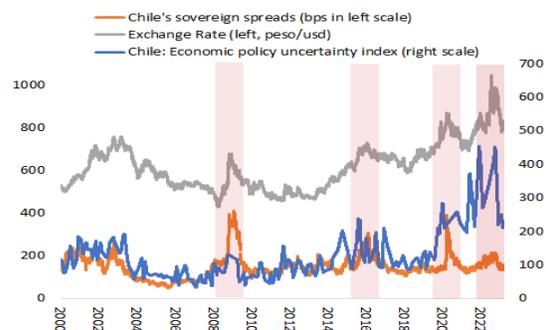
Sources: Bloomberg, Datastream, J.P. Morgan.

- *Major natural disasters.* Natural disasters entail considerable economic costs, with adverse implications for fiscal balances owing to post-disaster humanitarian relief, restoring basic infrastructure, and reconstruction needs. These crowd out other priority spending, and in some extreme cases, cause scarring effects on human capital accumulation and potential growth (Cevik and Huang 2018). Large natural disasters can raise government expenditures by an average of 15 percent and lower revenue by 10 percent over five years (Melecky and Raddatz 2011) (Figure 7). They often lead to longer-lasting loss in output (Gerling 2017). Although natural disasters in general do not affect immediately the access to capital markets, the resulting increase in debt could lead to higher borrowing costs in the near term (Klomp 2015). Chile is highly exposed to earthquakes, with costs reaching as much as 14 percent of GDP (2010 earthquake) (Figure 8).[11] In Chile, while other natural disasters, such as floods and droughts, are more recurrent, their cost has been much more contained (MOF 2018 Public Finance Report). Severe natural disasters often require large fiscal packages, although insurance sometimes covers a large share of the estimated cost. The increasing frequency and severity of natural disasters and extreme weather events from climate change would imply higher costs.

- *Epidemics.* As seen in the COVID-19 pandemic, a widespread epidemic can raise health concerns and generate a sizeable drop in output. Swift fiscal support in a matter of weeks was called for to support people and firms. In Chile, sizeable fiscal measures (at 13 percent of GDP) were announced in 2020-2021, comparable to the scale in advanced economies (Figures 9 and 10).[12] Debt rose by nearly 10 percentage points of GDP relative to pre-

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[11] Large earthquakes, defined as damages over 2 percent of GDP, have occurred 6 times in Chile since 1960 and cost an average of 6 percent of GDP. Over 1960-2019, around 15 earthquakes worldwide have caused damage in excess of 10 percent of yearly GDP. while the cost of earthquakes in other countries can provide a reference of potential costs, cross-comparability depends on the country's size and level of development.

[12] In 2022, additional fiscal support of 1.3 percent of GDP was part of its Inclusive Recovery Plan (IMF, 2022).

pandemic levels. Financing conditions initially tightened (in March 2020) but subsequently became accommodative after the easing from governments globally.

**Figure 7. Frequency of Major Earthquakes and Damage
(Number of events since 1996; percent of GDP on horizontal axis)**

Damage in comparable countries:
Indonesia in 2004: 10 percent
Türkiye in 2022: 4 percent
Japan in 2011: 3 percent

Damage (Percent of GDP)
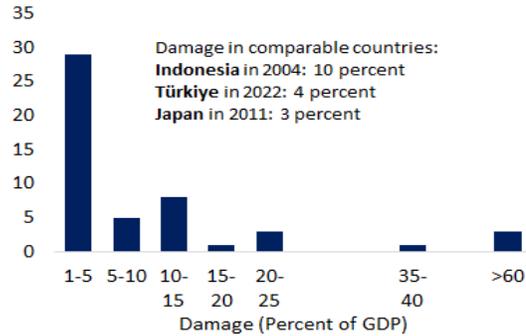
Source: EM-DAT, IMF WEO, news sources, and IMF staff

Sources: EM-DAT, IMF WEO, news sources, and IMF staff calculations.

**Figure 8. Cost of Major Natural Disasters in Chile,
(Percent of GDP)**
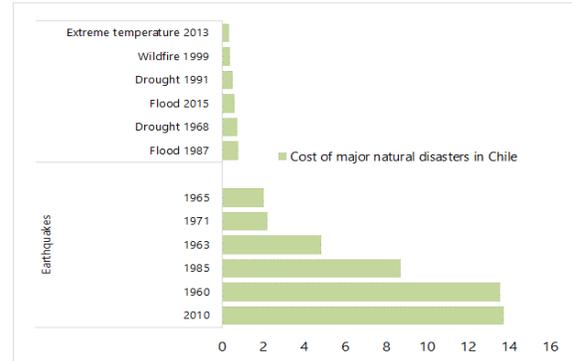
Sources: EM-DAT, IMF WEO, news sources, and IMF staff calculations.

- *Other tail risks.* High inflation, stagnated real wage growth, and widening inequality could trigger social unrests, which can raise fiscal needs and lead to ratings downgrades. Moreover, political gridlocks could make fiscal reforms more difficult. While these may not lead to an immediate fiscal need, they will weaken the ability to undertake fiscal adjustments. At the same time, political gridlocks can also disrupt public services or constrain the ability to refinance in debt markets, as evidenced in the debt ceiling standoffs (2011, 2013, 2023) and the government shutdown (2018-19) in the United States. Moreover, governments are prone to cyber-threats that can cause significant disruptions in basic public services, such as in Costa Rica in 2022.

Figure 9. Fiscal Support in Response to COVID-19 Pandemic (Percent of GDP)
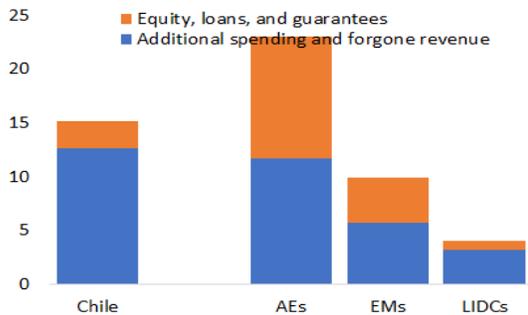
Sources: Fiscal Monitor database of Country Fiscal Measures in response to COVID-19 pandemic. It denotes weighted average across country groups: advanced economies (AEs), emerging markets (EMs), and low-income developing countries (LIDCs).

Figure 10. Compliance of Structural Balance during Significant Adverse Shocks (Percent of GDP)
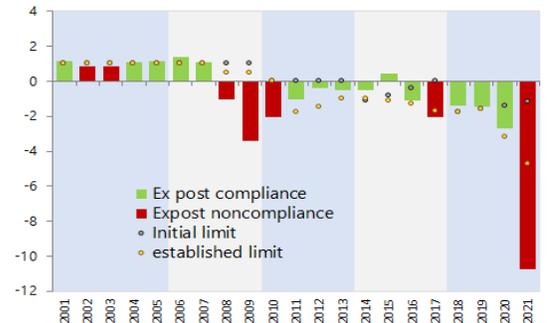
Sources: Public Finance Report 2022Q4, Ministry of Finance, Chile.

Table 2. Stylized Illustration: Impact of Tail Events on Fiscal Needs and Market Access

Key Tail Risks Facing Chile	Fiscal needs	Disruptions to capital market access	Remarks based on historical episodes in Chile or international references
1 Global slowdown/recession or sharp tightening of global financial conditions	Significant and prolonged for 2-3 years	Severe and prolonged	Global Financial Crisis (2008-11): Chile recorded structural deficits as much as -3.4 percent of GDP and did not comply with structural balance rules ex-post for three consecutive years (2008-10). Spreads rose by 250 bps to over 400 bps and stay elevated for 10 months; exchange rate depreciated by 25 percent.
2 Spillovers from regional crisis	Large	Severe	Latin American crisis in 1980s and Asian Financial Crisis in 1997. Growth deteriorated sharply with spikes in sovereign spreads. Exchange rate also depreciated significantly.
3 Significant deterioration of terms of trade	Moderate but reduce revenues significantly;	Moderate	Sharp decline in copper prices. Prices fell by over 40 percent between 2010-16. Structural deficits widened; spreads rose by 150bps. Sharp deterioration of terms of trade in other countries often lead to a significant widening of fiscal deficits and exchange rate depreciation.
4 Major natural disasters	Large but partly covered by insurance	Limited	The 2010 earthquake in Chile incurred an estimated cost of 14 percent of GDP. Structural deficits were 2.1 percent of GDP in 2010 but no notable impact on spreads and exchange rate. International experience point to an average cost of 5-6 percent of GDP for major earthquakes.
5 Epidemics	Severe for 1-2 years	Severe but temporary	COVID-19 pandemic (2020-21): Structural deficits reach unprecedented levels at -10.7 percent of GDP and growth contracted. Spreads rose temporarily for 3 months (from 140 to nearly 400 bps). Exchange rate depreciated by 10 percent at the onset of the pandemic. Most other countries also experienced a sharp growth slowdown and widening deficits, and a temporary disruption in capital market.
6 Political risks: · Social unrests · Political gridlocks	Moderate; raised policy uncertainty	Limited	The 2019 social unrest episode might have added to fiscal pressures and delayed reform momentum. Political gridlocks could prevent countries from borrowings (e.g., debt ceiling standoffs in United States in 2011, 2013, 2023).
7 Cyber-threats	Modest	Moderate; depends on situations	Increasing cyber-threats could disrupt basic public services. For example, the ransomware attack in Costa Rica disrupted public services (social security and health systems).

Sources: IMF staff compilations.

B. Ways to Manage Tail Risks

32.   Managing fiscal risks related to tail events will require a holistic framework, considering the overall policy mix (IMF 2016). A tail event, by definition, has a large impact on the economy, thus requiring a combination of policies (fiscal policies, monetary and financial policies) and other emergency measures (healthcare or disaster response) at the same time to address the specific shock.

33.   In the context of fiscal policies, a variety of fiscal tools can enhance resilience against the adverse impact of a tail event, including building fiscal buffers, making use of risk-sharing instruments, quantifying the vulnerabilities, and strengthening the counter-cyclical responses.

- *Building fiscal buffers* is one of the best tools to respond to different tail risks. It allows governments to respond swiftly and forcefully to contain the damage should a tail event occur, without jeopardizing the credibility and sustainability of public finances. Maintaining an ample buffer can entail either keeping a prudent debt well below its limit and/or accumulating liquid financial assets. A risk-based approach can help estimate the size of the buffer and the optimal mix between different instruments, weighing the opportunity cost and potential benefits (see Section IV).

- *Enhancing risk-sharing mechanisms.* Given that a tail event could have an overwhelming impact, it is sometimes unrealistic to rely on government own resources alone. Contingency financing plans for tail risks and recovery should rely on a mix of self-insurance (contingency reserves or stabilization funds), grants or borrowed resources, and risk transfer arrangements based on insurance or state-contingent debt instruments. A risk-sharing mechanism with the private sector or other countries may help bring in resources to mitigate the adverse impact. For example, disaster risk-financing strategies can help transfer or share the risks of natural

disasters to cover immediate humanitarian reliefs and long-term reconstruction needs. Common examples include the regional insurance against disasters (e.g., Caribbean Catastrophic Risk Insurance Facility in the East Caribbean Currency Union), catastrophe bonds by Barbados or Mexico, the African Risk Capacity, or IMF Catastrophe Containment and Relief Trust and the Catastrophe Deferred Drawdown Option (Cat DDO) of the World Bank. International experience suggests that reserves could aim for 3 percent of total spending to manage fiscal risks from natural disasters (Cebotari and others 2009).

- *Quantifying the vulnerabilities* of various tail risks can help identify the potential fiscal costs and facilitate the design of appropriate responses (IMF Fiscal Risks Toolkits). Governments can regularly integrate a probability assessment of the frequency and severity of different tail risks, the potential fiscal cost and financing strategies into their fiscal frameworks (including budget design, stress test, public investment planning, and debt/asset management).

- *Strengthening counter-cyclical response.* Governments can foster economic resilience by upgrading the social protection systems, making them more scalable and targeted, which can protect vulnerable people in difficult times. Adopting semi-automatic stabilizers—fiscal policies that can expand in adverse situations in a predetermined way (IMF 2022b)—can help deliver targeted and timely support. A flexible fiscal rule, comprising a well-defined escape clause, allows quick deployment of fiscal support in the budget and preserves credibility (Caselli and others 2022).

34.   Chile will need to build fiscal buffers gradually after its large draw-down during the pandemic to improve its resilience against tail events. Chile maintains multiple fiscal buffers such as the stabilization funds and various contingency funds to meet additional fiscal needs in times when accessing capital markets is costly. Chile also has issued catastrophic bonds to insure for disaster risks and maintains a precautionary buffer through its IMF FCL program. However, the balances in the stabilization funds have declined in the aftermath of the pandemic and need to be replenished in the coming years. Alongside the proposed provision of escape clauses, rebuilding fiscal buffers will enhance the flexibility of the government to respond to shocks.

- Building on the current analyses of fiscal risks, further actions frame them within an integrated asset liability management perspective will be advisable. The authorities recognize the potential fiscal impact of tail events and have made analyses to quantify fiscal risks in various reports. For example, they publish detailed information on a range of explicit contingent liabilities and individual fiscal risks in different documents.[13] Regarding natural disaster risks, the debt office of the MOF performed a comprehensive analysis to identify and quantify natural disaster risks, and their impact and expected loss, while long-term projections of the sustainability of main fiscal aggregates have relied on specific studies (see IMF 2021 Fiscal Transparency Evaluation). In view of the risks facing Chile, Strengthening and publishing such risk analyses (including making scenario analysis more regularly) will improve

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[13] The annual Contingent Liabilities Report contains detailed information and in-depth analysis on a range of explicit contingent liabilities (although a summary of those risks and natural resources risks is not available).

the quality of budget discussion.[14] A summary reporting of fiscal risks alongside a comprehensive debt sustainability analysis—including stochastic projections and scenario analysis such as those in the United Kingdom or produced by the European Commission—can help quantify a range of fiscal risks. An increasing number of countries have published annual Fiscal Risk Statements alongside their annual budgets (Brazil, United Kingdom, New Zealand, Indonesia).

- Developing an integrated asset and liabilities management framework is an important step in managing risks. This can help incorporate long-term fiscal risks such as demographic shifts and climate change into the fiscal frameworks. An integrated sovereign asset and liability management framework (SALM) is necessary and can include (i) the types of assets and liabilities to be considered in the analysis; (ii) assessing exposures of the public sector balance sheet to financing risks to identify mismatches; (iii) the risk tolerance of the government and the ability to transfer risks; and (iv) regular publications and periodic evaluations on its implementation (see IMF 2021 for details, notably Box III.2).

C. Recommendations

- Continue to improve fiscal risk management, including developing an integrated sovereign asset-liability management framework.

IV. ESTIMATING PRUDENT FISCAL BUFFERS

A. A Risk-Based Approach in Determining a Fiscal Anchor

35.   A risk-based approach sets a medium-term fiscal anchor to ensure macro stability and sustainability of public finances. The fiscal anchor is often expressed in terms of a prudent level of government debt to output so that the government has space (buffers) to respond to shocks, with a reasonably low risk that debt would exceed a level beyond which it would pose a debt distress or a large cost to the economy. It is increasingly common to apply a risk-based approach to determine the fiscal anchor and safety buffer (Caselli and others 2022). A risk-based approach simulates shocks to determine the size of buffers that can prevent an abrupt cut in spending over a chosen horizon within a confidence interval. The size of the buffer can be based on what the government considers a minimum degree of confidence that it is adequate to meet adverse shocks.

36.   The size of prudent fiscal buffers would depend on multiple factors, including the size and persistence of the shocks, their impact on the economy, the dependence on natural resources, and the risk tolerance in the society, among other factors. The larger or more persistent the adverse shocks, the higher buffers are likely required. A higher exposure to exchange rate risks, for example a higher share of foreign currency denominated debt, would

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[14] In the times of high uncertainty during the COVID-19 pandemic, the government presented a one-off alternative macro and fiscal scenarios in their Public Finance report.

require a larger buffer. Finally, countries with strong resilience in the private sector may require less fiscal buffers.

37.   Besides the size, the composition of buffers is another consideration. Governments have different ways to finance new spending needs during adverse shocks. They can borrow, draw down liquid assets, and/or activate instruments to transfer risks (e.g., regional insurance or catastrophe bonds in case of natural disasters). Government's unfettered access to liquidity at low cost in case of tail event is critical to determine the composition of the buffers. Countries may need a higher liquidity buffer if, in the event of tail risks, the ability to borrow quickly at affordable rates is hampered.

38.   When determining the size and composition of the fiscal buffers, the government will need to consider its balance sheet. The consideration should comprise both the asset and liability sides of government balance sheet and account for the interactions of fiscal policy in the overall policy mix.

39.   Chile has adopted a prudent gross debt ceiling that complements the structural balance rule to maintain debt sustainability. Anchoring fiscal policy to a medium-term debt anchor (a stock variable) is appropriate because it links the annual budget operations to debt sustainability. In establishing the current prudent ceiling of central government gross debt at 45 percent of GDP, the government sought to ensure a prudent safety margin for typical macroeconomic shocks (2023 Public Finance Reports, MOF).

40.   Given notable natural resource revenues, Chile has an option to accumulate liquid assets as fiscal buffers. While Chile has sound credit ratings and is likely to retain access to capital markets in an adversity, there could be tail-risk events that temporarily make access to markets very costly, particularly if financing needs are large in tail events. Taking advantage of higher than expected natural resource revenues (such as lithium) to accumulate liquid assets, such as in the ESSF, would allow Chile to reinforce its resilience against tail risks.

B. Estimating a Prudent Anchor and the Size of Safety Buffer

41.   Two related quantitative models are used to determine the prudent fiscal buffers. Both models use a risk-based probabilistic method to assess the size of prudent fiscal buffers, calibrated to Chile's economy. The magnitude and persistence of adverse shocks are estimated using historical data from 1990 to 2022. Other exogenous parameters such as the risk tolerance, time horizon, and debt limit are set to different levels to illustrate the sensitivity and robustness of results.

- The first model (Eyraud and others 2018) is a risk-based approach to determine a prudent debt level such that debt will stay below an exogenous limit with a high likelihood, accounting for shocks that affect debt dynamics. The difference between the limit and the estimated debt anchor is the safety buffer. This approach ensures that public debt stays at prudent levels sufficiently distanced from debt limit (Brunnermeier, Merkel, and Sannikov 2022). The method accounts for a fiscal reaction (in a reduced form) from a change of output when the shock hits. Stochastic simulations—based on a multivariate normal distribution of

shocks—are then conducted to arrive at different debt trajectories over certain time horizon. The simulations form a debt distribution so that one can obtain the probability that simulated debt exceeds a certain limit at a specific point of time (Annex II). We also extend the method based on Akanbi, Gbohoui, and Lam (2023) to allow for an asymmetric growth shock to determine the size of buffers under tail events.

- The second tool uses a small-open economy dynamic general equilibrium model (Melina and others 2016) (Annex III). The model contains a set of fiscal instruments and a sovereign wealth fund, as well as a production sector of natural resources. It accounts for the interactions between output, consumption, and countercyclical fiscal policy responses. The government is assumed to conduct counter-cyclical fiscal policy—subject to fiscal rule limits and an escape clause provision—to respond to adverse shocks. The financing can come from debt or drawing down assets in the sovereign wealth fund. The model is first calibrated to the main features of Chile's economy, and then simulated with 1,000 shock scenarios, where the magnitude and persistence of adverse shocks are estimated using a vector-autoregression (VAR).[15]

42.   The capacity for government to borrow is subject to a large degree of uncertainty. On the one hand, low interest rates, such as the trend decline over the last decade, can improve governments' capacity to borrow by allowing them to sustain higher debt levels without reducing deficits (Blanchard 2019). On the other hand, fiscal pressures from long-term challenges (such as population aging and climate change) could reduce the ability to run large budget surpluses. Moreover, the safe-asset status of government bonds can change, particularly in the current context of high inflation. While a temporary and unexpected increase in inflation could lift the fiscal limit, the fiscal space could shrink if investors begin to worry about inflation risks and demand higher risk premium (Rudebusch and Swanson 2012).

43.   The capacity for government in Chile to borrow is likely high and subject to a wide range. Under the framework by Mian, Straub, and Sufi (2022), the sustainable debt limit is the upper bound of a debt level determined through the budget balance that a government can sustain—economically and politically—over a long run.[16] The *maximum sustainable level of debt* varies over time and depends on (i) prevailing macro conditions such as global interest rates; and (ii) the elasticity between interest rates and debt levels. For example, a sharp tightening of financial conditions can reduce the ability for a country to sustain its debt. Changing risk perceptions of investors can lead to sharp changes in interest rates. Calibration based on the methodology in Mian, Straub, and Sufi (2022) suggests that the debt limit is a wide range, at 50

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[15] The model initially assumes same returns on SWF assets and the cost of public debt, essentially is a net debt concept. This assumption will be revisited in next section when deciding the composition of the safety buffer.

[16] Mian, Straub, and Sufi (2022) compute two concepts of sustainability – a *maximum debt limit* (debt above this level is unsustainable) and a *maximum sustainable level of debt* (associated with a primary balance that governments can sustain over a long period). The latter is more relevant for our analysis because if debt exceeds that level, there is a high risk of debt distress as markets may lose confidence on the government's ability to deliver sufficiently high primary surplus to prevent an unsustainable rise in debt.

percent of GDP if interest rates are high or reaching much as 120 percent of GDP if interest rates are low and less sensitive to debt (Figures 11 and 12).[17] For the purpose of calibrating the prudent debt anchor, a conservative debt limit of 55 percent of GDP is used.

Figure 11. Fiscal Debt Limits (Sustainable budget balance in percent of GDP)
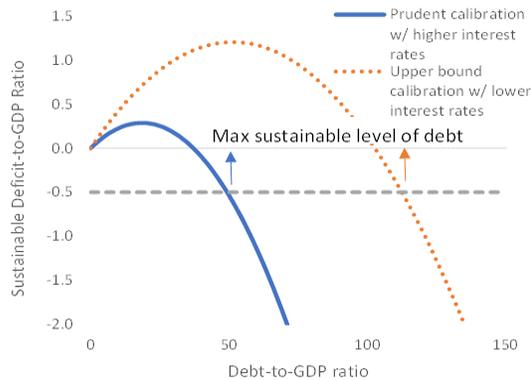
Figure 12. Implied Interest Rates on Government Debt (Percent)
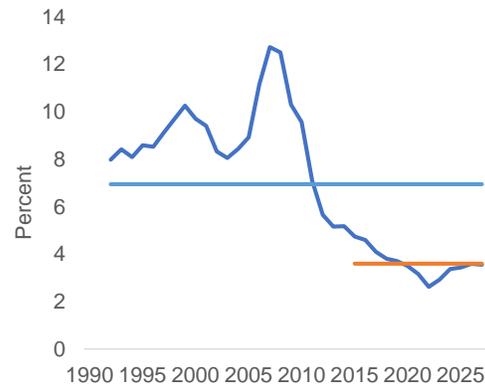
Source: IMF staff estimates.

Note: The vertical line crossing the axis relates to the maximum sustainable primary balance and its corresponding debt-to-GDP ratio.

44.   Based on a conservative debt limit, maintaining a prudent gross debt ceiling at 45 percent of GDP remains appropriate for typical macroeconomic shocks. Simulation results show that if policymakers are willing to accept a 5-percent probability that debt would exceed 55 percent of GDP, maintaining the prudent ceiling at 45 percent of GDP is appropriate over the medium term (Figure 13). Keeping the debt below 45 percent of GDP allows Chile to withstand most adverse shocks. Accounting for current ESSF balance at 2½ percent of GDP, it would imply the existing net debt anchor is around 42 percent of GDP. As gross debt was 37 percent of GDP (or 35 percent net of ESSF assets) as of end-2022, according to simulations based on Eyraud and others (2018) and the DSGE model (Figure 13), there is a high likelihood (90-95 percent probability) that debt would remain below the prudent ceiling over the medium term, giving enough space to respond to adverse shocks.

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[17] In the prudent scenario, the elasticity of debt-to-GDP ratio to interest rates is assumed to be 3.1, representing the higher end of the estimated range (1.5-3.1) among 31 advanced economies and 25 emerging market economies in Lian and others (2020). This elasticity assumes that a 10-percentage points increase in the debt-to-GDP ratio could raise interest rate by 31 basis points. The neutral interest rate is assumed to be 6 percent, consistent with the average level between 2007 and 2022. The debt limit would further reduce to 50 percent of GDP if neutral rates is at 7 percent (average level for Chile between 1992 and 2012). In the alternative less prudent scenario, the elasticity is assumed to be at the lower end of the estimated range at 1.5, while neutral interest rate is set at 3.6 percent over the medium term based on the interest rate outlook in financial markets.

Figure 13. Prudent Gross Debt Anchor
(Percent of GDP)

A. Based on Eyraud and others (2018)	B. Based on the DSGE model
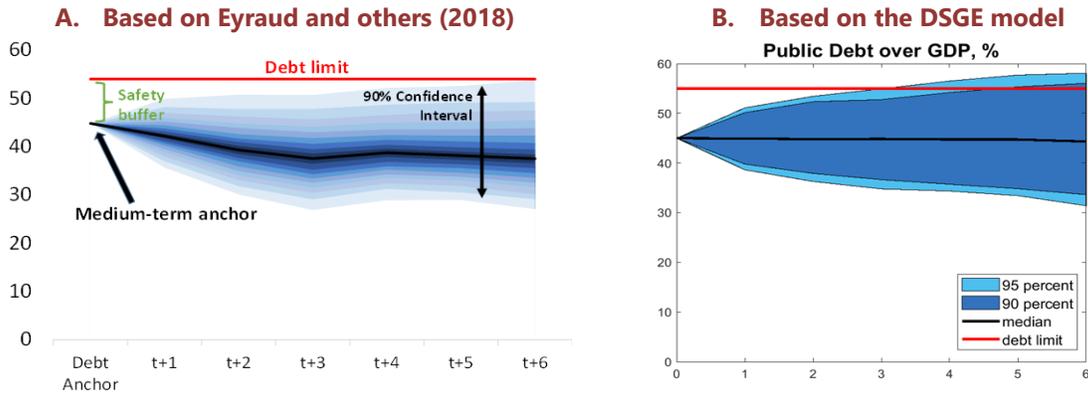
Sources: IMF staff estimates based on IMF-FAD
calibration toolkit (Annex II).

Source: Model simulations based on Melinda and
others (2016) (Annex III).

**45.** **Sensitivity analyses show that the prudent debt level depends on several factors:**

i. *Size and persistence of shocks, particularly tail risk events.* In general, the larger and more persistent the shocks, the larger prudent buffers are required. Tail-risk is tilted to the downside, suggesting an asymmetric and highly nonlinear effects on growth and public debt ratios.[18] Historical information on the fiscal cost of tail events (such as major natural disasters) can guide the simulation of asymmetric growth shocks. Based on the methodology in Akanbi, Gbohoui, and Lam (2023), an asymmetric growth shock that is calibrated to cause a larger drop in output would require an additional safety buffer at about 5 percent of GDP (Figures 14 and 15; Table 3).[19] Tail-events such as a major natural disasters (calibrated to a loss of 12 percent of GDP based on Chile's three largest earthquakes) would require an additional safety buffer of about 7½ percent of GDP.

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[18] In the case of natural disasters, the World Bank integrates the Damage and Loss Assessment into the post disaster needs assessment tool to estimate disaster related damage and loss at the sector level and identify aggregate impact. For example, the World Bank assessed Türkiye's 2022 earthquake cost 4 percent of GDP. Guerson (2022) uses Monte Carlo simulations to assess the appropriate size of government savings funds to insure against natural disasters for ECCU. It should include direct costs (immediate damage to public physical capital) and indirect costs (tax revenue losses and economic activity).

[19] The overall growth shock Y_t combines the typical historical growth shock Y_t^* with a second component drawn from a Pareto distribution: $Y_t = Y_t^* + I_{D_{t=1}} Z_t$, where I is the indicator function, D_t is drawn from a Bernoulli distribution (where p is the exogenous probability of the occurrence of the tail risk event), and Z_t is drawn from a Pareto distribution where parameters are jointly calibrated to match the average growth effects of natural disasters and the skewness of growth distribution.

Figure 14. Asymmetric Growth Distribution with Tail Risks
(Frequency)

Growth shock realization
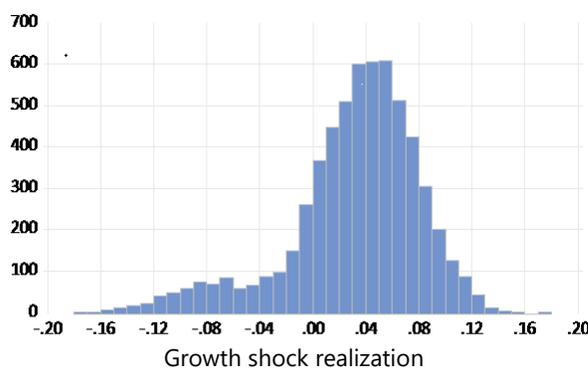
Sources: IMF staff simulations.
Note: Based on 10,000 simulations on the growth shocks. The shocks are drawn from a combination of a normal distribution and an additional component from a Pareto distribution, calibrated to match the average growth effects and the skewness of growth distribution from natural disasters. The tail-risk scenario considers an adverse growth impact is 12 percent with a 10 percent probability of occurrence.

Figure 15. Additional Buffers for Tail-Events (Asymmetric Growth)
(Debt in percent of GDP)
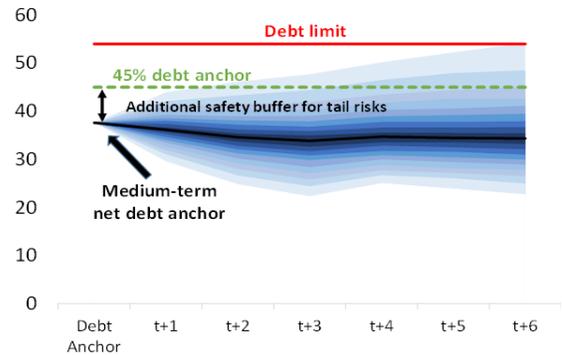
Source: IMF staff estimates.

ii.   *Countercyclicality of fiscal responses.* In a severe crisis, governments are often more proactive to mitigate the adverse impact. For example, empirical evidence from Kiendrebeogo and others (forthcoming) suggests that countercyclical fiscal responses are higher during global financial crisis and the pandemic for most of advanced and emerging market economies (Figure 16). In that case, the debt anchor is likely lower with a higher prudent buffer (by about 2-3 percentage points of GDP) (Table 4).

iii. *Risk tolerance.* The degree of risk aversion of the society or policymakers in guarding against tail events would affect the size and composition of safety buffer. The prudent buffer would be higher if risk appetite of policymakers is low, thus maintaining a lower debt level (Table 4).

iv.   *Fiscal risks from contingent liabilities.* A realization of contingent liabilities could raise debt level (for example, recapitalization of failing banks or SOEs), thus requiring additional safety buffers to keep debt low (Table 3).

v.   *Other available buffers.* If there are other existing buffers that can be applied to mitigate the adverse impact of the tail-risk event, then government debt may stay higher without affecting sustainability. In other words, the anchor calibrated could be interpreted as a net debt concept.

Figure 16. Counter-Cyclicality of Fiscal Responses (estimated coefficient)
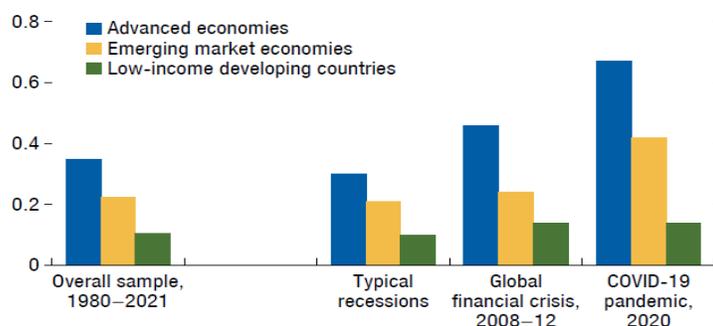
Sources: Kiendrebeogo and others (forthcoming); October 2022 Fiscal Monitor.
Note: The figure shows the average of time-varying coefficients by country income groups, based on panel regressions estimated on the sensitivity of GDP growth of the deficit to GDP ratio from 1980 to 2021 for more than 170 countries. Typical recessions are defined as periods when individual country's growth rates are below their own average levels over the previous three years.

Table 3. Sensitivity Analysis of Simulated Debt Anchor and Safety Buffer
(Based on IMF-FAD toolkit; percent of GDP unless otherwise noted)

Description	Baseline	Alternative scenario (Sensitivity analysis)	Change in debt anchor (percentage points of GDP)
Debt anchor	45		
Safety buffer	9		
Debt limit	54	60	+6pp
		50	-4pp
Risk tolerance (in percent)	5 percent	10 percent	+4pp
Maximum sustainable primary balance	2	1	-8pp
Contingent Liabilities	0.3 percent of GDP per year	0.8 percent of GDP per year	-3pp
Sample horizon	1992-2022	2000-22	-7pp

Source: IMF staff estimates based on FAD calibration toolkit.

46.   The uncertainty surrounding the safe debt level and the preference to stay resilient even in tail events would call for prudence in determining the size of buffers. Debt too close to the prudent debt ceiling may leave the government greater risks of breaching the fiscal rules and impairing the ability to exercise counter-cyclical policies in face of adverse shocks. Our sensitivity analyses in both quantitative models suggests that economic resilience in Chile is very strong. Accounting for tail risk events with a risk tolerance at 5 percent (Table 4) and the recent episode of higher volatility on output during 2000-2022 (Table 3), a judgement based on relevant scenarios would suggest another 3.5-7 percentage points of GDP could serve as fiscal buffers (Tables 3 and 4).[20] Quantitative simulations suggest that at the current debt level the economy can withstand tail risks with a high probability without affecting debt sustainability.

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[20] The lower bound of 3.5 percent of GDP is based on the difference between the baseline and the "tail event on growth" scenario in Table 4 (that is, the difference between 44.7 and 41.2 percent of GDP in these scenarios). The

Table 4. Sensitivity to Macro Shocks on Prudent Debt Ceilings
(Based on the DSGE Model)

| | Scenarios based on DSGE model | | | | | | | |
| | Baseline debt limit | | | | Lower debt limit | | | |
	Baseline	Less proactive countercylical fiscal policy	More proactive countercylical fiscal policy	Tail-event on growth	Lower debt limit	Less proactive countercylical fiscal policy	More proactive countercylical fiscal policy	Tail-event on growth
Coefficient of countercyclicality 1/	0.5	0.2	0.7	0.5	0.5	0.2	0.7	0.5
Maximum debt limit	55	55	55	55	50	50	50	50
Shock Processes	VAR 2/	VAR	VAR	Regime Switching 3/	VAR	VAR	VAR	Regime Switching
Risk Tolerance 4/								
1 percent	38.7	44.5	36.3	33.4	33.7	39.5	31.3	28.4
5 percent	**44.7**	47.8	41.9	41.2	39.7	42.8	36.9	36.2
10 percent	47.1	49.4	45.2	44.3	42.1	44.4	40.2	39.3

Source: IMF staff estimates.

1/ The coefficient on the counter-cyclicality of fiscal policy is measured by the elasticity of primary deficits with respect to GDP growth. A larger coefficient means a stronger fiscal stimulus during the recession.

2/ The VAR is estimated based on a regression of 4 variables: output growth, sovereign spreads, copper prices, and copper production (Annex III).

3/ The regime switching simulation uses a model with two regimes in which the distributions of shocks have different volatility. It is estimated series by series.

4/ The risk tolerance refers to the probability of exceeding the debt limit in 5 years. It is assumed that sovereign assets do not change in the calculation.

C. Composition of Fiscal Buffers: A Balance Sheet Consideration

47.   Governments can reduce public debt to give space for future borrowing or maintain liquidity assets to smooth spending needs during adverse shocks. While governments may ex-ante prefer to reduce debt rather than accumulate assets, there is an incentive to have assets as a macro-stabilization policy. This is because in adverse times when debt becomes more costly to roll over, having liquid assets allows governments to avoid rolling over maturing debt at high interest rates and frees up resources to stabilize the economy. The stabilization fund serves as a liquidity buffer during tail events with extreme financial conditions. It provides time to recalibrate, and if needed, implement appropriate fiscal responses to ensure macro stability. However, the risk-adjusted return on financial assets is likely lower than cost of

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upper bound of 7 percent of GDP reflects the empirical simulations using IMF-FAD toolkit to account for greater volatility of output in recent period (that is, a shorter sample considering the output volatility during 2000-2022) relative to the baseline of the full sample 1990-2022) (Table 3). Certainly, other scenarios presented in Tables 3 and 4 with different parameters could result in lower or higher estimates and the indicative range of 3.5 to 7 percentage points of GDP is based on judgement with relevant scenarios that are plausible but not extreme for the economy.

borrowing on average. The net loss from accumulating assets rather than repaying debt is an insurance premium against situations where debt becomes costly to roll over during tail events.[21]

48.   Maintaining certain liquidity in assets could be optimal in face of tail risks. A complete loss of access to market is unlikely for Chile, even during tail events, given its very strong fundamentals and high credit standings. A plausible scenario could be either that the access comes at a high cost owing to a sharp tightening in global financial conditions or that political constraints prevent it from borrowing (similar to the debt ceiling holdoff in the United States). However, determining jointly the liquid assets and debt levels is difficult, as the interplay of different factors in nonlinear ways is hard to estimate or calibrate. Section III points to some common features of tail events in Chile—they often call for substantial fiscal needs for more than one year, with most occurring in the first year. Sovereign spreads surged and exchange rate depreciated sharply in the first year before returning gradually to pre-shock levels. We take these stylized facts to simulate the gross financing needs arising from tail events for two cumulative years, comprising (i) the rollover of maturing debt and (ii) needs for counter-cyclical fiscal responses, and construct different ways to finance based on different instruments.

49.   Illustrative simulations indicate that a stabilization fund equivalent to about 5-7 percent of GDP can help mitigate liquidity needs stemming from tail risks. The purpose of the stabilization fund is to smooth borrowing needs in instances where the government faces extreme financial conditions due to tail events. The exercise first simulates the fiscal needs during adverse shocks based on the DSGE model mentioned before. Financing needs for the government in each year consist of overall deficits and debt amortization. The deficits are simulated using the DSGE model for the first two years based on the shocks at 5-percent level over 2 years (Figure 17). Moreover, the debt rollover needs are set at 0.5 percent of GDP each year, approximately the size of foreign currency-denominated debt service. In the adverse shock, the government faces a spike in spreads and refrains from borrowing in the markets during the first year of crisis. As the exchange rate against the US dollar usually depreciates in an adverse shock, withdrawing foreign-currency denominated assets in the stabilization could be less costly than borrowing additional debt (Figure 19). Subsequently, market conditions improve, and the government is assumed to issue debt to cover 40 percent of the financing requirements in the second year (Figure 18).[22] If the government plans to issue more debt in the second year, the needs for prudent liquid assets will be smaller conditional on the size of fiscal needs, as shown in Figure 18. Determining the precise level of liquid assets would require judgement beyond the

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[21] The effects of asset accumulation may affect debt servicing costs. As assets accumulate, Chile builds resilience against adverse shocks, which could have a positive effect on crediting ratings and reduce the cost of servicing debt, making the insurance premium of building buffers lower.

[22] The assumption of 40 percent is based on two general observations on how governments respond reasonably to severe adverse shocks. First, most of the fiscal needs occurred in the first year while the needs tend to be smaller subsequently. For example, fiscal needs increased by about 8 percent of GDP during the first year of the Global Financial Crisis, and another 4 percent of GDP in the second year. Second, the ESSF tends to be drawn down consecutively during an adverse shock, sizable in the first year and modestly in the second year. For example, the ESSF balances declined by 7.6 percent of GDP in 2009 and an additional of 0.6 percent of GDP in 2010 during the Global Financial Crisis.

model because circumstances would vary depending on the size and nature of the shocks and the capacity or willingness to borrow. In a range of plausible scenarios (Table 5), the simulated cumulative financing needs range from 5.1 to 11.6 percent of GDP for two years, in which 3.4 to 7.3 percent may require liquid assets or other financing.[23] Under these simulated scenarios, maintaining a liquid asset buffer of about 5-7 percent of GDP in the ESSF can help buffer against the financing needs in a tail event for the first two years.

Figure 17. Cumulative Additional Fiscal Needs for Two Years in Face of Tail Risks (Percent of GDP)
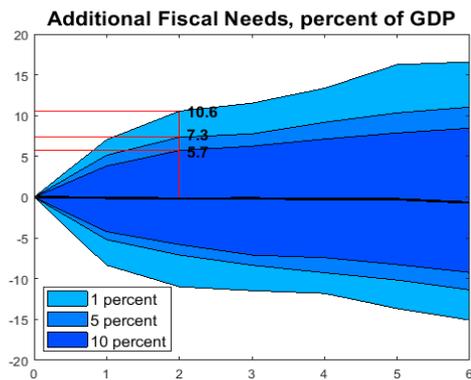
Source: IMF staff estimates.

Figure 18. Size of Stabilization Funds Depend on Fiscal Needs and Debt Financing (Percent of GDP)
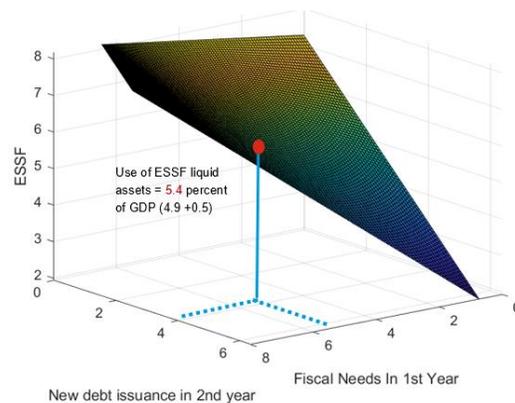
Source: IMF staff estimates.
The use of ESSF assets at 5.4 percent of GDP refer to the baseline scenario (see Table 5 for details).

50.   The size of liquid asset buffers depends on multiple factors: the duration of the spikes in spreads, how strong fiscal policy responds to shocks, policymakers' risk tolerance, and the availability of other types of buffers (Table 5 and Figure 18). Countries often have multiple ways to respond to shocks besides having liquid assets. Even at times of high cost of borrowing in international markets, governments are often able to borrow in domestic financial system given sovereign bonds could be perceived as safe assets during crises. Self-insurance through building liquidity in a stabilization fund entails opportunity costs and involves social choices. For example, the Fund FCL augmented the precautionary buffers and provides a contingent credit line. Chile also issues financial instruments such as catastrophic bonds that could insure against natural disasters. Social attitudes to risks will result in different approaches. Combining risk mitigation instruments from a menu of options is reasonable because they tend to be complementary to one another. While a smaller size of liquid assets may be inadequate, large

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[23] The prudent level of liquid assets is based on the estimated drawdown of liquid assets in the ESSF for the first two years across scenarios. The lower bound of 3.4 percent of GDP is based on the scenario of "less proactive countercyclical fiscal policy", that is the sum of 2.9 percent of GDP in the first year and 0.5 percent of GDP in the second year. The upper bound of 7.3 percent of GDP is based on the scenario of "low risk tolerance", the sum of 6.8 percent of GDP for the first year and 0.5 percent for the second year.

liquidity assets in the ESSF is likely not optimal given lower returns on average than interest rate on government bonds. It will give rise to political pressures to spend it in normal times.

Table 5. Simulation Results on the Size of Stabilization Funds
(Percent of GDP, unless otherwise noted)

| Simulation results on the size of stabilization funds (percent of GDP unless otherwise stated)	Baseline		High risk tolerance		Low risk tolerance		Less proactive countercyclical fiscal policy		Severe growth slowdown		More proactive countercyclical fiscal policy	
Coefficient of counter-cyclicality	0.5		0.5		0.5		0.2		0.5		0.7	
Shock Processes	VAR		VAR		VAR		VAR		Regime Switching		VAR	
Risk tolerance (percent)	5		10		1		10		10		10	
Financing needs when tail events occur (A+B), of which:	**8.3**		**6.7**		**11.6**		**5.1**		**7.3**		**7.7**	
Cumulative additional fiscal needs for two years[1/] (A)	7.3		5.7		10.6		4.1		6.3		6.7	
External debt amortization needs for two years[2/](B)	1.0		1.0		1.0		1.0		1.0		1.0	
Financing during tail events (C+D+E) (spike in spreads in first year)	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2	Year 1	Year 2
Use of liquid assets in ESSF (C)	4.9	0.5	3.9	0.5	6.8	0.5	2.9	0.5	4.3	0.5	4.5	0.5
New debt issuance in the second year (D)	-	2.9	-	2.3	-	4.2	-	1.6	-	2.5	-	2.7

Source: IMF staff estimates.

1/ The tail event is assumed to create additional fiscal needs for two years and a temporary spike in spreads on external sovereign bonds for the first year (see Section III). Cumulative additional fiscal needs refer to the additional counter-cyclical fiscal responses for the first two years based on the simulations when tail event occurs. It is assumed that 60 percent of fiscal responses occur in the first year, while the remaining enters in the second year. This assumption is motivated by historical tail risk events where governments incurred larger deficits in the first year when the shocks occurred, relative to the subsequent year. For instance, prior to the Global Financial Crisis (GFC), the government achieved a primary surplus of 3.6 percent of GDP in 2008. However, during the GFC, primary deficits of 4.5 percent of GDP in 2009 and 0.3 percent of GDP in 2010 were recorded. This indicates that fiscal needs increased by about 8 percent of GDP in the first year and another 4 percent of GDP in the second year, relative to pre-crisis levels. Different profiles of the fiscal needs for the first and second years are simulated and results are summarized in Figure 18.

2/ Financing needs thus consist of additional deficits from the simulations and the two-year amortization of external debt when tail event occurs. From the historical data, the annual amortization needs are about 3 percent of GDP on average, of which domestic debt is 2.5 percent of GDP and external debt service is at 0.5 percent of GDP. It is assumed that tail events do not affect the rollover of domestic debt (given safe asset status) but would temporarily lead to a spike in spreads on external interest rate. The government refrains from external borrowings owing to high cost in the first year of crisis. In the second year, based on historical experience, the government can issue debt to meet the remaining financing requirements as market conditions improve. In the case of Chile, even during some severe crises, the financing conditions often improved within the year of the shock occurred, which could have allowed the government to borrow at a more reasonable cost and mitigate the need to withdraw assets from the stabilization fund.

51. **Hence, designing the composition of fiscal buffers would call for a holistic and integrated asset-liability management.** A critical element of such integrated asset-liability management is coordinated based on the whole sovereign balance sheet under a comprehensive framework that accounts for different options and instruments to manage risks and returns (Figure 19), rather than focusing only on a stabilization fund. It is because managing government asset and liability separately in isolated balance sheets is often suboptimal. The balance sheet management is to ensure financing the budget deficits at low cost subject to an acceptable level

of risks and to minimize vulnerability of government finances in the adverse shocks. In that context, the Autonomous Fiscal Council can broaden its role in fiscal oversight to provide independent assessment.

Figure 19. Returns on SWFs and Average Government Borrowing Cost (Percent)

Figure 20. Consolidated Assets of the Public Treasury (Percent of GDP)
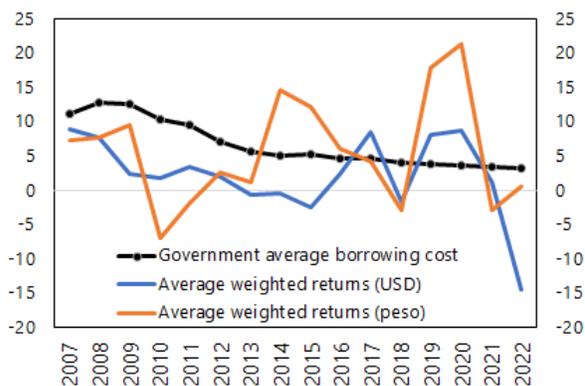
Sources: IMF WEO and Chile Sovereign Wealth Fund annual reports.

1/ Returns on fund balances are based on weighted average returns on ESSF and PRF and expressed in terms of U.S. dollar and Chilean peso annually. The returns in terms of peso are calculated by converting the US dollar returns reported in Sovereign Wealth Fund annual reports with annual exchange rates. Government borrowing cost refers to interest expense at a given year relative to debt level of the previous year.

Sources: Ministry of Finance Public Finance Report 2022 Q4 and IMF staff estimates.

Other active funds include (i) education fund (FpE), Regional Support Fund (FAR), the Fund for Diagnosis and High Cost Treatment (TAC) and other assets of the Public Treasury (OATP). Projection between 2023-2030 for Economic and Social Stabilization Fund is based on model baseline. Projection for Pension Reserve Fund is assumed to rise at 0.2 percent of GDP per year (minimum contribution rate). Other active funds are held constant as a percent of GDP for illustration during 2023-30.

D. A Dual Anchor or Net Debt Anchor?

52.   In theory, a net debt ceiling could offer a more comprehensive coverage of balance sheet items, connected to solvency and sustainability concerns. Fiscal anchors should encompass both government's liabilities and assets, and, in general principles, for commodity exporters, resource wealth. Liquid assets can be sold to meet financing needs, while natural resource wealth (the present value of future resource revenues) can be used as collateral for borrowing or for financing investment. Yet, while offering a more appropriate measure of their solvency, a net debt anchor can be less practical, as evaluating the value of government liquid assets is both difficult and highly uncertain.[24] For example, assets of the ESSF (mainly treasury bills or foreign sovereign bonds) can be included but not those of the PRF. It is because assets in

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[24] For example, there are difficulties associated with estimating: (i) long-term commodity prices (which are necessary to project future resource revenue) and separating temporary from permanent price changes, and (ii) the actual amount of exploitable reserves and of production (which can depend on conjunctural factors, including the price of the commodity). Liquid assets should satisfy the following criteria: (i) be under the control by government; and (ii) it should be possible to value them in an accurate, fair and timely manner.

the latter fund are legally not freely or fully usable at times of stress, because they are earmarked to cover the solidarity pillar of the pension system (PRF).[25] Similarly exclusion would apply to assets of other specific purpose funds (e.g., the Education Fund, the Regional Support Fund, and the High Cost Treatment and Diagnosis Fund). The proposed Natural Disaster Fund will depend on the provisions of the fund, which could be restricted to cover only natural disasters but cannot be drawn to cover expenditures owing to other tail events (Figure 20).

53.   In the case of Chile, keeping the prudent gross debt ceiling is appropriate. As the debt rule is newly established in 2022, reframing it to a net debt concept may give the impression of frequent changes, making it more difficult to communicate to the public, which could risk undermining the credibility of the rules. Given that the current size of ESSF is relatively small (2.4 percent of GDP in end-2022), it would not make a decisive difference by anchoring on a net debt concept.

54.   Adopting a dual anchor on gross debt and asset balances will be challenging. A dual anchor (a prudent ceiling on gross debt and a floor on financial assets) will make the fiscal rules overly complex. While this will bring some benefits of reinforcing the government's commitment to rebuild fiscal buffers, the dual-anchor approach could complicate the asset-liability management. For example, if debt is below the ceiling but assets in the stabilization fund are below the floor level over the medium-term horizon, governments may be forced to borrow to deposit in the stabilization fund to comply with the anchors. This will not change the net debt (hence sustainability outlook) and is not optimal if the cost of borrowing is higher than returns on liquid assets. This makes setting an explicit floor less practical. To reinforce the government commitment in building buffers, an option is to include projections or non-binding indicative targets in the MTFF documents without an explicit anchor in the FRL.

E. How to Build Buffers and at What Pace?

55.   The appropriate mix of gross debt and financial assets needs to be considered jointly in the government balance sheet. This involves various dimensions such as asset-liability management, portfolio diversification, currency composition, maturity, and interactions between fiscal and monetary authorities, which go beyond the consideration of typical fiscal rules (Bianchi and Sosa-Padilla, forthcoming). For example, large adverse shocks (e.g., major natural disasters) give rise to large fiscal needs. Drawing down liquid asset buffers is appropriate: i) allow stronger counter-cyclical fiscal response; (ii) limit the rise in debt within the prudent ceiling; and (iii) allow a smooth adjustment in primary spending (Figure 21).

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[25] The PRF can be transferred to the budget only up to a limit. Since 2022, the use of resources in the PRF cannot exceed 0.1 percent of previous year GDP.

Figure 21. Illustrative Fiscal Responses and Adjustment in the Tail Event
(Percent of GDP)

A. Primary balance

Adverse shock: without use of stabilization fund
Adverse shock: draw-down of stabilization fund
Baseline: no shock scenarioo

B. Government Debt

Adverse shock: without use of stabilization fund
Adverse shock: draw-down of stabilization fund
Baseline: no shock scenarioo

Use of stabilization fund ESSF
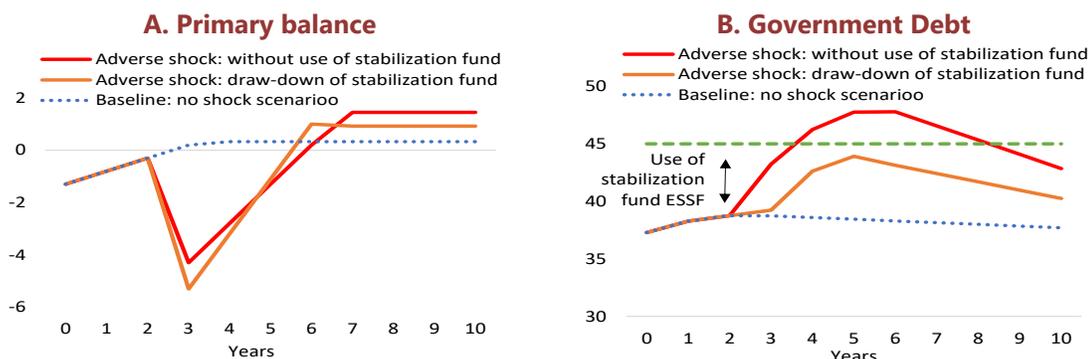
Source: IMF staff estimates.
The chart illustrates the years on the horizontal axis. It illustrates a hypothetical severe adverse shock that occurs in year 3.

56.   Fiscal efforts to reduce structural deficits are an important way to build buffers. As natural resources prices are volatile, countries cannot just rely to save liquidity assets from a windfall revenue from a positive shock on natural resources. We illustrate the joint interaction between accumulating buffers while containing debt vulnerabilities in three scenarios (Figure 22):

i.   The baseline considers a gradual adjustment to improve structural primary balance from the current level to a small structural surplus by 2026 (**blue** line in Figure 22). The primary balance in the baseline is assumed to follow the projections in April 2023 WEO, while the debt profile could differ because of differences in the interest rate to growth differential. Fiscal savings from the improvement of structural balance help accumulate liquidity buffers in the ESSF to about 6 percent of GDP over the medium term, while stabilize government debt well below the prudent ceiling level.

ii.   A 'borrow to save' scenario considers assets are quickly accumulated in the ESSF, giving the impression that the government is building a strong buffer against adverse shocks (**red** line in Figure 22).[26] However, accumulating assets in a fund by raising debt borrowing often does not constitute real savings to the economy, in which structural balance remains unchanged. Net debt does not reduce much and gross debt gets very near to 45 percent of GDP such that a deterioration of macro conditions could push debt exceeding the ceiling. The 'borrow to save' strategy involves fiscal costs and is not generally desirable given the average cost of borrowing could be higher than the returns on sovereign liquidity assets in Chile (Figure 19), unless policymakers have a high degree of risk aversion when liquid assets are at very low levels.

iii.   An "aggressive tightening" scenario builds liquid assets quickly (achieving in 5 years) while keeping debt low (**yellow** line in Figure 22). But it involves a sharp fiscal tightening

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[26] The existing law (*Decreto con Fuerza de Ley* 1, Article 2D) has a provision to allow making an extraordinary deposit in the ESSF funded by debt financing if risk aversion is very high, though it could involve fiscal cost.

of structural balance by 0.75 percentage points of GDP in a year. This may not be socially preferably or feasible given it may involve an abrupt cut in public services.

iv. The size and evolution of debt and liquid assets depend critically on the level of interest rates. A higher interest-growth differential would mean higher debt in the interim and a slightly lower pace of asset accumulation (Figure 23).

57. **On balance across scenarios, accumulating asset buffers through fiscal efforts to improve structural balances would be a preferred option.** Building buffers can be gradual over the next few years. This would balance various considerations to keep debt below the prudent ceiling, while allowing time to build consensus and undertake sustained gradual fiscal adjustments. The approach will be conducive to accumulate fiscal surpluses to effective fiscal policy management. In case of a transitory favorable revenues from natural resources, the government can save those in liquid assets to build buffers sooner.

Figure 22. Illustrative Scenarios for Rebuilding Buffers (Percent of GDP)
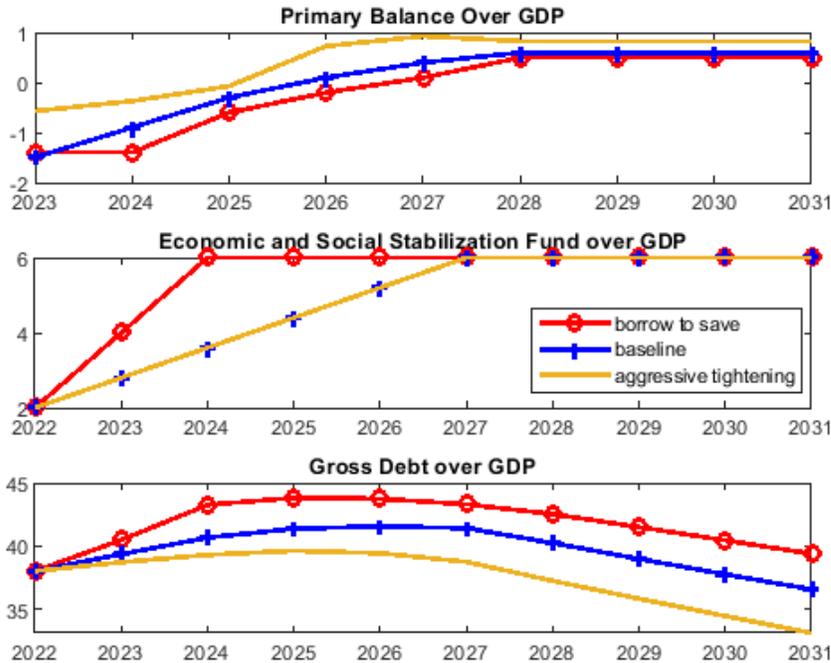
Source: IMF staff estimates.

Figure 23. Sensitivity Analysis for Rebuilding Buffers (Percent of GDP)
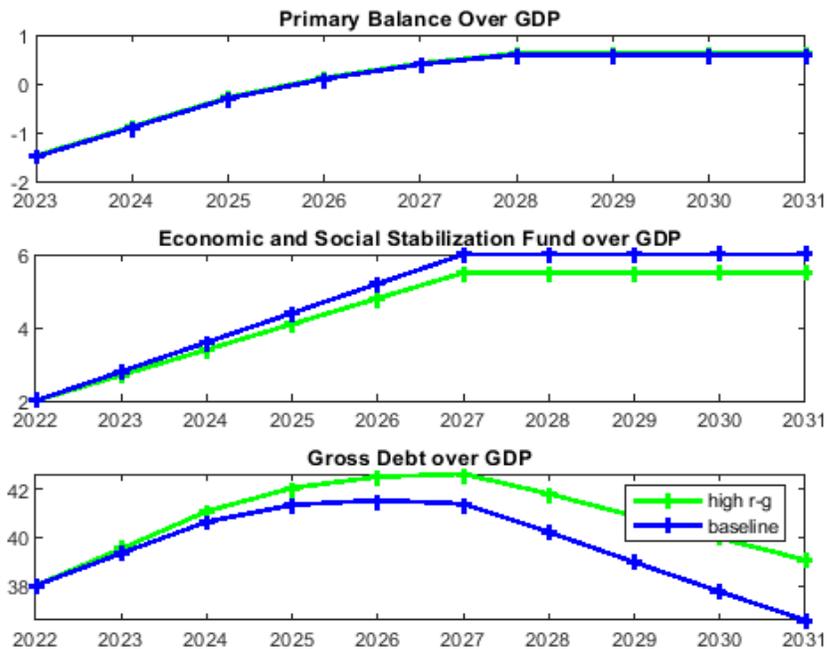
Source: IMF staff estimates.
The alternative scenario assumes interest-growth differential is 1.1 percentage points higher than the baseline.

F. Recommendations

- Maintain the existing prudent debt ceiling level on gross central government debt at 45 percent of GDP and keep the current debt level well below the ceiling over the medium term. Avoid setting explicit dual anchors on government debt ceiling and a floor on stabilization fund given challenges in communication.

- Apply an integrated asset-liability management to consider jointly the gross debt levels and the size of prudent liquidity buffers of ESSF under the government balance sheet, accounting for other available instruments.

- Rebuild buffers gradually through reducing structural deficits over the medium term. Given the current debt level and the scope of fiscal adjustments, a prudent range of liquidity buffers of 5-7 percent of GDP can help respond to tail events. Adjust the size and pace of accumulation according to the risk tolerance of the society and the size of the shocks. Avoid borrowing government debt at high interest rates to accumulate assets in the stabilization fund.

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Annex I. Fiscal Rules in Chile and International Experience

Fiscal rules in Chile

1.   Chile's fiscal rule has been instrumental in the fiscal framework. It coalesces political consensus for fiscal responsibility and anchors the public debate on the budget. Policymakers have a consensus that the fiscal rule helps contain government spending and raise the prominence to improving public financial management.

2.   Chile has adopted a structural balance rule and recently established a prudent debt ceiling in the fiscal rule framework. The structural balance rule, adopted since 2001, sets limits on the central government structural balance, with an independent body providing key inputs (Table A.1.1). In the aftermath of the pandemic, Chile upgraded its fiscal framework in 2022 to introduce a prudent debt ceiling on central government gross debt (at 45 percent of GDP) and a provision on the escape clause.[27] The revised framework aims to enhance the sustainability of public finances and promote countercyclical fiscal policy (Indications 116-370 to the bill to modify Law No. 20,128). The debt rule complements the structural budget balance rule in the fiscal framework. Although the compliance of structural balance relative to last established limit was met for most of the years (Figure 10), government debt continued to rise while assets in the SWF declined gradually. This reflects the need of assessing the output gap appropriately to inform the target of the structural balance rule (IMF 2018).

3.   The fiscal council—Autonomous Fiscal Council (CFA)—was established in 2019 to have a broader mandate of fiscal oversight. This replaced the previous Fiscal Advisory Council (AFC) with a narrower set of fiscal supervisory functions. The CFA has independent budgetary funding and oversees two existing independent committees—on potential GDP and long-run copper price—and ensure such parameters are correctly used in the computation of the structural balance. The CFA provides opinions on the fiscal rule, including methodological changes to the structural balance rule, and serves to enhance its rigor and transparency.

4.   The fiscal rule covering central government gross debt is appropriate for Chile.

   a.   While fiscal rules ideally should have a broad coverage on all government and public sector entities that have significant impact on public finances, broadening the institutional coverage to public corporations and subnational governments will require political consensus and sound enforcement mechanism, as well as provisions not to infringe the financial autonomy of public corporations. Chile is classified as a unitary country (OECD/KIPF 2016) and municipalities cannot borrow and do not pose risks to central government debt, although they share expenditure responsibilities with the central government on public health and

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[27] The escape clause (applicable only starting in 2026 to promote credibility) can be triggered in the event of a major natural disaster, confinement cases, or a significant deterioration in the economy. It allows higher spending from the fiscal rule limits for up to two years, while establishing a clear convergence path to the target when the clause is triggered. A new natural disaster fund (Fund for Natural Disasters, Foden) will be established as part of a broader scheme to build resilience against natural disasters. It also strengthened the social safety net by introducing an automatic Emergency Family Income (IFE) in case of confinement, enhanced sovereign wealth funds and the Autonomous Fiscal Council (CFA).

education. Public corporations largely run on a commercial basis, all of which have a net asset position. In that context, the focus on central government is appropriate.

b. In principles, fiscal anchors should encompass both government liabilities and financial assets.[28] While a single limit on net financial worth is simpler conceptually, it does not specify the composition of assets or debt the government should hold compatible with the same level of net financial worth. The net debt concept often does not constitute an appropriate fiscal anchor. It was difficult to define assets that are truly liquid, especially in times of stress. Net debt is also harder to communicate and less transparent and subject to valuation changes. Another limitation is that anchoring on net debt might conceal the build-up of fiscal risks over time, as it masks obscure financing ("below-the-line") operations (such as government holdings on a public bank or state-owned enterprises after recapitalization) that would instead be captured by the gross debt concept. That said, net debt can be used as a complementary fiscal indicator and reported regularly. In practice, most countries with debt rules express them in gross terms. Only less than a handful of countries include financial assets in their fiscal frameworks, but not expressed in terms of numerical values (Australia, New Zealand, Uruguay, and the United Kingdom). For example, New Zealand indicated in the FRL a commitment to "achieve and maintain levels of net worth that provide an adequate buffer against potential future events adversely impacting the Crown's balance sheet."

Annex Table A.1.1. Key Features of the Current Fiscal Rules in Chile

Type of national rules (Start date in bracket)	Key characteristics					
	Monitoring outside government	Formal enforcement procedures	Coverage	Statutory basis	Escape clauses	Investment excluded from rules
Budget balance rule (2001)	Yes	No	Central government	Yes	No	No
Debt rule (2022)	Yes	No	Central government	Yes	No	No

Budget balance rule (since 2001, revised in 2008, 2009, 2010): The rules set the limits on the structural budget balance, with an independent body providing key inputs. Government expenditures were budgeted ex ante in line with structural revenues, i.e., revenues that would be achieved if: (i) the economy were operating at full potential; and (ii) the prices of copper and molybdenum were at their long-term levels.

Debt rule (since 2022): A prudent debt ceiling is set for central government gross debt at 45 percent of GDP.

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[28] A net debt concept (gross debt net of financial assets) is relevant when considering sustainability as it offers a comprehensive coverage of the government balance sheet items directly connected to liquidity and solvency concerns (Oct 2018 Fiscal Monitor Public Balance Sheet). For commodity exporters, it can theoretically include state-owned natural resource wealth as those assets can generate revenues, or can be sold or collateralized, if necessary, to meet part of government financing needs.

Key Trends on Fiscal Rules across Countries

5.   An increasing number of countries have adopted numerical fiscal rules in their fiscal framework. Over 100 countries have adopted at least one rule as of end 2021. A combination of budget balance rule with a debt rule has been common in practice. As of 2021, 85 countries adopted fiscal rules that included an explicit ceiling on government debt, and this number has been increasing over time (Figure A.1.1). At the same time, more than 80 percent of countries with a debt ceiling have also rules imposing constraints on the (nominal or structural) budget balance, and among those, almost a third has expenditure ceilings.

The pandemic put the fiscal rules and frameworks to test. During the pandemic, over 80 percent of countries with fiscal rules have activated the escape clauses or suspended temporarily fiscal rules, a much higher percentage than during the global financial crisis (Figure A.1.2; Davoodi and others 2022). About half of countries with fiscal rules have had deficits or debt exceeding the limits of their fiscal rules. As a result, many countries are facing the challenge of how to return to the fiscal rules (Figure A.1.3).

Annex Figure A.1.1. Types of Fiscal Rules (Number of countries with different types of fiscal rules)
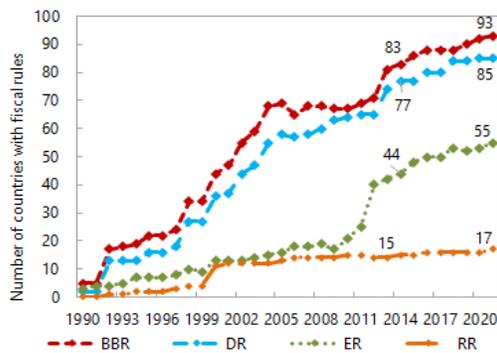

Source: Davoodi and others 2022, IMF Fiscal Rules Dataset 2021.

Annex Figure A.1.2. Changes in Fiscal Rules during the Pandemic vs Global Financial Crisis (Percentage of countries with fiscal rules)
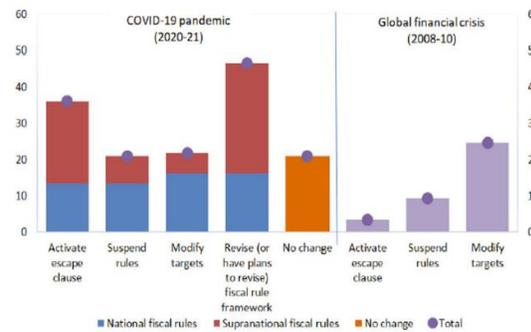
Source: Davoodi and others 2022, IMF Fiscal Rules Dataset 2021.

Annex Figure A.1.3. Deviation from the Deficit and Debt Rule Limits (Percent of GDP by income group)

Fiscal Deficit

Government Debt
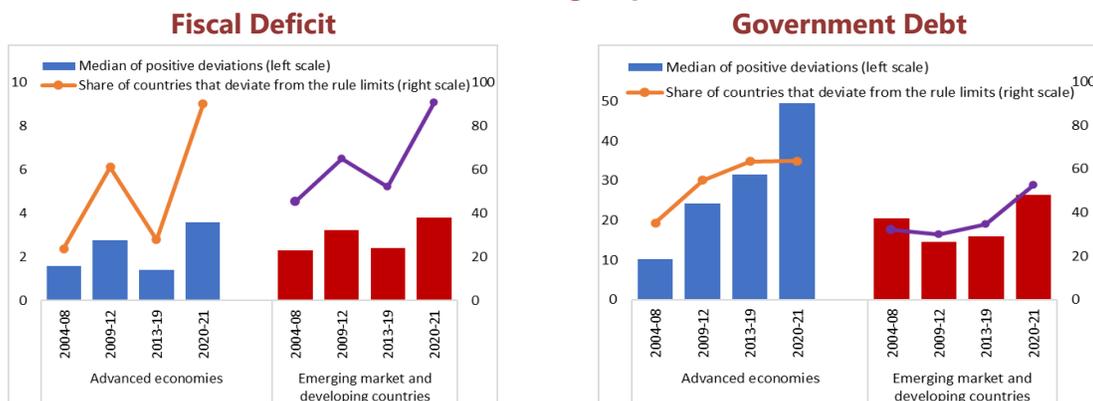
Sources: Davoodi and others 2022; IMF Fiscal Rules Dataset: 1985-2021; IMF WEO Database.

Annex II. Estimating Prudent Anchor—IMF Calibration Toolkit

This Annex describes the approach used to estimate a safety buffer and debt anchor for Chile. It summarizes the methodology of the IMF's debt anchor calibration toolkit (Eyraud and others 2018), extended by Akanbi and others (2023) to incorporate natural disaster risks. Overall, the procedure consists of generating macroeconomic shocks based on an econometric model and simulating possible paths for government debt using a reduced-form fiscal reaction function and debt accumulation equation.

First, typical macroeconomic shocks are simulated at an annual frequency for Chile. Specifically, 1,000 sequences of macroeconomic shocks (over the six-year projection horizon) are drawn from a multivariate normal distribution with a variance-covariance matrix that is estimated using historical data for Chile spanning 1992-2022 (due to data availability).[29] The estimated variance-covariance matrix describes the joint dynamics of the macroeconomic (non-fiscal) variables needed to project public debt, namely real interest rates, real GDP growth, and the exchange rate. Next, for each of the shock simulations, macroeconomic variables are computed over the six-year projection horizon, by adding the generated shocks each year as the error term.[30]

Subsequently, a fiscal reaction function (reduced-form equation)—aims at capturing how fiscal policy reacts to public debt and current economic conditions (measured by the output gap)—is estimated for a panel of 26 emerging economies, including Chile. Specifically, the estimated panel regression takes the following form:

$$pb_{it} = \alpha_i + \beta_1 pb_{it-1} + \beta_2 ygap_{it} D_{it} + \beta_3 ygap_{it}(1 - D_{it}) + \beta_4 d_{it-1} + \varepsilon_{it}$$

where pb_{it} is the primary fiscal balance in country i and year t measured as a percent to GDP; $ygap_{it}$ is the contemporaneous output gap[31] (D_{it} is a dummy indicator equal to 1 if the output gap is nonnegative, i.e. actual output above or equal trend, and 0 otherwise, to capture the potentially asymmetric reaction of the primary balance to the output gap); d_{t-1} is the gross public debt-to-GDP ratio at the end of the previous year; and αi consists of country fixed effects. The terms of trade can be used instead of the output gap in commodity-exporting countries that rely on commodity-based revenue, which is what we use in the case of Chile. To account for the possibility that fiscal policy can itself be a source of shocks, the primary balance is subject to a fiscal policy shock $\varphi_{it} \sim N(0, \sigma^2\varphi_i)$, where $\sigma^2\varphi_i$ is calibrated to the country-specific variance of the residuals of the reaction function. Finally, the reaction function is restricted by assuming that the maximum primary surplus that a country is capable of achieving following a shock is capped at 2 percent of GDP for Chile.

Next, debt trajectories are computed and the debt anchor is defined such that debt exceeds the country's debt limit only with a small probability over the forecast horizon. A projected debt path is

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[29] Data for Chile are obtained from IMF World Economic Outlook database, International Finance Statistics, and the Commodity Terms of Trade Database developed in Gruss and Kebhaj (2019).

[30] An alternative approach would be to use a VAR to estimate the underlying shocks and make projections, where the lagged effect of shocks can be taken into account through the autoregressive structure of the model.

[31] The output gap is projected over the forecast horizon using GDP growth forecasts obtained from simulations (based on the joint distribution of macroeconomic variables) combined with an Hodrick-Prescott filter.

computed for each sequence of country-specific shocks – which include shocks to the macroeconomic variables from the variance-covariance matrix and fiscal shocks – using the conventional debt accumulation equation (intertemporal accounting identity). For each projection year, the frequency distribution of the projected debt-to-GDP ratios is calculated and allows for a probabilistic analysis of debt trajectories. In particular, it is possible to calculate the share of debt paths that cross a given debt limit at a certain year. The debt anchor is then computed as the starting level of debt for which simulated debt trajectories (over a six-year period) would exceed a given debt limit with a probability given by the risk tolerance.

An extension accounting for natural disaster risks is also applied based on the approach in Akanbi and others (2023). It captures the fact that natural disasters pose an adverse effect on growth with severe downside risk, implying the need to consider an asymmetric distribution with thicker left tail in the growth distribution. The user can directly specify the growth impact following a disaster shock (assumed to be 12 percent of GDP for Chile). The overall growth shock Y_t combines the typical historical growth shock Y_t^* with a second component: $Y_t = Y_t^* + I_{D_{t=1}} Z_t$, where I is the indicator function, D_t is drawn from a Bernoulli distribution (where p is the exogenous probability of the occurrence of the tail risk event), and Z_t is drawn from a Pareto distribution, in which parameters are jointly calibrated to match the average growth effects of natural disaster shocks and the skewness of growth shocks distribution. Finally, the tool incorporates a mechanism that mitigates the effects of natural disaster shocks (e.g. natural disaster funds, catastrophe bonds), through an exogenous parameter (user-defined parameter in percent of GDP), which would be activated during tail-event shocks, such that the mechanism could disburse buffers in some years (user-defined) after the tail event occurs. This would imply a lower need for safety buffers on debt.

Finally, there are some important caveats to these methodologies. First, there is high uncertainty around defining a country's exogenous 'debt limit'. Second, the validity of this approach is conditioned on the quality of the shocks generated to produce the forecasts. Third, there may be other tail risks that are not accounted for. Finally, other shortcomings include the possibility that relationships estimated using past data may not be relevant for the future or/and the forecasting model does not have a satisfactory goodness-of-fit.

Annex III. A Dynamic Stochastic General Equilibrium Model with Public Debt and Natural Resources

This annex summarizes a dynamic stochastic general equilibrium (DSGE) model—Debt, Investment, Growth, and Natural Resources (the DIGNAR model)—based on Melina and others (2016). It is a small-open economy DSGE model with a rich set of fiscal instruments—including a sovereign wealth fund—as well as a production sector in natural resources. The model accounts for the interactions between adverse shocks, countercyclical policy responses, and aggregate macroeconomic impact.

A. Model Features

The DIGNAR is a small open economy model with three sectors developed in Melina and others (2016). It is embellished with multiple types of public sector debt, multiple tax and spending variables, and a resource fund. The model abstracts from the monetary and other nominal rigidities. Please refer to Melina and others (2016) for the full model discussion.

Household. There are two types of households, intertemporal optimizing households and hands-to-mouth households. Both households earn labor income, consume domestic and imported goods, pay taxes, and receive government transfers. Hands-to-mouth households are financially constrained so that they cannot save or borrow to smooth consumption over time.

Production sector. The economy has three production sectors: (i) a non-tradable goods sector; (ii) a (non-resource) tradable goods sector; and (iii) a natural resource sector. Firms in both non-tradable and tradable goods produce output with a Cobb-Douglas technology by combining capital and labor inputs. Natural resource production is an exogenous production function that can be calibrated to the size of natural resource sector in the economy, with all output of natural resources is assumed to be exported for simplicity reason. The model itself allows a split between domestic consumption and exports but will not change the simulation results materially.

Government sector. The total receipts of the government consist of (i) government revenues including tax revenues (consumption tax and labor income tax), resource revenues and user fees on infrastructure services, foreign aid, interest earnings, and (ii) other financing receipts such as transfers from the sovereign wealth and proceeds from bond sales. The government expenditures consist of government consumption, public investment, transfers to households. The model also allows financing items such as debt service payments, and transfers to the sovereign wealth fund. Governments are subject to annual budget constraints in each period and the intertemporal constraints on debt sustainability.

Government conducts countercyclical policies, potentially subject to fiscal rule limits and the provision on the escape clause, in response to adverse shocks. The financing for deficits is assumed to be either debt financing, raising more tax revenues or drawing down the assets in the sovereign wealth fund. In the baseline, we have a fiscal response function as follows:

$$\frac{G_{ct}}{Y_t} = \frac{G_c}{Y} + \rho_g \left(\frac{Y_t}{Y_{t-1}} - 1 \right)$$

where $\rho_g < 0$, government spending as percent of GDP, $\frac{G_{ct}}{Y_t}$, increases during the economic recession.

The model includes an exogenous specification that the sovereign risk premium that moves along with debt-to-GDP ratios.

$$R_t = R^f + v_{dc} \exp \left[\eta_{dc} \left(\frac{d_t}{y_t} - \frac{d}{y} \right) \right]$$

The interest on the external debt R_t is a sum of risk-free rate R^f and risk premium, which depends on the deviation of total external debt to GDP $\frac{d_t}{y_t}$ to its steady state $\frac{d}{y}$, the steady state risk premium v_{dc} and the elasticity η_{dc}.

B. Model Calibration

The model is calibrated to align with the key macroeconomic features of Chile. The parameters are calibrated to match key national accounting statistics, such as GDP growth, private investment, the size of the mining sector, imports and exports as a percent of GDP. The model is also calibrated to match the size of government tax revenues, total expenditures, and investment (measured in terms of total government expenditures) in Chile. The government debt structure matches the data, such as the relative share of external and domestic debt and the share of domestic and external financing. The model also calibrates to match the relative size of government and private sector debt. The calibration also captures the key parameters of the fiscal reaction functions, including the elasticity of countercyclical fiscal policy (see Annex Table III.1). The calibration is based on the initial steady state level using publicly available data and the IMF WEO database.

Annex Table A3.1. Calibrations of the DIGNAR model

| Definition (in percent, unless indicated otherwise)	Source	Value
GDP growth rate	IMF Article IV projection for 2027	2.5
Exports/GDP	Average last 10 years, WEO database	30.3
Imports/GDP	Average last 10 years, WEO database	30.3
Public consumption/GDP	IMF WEO database	21.3
Public investment/GDP	IMF WEO database	2.3
Private investment/GDP	IMF WEO database	22.7
Mining value added (natural resource production)/GDP	IMF WEO database	10.0
Government wealth fund/GDP (external savings)	ESSF report	2
Public domestic debt / GDP	IMF WEO database	23.2
Private foreign debt/GDP	IMF WEO database	63.9
Public external commercial debt/GDP	IMF WEO database	14.6
Total public revenues/GDP	Average last 10 years, WEO database	23.3
Annualized domestic net real interest rate	IMF WEO database	3.0
Share of government natural resource revenues in total government revenues	IMF WEO database	4.6
Elasticity of sovereign risk, level	Parameters based on EMDE averages.	0.4
Countercyclicality of government spending, level	IMF WEO database and staff estimates	0.5
Source: IMF staff estimate, WEO database		

C. Impact of Adverse Economic Shocks

The analysis considers four types of tail-event shocks: (i) a shock on the production of natural resources (copper); (ii) a terms of trade shock (akin to a shock on export price of copper); (iii) a shock on external risk premium; and (iv) a major natural disaster shock such as a major earthquake. In each case, the analysis shows a tail event to illustrate the channels and impact on key macroeconomic variables. The variable on government debt can be considered as a net concept adjusting for the sovereign wealth fund.

- *A shock on the production of natural resource.* The tail event assumes a temporary decline in the production growth of copper by 4.2 percent from the steady state, which corresponds to the big decline in 2008. In this situation, GDP growth declines by more than 0.5 percentage point because of the sharp contraction in the copper and related sectors by over 4.2 percent. The decline in exports of copper contributes to a deterioration of both current account deficits and real exchange rates. Fiscal deficits rose because of (i) a decline in copper revenue (natural resources revenue is about 1 percent of GDP in the data); and (ii) the counter-cyclical fiscal policy responses to mitigate the adverse impact. The results show that primary deficits rise by 0.2 percentage of GDP, while the government debt rose by more than one percentage of GDP.

- *A terms of trade shock through natural resource prices.* The tail event assumes the copper prices to fall by 50 percent for a year, similar to the magnitudes observed during the global financial crisis in 2008-09. The negative terms of trade shock leads to a sharp contraction in the resource sector, which in turn, contributes to a severe decline in GDP by 4 percent. Current account deficits widen. Fiscal deficits rose by 2.5 percentage points of GDP because of a loss of resource revenues and the countercyclical fiscal policy responses. As a result, government debt rises by 4.5 percentage points of GDP, partly because of deficit financing and the denominator effects from the decline in GDP.

- *Major natural disaster shock.* To consider a tail event of a major natural disaster, the analysis assumes it would be similar to a negative shock in the total productivity factor. It is because a major natural disaster such as a severe earthquake tends to generate large disruptions on the production. The tail event considers a 12-percent drop in the TFP, calibrated to similar level identified in Chile's Fiscal Transparency Evaluation (IMF 2021), which suggests the 2010 earthquake led to a loss of 12-15 percent of GDP. A large negative shock in TFP leads to a sharp drop in production output by firms and in GDP growth by more than 6 percentage points. Primary deficits rose because of counter-cyclical policies (such as post-disaster humanitarian relief and reconstruction) by 4.5 percentage points of GDP as a result, which contributes to a sharp rise in debt by over 14 percentage points of GDP. TFP shocks tend to be longer-lasting than the price shocks of natural resources because of large persistent effects on activity.

Annex Figure A.3.1. Adverse Shock on Natural Resources Production (The shock is assumed to be a 4.2 percent drop in copper production)
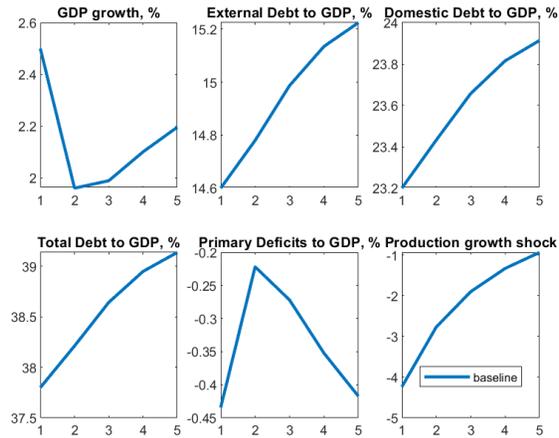

Annex Figure A.3.2. Adverse Shock on Natural Resources Prices (The shock is assumed to be a 50-percent drop in copper prices)
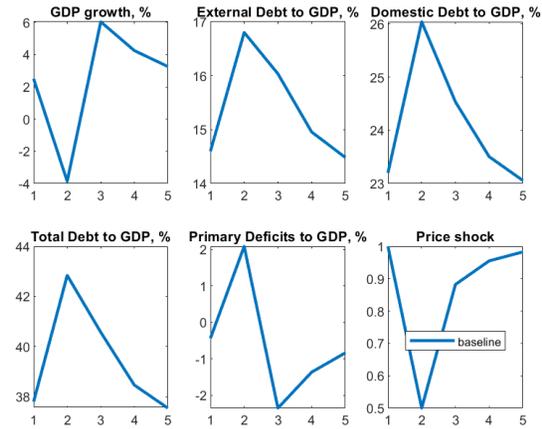
Annex Figure A.3.3. Adverse Shock on Productivity (The shock is assumed to be a 12-percentage points drop in TFP growth)
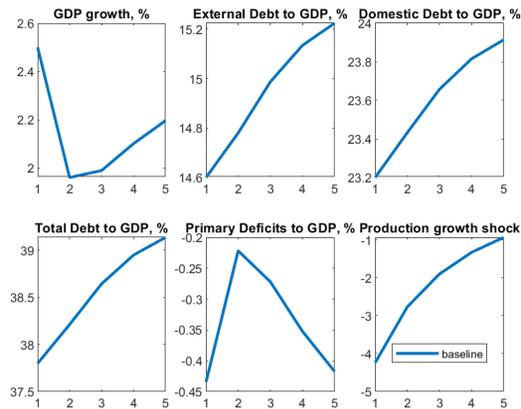
Annex Figure A.3.4. Adverse Shock on Risk Premium (The shock is assumed to be 250 basis points rise in sovereign spreads)
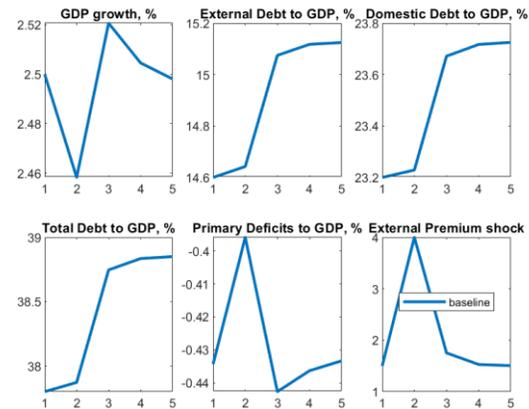
Sources: IMF staff estimates.

- *A surge in risk premium on external debt.* Chile is a small open economy that is vulnerable to the sharp repricing of risks in global financing conditions. A tail event of a global financial crisis could lead to a surge in the risk premium on external debt. The tail event here assumes the sovereign spreads on external debt rise by 250 basis points (bps), about the size of surge in 2008. A surge in sovereign spreads pushes up refinancing cost and interest payment on the newly issued debts—relatively small given low debt and limited external debt to GDP (14.6 percent of GDP)—and lead to a depreciation of real exchange rates. Overall deficits would widen but the shock alone has limited impact on output growth, partly because the crowding out effects from a rise in government debt is not sizable in the model. If one considers some amplification mechanism—such as working capital constraints (Mendoza, 2010) and financial accelerator (Bernanke and others 1999)—the effects on growth would likely be much larger as bad financial conditions cause firms to deleverage, reduce production and slow economic activities.

Caveats. The model cannot capture fully all key aspects of the institutional features in Chile's economy. A tail event may also bring nonlinear effects as well as more proactive stance on policy responses. At the same time, the model does not have amplification channels (such as debt overhang or financial sector channels (e.g., Bernanke et al, 1999 and Mendoza, 2010) nor endogenous sovereign spreads (common in the sovereign default literature; see Caputo, Irarrazabal, and Ordonez, 2022). Hence, the model results may be considered as a lower bound of the fiscal impact for tail-risk events. Some tail events are harder to model as it involves a complex dynamic than the model here. For example, a tail event of a pandemic may involve a sharp contraction of both aggregate demand and aggregate supply, and may also change household preference and distribution characteristics. Similarly, the model may not capture fully the tail event of a large-scale social unrest, which is a conceivable tail event in many countries but difficult to specify the channels without considering the political economy aspects. In the model, it could be similar to a negative TFP shock.

D. Model Simulations

The stochastic nature of the major economic shocks is calibrated using a vector autoregression (VAR). The analysis includes an estimation of an VAR with one lag based on historical annual data from 2000-2021. There are four key variables: GDP growth, copper prices, copper production, and sovereign spreads. Data are obtained from the World Bank (GDP US dollar in PPP terms), IMF WEO database, Chilean Copper Commission and FRED database. We estimate

Annex Table A.3.2. Estimated VAR Coefficients and Var-Covariance Matrix

| Coefficients Matrix				
	production	growth	spread	price
L.production	-0.28	-0.02	4.94	-2.67
Std. error	0.23	0.20	3.62	1.79
L.growth	0.26	-0.18	-0.36	-3.20
Std. error	0.27	0.24	4.26	2.11
L.spread	-0.02	-0.02**	0.36*	-0.04
Std. error	0.01	0.01	0.22	0.11
L.price	-0.03	0.00	0.66**	0.67***
Std. error	0.02	0.02	0.28	0.14
Intercept	0.07*	0.08**	0.17	0.62**
Std. error	0.04	0.03	0.59	0.29
Variance-Covariance Matrix				
production	0.0011			
growth	0.0001	0.0009		
spread	-0.0060	-0.0009	0.2823	
price	0.0003	-0.0006	-0.1193	0.0690

the volatility, persistence, as well as covariance of these four types of shocks. The estimated coefficients and variance covariance matrix of the VAR shows reasonable signs and magnitudes (Annex Table A.3.2).

The simulations consider 1,000 scenarios of shocks simulated based on the estimates of the VAR. The DSGE model allows alternative shock processes based on other data series or econometrics specifications. In other words, it takes the simulation results as exogenously given, regardless of the simulation approaches. In each scenario, we assume the shocks apply for the initial 10 periods and the economy will gradually return to the steady states according to the rules defined in Melina et. al (2016). By entering the simulated shock series to the model, one can obtain a distribution of debt to GDP ratio over the medium term (Annex Figure A.3.5).

The simulation results shows that there is a small likelihood that government debt would exceed the prudent debt level over the medium term (Annex Figure A.3.5). Given the current government debt level at 37 percent of GDP (as of end 2022), there is a 11 percent probability debt would exceed the prudent level of 45 percent of GDP in the medium term.

Besides the VAR estimation, a regime switching approach is used to account for higher volatility of growth during tail events. The regime switch model is estimated using historical data and estimation results show that the high volatility state highly correlates to the historical tail events. (Annex Figure A.3.6). We use this shock process in our sensitivity analysis.

Annex Figure A.3.5 Simulated Distribution on Public Debt to GDP Ratio (Percent of GDP)
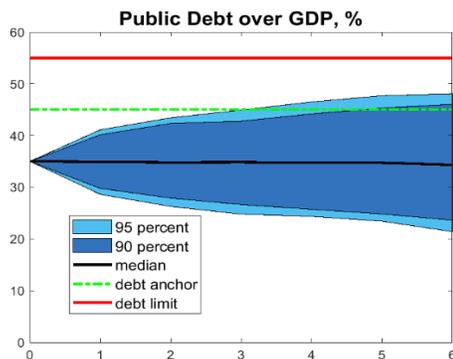
Annex Figure A.3.6. Regime Switch Estimation: High Volatility State on Growth (Probability)
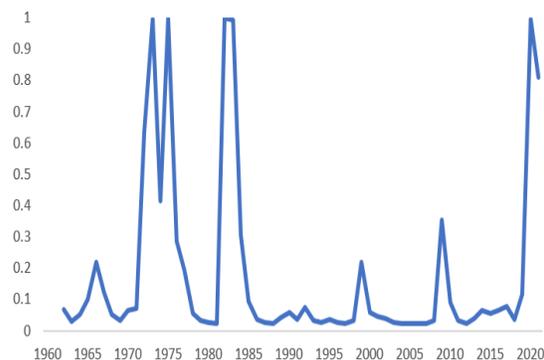
Sources: IMF staff estimates and simulations.
Note: The distribution in the left chart shows the debt to GDP ratio based on 1,000 simulations from VAR estimates.