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Fiscal rule and public investment in Chile

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Fiscal Rule and Public Investment in Chile

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Fiscal Rule and Public Investment in Chile

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Abstract*

This paper reviews the design and operation of the Chilean fiscal rule in the past 30 years. Using different empirical approaches, we assess its impact on fiscal procyclicality, public debt, and public investment. While there has been substantial progress in building a modern institutional framework for fiscal policy, we find that the rule is incomplete in two dimensions: it lacks an escape clause, and it needs to supplement the budget balance rule with a debt rule. The former is seen in the pervasive inability of the authorities to steer fiscal accounts back to their long-term sustainable path after the rule was breached the rule in 2009. The latter issue is illustrated by the speedy build-up of the public debt as a result of the need to finance fiscal deficits. We do not find, nevertheless, a negative impact of the rule on public investment. We propose reforms to improve on transparency and accountability, as well as to supplement the rule with escape clauses and a debt anchor.

JEL classifications: E61, E62, H54, O23

Keywords: Fiscal rule, Public investment, Chile

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1. Introduction

Chile has often been cited as an example of fiscal responsibility in Latin America in the past 40 years (Frankel, 2011a; OECD, 2018). Fiscal responsibility is the result of gradually implementing a modern institutional framework to manage fiscal policy, starting with the 1975 Organic Law of State Financial Administration and the Copper Stabilization Fund of 1985. Chile formally adopted a structural, budget-balance fiscal rule in 2001, enacted a Fiscal Responsibility Law in 2006—including the setup of two sovereign wealth funds—and established an Independent Fiscal Council in 2019.

Fiscal rules—in the form of quantitative targets for the government’s budget balance, debt, expenditure, and/or revenue—are a major building block of frontier fiscal institutions. Reasons to adopt a fiscal rule in Chile included strengthening fiscal solvency and sustainability (i.e., attaining sustainable levels of government deficits and public debt), contributing to macroeconomic stabilization (i.e., reducing fiscal policy pro-cyclicality), and making fiscal policy design and execution more resilient to government corruption, political interference, and private-sector lobby influence (i.e., strengthening the political economy of fiscal policy decisions and budget management). Another reason for adopting a fiscal rule is to avoid intergenerational inequity, which would otherwise occur if present generations impose on future generations larger net contributions to government financing than what the former contribute today. Note that this could be the case even when the intertemporal budget gap is equal to zero (Arévalo et al., 2019). As we discuss in this paper, intergenerational equity is not satisfied by Chile’s current fiscal rule.

During the past two decades, the Chilean rule has shaped the discussion of the government budget by introducing an explicit conceptual framework (a budget balance rule), relatively transparent procedures to compute the structural balance of the government, and a set of measures to evaluate its outcomes. While successful in general terms, in our view the rule is incomplete and shows significant limitations, particularly regarding the absence of an escape clause when breaching the rule and its neglect of the evolution of public debt.

In times of severe stress on fiscal finances as a result of the Covid-19 pandemic and the ensuing decline in economic activity, reviewing the Chilean experience with fiscal institutions is timely and enlightening. In this paper we first assess the evolution, compliance, and effectiveness of the Chilean rule from a historical perspective, considering the achievement of the target and debt sustainability. In Section 2 we describe the political economy of adoption and implementation

of the rule in the context of Chile’s overall fiscal framework, the modifications introduced by successive governments, and the deleterious effects of excessive optimism in the estimation of the parameters.¹ We evaluate the effectiveness of the rule not only in terms of improving the fiscal stance but also in terms of its ability to isolate fiscal management from the fluctuations of the price of copper, Chile’s main export commodity and an important source of fiscal revenue. We also discuss the breaching of the fiscal rule in 2009 and the difficulties in balancing fiscal accounts afterwards, given the absence of a protocol guiding the authorities on how to breach the rule and return to compliance. This section closes with an analysis of the behavior of public investment over the business cycle, comparing the pre and post-fiscal rule periods and identifying whether the rule has had short or long-term impacts on the level of public investment and/or its trajectory.

Having described the mechanics of the fiscal rule in Chile, next we focus on determining whether the observed evolution of key fiscal variables is the result of the rule’s implementation or it simply reflects the path followed by other economies in similar conditions. In Section 3 we use synthetic control methods to conduct a counterfactual analysis of public expenditures, debt, and investment in the pre-rule 1990-2001 period and the post-rule 2001-2019 period, to assess whether the implementation of the rule has had significant effects on the way governments manage their outlays. We consider the implementation of the fiscal rule as an intervention or “treatment” and assess its effects by comparing the observed trajectory of the selected variables to what would have been their path in the absence of the fiscal rule.

Our empirical analysis ends in Section 4, where we use a dynamic stochastic general equilibrium model to simulate the response of the Chilean economy to a set of exogenous shocks (productivity, world interest rates, and the terms of trade), with and without the fiscal rule in operation. The shocks are chosen and calibrated to represent the conditions prevalent in Chile around the time of the major breach of the fiscal rule in 2009. The model aims at disentangling the transmission channels of such shocks and highlight their likely effect on public investment and public debt.

Our previous analyses contribute to the policy debate with suggestions to improve and/or complement the current fiscal rule, in terms of both its design and its operation. We identify several

¹ Elbadawi et al. (2015) and Schmidt-Hebbel and Soto (2018) provide empirical evidence on why countries adopt and maintain rule-based fiscal policy regimes. Their results show that strong fiscal initial conditions, political stability, inflation targets, credible exchange regimes, global financial integration, democracy, and political checks and balances raise the likelihood to adopt and maintain fiscal rules. Chile fulfilled these conditions at the time of adoption.

issues. First, considering that the Chilean rule is a cyclically-adjusted (or structural) budget-balance fiscal rule and that the public debt has increased over the last decade, there is a clear need for attaining debt sustainability, adding to the current budget flow rule a rule on the stocks of public debt and sovereign wealth funds. Therefore, a complementary debt rule would improve on fiscal sustainability and intergenerational equity. Second, the rule makes no reference to the composition of public outlays: particularly government consumption versus public investment. By focusing only on the government's aggregate balance, it opens the door for less-than-optimal management of public investment, an issue that has become prominent in the literature on Latin America (see Ardanaz et al., 2019; Larraín et al., 2019). Third, in its implementation the rule has proven to be over-optimistic regarding government revenues. While key components and parameters of the rule—such as trend output and the long-term price of copper—are estimated by technical committees with independence of the fiscal authority, in fact their revenue forecasts had been systematically above actual revenues. Such over-optimism leads to persistent failures in meeting the target² and, if not corrected, might potentially undermine its political legitimacy. Fourth, the issue is compounded by the absence of transparent escape clauses. During its first years of operation, the structural balance target was met; however, this has not generally been the case since the rule was breached in 2009. Lacking an escape clause, the rule is suspended *de facto* under strong adverse shocks such as the Global Financial Crisis in 2008-09 and the current Covid-19 pandemic. The unprecedented fiscal expansion in 2020 will require huge future efforts to ensure fiscal sustainability in Chile, which would be strengthened by adopting the changes in the fiscal rule that are advocated in this paper.

2. Chile's Fiscal Rule, 2001-2019

Modern institutional frameworks for the conduct of fiscal policy aim at reducing principal-agent problems arising between voters and political authorities due to government impatience, lack of representation of future generations, electoral competition, sensitivity to special-interest lobbies, corruption, and use of asymmetric and biased information (von Hagen, 2005). To overcome these distortions and negative externalities, experts suggest adopting a framework based on nine building blocks (Ter-Minassian, 2011; Debrun et al., 2009): a fiscal responsibility law, a multiyear planning horizon, rules for government asset and liability management, sovereign wealth funds,

² See Frankel (2011b) for international evidence on this issue.

requirements on budget accountability and transparency of the government's financial management, effective budget planning and execution, external control and auditing, a fiscal council, and, last but not least, a fiscal rule. Evidence suggests that effectiveness of a fiscal rule depends crucially on effective operation of the other building blocks.

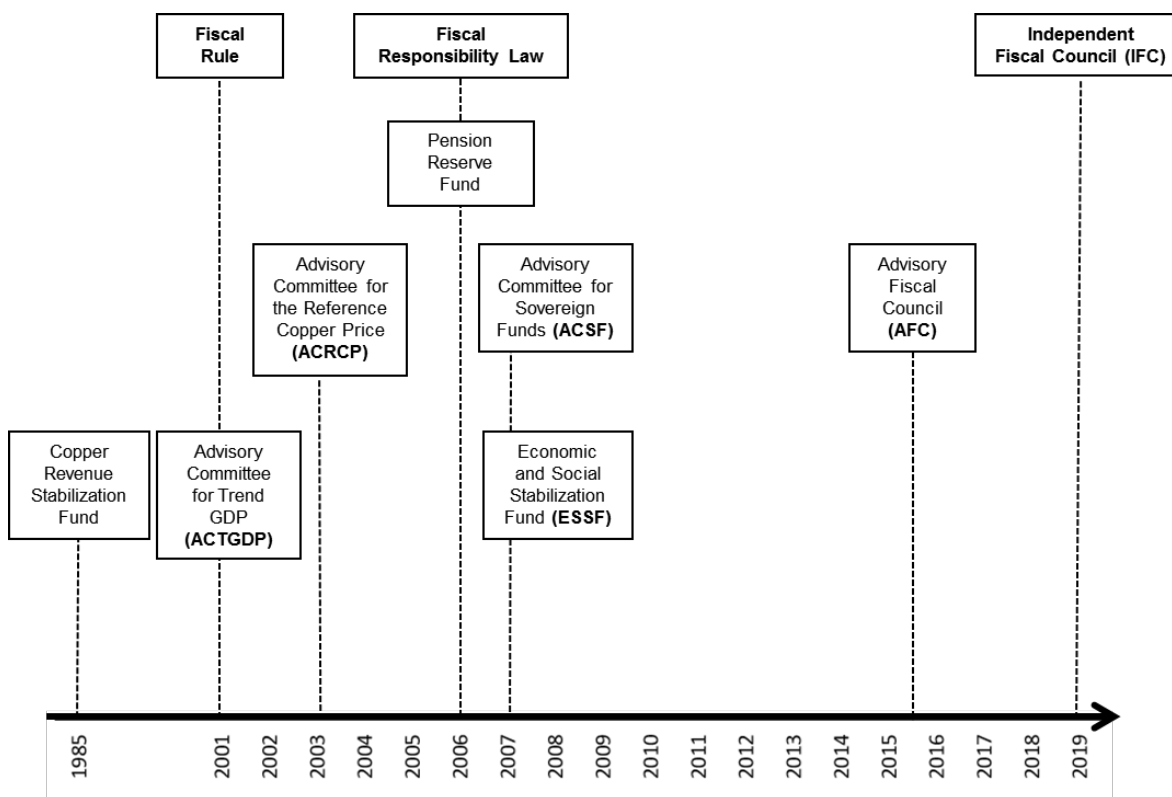
2.1 Chile's Institutional Framework for Fiscal Policy

World evidence suggests that the above-mentioned components are not adopted all at once, but gradually and sequentially. Chile is not an exception. In fact, it took the country several decades, as reflected by the timeline depicted in Figure 1.³ Chile's first institutional building block was an embryonic sovereign wealth fund (SWF)—the Copper Revenue Stabilization Fund (CRSF)—adopted in 1985. The next institutional milestone was reached a quarter of a century later: adoption of the fiscal rule by decree of the Ministry of Finance (MoF)—not by national law—in 2001. In order to strengthen operation and credibility of the rule, an original institutional arrangement was added shortly after starting the rule: projections of two unobservable key variables were outsourced to two committees composed by independent experts: the Advisory Committee for Trend GDP (ACTGDP) in 2001 and the Advisory Committee for the Reference Price of Copper (ACRPC) in 2003.

In 2006, Chile enacted its Fiscal Responsibility Law, a comprehensive piece of legislation that improves the overall institutional framework and strengthens the links between the fiscal rule, the establishment of two SWFs, and the use of government savings. This law does not impose any specific fiscal rule on the government. It rather requires adopting and implementing a fiscal policy framework aiming at fiscal sustainability, based on a distinction between actual and cyclically-adjusted government balances. This provides flexibility to governments to define the formula and parameters for the fiscal rule they commit to at the start of their administration. Finally, the law does not impose restrictions on how budget deficits are financed, maintaining MoF discretion on deciding between issuing public debt, using SWF savings, or selling government assets.

³ A detailed description of the eight building blocks of Chile's fiscal policy framework—other than the fiscal rule—appears in Appendix A.

Figure 1. Development of Chile's Institutional Framework for Fiscal Policy, 1985-2019



Source: Authors' compilation.

The law also establishes two SWFs: the Pension Reserve Fund (PRF) to finance future pension liabilities of the government and the Economic and Social Stabilization Fund (ESSF), where budget surpluses are transferred to and from where resources are withdrawn to finance budget deficits. The PRF was started in 2006. The preceding CRSF was absorbed by the new ESSF in 2007. Finally, the Fiscal Responsibility Law established the Advisory Financial Committee for Fiscal Responsibility Funds (AFCFRF) to advise MoF on investment regulations, governance, and management of both SWFs.

The final addition to Chile's fiscal framework was a fiscal council. It started in embryonic form as an Advisory Fiscal Council (AFC), established by MoF decree in 2013. The AFC was entrusted with a narrow set of functions and lacked independence and funding. Six years later, an Independent Fiscal Council (IFC) replaced the preceding AFC. The IFC has been mandated with a broader set of tasks, taking over the limited functions of AFC and adding others (described in Appendix A). The IFC is an independent fiscal institution that is accountable to Congress and has independent budgetary funding.

2.2 The Fiscal Rule

After 40 years of fiscal mismanagement and growing inflation, Chile's military government started a major fiscal adjustment program in 1975, attaining fiscal surpluses during 1976-1981. However, major policy mistakes in the late 1970s and strong adverse foreign shocks in 1981-82 led to a financial crisis, a deep recession, and huge fiscal and quasi-fiscal deficits (i.e., central bank losses) during 1982-1985.

As a condition of the World Bank's structural adjustment loan to Chile, the government agreed in 1985 to start the CRSF. It aimed at stabilizing government expenditure, making it less sensitive to changes in profits of the state-owned copper company Codelco, caused by the highly volatile price of copper, Chile's main export and the government's main non-tax source of revenue.⁴ Codelco profits in excess of a certain reference level were transferred to the CRSF, from which they were withdrawn when profits were low, in order to smooth government spending. This embryonic fiscal rule was continued by subsequent democratic governments until 2001, well beyond the end of the 1980s World Bank adjustment program.

After 1985, a major fiscal adjustment took place, reflected in improved fiscal balances. The subsequent democratic governments continued a conservative fiscal policy stance, recording an average fiscal surplus of 1.2 percent of GDP during 1990-2000. Public debt declined from 37 percent of GDP in 1992 to 13 percent of GDP in 2000.

2.2.1 Adoption of the Fiscal Rule

Chile's fiscal rule was adopted in 2000. In addition to the abovementioned permanent objectives of any fiscal rule, its adoption was probably motivated by two circumstantial government objectives: to return to budget surpluses after the 1999-2001 deficits, which stemmed largely from a cyclical downturn, and to strengthen fiscal policy against demands for higher public spending by interest groups.

Chile's adoption of a fiscal rule is consistent with the evidence on the conditions that countries exhibit when they put a rule in place: strong fiscal conditions (a fiscal surplus during the previous decade, very low public debt), government stability, a democratic government, political checks and balances, monetary policy based on inflation targeting pursued by an independent

⁴ Fuentes (2011) presents an early analysis of the importance of sovereign wealth funds and fiscal behavior in harnessing copper revenues.

central bank, global financial integration, and a development level consistent with higher middle-income countries (Schmidt-Hebbel and Soto, 2017).

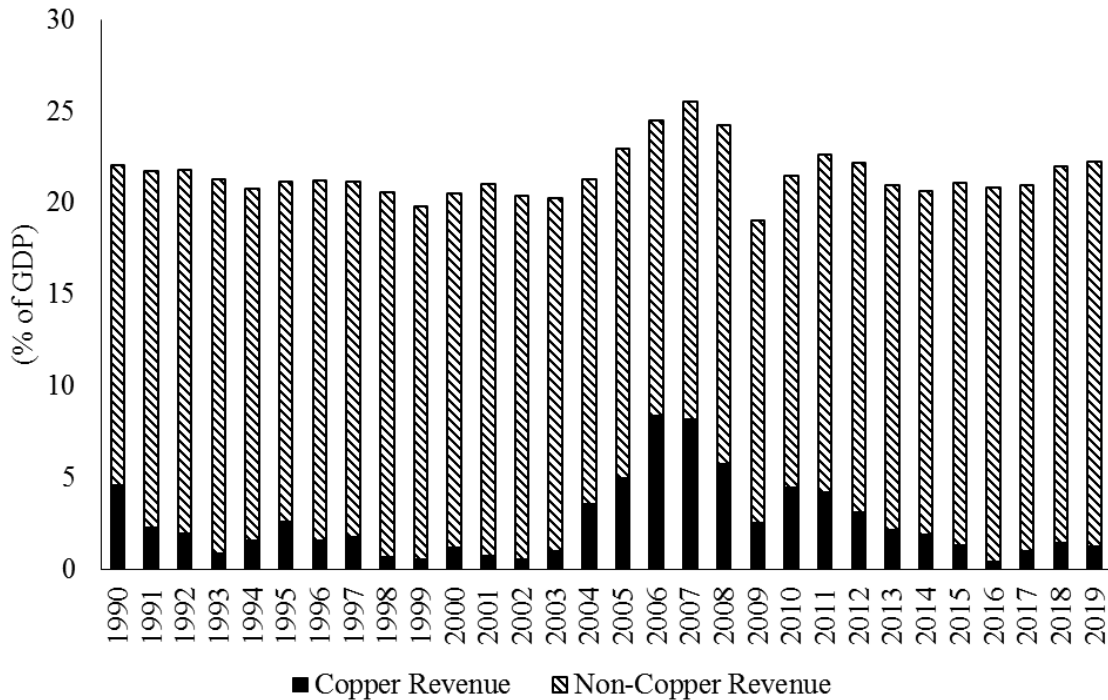
2.2.2 Main Features of the Rule

Chile's rule aims at contributing to two policy objectives: fiscal sustainability or solvency, and fiscal/macroeconomic stability. It is a budget balance rule (BBR), defined for the cyclically-adjusted balance (CAB) of the government, considering cyclical deviations of domestic GDP from trend and cyclical deviations of the international price of copper from its medium-term trend. Therefore, this rule corrects not only for the cyclical influence of the domestic business cycle (as done by most advanced economies), but also for the cyclical deviations of the copper price, like several other commodity-exporting countries (e.g., Norway, Colombia, and Peru). The reason for these corrections is that Chile's two largest sources of volatility of government revenue are the business cycle (that largely determines the cyclical behavior of non-mining tax revenue) and the swings in the price of copper (which largely determines the cyclical behavior of mining tax revenue).

Figure 2 depicts the evolution of government copper and non-copper revenue ratios to GDP.⁵ While non-mining revenue is on average roughly six times larger than mining revenue, the standard deviation of the latter is about twice that of the former (see Appendix A Table A2). This reflects the much greater volatility of the international copper price than that of the GDP level. Moreover, in comparison to the pre-rule 1990-2000 decade, the volatility of both sources of revenue has risen substantially during the two decades of the fiscal rule, reflecting the much larger volatilities of the price of copper and domestic GDP since 2001. Hence, with hindsight, the fiscal rule has been more necessary for the last two decades than during the 1990s.

⁵ All the data used in this section are described in Appendix A, Table A1.

Figure 2. Government Copper and Non-Copper Revenue, 1990-2018 (% of GDP)



Source: Budget Office (MoF), Ministry of Finance of Chile.

Note: The values for year 2019 are presented in “Informe de Finanzas Públicas: Primer Semestre 2020.”

Chile’s government spending is relatively insensitive to the business cycle because of the small role of automatic stabilizers on the expenditure side, such as government-financed unemployment benefits or institutionalized public employment programs during cyclical downturns. Hence, the fiscal rule distinguishes between current and cyclically-adjusted government revenue but not between current and cyclically-adjusted government expenditure.

The main target of the fiscal rule is the CAB ratio to GDP. It is set discretionally by the incoming administration at a level consistent with its objective of fiscal sustainability, as reflected by the corresponding level of government saving (net of government investment). The government’s objective of fiscal stability is reflected by setting overall spending (including government investment) at the level of cyclically-adjusted government revenue, less the CAB target. Therefore, the rule seeks to save during high-revenue periods in order to withdraw from the latter savings in bad times, over and above the saving or dissaving target reflected by the CAB. In

this way, the rule implies a-cyclical government spending, avoiding fiscal procyclicality, but it does not pursue a countercyclical policy.⁶

Unlike other countries with fiscal rules, Chile has neither established ex ante escape clauses from the rule that would apply under pre-specified conditions, nor ex post sanctions for violating the rule, nor ex-post corrections of deviations from the rule.

The CAB rule combines a partial application of the permanent-income theory to government spending with a target level for cyclically-adjusted government saving. The rule deviates from a permanent-income approach in two ways. First, it makes government expenditure independent only from two types of temporary shocks (business cycles and copper price fluctuations) but it ignores other temporary shocks stemming from cyclical deviations of the exchange rate or interest rates. Second, as the rule is only a BBR –without a complementary debt rule– it lacks feedback effects from public debt to government expenditure. This feature may lead to drift in government debt, inconsistent with the rule’s objective of fiscal sustainability.

2.2.3 CAB Rule Equation and Key Parameters

The fiscal rule is represented by the following equation for the cyclical component of the government balance, i.e., the difference between the CAB and the actual balance of the central government. This difference can be decomposed into the difference between cyclically-adjusted and current level of the three main government revenue categories: non-mining tax revenue and social security receipts (mainly driven by the business cycle), private mining tax revenue and Codelco transfers to the budget (the two latter differences driven by the cyclical component of the price of copper):⁷

$$(1) \quad B^* - B = (R^* - G) - (R - G) = (NMTR^* - NMTR) + (MTR^* - MTR) + (CR^* - CR)$$

where B is the central government balance, R is the central government revenue, $NMTR$ stands for the net non-mining tax revenue and social security receipts, MTR represents tax revenue from private mining companies, and CR are transfers from Codelco. A star above a variable indicates its cyclically-adjusted value; all others are current values.

⁶ For evidence on the importance of procyclical fiscal policy in emerging economies see Ilzetzki and Végh (2008) and Frankel, Végh and Vuletin (2013).

⁷ Tax revenue from private mining companies comprises income taxes and royalty payments. Transfers from public mining company CODELCO comprise income taxes, royalty payments, and payment of dividends.

Simple reordering of the first part of equation (1) shows that the fiscal rule boils down to limit actual government spending to cyclically-adjusted revenue net of the CAB:

$$(2) \quad G = R^* - B^*$$

Now let us turn to how the unobservable variable R^* —cyclically adjusted revenue—is projected. This requires projection of two key unobserved variables: trend GDP (projected by ACTGDP) and the reference price of copper (projected by ACRPC).

The members of ACTGDP and the ACRPC make use of historical macroeconomic time series data to provide individual projections for the level and rate of growth of trend GDP (for a five-year horizon) and for the international copper prices (ten-year horizon), respectively. Subsequently, MoF calculates trimmed averages of individual forecasts for both trend GDP and copper prices. Individual, trimmed-means and MoF forecasts as well as data series are made public. The corresponding individual, time-average and trimmed-mean data series are reported to the public.

MoF retains significant discretionary power in projecting other relevant macroeconomic and sector variables and methodologies that determine the final projection of the cyclical components of government revenue and of the CAB. Among the variables projected by MoF are the growth rates of domestic demand and imports, inflation, the exchange rate and the projections of production and sales by large private mining companies and Codelco. Key output elasticities for different tax categories that comprise non-mining tax revenue are also MoF estimates. These have been maintained invariant for several years.

However, the IFC plays a role in providing an independent assessment of MoF assumptions, estimates of parameters and equations, projections of key macro variables, as well as the step-by-step calculation of cyclically-adjusted revenue, the CAB, and the overall budget prepared by MoF.

Since its start in 2001, the fundamental features of the CAB rule have been maintained. Several technical aspects have been improved over time (such as considering GDP elasticities of tax revenue categories), complementing improvements in transparency and IFC monitoring of the rule's application to the budget calculation. Other changes have been of a temporary nature, such as the addition of cyclically-adjusted molybdenum revenue and other modifications in 2009-11, which are discussed below.

2.3 Breaches and Changes of the Rule

Major international and domestic shocks have hit the Chilean economy since the start of the fiscal rule: the favorable 2004-2013 super-cycle of high commodity prices (implying exceptionally high copper prices), the 2008-2009 Global Financial Crisis and Great Recession, and the adverse, partial reversal of high copper prices since 2014. Two important domestic shocks hit the Chilean economy during the last two decades: the large 2010 earthquake and the political crisis beginning in October 2019 combined with the Covid-19 pandemic since March 2020.

During the copper-price boom, the fiscal rule operated flawlessly, shielding public finances from political pressures for higher spending. There is generally strong adherence to the rule in good times. However, the opposite is true during bad times, as discussed next.

2.3.1 Downward Drift in the CAB Target Level, 2001-2010

The rule was adopted in 2001 with a numerical target for the CAB defined at 1 percent of GDP, a surplus intended for funding central bank recapitalization and government pension liabilities. This target was maintained until 2007. Facing huge budget surpluses resulting from the unexpected copper price boom, Minister Velasco reduced the CAB target to 0.5 percent of GDP for 2008 and 2009. The downward drift of the CAB target continued in 2010 and 2011. From 2011 to 2019, the CAB target has remained in the range between -1.0 and -1.8 percent of GDP.

2.3.2 Changes to the Rule in 2009-2010

In response to large adverse shocks to government revenue caused by lower copper prices, the world recession, and the ensuing domestic recession, Minister Velasco introduced in 2009 two major changes to the rule. First, he defined a lower (more negative) target for the CAB to accommodate large countercyclical government expenditure in 2009. Second, to gain additional fiscal space, he changed the rule's definition by widening the scope of cyclical adjustment to other revenue items and he included temporary tax cuts as "non-structural" (i.e., cyclical) revenue, adjusting the CAB measure upward.

On advice of the Corbo Commission (Corbo et al., 2011), the latter methodological changes were reversed by Minister Larraín in 2010, restoring the previous CAB definition that limits cyclical adjustment of revenue to GDP and copper price deviations. Minister Larraín also partially reversed the downward trend of the CAB target in 2011-2013.

2.3.3 Changes to the Rule in 2014-2017

In response to declining copper prices and a weak domestic economy, Ministers Arenas, Valdés, and Eyzaguirre lowered CAB target levels, despite the significant increase in tax revenue stemming from the 2014-2015 tax reforms. The latter reforms aimed at raising tax revenue by 3.0 percent of GDP and attaining a zero CAB in 2018 but failed in both dimensions. Expansionary fiscal policy led to a gross public debt increase from 12.7 percent of GDP in 2013 to 25.6 percent of GDP in 2018.

2.3.4 Changes to the Rule in 2019

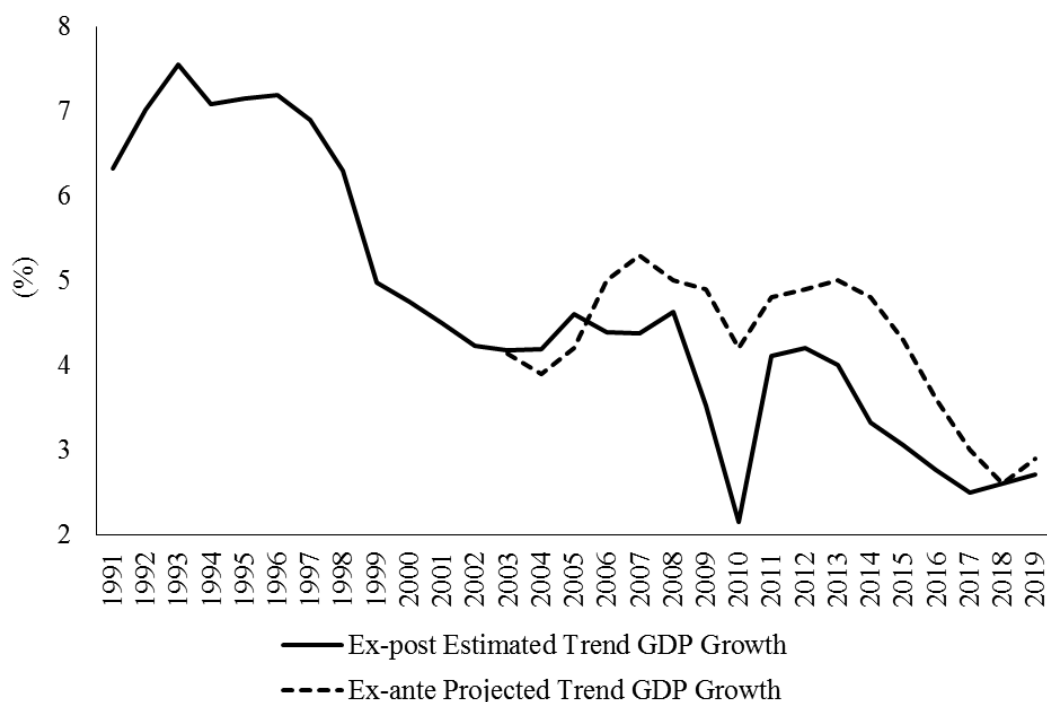
In 2018 Minister Larraín adopted a fiscal consolidation program, aimed at raising very gradually the CAB target from -2.0 percent of GDP in 2017 to -1.0 percent of GDP in 2021, consistent with stabilizing gross public debt at 26 percent of GDP in 2021. This path of fiscal consolidation was carried out during an 18-month period, through September 2019. Then, as a result of the Chilean domestic crisis that erupted in October 2019, Minister Briones obtained congressional support for an expansionary fiscal program for 2020 and beyond, which implied a significant departure from the previous consolidation. The Covid-19 pandemic and ensuing deep recession in 2020 led the government to implement an additional, very large countercyclical fiscal expansion. Public deficits and debt levels are projected to increase significantly in 2020 and subsequent years. This implies a full reversal of the stance of fiscal policy implemented until September 2019, involving major changes in CAB targets.

These modifications to the rule could be justified on the grounds of the imperfections in the rule's design and/or the perception of its inability to deal with unexpectedly large shocks. Deviations from previous policy could thus be considered second-best changes to the rule. Alternatively, discrete changes in the rule's definition and parameters, such as those introduced in 2009-2010, can be regarded as unusual breaches of the rule, either in the form of violating the fundamental objectives of the rule or as a failure of the administration to commit to the CAB target. In Section 5 we provide a thorough analysis of this issue, explore the overseeing role given recently to the IFC, and propose reforms aimed at correcting the current limitations of the rule, in order to institutionalize fiscal expansions in response to adverse shocks and strengthen their reversal in subsequent years.

3. Forecasts of Key Macroeconomic Variables for the Budget

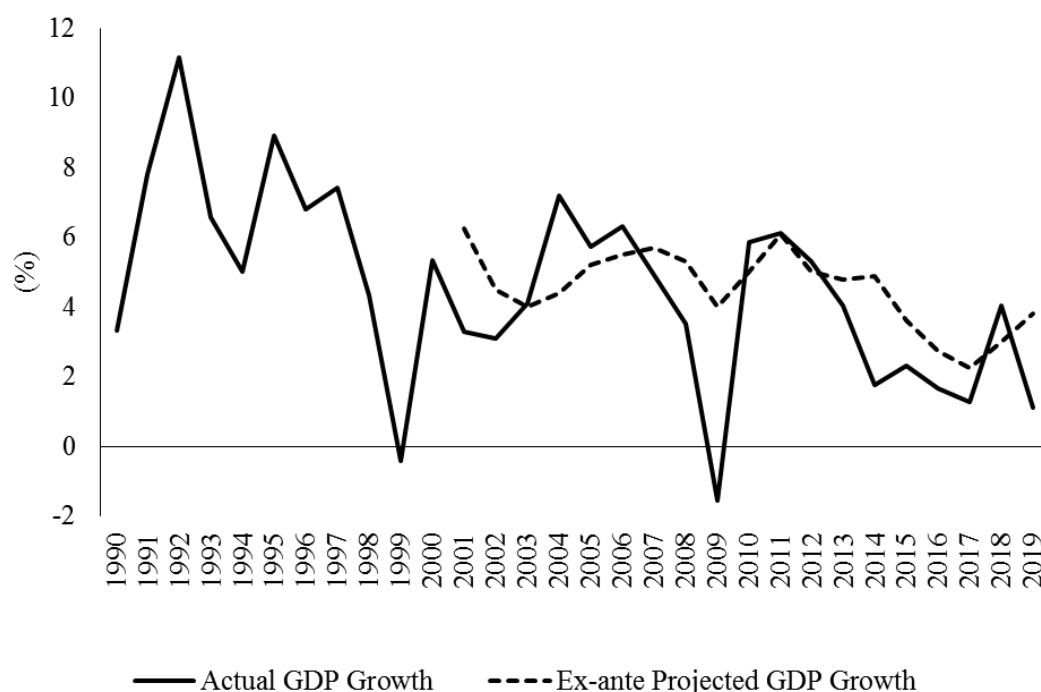
Ex ante projections of trend GDP growth were close to ex post estimations (as of 2019) of trend growth only during the first four years (2003-2006), as seen in Figure 3. Since 2007 trend growth projections have been systematically above their ex post estimations. Average ex ante projected trend growth exceeded ex post estimated trend growth by 0.7 percentage points (pp) per year during 2003-2019. This forecast bias is probably due to the combination of several factors: an unanticipated decline in trend GDP growth since the late 1990s, a large weight of past GDP and production-factor data in future trend GDP forecasts, and limitations of the Solow growth model as the only methodology that is applied in generating forecasts.

Figure 3. Ex Ante Projected Trend GDP Growth and Ex Post Estimated Trend GDP Growth, 1991-2019



Sources and notes: See Appendix Table A1.

Figure 4. Ex-Ante Projected GDP Growth and Actual GDP Growth, 1990-2019

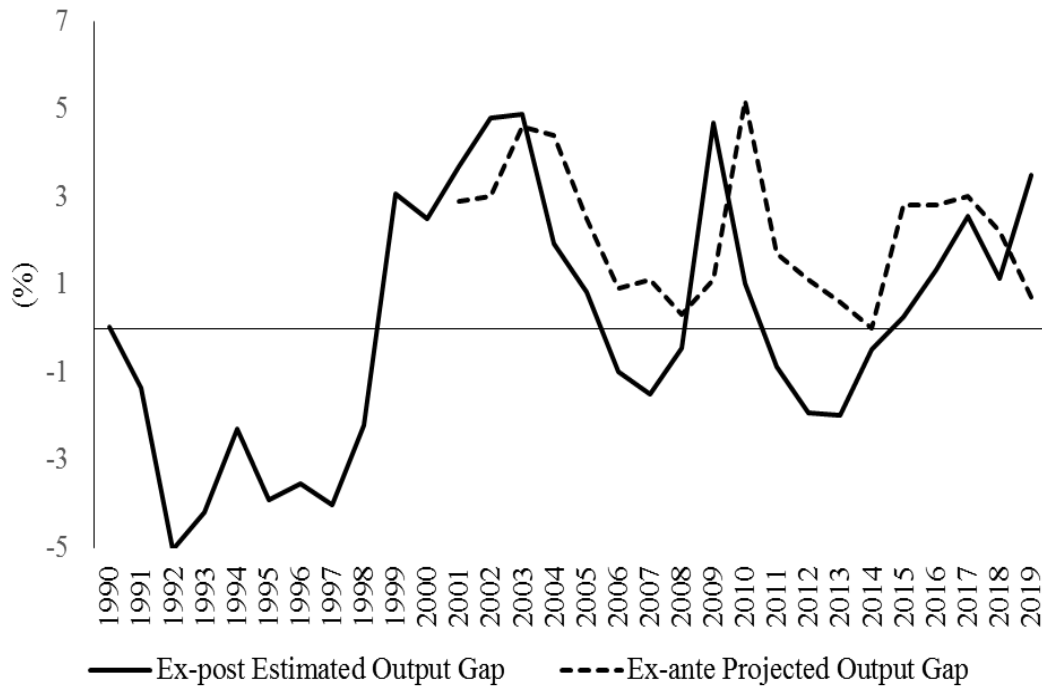


Sources and notes: See Appendix Table A1.

Ex ante projections of actual GDP growth (made since 2001) were also generally larger than actual GDP growth rates (Figure 4). On average, projected GDP growth exceeded actual GDP growth by 0.8 pp.

For each and every year in 2001-2019, the ex ante projected output gap has taken a positive value; i.e., governments have projected systematically weak domestic cyclical conditions for the following year (Figure 5). Ex post estimates or backcasts of the output gap are typically lower than ex ante gap projections. The average annual ex ante projected output gap is 2.15 percent, which is significantly larger than the average annual ex post estimate of 0.05 percent. This forecast bias in the output gap (a direct reflection of the bias in GDP forecasts) leads to government overspending and undersaving.

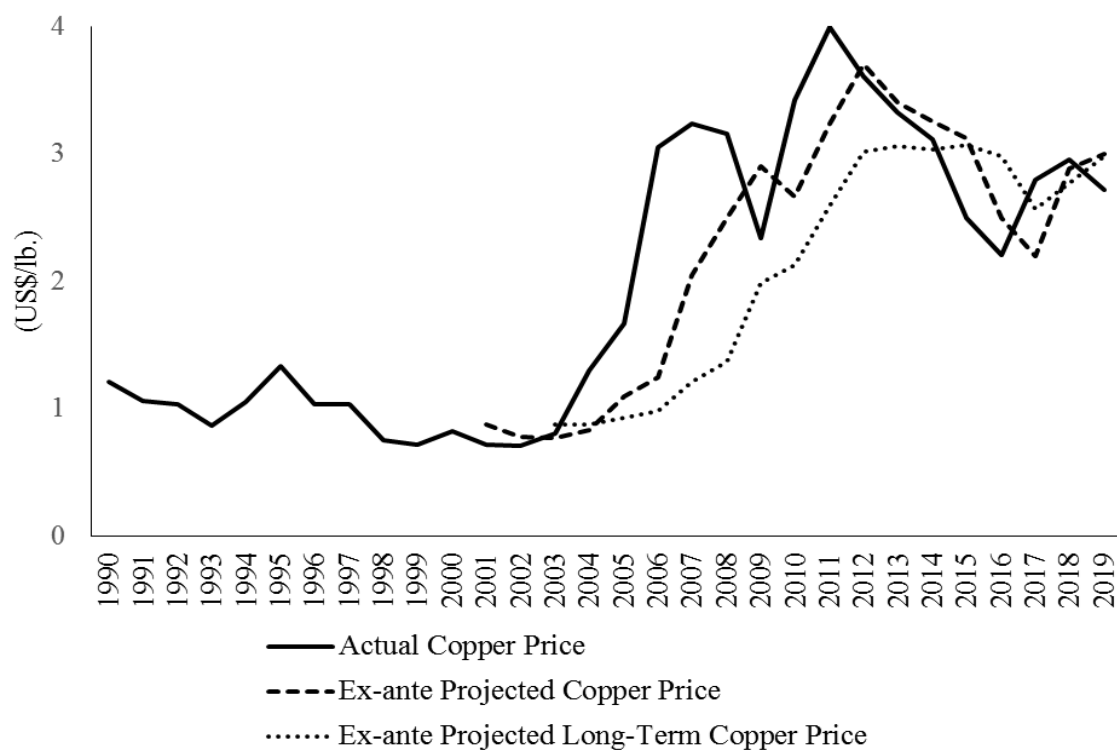
Figure 5. Ex Ante Projected Output Gap and Ex Post Estimated Output Gap, 1990-2019 (%)



Sources and notes: See Appendix Table A1.

ACRCP copper-price projections appear also to be significantly influenced by lagged prices. This leads to under-estimation of future prices during unexpected price booms (in 2004-2013) and hence over-saving, and to the opposite result afterwards (Figure 6).

Figure 6. Actual Copper Price, Ex Ante Projected Copper Price, and Ex Ante Projected Reference (or Long-Term) Copper Price, 1990-2019 (US\$/lb)



Sources and notes: See Appendix Table A1.

In summary, projections of the two key variables used in the Chilean fiscal rule had been subject to systematic biases, significantly overestimating GDP growth and underestimating copper prices. While these biases operate in opposite directions, two wrongs do not make a right. Fiscal authorities have been unwilling or unable to implement remedial measures, upgrading and updating the forecasting methodologies employed by the ACTGDP and ACRPC, thus jeopardizing credibility of the rule.

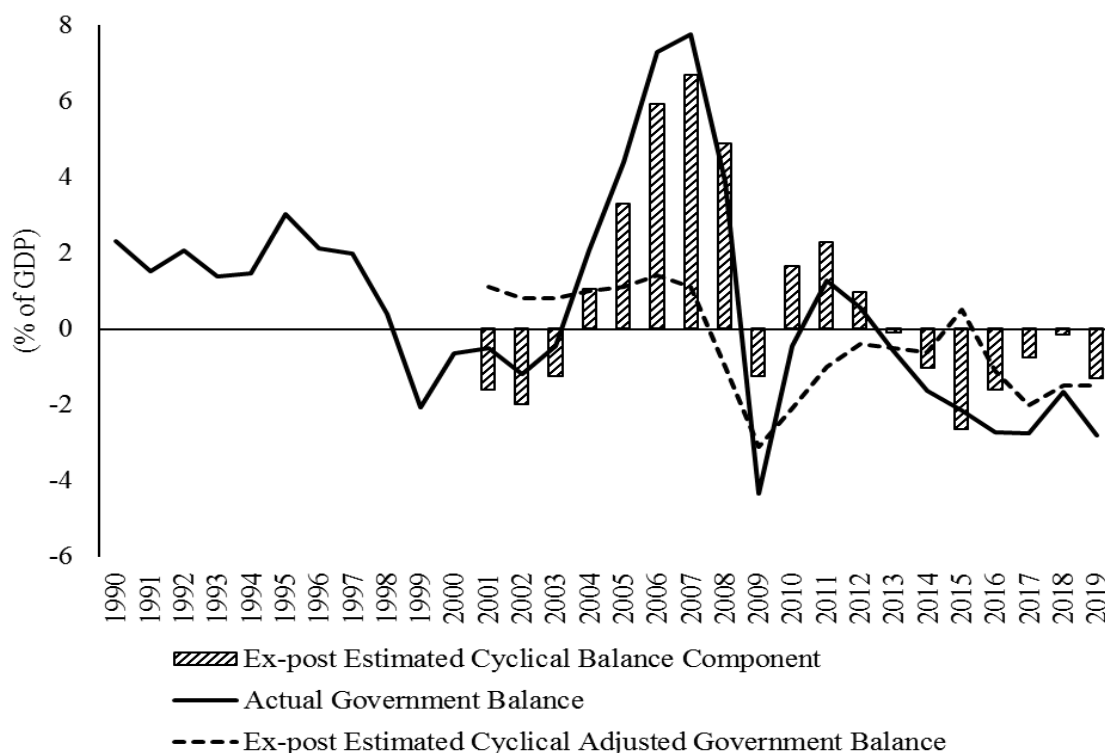
4. Fiscal Performance under the Rule

4.1 Actual Fiscal Balance and CAB

Fiscal consolidation in Chile started well before the fiscal rule was in place. The actual fiscal balance (as share of GDP) averaged 1.2 percent of GDP in 1990-2000 and fell to an average 0.3 percent of GDP since the start of the rule (2001-19), see Figure 7. The actual fiscal balance exhibits a very large trend decline, from a surplus close to 2 percent of GDP in the early 1990s to a deficit close to 3 percent of GDP in the late 2010s. This large change in Chile's fiscal stance reflects the

3 p.p. reduction in the CAB target since the start of the rule and the forecast errors and biases in GDP and copper price projections.

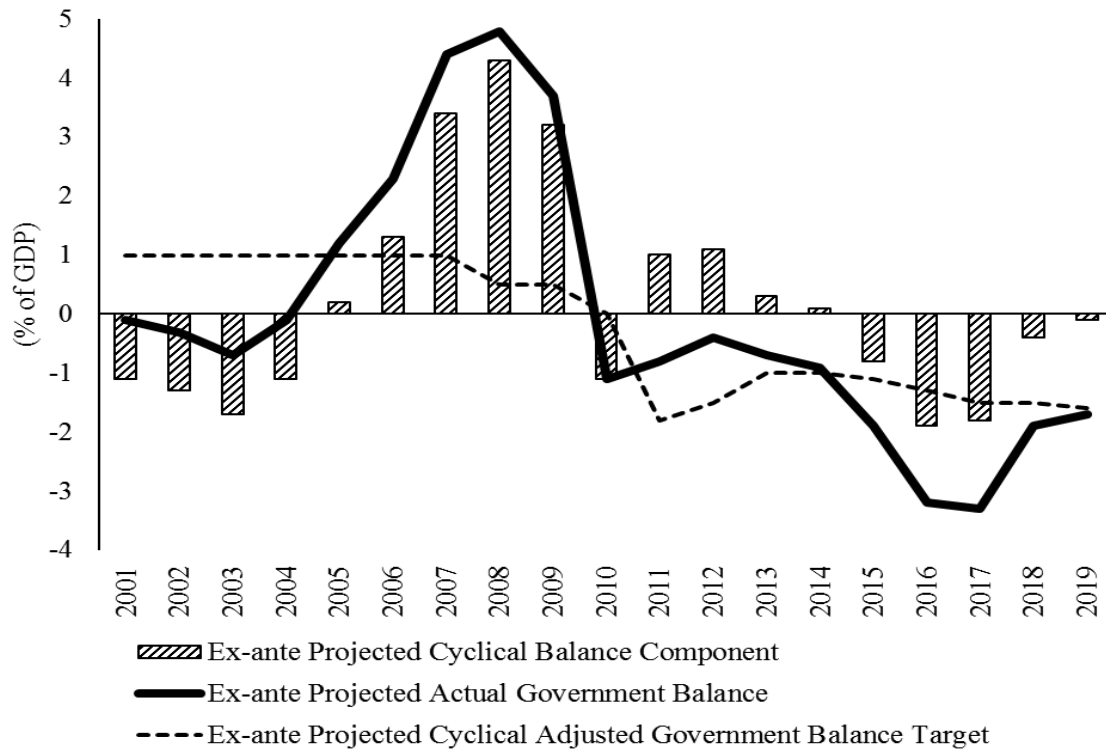
Figure 7. Ex Post Estimated Cyclical Adjusted Balance, Actual Government Balance, and Ex Post Estimated Cyclical Balance Component, 1990-2019 (% of GDP)



Sources and notes: See Appendix Table A1.

Yet the fiscal rule has stabilized public finances, compared to the counterfactual case of absence of the rule. This is apparent when comparing the ex ante CAB target and the ex ante actual government balance (Figure 7). The former is much more stable than the second, and their difference—the cyclical component of the budget—shows a high variance that reflects the GDP and copper-price cycles.

Figure 8. Ex Ante Projected Cyclical Adjusted Balance Target, Ex Ante Projected Actual Government Balance, and Ex Ante Projected Cyclical Balance Component, 2001-2019 (% of GDP)



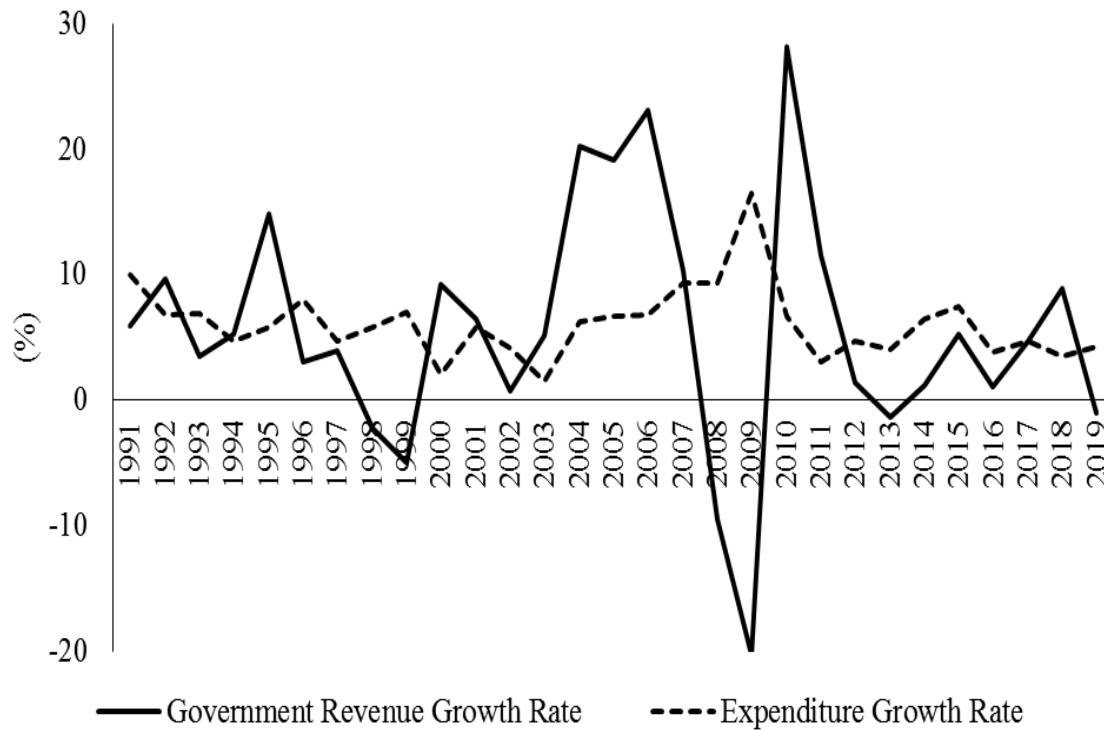
Sources and notes: See Appendix Table A1.

The ex post measures of the CAB, the actual balance, and their difference (the ex post cyclical budget component), depicted in Figure 7, differ from the ex-ante measures in Figure 8, due to the forecast errors and biases that were noted above. Hence the correlation between the corresponding ex-ante and ex-post measures—of around 0.6—are not very high (Appendix A Table A3).

4.2 Government Revenue and Expenditure Cyclicity

The fiscal rule has led to significant cyclical delinking of expenditure growth from revenue growth (Figure 9). With the significant increase in GDP and copper-price volatility since 2001, the standard deviation of revenue growth doubled between 1990-2000 and 2001-2019. However, due to the fiscal rule, the standard deviation of expenditure growth increased only slightly. Since 2001, the standard deviation of revenue growth has been almost four times as large as the standard deviation of expenditure growth (Appendix A Table 2).

Figure 9. Government Revenue and Expenditure Growth Rates, 1991-2019 (%)



Source: Budget Office (DIPRES), Ministry of Finance of Chile.

Note: The values for year 2019 are presented in “Informe de Finanzas Públicas: Primer Semestre 2020.”

4.3 Fiscal Pro and Countercyclicality

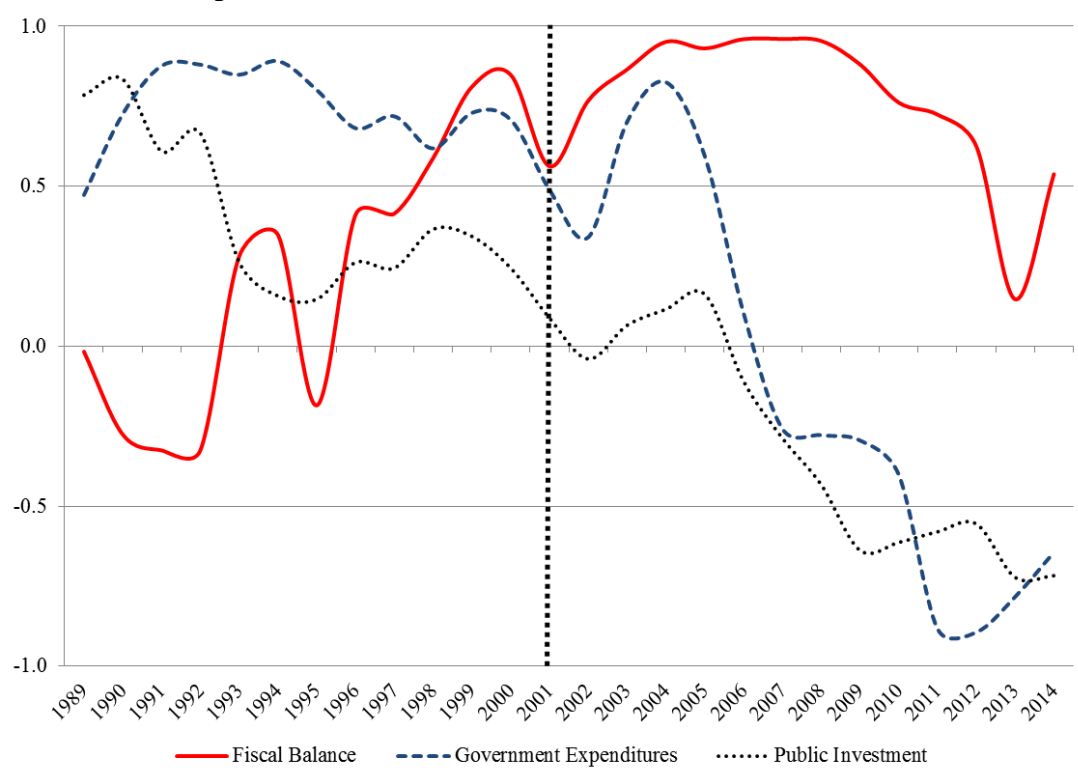
Chile’s fiscal rule has been rather successful in lowering fiscal procyclicality. While the rule’s design implies government expenditure a-cyclicality, the strong discretionary and expansionary fiscal policies adopted in response to adverse shocks (e.g., in 2009 and 2019) imply that Chile has had de facto countercyclical fiscal management.

In Figure 10 we reproduce the evidence on fiscal cyclicality in Chile, following the methodology proposed in Schmidt-Hebbel and Soto (2018). The rolling 10-year correlation between the cyclical components of real government expenditure and real GDP has steadily declined from levels above +0.5 before 2001 to levels close to -0.5 after 2007. This shows a strongly countercyclical expenditure behavior during the last decade, reflecting the combination of an a-cyclical fiscal rule (in design) with strongly countercyclical expenditure deviations from the rule during strong adverse shocks. As a result of the latter, the current fiscal balance changes from a-cyclical until the late 1990s to strongly pro-cyclical since the late 1990s.

The rolling 10-year correlation between the cyclical components of public investment and real GDP show a similar pattern. Before 2001 public capital expenditures had been mildly procyclical but this reversed in the 2000s when they became strongly countercyclical.

The latter results are confirmed by empirical studies for Chile's fiscal rule, which show that there has been a reduction of the pro-cyclical bias in fiscal policy, de-linking government expenditure from cyclical shocks and strengthening the role of government saving in buffering cyclical shocks (e.g., Larraín and Parro, 2008; Kumhof and Laxton, 2009; Ter-Minassian, 2011; Schmidt-Hebbel, 2010; OECD, 2010; Frankel 2011a; Schmidt-Hebbel 2012).

Figure 10. Ten-Year Rolling Correlations of the Cyclical Components of Real GDP and Government Expenditures, Public Investment and Fiscal Balance in Chile, 1989-2014



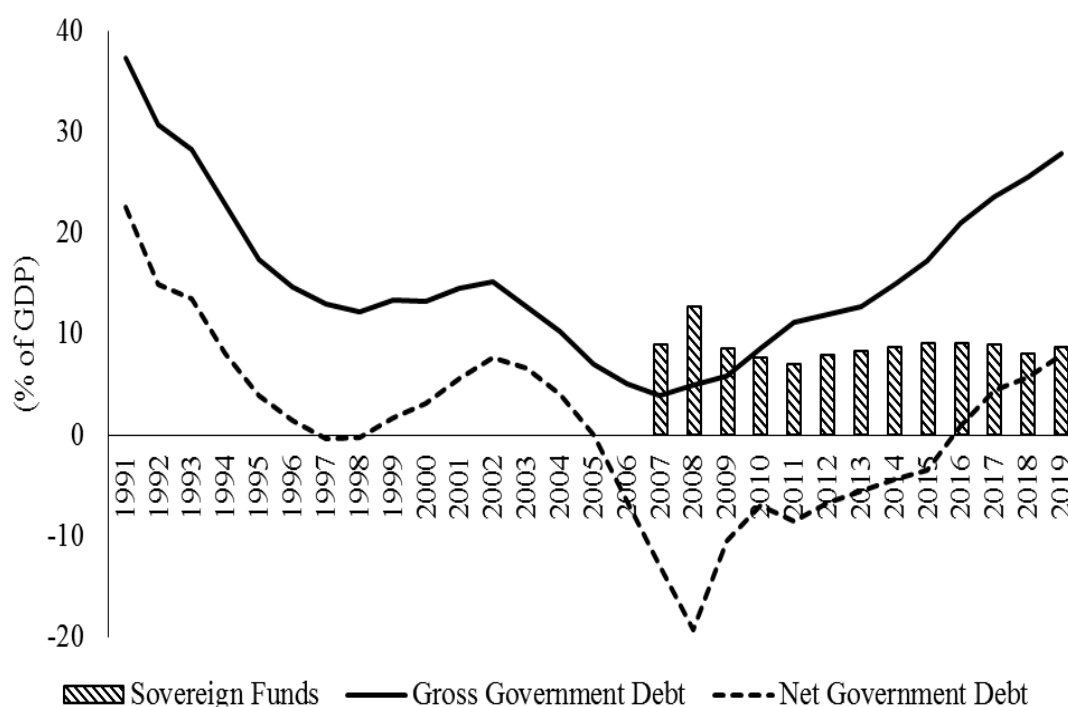
Source: Authors' compilation elaboration based on Schmidt-Hebbel and Soto (2018).

4.4 Fiscal Solvency: Gross Debt, Net Debt, and Sovereign Risk Premia

Reflecting the strong fiscal stance and high GDP growth between 1991 and 2007, the ratios of gross debt and net debt (gross debt minus SWF assets) to GDP exhibit a negative trend until 2007-2008 (Figure 11). Since then, the deteriorating fiscal position is reflected in growing levels of gross

and net debt ratios. As discussed above, deterioration of the fiscal position is projected to continue into the medium-term future.

Figure 11. Gross Government Debt, Sovereign Fund, and Net Government Debt, 1990-2018 (% of GDP)



Source: Budget Office (DIPRES), Ministry of Finance of Chile.

Note: The values for year 2019 are presented in “Informe de Finanzas Públicas: Primer Semestre 2020.”

Chile’s sovereign risk premium declined in the 1990s until reaching all-time lows in 2005-2007. Since then, it has increased somewhat, reflecting rising deficit and debt ratios to GDP. Empirical studies show that the gains in fiscal sustainability, fiscal solvency, and credibility during the early years of the fiscal rule were reflected in lower sovereign risk premiums.

4.5 Macroeconomic Performance under the Rule

Several studies have provided arguments and estimates about the macroeconomic effects of Chile’s fiscal rule, based largely on early evidence (see Table 1 for a summary of research results). They suggest that the rule has led to higher income growth, lower income volatility, lower exchange-rate and interest-rate volatility, less real exchange rate appreciation during cyclical upturns, lower dependence on foreign financing during cyclical downturns, and larger buffer-stock

accumulation. The evidence in these studies, however, considers exclusively the period immediately before Minister Velasco breached the rule and, therefore, their favorable view on the working of the fiscal rule must be taken with caution. There are no studies that have scrutinized with sufficient detail the working of the fiscal rule in Chile or its macroeconomic effects after 2012.

Table 1. Evidence on Macroeconomic Performance

Specific Variable	Empirical Findings
Income Growth	+ (10)
Income Growth Volatility	- (4,10, 12)
Sovereign Risk Premiums	- (1, 2, 3, 4, 5, 6, 7, 8, 10, 11, 12)
Interest rate Volatility	- (3, 6)
ER Volatility	- (3, 5)
RER Appreciation during Booms	- (3, 5)
Dependence on Foreign Financing during Downturns	- (3, 5)
Asset Accumulation as a Buffer Stock	+ (3, 4, 6, 7, 9, 10, 11, 12)

Sources: The numbered sources are the following studies: 1. Fiess (2005); 2. Franken et al. (2006); 3. Rodríguez et al. (2007); 4. Kumhof and Laxton (2009); 5. Velasco et al. (2010); 6. Ter-Minassian (2011); 7. Schmidt-Hebbel (2010); 8. OECD (2010); 9. Engel et al. (2011); 10. Schmidt-Hebbel (2012); 11. Marcel (2013); 12. Larraín and Parro (2008).

Notes: The qualitative results listed in the last column of this table summarize signs of the effect of fiscal rule reported in 13 studies of fiscal rules. Positive and negative signs correspond to statistically significant positive or negative effects of a specific variable.

5. The Fiscal Rule and Public Investment

Chile's CAB rule does not distinguish between current and capital expenditure by the government. Therefore, public investment is not shielded from adverse shocks that affect government revenue; hence capital spending is not protected from discretionary cuts by the government.

The responsibility of proposing the composition of government expenditure relies entirely on the MoF but the budget has to be approved annually by the Congress. However, congressional influence on the allocation between current and capital expenditures is limited. The Congress may reduce some expenditures or investment items, but it cannot increase expenditures in any area. As

in most countries, a significant part of government expenditure is non-discretionary current spending, stemming from legal entitlements in social spending and financial needs of government administration. Hence, a large part of fiscal policy discretion falls potentially on public investment.

An important idiosyncratic feature of Chile is the role of public enterprises and private concessions for public infrastructure. According to standard government accounting practice, public enterprises are not included in general government accounts. Therefore, investment by public enterprises is not part of government investment. However, equity capitalization of public enterprises by the government is a below-the-line financial operation in which the government engages from time to time.

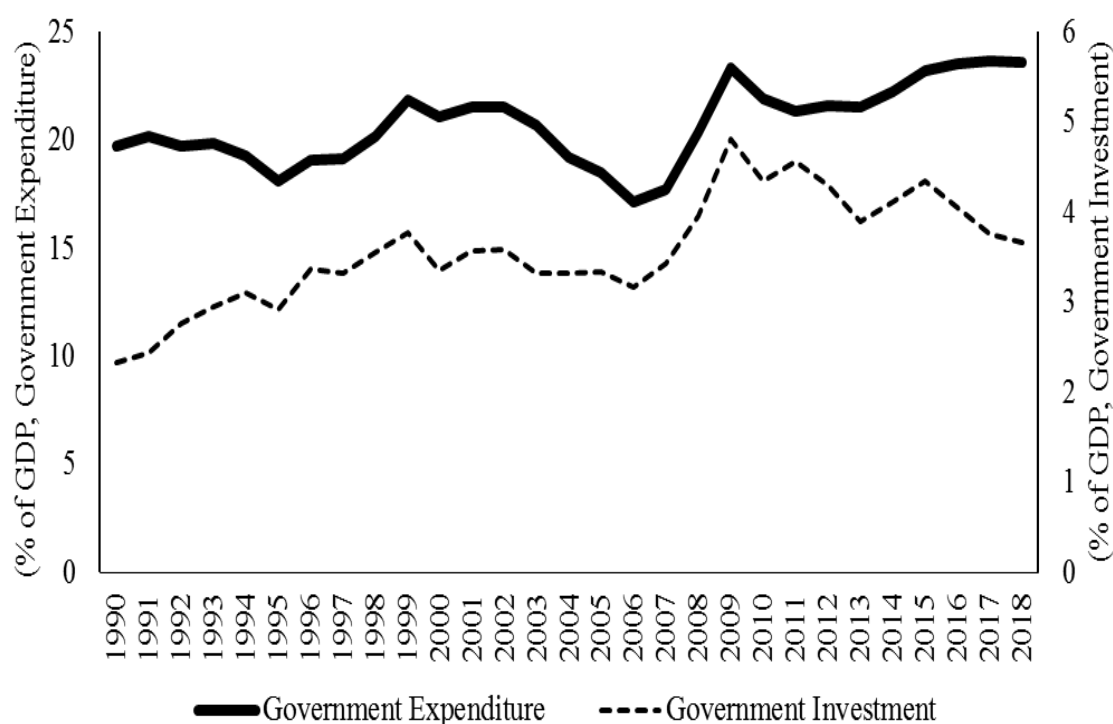
Figure 12 presents the evolution of the ratios of aggregate government expenditure and gross government investment to GDP. While total expenditure exhibits a rising trend throughout 1990-2018, government investment rises since the 1990s—but only until reaching a peak of 4.6 percent of GDP in 2011. Since 2012 government investment shows a gradual reduction. Government investment is countercyclical, expanding strongly during the cyclical downturn of 2008-2010. Both types of outlays were raised during the 2009 crisis, reaching a peak that year. In the following years both ratios declined, in an effort to control the fiscal deficit. However, during 2016-18 the government current expenditure ratio went back to the previous peak, while the ratio of investment to GDP continued declining. Although these changes were not large, they took place in a context of high aggregate government spending and increasing net and gross government debt (by about 10 percentage points of GDP).

Since 1993 Chile has implemented a system of competitive franchising of public investment to private corporations through private-public partnerships or PPPs (Programas de Concesiones). This includes road infrastructure, public utilities (hospitals, schools, jails, etc.), and seaport and airport infrastructure. This rather successful policy substitutes for public investment outlays.

As shown in Figure 13, there is a marked difference before and after the implementation of the fiscal rule. Public investment was very high in the 1990s, attaining a record 3.2 percent of GDP in 1996 (Figure 13). However, since 2003 it has declined to low levels of execution, not exceeding 0.5 percent of GDP in any year. This trend reduction should not be attributed to adoption of the fiscal rule in 2001 but to other weaknesses in budget planning, including the lack of a strong evaluation process of public investment, and the dominance of political priorities on current rather

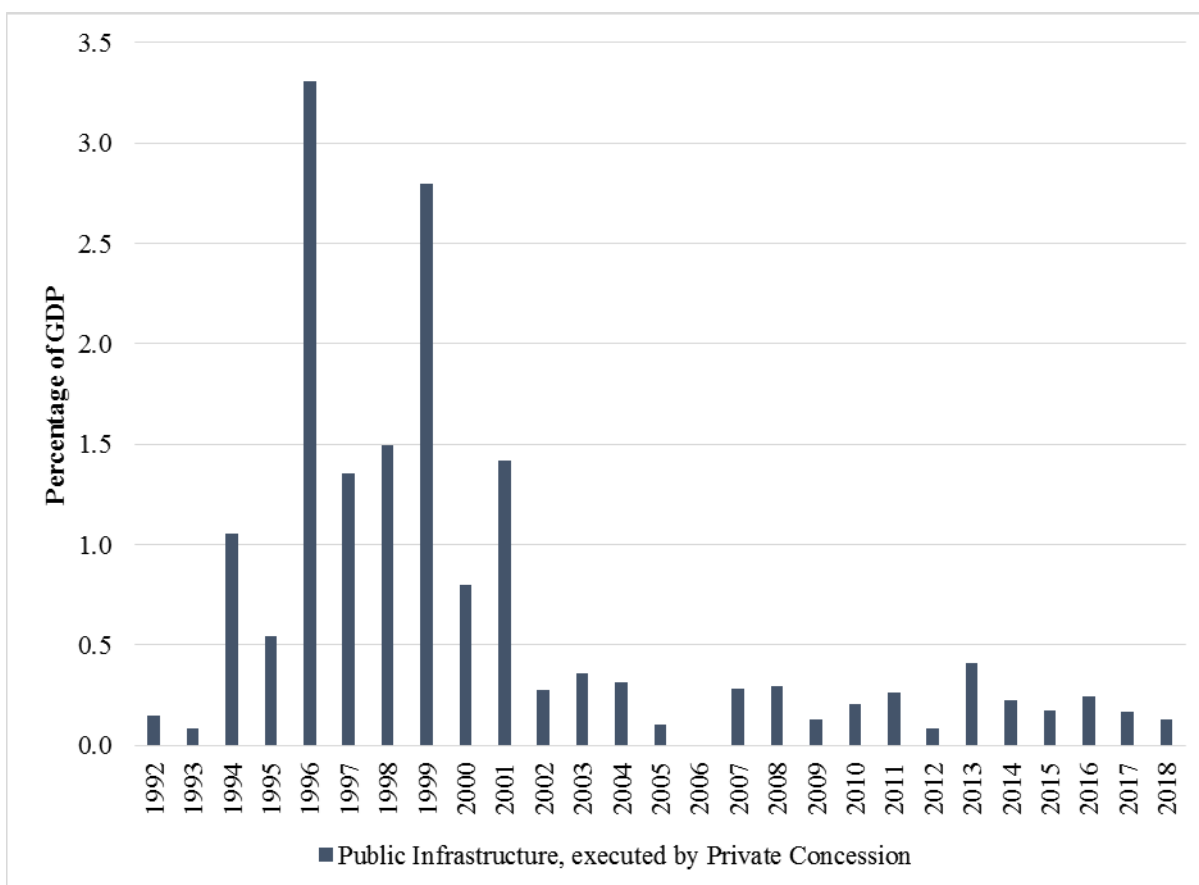
than on capital expenditure of the government. Clearly, PPP investments have not compensated for the retrenchment in public investment observed since the early 2000s. MOP (2016) identifies a series of deficiencies in the PPP schemes used in Chile (in contracts, management, and incentives) as well as the need for better planning and coordination of initiatives. It also suggests that initial investment projects in roads, airports, and ports were easier to handle and implement than those in hospitals, jails or education that followed, which in turn might have slowed down PPPs. These limitations, nevertheless, do not result from the implementation or management of the fiscal rule.

Figure 12. Government Expenditure and Government Investment, 1990-2018 (% of GDP)



Source: Budget Office (DIPRES), Ministry of Finance of Chile.

Figure 13. Public Infrastructure Investment by Private Concession, 1992–2018 (% of GDP)



Source: Budget Office (DIPRES), Ministry of Finance of Chile.

6. A Counterfactual Appraisal of Chile under the Fiscal Rule

6.1 Synthetic Control Methods

In this section we employ a synthetic control method (SCM) to obtain a counterfactual trajectory for the variables of interest (fiscal balance, public investment, and public debt), had the fiscal rule not been in place in Chile since 2001. We consider the implementation of the fiscal rule as an intervention or “treatment” and assess its effects on the selected variables. Measuring these effects entails comparing the observed path of the variables to what would have been their path in the absence of the fiscal rule. The main difficulty is, naturally, to identify the latter (dubbed as the “missing counterfactual problem”). This methodology has been applied before to study the role of fiscal rules in Panama, Peru, and Colombia by Ardanaz et al. (2019).

Several methodologies have been used to evaluate quantitatively the performance of Chile's fiscal rule, including time-series analysis (Fiess, 2005), comparative case studies (Berganza, 2012), simulated general equilibrium models (Medina and Soto, 2016; Kumhof and Laxton, 2009), and simulated fiscal trajectories (Villena et al., 2018). The use of traditional econometrics –such as time series models—to estimate medium and long-term effects of policy intervention is jeopardized by the simultaneous presence of shocks to the outcome of interest, aside from the effect of the intervention. Simulated fiscal trajectories, on the contrary, neglect the presence of any type of shocks that can influence the effects of the fiscal rule.

Comparative case studies are based on the premise that the effect of an intervention can be inferred by comparing the evolution of the outcome variables of interest in the unit exposed to treatment vis-à-vis a group of units that are comparable to the exposed unit but were not affected by the treatment.⁸ As noted by Abadie (2019), this can be achieved when the evolution of the outcomes for the unit affected by the intervention and the comparison units is driven by common factors that induce a substantial amount of co-movement. Comparative case studies are nevertheless limited by two problems that SCMs can overcome. First, there is typically some degree of ambiguity about how comparison units are chosen. Comparison groups are often selected on the basis of subjective measures of affinity between affected and unaffected units. Second, comparative case studies typically employ inferential techniques that measure only uncertainty about the aggregate values of the data in the population. They neglect uncertainty about the ability of the control group to reproduce the counterfactual outcome trajectory that the affected units would have experienced in the absence of the intervention or event of interest. This type of uncertainty is not reflected by the standard errors constructed with traditional inferential techniques for comparative case studies (Abadie et al., 2010).

SCM thus offers the advantage of allowing researchers to systematically select comparison groups. The basic idea behind SCM is that a combination of non-treated units (called the “donor pool”) often provides a better comparison for the unit exposed to the intervention than any single unit alone. These non-treated units are chosen to match as closely as possible the pre-treatment characteristics of the treated unit (Abadie et al., 2010). The choice of the pre-treatment

⁸ Difference-in-difference analysis and randomized control trials are comparative case studies often used in microeconomic research as an alternative to a counterfactual analysis. However, these techniques are not useful to study macroeconomic policies (such as implementing fiscal rules) or for unique events (such as Brexit) mainly because they assume that the treatment is a once-and-for-all event and the effects of such treatment do not change over time.

characteristics should include variables that can approximate the path of the treated country but should not include variables that anticipate the effects of the intervention. The identification assumption of SCM is that if the synthetic control unit provides a good approximation of the outcome for the treated unit in the pre-treatment period, then any subsequent difference between the treated and control units can be attributed to the effect of the intervention (policy) on the outcome. Therefore, the units in the donor pool must not be affected by the treatment.

An additional advantage of SCM is that, unlike other techniques such as the difference-in-differences approach, which measure the once-and-for-all effect of a treatment, the SCM can account for the effects of confounders changing over time, by weighting the control group to better match the treatment group before the intervention. In particular, when treatment and potential control groups do not follow parallel trends and difference-in-differences methods lead to biased estimates.

Two key issues are to be taken into account when undertaking SCM exercises. First, that the pre-fiscal rule period be sufficiently long to provide for a consistent estimate of the time-varying effects of the fiscal rule. Ferman et al. (2018) find that the lack of guidance on how to choose the matching variables used in the SCM estimator would be asymptotically irrelevant when the number of pre-treatment periods goes to infinity. Second, that potential donors (countries) are properly suited for the exercise. As noted by Abadie et al. (2010), researchers trying to minimize biases caused by interpolating across regions with very different characteristics may restrict the donor pool to regions with similar characteristics to the region exposed to the event or intervention of interest. More recently, Firpo and Possebom (2018) find that the root mean-squared prediction-error (RMSPE) statistic has good properties with respect to size, power, and robustness when selecting the appropriate specification for the SCM estimator. We use the latter criterion when selecting the donor group.

6.2 Application

In what follows, we apply the SCM estimator to fiscal balances, public investment, and the stock of public debt. We collected information for the three variables from the IMF for the world sample and from the MoF for Chile.⁹ We expressed all data as a share of GDP. We also collected data for additional controls –such as private investment, terms of trade and the dependency ratio—that are

⁹ Data sources and definitions are described in Appendix B.

used when estimating the counterfactual scenario. Finally, business cycles and terms of trade shocks were computed using appropriate time-series filters.

Data on fiscal rules were obtained from Schmidt-Hebbel and Soto (2018). Their complete database comprises 152 countries and covers the period 1970-2017, including countries and years with and without fiscal rules. Countries that had implemented fiscal rules at the national level were excluded from the pool of donors as they are treated units. Likewise, in order to have a pre-fiscal rule period sufficiently long to provide for a consistent estimate of the time-varying effects, we excluded countries without data 10 years prior to the implementation of the Chilean fiscal rule in 2001. We also excluded countries without full data 10 years after the start of the rule in Chile, in order to have unbiased counterfactuals. Our final database comprises 73 countries and covers the period 1982-2017.

SCM models were selected on the basis of three criteria. First, we aimed at minimizing the RMSPE of the models. Second, we aimed at minimizing the distance between the synthetic and actual values of the treated unit. Third, we checked the ability of the donor pool to replicate the evolution of each fiscal variable in the pre-treatment period. Control variables of each model were selected following the empirical models included in Schmidt-Hebbel and Soto (2018) and, inevitably, on the basis of available data for the countries in the donor pool.

The first finding highlighted by the SCM analysis is that prior to the implementation of the fiscal rule in Chile, the synthetic and actual fiscal balance evolved in a similar fashion, although with an important difference in their levels as shown in Figure 14, where the vertical dashed line in 2001 identifies the rule's start. In fact, the actual data indicate that Chile had a fiscal surplus of around 1.15 percent of GDP in the period 1991-2000, while the SCM projects an average level of 0.71 percent of GDP. Therefore, the fiscal rule implemented in 2001 followed the historic trend by setting its initial CAB target at a 1 percent-of-GDP surplus. In this sense, the rule ought not be seen as a disciplining device for fiscal policy, but rather as a mechanism for sustainable public finances.

Fiscal balances after the implementation of the CAB rule were driven mostly by the commodity boom of the 2000s. Copper prices more than doubled in real terms over the previous decade and, subsequently, generated a large, sustained fiscal surplus (3 percent of GDP on average between 2001 and 2008). The synthetic control projection for that period is of a balanced budget

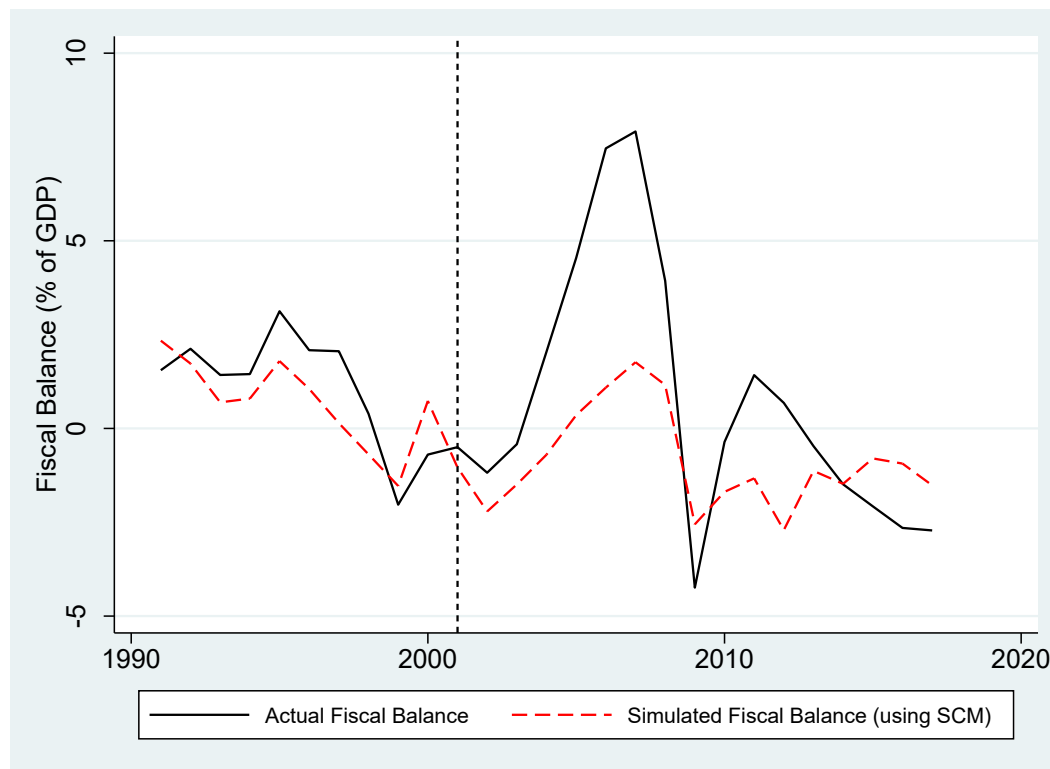
(-0.13 percent of GDP), which indicates that the Chilean government chose to run a fiscal surplus and save rather than spend the copper revenues from the commodity boom.

The fiscal stance drastically reversed in 2009 when. As a result of the domestic recession and discretionary fiscal expansion, the deficit reached an all-time high level of 4.2 percent of GDP and the fiscal rule was breached. The SCM simulation projects a fiscal imbalance of only -2.5 percent of GDP, thus indicating that the fiscal shock in Chile was far more significant than in the control group. Fiscal deterioration was, in our view, the result of two forces: on one hand, the need to boost the Chilean economy, which was adversely affected by the Global Recession, and, on the other hand, the political cycle brought upon by the presidential election of 2009. The fiscal rule was breached again in 2010, allegedly because of the reconstruction effort following a devastating earthquake in February 2010. Budget figures indicate that the 2009-2010 budgets were heavily tilted towards expanding current expenditures and transfers. Political pressures to soften the fiscal rule led the authorities to request a reform proposal from a group of economists¹⁰ that recommended lowering the target to 0.5 percent of GDP but not further. This was implemented in 2008, but the target was further lowered to 0 percent in 2009.

While subsequent governments have all declared their willingness to abide by the fiscal rule, this commitment has not materialized. Between 2010 and 2013 the government managed to reduce the cyclically-adjusted structural fiscal deficit significantly, but finances worsened again in 2014 and deteriorated alarmingly in the period 2015-2017. The worsening in the fiscal stance after 2014 is more serious than what would be expected from the experience of the control group: as shown in Figure 14, the SCM prediction of the fiscal stance for Chile is significantly higher—by 1 to 1.5 percentage points of GDP—than the actual fiscal balance.

¹⁰ Engel et al. (2007) proposed lowering the fiscal target on grounds that the Central Bank's debt had declined to manageable levels, exchange-rate risks had diminished, and the sovereign wealth fund had sufficient resources. Marcel (2013) argues that "In 2009, as a temporary response to the international financial crisis, the target was reduced to zero percent of GDP. That was the first time it was explicitly recognized that the target was being used as an instrument of fiscal policy." The lowering of the target proved, nevertheless, to be permanent.

Figure 14. Actual Fiscal Balance and Simulated Counterfactual Fiscal Balance



Note: The simulated counterfactual is obtained using synthetic control methods.

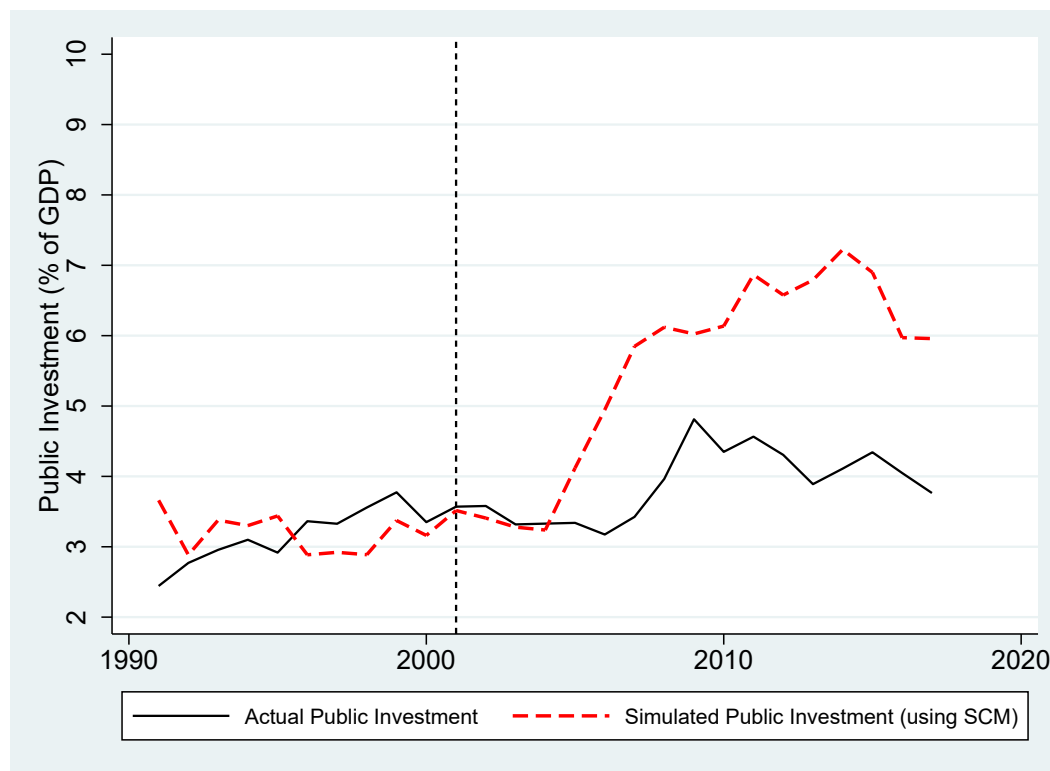
We now turn to two other components of fiscal policy, aiming at disentangling the role of the fiscal rule in hampering public investment and increasing public debt, particularly during the periods when the authorities aimed at returning to fiscal equilibrium.

Figure 15 shows the behavior of public investment over GDP in Chile and its SCM counterfactual. Note that prior to the implementation of the fiscal rule the difference between actual public investment and the SCM forecast is almost nil: on average, the actual public investment ratio to GDP was 3.1 percent, while its SCM counterpart was 3.2 percent. During the first years of the fiscal rule, the SCM projected and the actual public investment ratios to GDP are virtually identical, indicating that complying with the fiscal rule in non-stress periods had no significant effects on public investment in Chile compared to donor countries. However, 2005 marks an inflection point whereby SCM projections grow vigorously: starting that year, the projected public investment ratio to GDP rises quickly, attaining 6 percent and more since 2007 while actual public investment lags significantly behind (slightly below 4 percent of GDP). The difference is not compensated by private concessions which, at the time, had shrunk to around 0.1

percent of GDP (as shown in Figure 13 above). A timid expansion in public investment came to a halt after the 2009 crisis and the breaching of the fiscal rule. The gap between the counterfactual scenario –as projected using the SCM—and actual investment in Chile widens steadily to reach around three percentage points of GDP in 2014. These differences are quite large when considering that total public investment is just (or only) 4 percent of GDP. This implies that the cumulative effect on the stock of public is very significant.

Note that public investment declined steadily between 2009 and 2018. The breaching of the fiscal rule led to a significant expansion in current expenditures and transfers, adopted first in response to the domestic effects of the Global Financial Crisis, and then in response to the destruction of the 2010 earthquake. That is, breaching the fiscal rule in 2009 and non-compliance afterwards have taken mainly the form of expanded current expenditures and not by accumulating public physical capital. On average, the actual public investment ratio declined by 20 percent between 2009 and 2018.

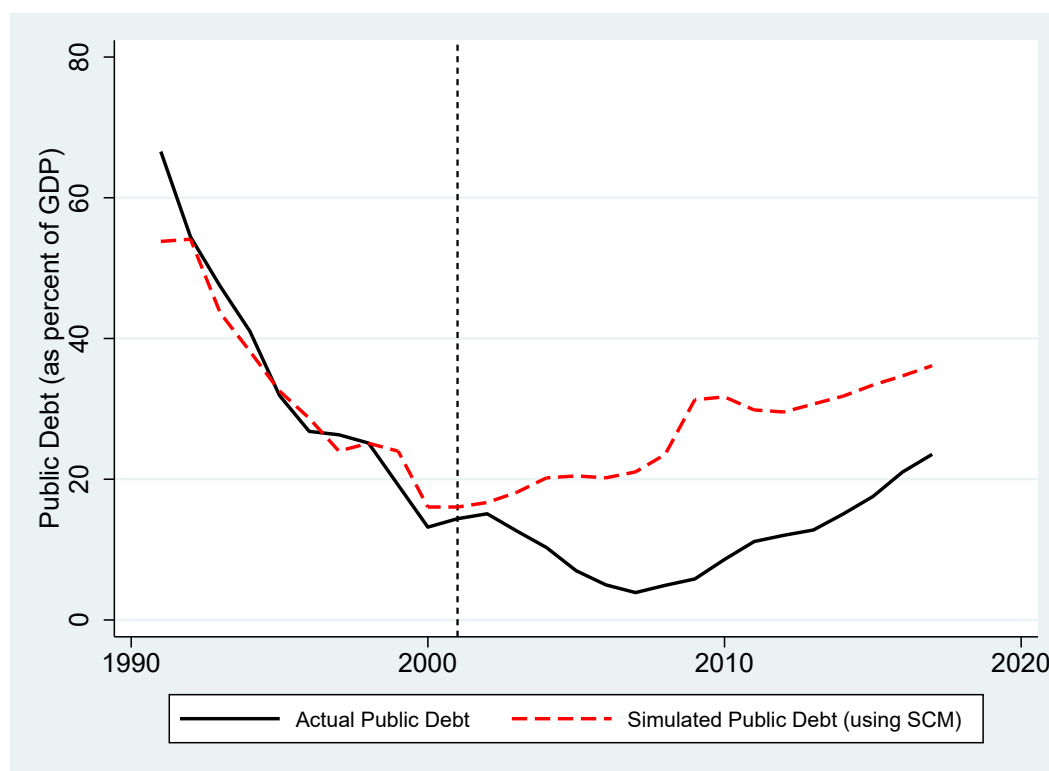
Figure 15. Actual Public Investment and Simulated Counterfactual Public Investment



Note: The simulated counterfactual is obtained using synthetic control methods.

Figure 16 shows evidence of the effects of the 2009-2010 crisis and its aftermath on public debt. We focus on gross public debt, thereby neglecting changes in sovereign wealth funds. Before discussing the evolution under the fiscal rule, it is worth noting that the counterfactual SCM projection reproduces the significant decline in public debt observed in the 1990s. Chile's public debt stood at a high level of 67 percent of GDP in 1991. Rapid subsequent growth and fiscal prudence reduced the debt to close to 20 percent of GDP at the end of the 1990s, which is the level exhibited by the SCM projection for Chile. From 1995 onwards, both actual and SCM projected levels are very similar.

Figure 16. Actual Public Debt and Simulated Counterfactual Public Debt



Note: The simulated counterfactual is obtained using synthetic control methods.

After implementation of the fiscal rule in 2001 and until 2007, the public debt declined even further, which is coherent with complying with the CAB target of a 1 percent-of-GDP surplus. By 2008 Chile's public debt reached an all-time low of 3.9 percent of GDP. The SCM estimation suggests a much higher level of public debt of around 20 percent of GDP for the 1990s, which is consistent with both the initial level of public debt and the SCM projection of a balanced budget, as described in Figure 14 above and discussed in the previous paragraphs.

Note that the SCM counterfactual scenario projects a significant jump in public debt between 2008 and 2010 from 23 percent to 32 percent, and subsequently the debt ratio continues rising toward 35 percent of GDP. The actual data shows a different path: the public debt started to rise in 2007, one year before the projected SCM jump, when it grew by around 1 percent of GDP in 2008 despite the 3.5 percent growth in GDP of that year. It continued expanding during and after the 2009-2010 crises and, while the public debt of Chile was below its counterfactual level as of 2017 (at 24 percent of GDP), the gap was closing very fast.

In summary, according to these SCM projections, the fiscal rule explains little of the fiscal behavior observed between 2001 and 2018, regarding the evolution of the fiscal balance, public investment, and public debt. Instead, the rule ought to be seen as an institutionalization of the responsibility that characterized Chile's fiscal performance before the 2008-2010 crises. The severe shocks experienced in the latter period led to non-compliance with the rule and a prolonged period of significant fiscal imbalances, far more serious than what can be explained by our SCM projections. The latter, in fact, suggest authorities should have kept fiscal balances under control (the projected deficit is well below one percent of GDP in any year after 2010).

While the actual fiscal deficit is not targeted in the fiscal rule but the cyclically-adjusted fiscal deficit, it should be acknowledged that the authorities have interpreted the compliance with the fiscal rule with significant latitude since 2009 and that, prior to the Covid-19 pandemic, there has been little effort to achieve the balanced budget of the rule. After breaching the rule, successive administrations have all claimed to be returning to compliance, but on timetables that exceeded by a significant margin their tenure in office. This basically leaves the issue to the following administration, and with "intermediate targets" for the CAB that are far from the zero-deficit target. As a result, the CAB target fluctuated between -1.0 percent and -1.8 percent of GDP from 2011 to 2019.

7. Simulating the Effects of the Chilean Fiscal Rule in a DSGE Model

*"For men are good in but one way, but bad in many."
Aristotle, Nichomachean Ethics, Book II, Chapter 6.*

Applied to our concerns, the above quote tells us that there is one way to comply with a fiscal rule, but it could be breached in many ways. Therefore, when trying to assess the role of fiscal rules in public investment, it would be difficult to build a counterfactual scenario of an economy that does

not comply with a fiscal rule, without resulting in arbitrariness or being limited by the particular assumptions chosen to represent fiscal irresponsibility. Our goal is, consequently, rather modest but more realistic. We build a DSGE model to simulate and compare the effects of different macroeconomic shocks on fiscal variables—in particular, public investment—in two representative economies: one is endowed with a CAB rule while the other is not confined by a fiscal rule but has an intertemporally responsible government. In the no-fiscal rule economy, the government is intertemporally solvent, in that it internalizes the present and future costs of its policies and never defaults on the public debt. In the fiscal rule case, which represents the Chilean CAB case, the government complies with the rule at all times.

The DSGE model allows us to track and quantify with relative ease the short-term, dynamic response to shocks of tax revenues, expenditures, transfers, and public debt, as well as to evaluate their effect on private consumption, investment, and the different sources of household income. We study the impact of shocks to productivity, the terms of trade, and foreign interest rates observed at the time of the breach of the Chilean fiscal rule in 2009 and assess whether the CAB rule was instrumental in ameliorating or deepening the effects of such negative shocks, in particular regarding their effect on public investment.¹¹ The model explicitly accounts for all tax sources (mining, consumption, labor, and capital taxes) and main public outlays (such as public investment, transfers, and expenditures). The structure is kept simple to highlight the transmission mechanisms of the shocks as well as the role of taxes, expenditures, and public debt.

We assume that the economy produces two internationally tradable goods. Sector 1 produces an exogenous quantity of an exportable good. This aims at replicating Chile's export structure which is based on natural resources (copper and other minerals) that, in the short run, behaves almost as an endowment sector. We also assume that the exportable good is not consumed domestically, since evidence shows that domestic consumption of copper is negligible. Exports pay a royalty or export tax, thus having a significant impact on fiscal revenue. The export-tax rate is set to match the average contribution of the mining sector to government revenue in Chile. Sector 2, on the other hand, produces a tradeable final good, using private capital, labor, and public capital. Public capital operates as a positive externality provided freely by the government (e.g.,

¹¹ Previous work that has analyzed the Chilean fiscal rule include Medina and Soto (2016) and Kumhof and Laxton (2009) but with different objectives than those pursued by this paper. The former paper analyzes how the economy responds to a commodity price shock under different types of rules, while the latter investigates whether automatic stabilizers are welfare improving compared to a balanced budget rule.

roads, ports, and other public infrastructure). This tradeable good competes with imports and it can be used for consumption or investment.¹²

There are two types of consumers: an exogenous share of the population has access to capital markets (Ricardian agents) and the rest is restricted to consume their income in every period (hand-to-mouth agents). Private consumption by Ricardian agents—and thereby saving and investment—is determined by a representative agent who maximizes her intertemporal utility function, which depends only on consumption. The agent saves by acquiring capital goods, but their purchase is subject to the payment of an adjustment cost. The private sector does not have access to foreign borrowing or lending (only the government borrows abroad) and, therefore, the private-sector current account is zero).

In order to keep the model simple, we assume that households offer inelastically one unit of labor in the market. Wages are nevertheless endogenously determined. Ricardian agents also receive income in the form of profits of firms in sectors 1 and 2 and the returns of capital goods, and pays taxes on consumption and each source of income. They do not receive transfers from the government. The hand-to-mouth representative agent consumes her labor income net of income taxes plus the transfers received from the government. Taxes are set in the calibration to replicate both VAT in Chile as well as average tax rates on labor and capital.

The government collects taxes and decides how much to transfer, spend, and invest in public capital. Public investment is subject to an adjustment cost (akin to that of private capital). Transfers and government expenditures have been used by the Chilean government for short-term countercyclical policy, and we take that into consideration. The government can also acquire debt in the international market, paying the risk-free international rate plus a premium that depends proportionally on the ratio of the stock of public debt to GDP (Schmitt-Grohé and Uribe, 2003).

In the absence of an objective function for the government, we cannot distinguish between public investment, expenditures, and transfers within the outlays of the government. To deal with this shortcoming we study the relationship between the ratio of government expenditures and transfers to GDP and the output gap. We empirically found that, over the years, the relationship is highly stable and that the fiscal policy has been slightly countercyclical (in line with the descriptive discussion in Section 2.2). This, in turn, implies that public investment has potentially been one

¹² The model used here is similar to the one in Chumacero and Fuentes (2006), but with the focus on how the existence of the rule affects macro variables, especially public investment, when the economy is facing a technology or price shock.

key adjustment variable allowing the government to comply with the CAB rule (the other key variable is the public debt). When introducing this feature in our DSGE model, we maximize the tension between complying with the fiscal rule and sacrificing public investment and/or accumulating public debt.

Finally, we model the Chilean CAB fiscal rule adapting an original version by Rodríguez et al. (2006) as follows:

$$B_t^* = B_t - (\tau_k r_t k_t + \tau_l w_t l_t + \tau_c c_t) + \left[(\tau_k r_t k_t + \tau_l w_t l_t + \tau_c c_t) \left(\frac{\tilde{Y}_t}{Y_t} \right)^\eta \right] - \tau_1 p_t y_{1t} + \tau_1 \tilde{p}_t y_{1t}$$

where B_t is the effective balance, Y_t correspond to GDP, \tilde{Y}_t is trend GDP, \tilde{p}_t represents the long-run price of natural resources, and η is the elasticity of tax collection respect to GDP, which is assumed to be equal to 1. The actual balance is adjusted by net non-mining tax revenues in period t and by tax revenues from private mining-companies in period t plus the revenues from the public company.

The DSGE model is calibrated using parameters that characterize the Chilean economy (details on the model and its calibration are presented in Appendix C). We use this framework to simulate the effects on private investment and public debt of three types of shocks faced by the Chilean economy around the GFC of 2008/09 and the subsequent breach of the fiscal rule: (a) a productivity decline of two percent, as estimated by the National Productivity Commission for 2009, (b) a temporary drop in the international price of copper of around 25 percent, as shown in Table 6, and (c) an increase in the international interest rate by one percentage point after the GFC. Chile's EMBI sovereign spread rose from 0.95 in December 2009 to a maximum of 1.66 in June 2010, before it receded to 1.15 by the end of that year.

We simulate the effects of the shocks using impulse-response functions for each shock separately and present the main results in Figures 17 to 19. Shocks take the form of an impulse, that is a once-and-for-all shock given at time $t = 0$. The figures display the simulated evolution of key variables as deviations from their steady-state values. Red lines represent the response of the economy when operating under the CAB fiscal rule; blue lines display the response of the economy in the absence of such rule, but the economy is still ruled by a responsible authority. Since the model has a stationary steady-state, responses eventually dissipate. Consequently, the model best describes the short-run response to essentially transitory shocks.

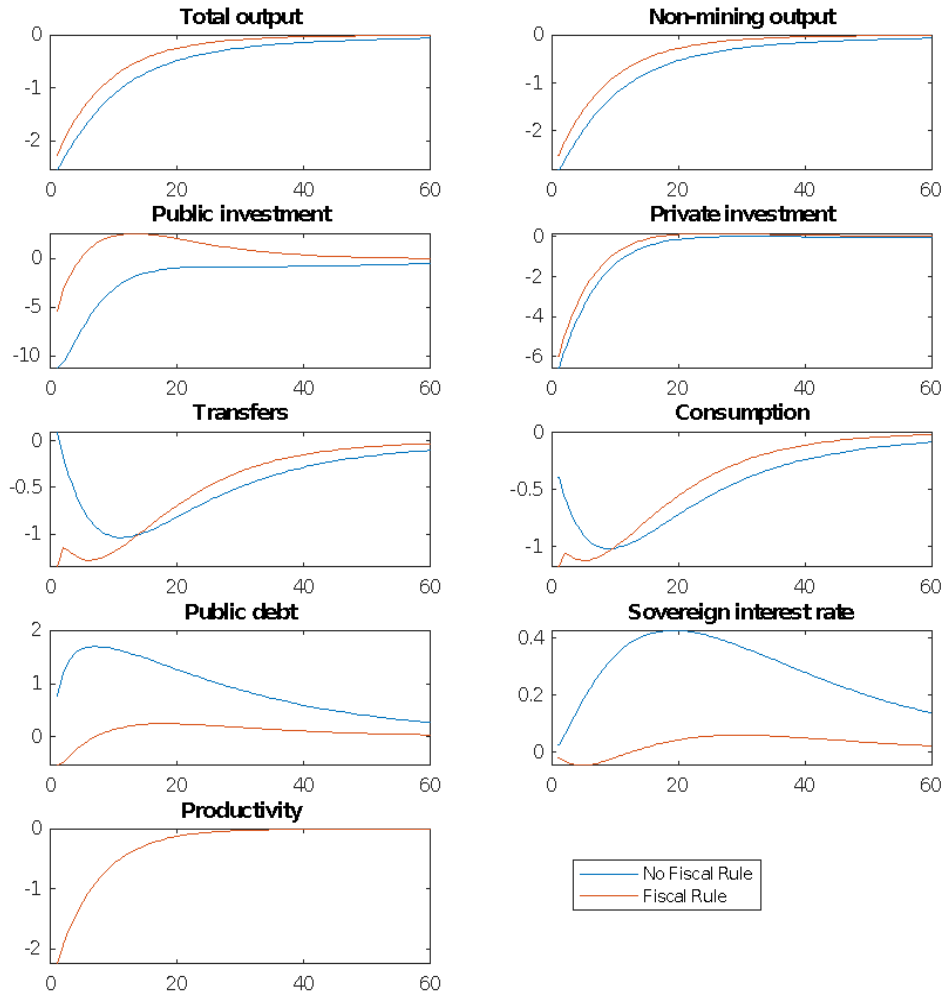
Figure 17 depicts the effects of a negative productivity shock of 2 percent that induces a drop in GDP (recession) in the range of 2 percent to 2.5 percent. The negative shock occurs in the non-mining sector, which reduces output and the marginal productivity of capital and labor. This, in turn, affects the consumption-saving decision of the Ricardian agents; private saving and investment declines in response of the shock and to allow consumption smoothing for these households. Hand-to-mouth households lose income due to the reduction in the wage rate and, therefore, are forced to reduce consumption. Note that, under the fiscal rule, government transfers are unable to counterbalance this effect as they drop in around one percentage point of GDP, compared to zero in the case of fiscally responsible government.

The recession is, nevertheless, milder under the CAB rule. The difference is given by the behavior of public investment, which declines less in the economy with a fiscal rule than in its counterpart. That is, under the fiscal rule the authorities rely more on adjusting transfers than capital expenditures than in the absence of such rule. Note, moreover, that this induces asymmetric effects on the public debt and the interest rate paid by the government: both increase significantly more in the absence of the CAB rule. This result is coherent with the notion that a CAB rule, which is fulfilled at all times, will not necessarily require a target-debt rule.

In conclusion, while the Chilean CAB rule is mute regarding the composition of government expenditures, the simulations in our model would indicate that, under full compliance with the rule, the authorities would find it convenient to rely more on adjusting current transfers than public investment. Note, furthermore, that the public debt increases significantly more in the absence of a public rule (or when the rule is not obeyed), even if transitorily, thus suggesting the convenience of enacting a debt-ceiling rule to avoid excess borrowing.

In the model debt levels would return to their steady-state equilibrium levels because governments are fiscally responsible and, in particular, because of the full compliance to the zero-deficit target of the economy under the fiscal rule. In reality, and as long as Chilean governments adhere to “intermediate targets” with significant deficits, there is no guarantee that debt levels will not continue to expand permanently. The issue is nowadays even more pressing since, as a result of the containment measures for the Covid-19 pandemic, public debt levels are expected to rise significantly and reach around 50 percent of GDP by 2024 (Dipres, 2020).

Figure 17. Effects of a Productivity Shock (a 2% decline) on Public Investment and Key Macroeconomic Variables



The second shock we study is a 25 percent drop in the terms of trade. The responses in Figure 18 indicate that the decline in output is very similar in magnitude and phase in both economies, with and without the fiscal rule. Remember that total output is defined as:

$$y_t = p_t y_{1t} + y_{2t},$$

where y_{1t} represents output in the mining sector, y_{2t} is the non-mining sector, and p_t stands for the terms of trade. So total output is expressed in the units of the importable good. When the relative price of this good increases (p_t declines), total output falls.

The decline in the terms of trade reduces profit in the mining sector, reducing Ricardian consumers and government's revenues. The Ricardian household smooths consumption, reducing private investment and propagating, in this way, the negative shock to the non-mining sector.

The government under the CAB rule faces a tighter constraint than under the typical intertemporal budget constraint, so it sacrifices transfers to hand-to mouth consumers rather than public investment, compared to the intertemporal responsible government. Thus, the contraction of the non-mining sector is much stronger in the absence of the fiscal rule. Under the fiscal rule, public investment almost does not change, while in the absence of the fiscal rule, public investment deviates by about 10 percent from its steady state. Furthermore, government transfers behave differently immediately after the shock. Under the fiscal rule transfers to the private sector decline, while they move in the opposite direction in the absence of the rule. This, in turn, has an impact on the stock of public debt and, thereby, on the interest rate paid by the government. Notice that under the fiscal rule the debt converges in about 12 quarters to the steady-state debt to GDP ratio, while in the other case takes a longer time span (about 40 quarters). Even though the fiscal rule does not have any specific clause that protects public investment, it is indirectly protected when the government complies with that rule.

Finally, Figure 19 shows the effects of a 100-bp increase in the international interest rate that impacts the government's budget constraint by raising interest payments on the public debt. In both cases, the government is forced to adjust its outlays, causing a recession. Cuts in public investment reduces output in the non-mining sector and the marginal productivity of private investment, thereby reducing output even further. The path of non-mining output for both the economy with a CAB rule and with a responsible government follows the paths of public and private investment. In the other hand, consumption follows the paths of the government transfers in each case. The immediate impact is similar but the recovery in output is much faster when the CAB rule is in place. Government transfers do not change much, while public investment is reduced in the short run but with a faster recovery under the fiscal rule scenario, which explains why the recession is milder.

Figure 18. Effects of a Negative Shock to the Terms of Trade (a 25% decline) on Public Investment and Key Macroeconomic Variables

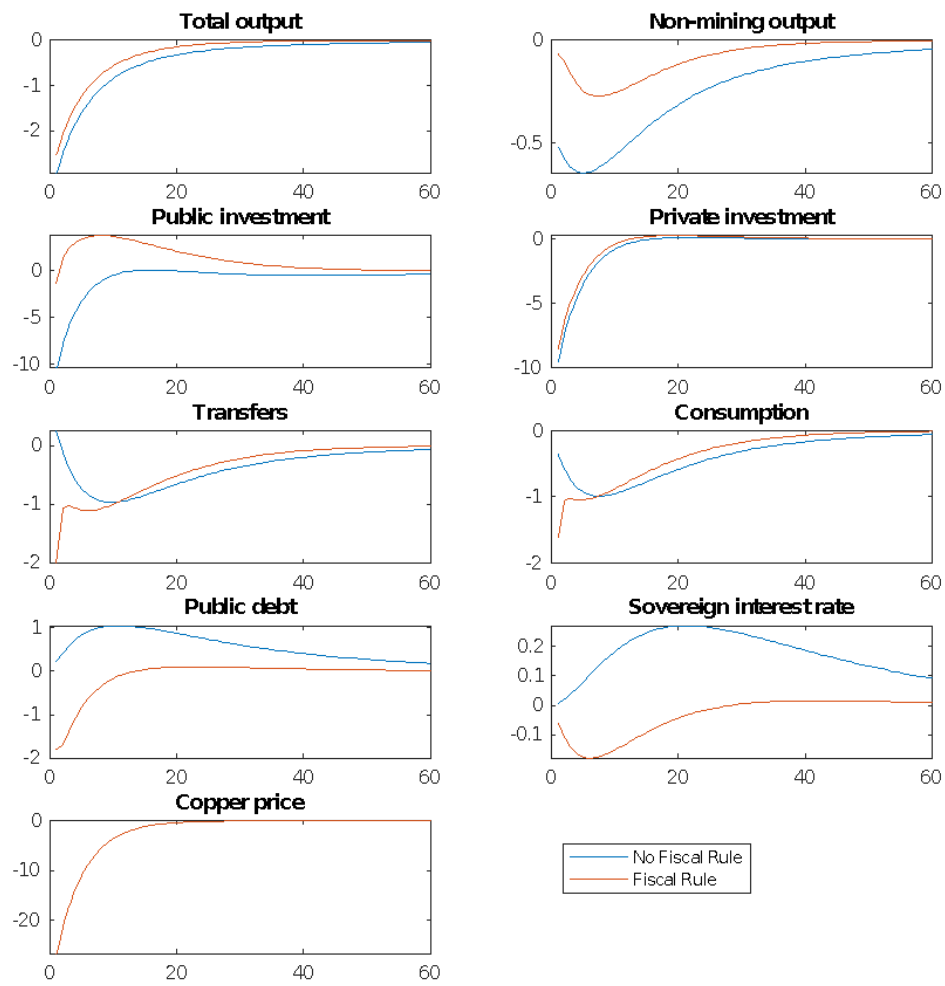
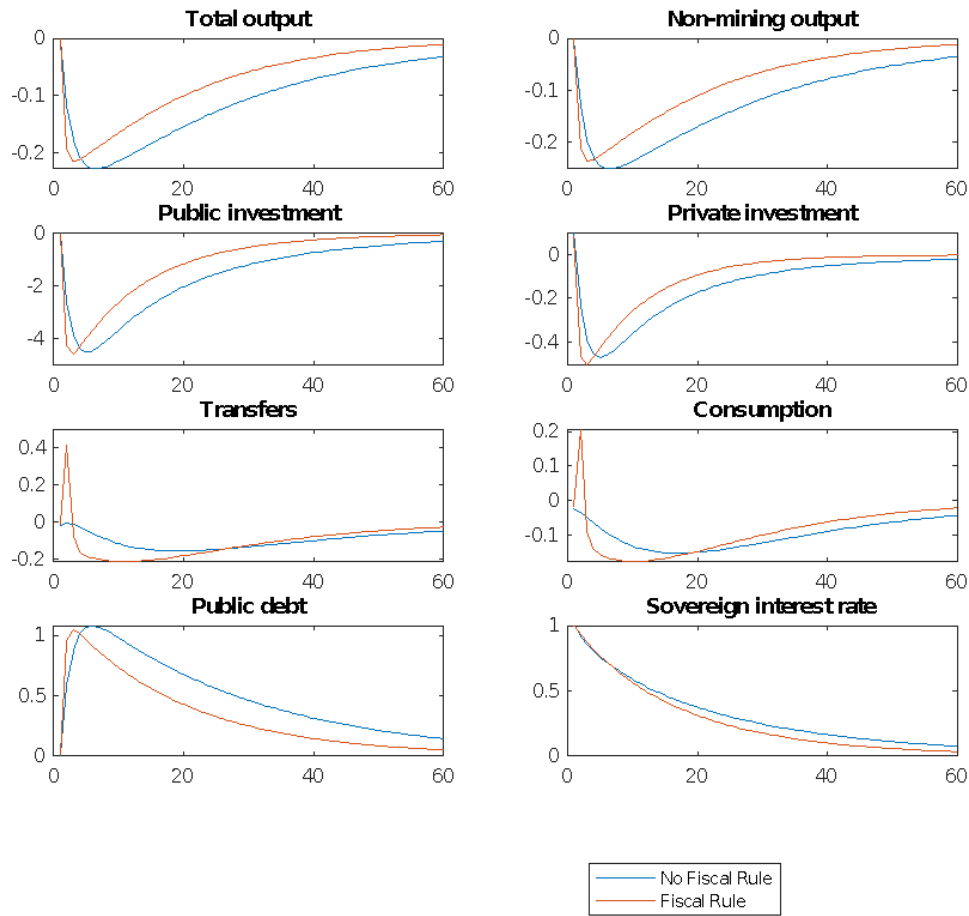


Figure 19. Effects of a Sovereign Interest Rate Shock (a 100 bp increase) on Public Investment and Key Macroeconomic Variables



Although the fiscal rule is acyclical and considering that the government had used transfers to the private sector in the past as countercyclical policy, but with a one-period lag, the CAB rule has done a better job in smoothing GDP cycles under different scenarios of negative shocks, but with a higher cost in terms of consumption. Nonetheless, the differences are not large, which is in line with the notion that Chile was conducting a prudent fiscal policy in the absence of a fiscal rule.

8. Chile's Fiscal Institutions, Fiscal Rule, and Public Investment: Evaluation and Proposals for Improvement

Here we take stock of the insights and findings of the previous empirical sections, present an assessment of the strengths and weaknesses of the fiscal framework and the fiscal rule, and their relation to public investment. and offer specific proposals for reform.

8.1 Institutional Framework

Chile gradually developed its institutional framework for fiscal policy. Most of the necessary components of a modern framework perform reasonably well, and recent addition of an IFC has strengthened analysis, governance, transparency, and monitoring of the fiscal rule in particular and fiscal policy in general. But the framework still has significant shortcomings due to its rather limited tasks and responsibilities and its small budget and staffing, even considering the narrow functions that the law has assigned to the IFC.¹³ This, however, is not the only institutional limitation.

The budgetary process is largely limited to a one-year horizon. The four-year budget forecasts reported by the MoF at the inauguration of each administration are potentially useful as a reference but do not commit governments to embark on a strict fiscal consolidation path. This absence of commitment weakens both fiscal solvency and medium-term planning of government programs, particularly of public investment.

The fiscal authority in Chile also does not engage in a comprehensive and transparent management of the government's balance sheet. Most of the explicit assessment is on gross public debt and net public debt (gross debt less SWF assets), without consideration of other financial government assets and, more importantly, of the vast array of explicit, implicit, and contingent government liabilities.

8.2 Reform Proposals for the Fiscal Framework

Considering the limitations of the current framework, we propose the following reforms.

First, in order to move toward a multi-year budget horizon, we propose reforming the current fiscal rule by complementing the CAB rule with a net debt rule. This would strengthen the

¹³ A previous effort in this direction was made in a Conference organized by the MoF and IMF and edited in Larraín et al. (2019).

commitment of governments to announce and commit to future fiscal consolidation paths after facing temporary budget shocks. Below, we provide additional reasons to justify the inclusion of a debt component in the Chilean fiscal rule.

Second, the budgetary formulation and process should be complemented by continuing assessment and management of the government's comprehensive balance sheet, according to the principles of modern finance. This should feed into the government's multi-year investment plan, including all government investment projects and infrastructure concessions programs.

Third, we propose a substantial enlargement of IFC's tasks and responsibilities, with a concomitant expansion of its budget and staff. While fiscal and financial decisions on the balance sheet would remain with the fiscal authority (DIPRES and MoF), we recommend that measurement, analysis, and proposals for improvement of the management of the government's overall balance sheet should be outsourced to the IFC.¹⁴ The IFC should also take over from DIPRES the responsibility of managing the ACTGDP and ACRPC and monitoring of the estimations and projections of trend GDP as well as future copper prices. Finally, it should also assume the responsibility of preparing projections of all additional relevant macroeconomic and sector variables, identified in Section 2, which would be of mandatory use by DIPRES for preparation of its annual and multi-annual budgets and its medium-term fiscal projections, based on the fiscal rule.

8.3 Fiscal Rule

As mentioned, several studies provide evidence that adoption of Chile's fiscal rule (and the complementary fiscal framework) has had positive effects on the conduct of fiscal policy, its credibility, and its effectiveness. Fiscal solvency and sustainability have been strengthened by the rule, at least under normal and favorable macroeconomic conditions.¹⁵ The pro-cyclical bias of fiscal policy is avoided by the a-cyclical rule, and intergenerational equity has been strengthened by the funding requirement of the Pension Reserve Fund.

¹⁴ The IFC should be entrusted with independence to carry out assessments and studies aimed at understanding and improving the fiscal stance, the sustainability and effectiveness of fiscal policy, and the overall effects of fiscal policy on macroeconomic performance, and initiative to present recommendations on fiscal policy reform, including institutional changes, budgetary formulation and execution, fiscal rule design and implementation, management of the government's comprehensive balance sheet.

¹⁵ It is important to acknowledge that it is difficult to separate purely technical motives from political motives for breaching the rule.

There are two main weaknesses that we identify in the design of the actual rule. The first is the lack of a debt anchor, which implies that there is no feedback from the stock of net public debt to government expenditure. It implies that under the current CAB rule, even if strictly enforced or complied with, public net debt could exhibit a drift to any value or, at least, exhibit long periods of drift towards lower values (2002-2008) or higher values (from 2008 to the present), without a self-correcting feedback mechanism from spending to debt.

Furthermore, should the government for any reason decide to permanently reduce the level of public debt (e.g., to lower debt service), it would have to change the target of the CAB rule in order to achieve a sustained structural surplus. Changing the CAB target usually entails political strife and uncertainty that could be avoided altogether by complementing the current fiscal framework with a debt-ceiling rule.

The rule also lacks escape clauses—i.e., it does not foresee exceptional conditions caused by severe shocks which could require formal temporary suspension of or deviation from the rule. It also does not provide for a protocol to return to the CAB target once the rule has been breached. The decision to breach the rule is left exclusively to the fiscal authority without having to formally identify the conditions that justify the decision, the magnitude of the breach, the instruments involved, and the expected path to return to compliance. The absence of a clear protocol and the fact that the magnitude of the breach is arbitrarily set by the MoF without an independent assessment by the IFC opens the door to political interference and suspicion, as in 2009 when the breaching of the rule had strong support from economists but also incumbent politicians as a means to win the presidential election held that year.

Also, there is the key issue of the measures and instruments involved in the breaching of the rule. Since breaching the rule is a transitory phenomenon, instruments and measures ought to be transitory as well. In 2009, a significant fraction of the countercyclical expansion in expenditures was in the form of permanently hiring new public employees. While in principle these additional public workers were hired under fixed-term appointments, in practice their contracts became permanent.

The combination of the rule's a-cyclical nature and its lack of escape clauses has led governments facing major adverse shocks to lower their CAB targets in order to implement countercyclical fiscal policies (in 2009-10 and in 2019-20). This second-best response to a double design failure can be considered a strength when it leads responsible governments to enact

countercyclical policy in response to strongly adverse shocks. However, it should be considered a weakness if used by an irresponsible government to adopt an expansionary fiscal policy in the absence of adverse shocks (as in 2014-17). Given that fiscal rules are in place to inhibit irresponsible fiscal policies, we think it would be better to change the current fiscal rule. Moreover, the lack of a debt anchor implies that bygones are treated as bygones: high deficits and debt accumulation during certain periods are not corrected by subsequent efforts to reduce deficits and debt levels.

The management of the fiscal rule also shows strengths and weaknesses. Under favorable macroeconomic conditions, the rule has been strongly enforced, enabling the government to accumulate significant savings and avoid political pressures for increased spending. A feature that strengthens the political economy of the rule is the existence of independent committees in charge of forecasting key macroeconomic variables (trend GDP and copper prices).

However, CAB targets have exhibited a drift trend toward lower values since 2008. As a result of the latter, and in combination with strong adverse shocks, government deficit and public net debt ratios to GDP exhibit an alarming deterioration. It is often criticized that projections are excessively influenced by recent observations, generating systematic biases in projections of long-term copper prices and of trend GDP, and hence in output gap, cyclically-adjusted revenue, the CAB, and government spending. Despite criticism, the fiscal authority has been reluctant to change methodologies and improve forecasts.

Implementation of the fiscal rule and its application to the budget is complex, requiring a combination of assumptions on macroeconomic and sector variables, parameters, and some ad hoc decisions. While significant progress has been made in documenting calculations and projections of cyclical adjustments to government revenue and the budget, it is still not possible for outside observers to replicate DIPRES calculations and projections of the budget or to re-compute the mapping from key and secondary macroeconomic assumptions, and key parameters and elasticities. This lack of full transparency imposes credibility costs in applying the rule.

Finally, a major weakness in the implementation of the rule was its breach in 2009, when the MoF and DIPRES introduced major changes in the definition of cyclical adjustments and the rule's parameters to show significantly larger CAB levels than those obtained under the previous methodology, as discussed in Section 2. In our view, these changes constitute a serious breach of the rule, eroding its credibility and representing a severe blow to the institutional framework of

fiscal policy. The presence of the IFC since 2019, however, makes a future repetition of this event unlikely.

8.4 Reform Proposals for the Design and Implementation of the Fiscal Rule

To overcome the main drawback in rule design, we propose to complement the existing BBR rule for the CAB with a debt rule (DR). While the CAB rule would apply to annual budget formulation and execution, the DR would be reflected in a numerical target for attaining a stationary net public debt (or net total financial liabilities) as a ratio to GDP. The time path defined for achieving the net public debt ratio would determine the path for annual CAB targets required to achieve the target over the medium term. This would ensure feedback from the stock of net public debt (or total net financial liabilities) to CAB and to public spending and budget balance levels, required for consistency with a permanent-income approach to fiscal policy. This extension of the rule would reinforce the intertemporal consistency, credibility, and effectiveness of Chile's fiscal policy. Furthermore, it would enforce intergenerational fairness by avoiding future generations to be left to make a larger net contribution to the government's finances than today's generation, which would otherwise be the result of mounting public debt.

In order to institutionalize changes in short-term CAB targets when facing large adverse shocks, we propose the introduction of an option for the MoF to invoke an escape clause that allows for a change in the government's previous commitment to the future time path of CAB targets, public deficits, and net debt levels.¹⁶ The conditions for invoking the escape clause should be pre-specified in a government document and the IFC should provide an explicit assessment if such conditions are satisfied when the government invokes the escape clause. We think that this alternative provides an explicit recognition of the policy discretion required by governments under severely adverse conditions (such as in 2008-10 and 2019-20) but limits its exercise by defining ex ante the conditions under which an escape clause can be invoked, under the scrutiny of the IFC. The escape clause should also consider a protocol for an effective and swift return to fiscal discipline.

¹⁶ An alternative to the escape clauses is to replace the current a-cyclical CAB rule by an explicit countercyclical rule, where the CAB target is changed by a fraction of the projected output gap. This has the advantage of a non-discretionary change but comes at the cost of over-parameterization of the current rule and its dependence on an ex ante defined, inflexible elasticity of CAB with respect to the output gap, bringing all the measurement error of this variable that has been largely discussed in the literature. Therefore, we do not recommend this alternative.

Finally, we recommend that DIPRES provide a detailed, step-by-step calculation of the cyclical components of government revenue and balance, both ex-ante and ex-post.

8.5 The Fiscal Rule and Public Investment

Chile's CAB rule does not distinguish between current and capital expenditure by the government. Therefore, public investment is not shielded from adverse shocks that affect the cyclically-adjusted government stance. However, public investment seems to be largely independent of fiscal revenue cycles both before and during the fiscal rule, perhaps reflecting institutional features (e.g., multiyear planning and budget inertia) that our aggregate analysis cannot identify. It is, nevertheless, important to acknowledge that public investment in Chile is low and that, in our counterfactual analysis, it has been shown that during the period of the implementation of the fiscal rule it displayed poorer performance than the synthetic Chile. In the context of a mechanical model where the government complies with the fiscal rule, as seen in Section 4, public investment will not necessarily suffer when the economy faces negative shocks in terms of trade, productivity or real interest rate.

Considering the performance of public investment, we do not favor adding specific conditions to the fiscal rule to deal with public investment. This issue should be addressed as part of a plan for development of the economy. Deciding what is the path that the economy will follow in this respect, it comes as a second stage to decide if the investment is carried out directly by the government or through private concessions.

Regarding funding, we propose that public investment should be treated consistently as part of the systematic and comprehensive assessment and management of the general government's balance sheet, including explicit financial assets and liabilities, real assets (general government real estate and equipment, SOEs, infrastructure, land, national parks, among other), implicit liabilities (e.g., future pension payments), and contingent liabilities (e.g., government guarantees for private concessions and particular bank credit programs).

This would imply that public investment is evaluated ex ante and implemented as part of the overall portfolio management of public-sector assets and liabilities. As discussed above, this requires strengthening the institutions for efficient social evaluation and political decision-making regarding public investment projects, PPP concessions on public infrastructure, and financial

decisions regarding SOE investment projects. These steps will enhance the quality of public investment jointly with an improvement in the management of public finances.

9. Concluding Remarks

This paper has assessed the performance of the balanced budget rule applied in Chile since 2001 using different approaches. It pays special attention to how the rule may have affected public investment in different episodes and circumstances. After summarizing the weaknesses and strengths of the rule, the paper includes several proposals regarding how to improve fiscal institutions.

The fiscal rule is based on a cyclically-adjusted budget balance that isolates total government outlays management from the price of copper and from business cycles. To comply with the rule, the government saves transitory revenues and dis-saves them during downturns. This optimal intertemporal behavior can be implemented without a fiscal rule, and Chile had been successfully doing so for over a decade prior to enacting the rule. Why, then, did Chilean authorities feel the need to enact a fiscal rule in 2001? The answer has political and macroeconomic management components. On one hand, there was a pressing need to isolate the management of public finance from increasing political pressure. On the other hand, there was a progressive increase in the volatility of the main sources of government revenues (copper revenues and domestic taxation), which made it necessary to tighten spending to comply with long-run fiscal sustainability.

During the copper-price boom of the 2000s, the fiscal rule operated flawlessly. In 2009, facing the international financial crisis, a countercyclical policy was put in place and the government did not meet the target of a CAB equal to zero. We do not consider that the rule is breached or violated when a countercyclical expansion is implemented by the fiscal authority in response to adverse shocks, leading to discrete changes in current and future CAB targets and actual deficit and debt profiles. Such deviations can be considered second-best changes to the rule, considering its limitations in design: its a-cyclical character, the lack of an escape clause, and the lack of a debt anchor. However, we do consider that discrete changes in the rule's definition and parameters, such as those introduced in 2009-2010, are breaches to the rule and a severe blow to the institutional framework of fiscal policy. Today, with the IFC as the fiscal policy watchdog, such arbitrary violations would be harder to adopt.

Public investment does not seem particularly affected by the adoption of fiscal rule. After the implementation of the rule in 2001, however, public investment over GDP has been persistently below the counterfactual benchmark provided by synthetic control methods, up to 2 percentage points of GDP. This may not seem high, but consider that simulated investment in benchmark Chile was above 6 percent of GDP, while effective public investment Chile was around 4 percent. This gap is not overestimated by the exclusion of public-private partnership investment, since the latter was around 0.2 percent of GDP between 2010 and 2018. The secular decline in public investment after 2010 is nevertheless worrying.

We further delve into the transmission mechanisms linking fiscal policy and public investment by simulating an artificial economy hit by the shocks observed around the times of the global recession of 2009 and the breaching of the rule using two alternative scenarios—with and without the fiscal rule. We build a DSGE model that mimics the main features of the Chilean economy in terms of fiscal structure (tax rates, revenue sources, expenditures outlays and transfers to the population), consumption structure (with Ricardian and liquidity constrained consumers), production of natural resources and private investment. We include the Chilean budget balance fiscal rule and, as an alternative, a responsible government that does not follow the rule but respects its intertemporal budget restriction at all times (such as Chile before 2001).

Our simulations show that, under the CAB rule, public investment does not bear the brunt of an adjustment when facing negative shocks to productivity, the price of copper, and international interest rate shocks of the size observed in 2009/10. We find that when the economy faces a recession, public investment is less affected under the fiscal rule than in its absence. In the rule-based economy the decline in public investment is milder, but the government must sacrifice more transfers to the population. Furthermore, private consumption declines more in the absence of the fiscal rule, reflecting the differential impact of transfers. As expected, without a fiscal rule, the rise in the transfer component of the economy also increases external debt and the interest rate risk premium. The CAB fiscal rule keeps the level of external debt under control.

On the basis of our scrutiny of the historical facts and the empirical counterfactual analysis, we propose several reforms to fiscal institutions. There are two main proposals regarding the design of the rule. First, Chile should establish ex ante escape clauses from the rule that would apply under pre-specified conditions. These escape clauses must include the path that the government will follow to return to compliance of the rule. A rule without ex ante escape clauses,

without ex post sanctions for violating the rule and without ex-post corrections of deviations from the rule is weak. It will be breached with probability one. Second, the rule is only a budget balance rule—without a complementary debt rule—and it lacks feedback effects from public debt to government expenditure. This feature may lead to drift in government debt, which is inconsistent with the rule’s objective of fiscal sustainability.

As to the institutional framework, we propose moving toward longer-term budget planning, from a one-year horizon to a multi-year horizon. This proposal is consistent with the idea of complementing the existing rule with a debt rule: while the CAB rule would apply to annual budget formulation and execution, the DR would be reflected in a numerical target for attaining a stationary net public debt (or net total financial liabilities) ratio to GDP. The budgetary formulation must be accompanied by a continuous assessment of the government balance sheet, which comprises the management of real, financial and contingent assets and liabilities. This will provide a framework for the government's multi-year budget programming and investment plan. In line with these changes, we propose expanding the IFC’s tasks and responsibilities to include independent authority and initiative to study, assess and propose modifications of the fiscal institutions, budgetary formulation, fiscal rule (design and implementation, which includes a more involvement in parameter estimation), balance sheet management and analysis of macroeconomic effects of the fiscal policy.

Substantial progress has been made in terms of the institutional framework for fiscal policy in Chile. Until 2010, the gradual approach to institutional building benefited from political consensus regarding the convenience of fiscal discipline and the absence of major macroeconomic shocks. The global recession proved that Chile had a solid fiscal stance but also evidenced that, when breaching the rule, the authorities had no recourse to steer fiscal accounts back to its long-term sustainable path. As a result, public debt mounted. The need for significant changes to the design and operation of the fiscal rule in Chile is nowadays more pressing than ever, since the fiscal stance has deteriorated significantly and is expected to worsen as a result of the Covid-19 pandemic.

References

- Abadie, A. 2020. “Using Synthetic Controls: Feasibility, Data Requirements, and Methodological Aspects.” Forthcoming in *Journal of Economic Literature*.
- Abadie, A., A. Diamond and J. Hainmueller. 2010. “Synthetic Control Methods for Comparative Case Studies: Estimating the Effect of California’s Tobacco Control Program.” *Journal of the American Statistical Association* 105: 493–505.
- Alesina, A., and R. Perotti. 1996. “Income Distribution, Political Instability, and Investment.” *European Economic Review* 40(6): 1203-1228.
- Alesina, A. et al. 1999. “Budget Institutions and Fiscal Performance in Latin America.” *Journal of Development Economics* 59(2): 253-273.
- Ardanaz, M., A. Barreix and L.F. Corrales. 2019. “Las Reglas Fiscales en América Latina.” In: A. Barreix and L.F. Corrales, editors. *Reglas Fiscales Resilientes en América Latina*. Washington, DC, United States: Inter-American Development Bank.
- Ardanaz, M. et al. 2019. “Safeguarding Public Investment from Budget Cuts Through Fiscal Rule Design.” Discussion Paper IDB-DP-698. Washington, DC, United States: Inter-American Development Bank.
- Arévalo, P. et al. 2019. “The Intergenerational Dimension of Fiscal Sustainability.” European Commission Discussion Paper 112. Brussels, Belgium: European Commission.
- Berganza, J.C. 2012. “Fiscal Rules in Latin America: A Survey.” Documentos Ocasionales 1208. Madrid, Spain: Banco de España.
- Calmfors, L., and S. Wren-Lewis. 2011. “Fiscal What Are Fiscal Councils, and What Do They Do?” *VoxEu.org*, 21 April 2011. Available at: <https://voxeu.org/article/what-are-fiscal-councils-and-what-do-they-do>
- Cerda, R. et al. 2020. “Understanding Domestic Savings: An Empirical Approach.” *Applied Economics* 52(6): 905-928.
- Chumacero, R., and J.R. Fuentes. 2006. “Chilean Growth Dynamics.” *Economic Modelling* 23(2): 197-214.
- Chumacero, R., J.R. Fuentes and K. Schmidt-Hebbel. 2004. “Chile Free Trade Agreements: How Big is the Deal?” Working Paper 264. Santiago, Chile: Central Bank of Chile.

- Chumacero, R. et al. 2007. “Understanding Chilean Reforms.” In: E. Fanelli, editor. *Understanding Market Reforms in Latin America*, E. Fanelli. London, United Kingdom: Palgrave–McMillan.
- Corbo, V. et al. 2011. “Propuestas para Perfeccionar la Regla Fiscal.” Comité Asesor para el Diseño de una Política Fiscal de Balance Estructural de Segunda Generación para Chile. Santiago, Chile: Dirección de Presupuestos, Ministerio de Hacienda de Chile Available at: https://www.dipres.gob.cl/598/articles-76544_doc_pdf.pdf
- Debrun, X., and M.S. Kumar. “The Discipline-Enhancing Role of Fiscal Institutions: Theory and Empirical Evidence.” IMF Working Paper 07/171. Washington, DC, United States: International Monetary Fund.
- Debrun, X., D. Hauner and M.S. Kumar. 2009. “Independent Fiscal Agencies.” *Journal of Economic Surveys* 23(1): 44–81.
- Dirección de Presupuestos, Ministerio de Hacienda de Chile (Dipres). 2018. “Informe de Pasivos Contingentes (2018).” Santiago, Chile: Dipres.
- Dirección de Presupuestos, Ministerio de Hacienda de Chile (Dipres). 2019. “Indicador del Balance Cíclicamente Ajustado: Metodología y Resultados 2018.” Santiago, Chile: Dipres.
- Dirección de Presupuestos, Ministerio de Hacienda de Chile (Dipres). 2020. “Informe de Finanzas Públicas, Segundo Semestre 2020.” Santiago, Chile: Dipres.
- Elbadawi, I., K. Schmidt-Hebbel and R. Soto. 2015. “Why Do Countries Have Fiscal Rules?” *Revista Economía Chilena* 18(3): 28-61.
- Engel, E., C. Nielson and R. Valdés. 2011. “Chile’s Fiscal Rule as Social Insurance.” Central Bank of Chile Working Paper 627. Santiago, Chile: Central Bank of Chile.
- Engel, E., M. Marcel and P. Meller. 2007. “Meta de Superávit Estructural: Elementos para su Análisis.” Santiago, Chile: Dirección de Presupuestos, Ministerio de Hacienda de Chile (Dipres). Mimeographed document. Available at: http://www.dipres.gob.cl/572/articles-21746_doc_pdf.pdf
- Ferman, B., C. Pinto and V. Possebom. 2018. “Cherry Picking with Synthetic Controls.” *Journal of Policy Analysis and Management* 39(2): 510-32.
- Fiess, N. 2005. “Chile’s Fiscal Rule.” In: C. Burnside, editor. *Fiscal Sustainability in Theory and Practice: A Handbook*. Washington, DC, United States: World Bank.

- Firpo, S. and V. Possebom. 2018. “Synthetic Control Method: Inference, Sensitivity Analysis and Confidence Sets.” *Journal of Causal Inference* 6(2). Available at: <https://doi.org/10.1515/jci-2016-0026>.
- Frankel, J. 2011a. “A Solution to Fiscal Procyclicality: The Structural Budget Institutions Pioneered by Chile.” NBER Working Paper 16945. Cambridge, United States: National Bureau of Economic Research.
- Frankel, J. 2011b. “Over-optimism in Forecast by Official Budget Agencies and its Implications.” *Oxford Review of Economic Policy* 27(4): 536–562.
- Frankel, J., C.A. Végh and G. Vuletin. 2013. “On Graduation from Fiscal Procyclicality.” *Journal of Development Economics* 100(1): 32-47.
- Franken, H., G. Le Fort and E. Parrado. 2006. “Business Cycle Responses and the Resilience of the Chilean Economy.” In: R. Caballero, C. Calderón, L.F. Céspedes, editors. *External Vulnerability and Preventive Policies*. Santiago, Chile: Central Bank of Chile.
- Fuentes, J.R. 2011. “Learning How to Manage Natural Resource Revenue: The Experience of Copper in Chile.” In: P. Collier and A. Venables *Plundered Nations? Successes and Failures in Natural Resource Extraction*. London, United Kingdom: Palgrave Macmillan.
- Gruss, B., and S. Kebhaj. 2019. “Commodity Terms of Trade: A New Database.” IMF Working Paper 19/21. Washington, DC, United States: International Monetary Fund.
- Ilzetzki, E. and C.A. Végh. 2008. “Pro-Cyclical Fiscal Policy in Developing Countries: Truth or Fiction?” NBER Working Paper 14191. Cambridge, United States: National Bureau of Economic Research.
- International Monetary Fund (IMF). 2017. “Fiscal Rules at a Glance.” Washington, DC, United States: IMF. Available at: <https://www.imf.org/external/datamapper/fiscalrules/Fiscal%20Rules%20at%20a%20Glance%20-%20Background%20Paper.pdf>
- . 2019. “FAD Investment and Capital Stock Database 2019.” Washington, DC, United States: IMF. Accessed online May 21, 2020.
- Kumhof, M., and D. Laxton. 2009. “Chile’s Structural Fiscal Surplus Rule: A Model-based Evaluation.” IMF Working Paper 09/88. Washington, DC, United States: International Monetary Fund.

- Larraín, F., and F. Parro. 2008. “Chile Menos Volátil.” *El Trimestre Económico* LXXV(3): 563-596.
- Larraín, F., L. Ricci and K. Schmidt-Hebbel. 2019. “Enhancing Chile’s Fiscal Framework: Lessons from Domestic and International Experience.” Santiago, Chile: Ministry of Finance.
- Lienert, I. 2011. “Should Advanced Countries Adopt a Fiscal Responsibility Law?” IMF Working Paper 10/254. Washington, DC, United States: IMF.
- Marcel, M. 2013. “The Structural Balance Rule in Chile: Ten Years, Ten Lessons.” Discussion Paper IDB-DP-289. Washington, DC, United States: Inter-American Development Bank. Available at: <https://publications.iadb.org/publications/english/document/The-Structural-Balance-Rule-in-Chile-Ten-Years-Ten-Lessons.pdf>
- Mbaye, S., M. Moreno-Badia and K. Chae. 2018. “Global Debt Database: Methodology and Sources.” IMF Working Paper WP/18/111. Washington, DC, United States: International Monetary Fund.
- Medina, J.P., and C. Soto. 2016. “Commodity Prices and Fiscal Policy in a Commodity Exporting Economy.” *Economic Modelling* 59: 335–351.
- Ministerio de Hacienda de Chile. Various dates. “Estadísticas de las Finanzas Públicas.” Santiago, Chile: Ministerio de Hacienda de Chile.
- Ministerio de Obras Públicas de Chile (MOP). 2016. *Concesiones de Obras Públicas en Chile: 20 Años*. Santiago, Chile: MOP, División de Estudios y Análisis Financiero.
- Organisation for Economic Co-operation and Development (OECD). 2010. *OECD Economic Surveys: Chile*. Paris, France: OECD.
- . 2018. *OECD Economic Surveys: Chile*. Paris, France: OECD.
- . “National Accounts at a Glance.” Paris, France: OECD. Available at: <https://stats.oecd.org/Index.aspx?DataSetCode=NAAG>
- Rodríguez, J., C. Tokman and A. Vega. 2006. “Política del Balance Estructural: Resultados y Desafíos tras Seis Años de Aplicación en Chile.” *Estudios de Finanzas Públicas* 7. Santiago, Chile: Dirección de Presupuestos, Ministerio de Hacienda de Chile (Dipres).
- Rodríguez, J., C. Tokman and A. Vega. 2007. “Structural Balance Policy in Chile.” *Studies in Public Finance*. Santiago, Chile: Ministry of Finance.

- Schmidt-Hebbel, K. 2010. "Fiscal Rules and Institutions in the World and in Chile." *Manuscript*, Catholic University of Chile.
- Schmidt-Hebbel, K. 2012. "Fiscal Policy for Commodity Exporting Countries: Chile's Experience." In: R. Arezki et al., editors. *Commodity Price Volatility and Inclusive Growth in Low-Income Countries*. Washington, DC, United States: International Monetary Fund.
- Schmidt-Hebbel, K., and R. Soto. 2017. "Fiscal Rules in the World." In: L. Ódor, editor. *Rethinking Fiscal Policy After the Crisis*. Cambridge, United Kingdom: 103-138.
- Schmidt-Hebbel, K., and R. Soto. 2018. "Fiscal Rules and Fiscal Performance: World Evidence." Documento de Trabajo IE-PUC 517. Santiago, Chile: Pontificia Universidad Católica de Chile.
- Schmitt-Grohé, S., and M. Uribe. 2003. "Closing Small Open Economy Models." *Journal of International Economics* 61: 163-185.
- Stein, E., E. Talvi, and A. Grisanti. 1998. "Institutional Arrangements and Fiscal Performance: The Latin American Experience." NBER Working Paper 6358. Cambridge, United States: National Bureau of Economic Research.
- Ter-Minassian, T. 2010. "Preconditions for a Successful Introduction of Structural Fiscal Balance-Based Rules in Latin America and the Caribbean: A Framework Paper." Discussion Paper IDB-DP-157. Washington, DC, United States: Inter-American Development Bank.
- Ter-Minassian, T. 2011. "Should Latin American Countries Adopt Structural Balanced-Based Fiscal Rules?" *Revista de Economía y Estadísticas* XLIX(1):115-143.
- Velasco, A. et al. 2010. "El Enfoque de Balance Estructural en la Política Fiscal en Chile: Resultados, Metodología y Aplicación al Período 2006-2009." *Studies in Public Finance*. Santiago, Chile: Ministry of Finance.
- Von Hagen, J. 2005. "Political Economy of Fiscal Institutions." Discussion Paper Series of SFB/TR 15 Governance and the Efficiency of Economic Systems 149. Berlin, Germany: Free University of Berlin, Humboldt University of Berlin, University of Bonn, University of Mannheim, University of Munich.
- Villena, M., C. Gamboni and A. Tomaselli. 2018. "Fiscal Sustainability and the Cyclically Adjusted Balance Policy: Methodology and Analysis for Chile." *CEPAL Review* 124: 203-232.

World Bank. 2020. “World Development Indicators Database.” Washington, DC, United States:
World Bank. Accessed online April 16, 2020.

Appendix A. Components of Chile’s Institutional Framework

This appendix describes the eight key components of Chile’s fiscal framework (other than the fiscal rule, which is analyzed in Section 2), including their interrelations, and their main limitations and drawbacks, as of late 2019.

Fiscal Responsibility Law

Fiscal responsibility laws establish requirements on the executive to state transparently its short and medium-term policy objectives, to set short and medium-term targets for fiscal flows and stocks, to provide transparent information on budget planning and execution to the legislature, to implement a fiscal policy conducive to fiscal stability and solvency, and to account ex post for its fiscal policy execution and attainment of policy objectives (Lienert, 2011).

Chile enacted Law No. 20128 on Fiscal Responsibility in 2006 to improve its overall institutional framework and to strengthen the links between the fiscal rule, the establishment of two sovereign wealth funds (SWFs), and the use of government savings. Its major provisions are the following (Rodríguez et al., 2006):

- (i) Legal requirement for a new government administration to define and publish the fiscal policy framework for its 4-year term and its implications for the government’s “structural” (i.e., cyclically-adjusted) balance.
- (ii) Legal requirement for the administration to issue an annual report on the financial state of the government, its fiscal sustainability, and the macroeconomic and financial implications of fiscal policy, as well as an estimation of its cyclically-adjusted balance.
- (iii) Requirement of annual estimation of government contingent liabilities (required to determine the cyclically-adjusted balance target).
- (iv) Establishment of the Pension Reserve Fund (PRF) to finance future pension liabilities of the government. During its 10 first years of existence, the PRF accumulates funds at a yearly floor equivalent to 0.2 percent of GDP and a ceiling of 0.5 percent, where the actual figure within the aforementioned range is determined by the government. The funding sources for the floor are government revenues or government saving.

- (v) Establishment of the Economic and Social Stabilization Fund (ESSF), starting with the foreign resources accumulated in the former Copper Revenue Compensation Fund (which is abolished) and other foreign asset holdings of the government at the end of 2006. The budget surplus (after payment into the PRF) is transferred into the ESSF and resources are withdrawn from the ESSF to finance budget deficits (including payments into the PRF).
- (vi) Government option to engage in annual capital transfers to the Central Bank of Chile (CBC) for the latter's capitalization during five years (2007-2011), up to a ceiling of 0.5 percent of GDP and subject to availability of a government surplus after payment into the PRF. The government has the right to decide how to allocate the budget surplus to the ESSF and to CBC capitalization, subject to the abovementioned restrictions.
- (vii) International investment of the resources held in the two SWFs—PRF and ESSF—can be executed directly by the Treasury (under the MoF) or can be outsourced to the Central Bank of Chile (CBC) or private fund managers hired by the CBC. The law established a new Advisory Financial Committee for Fiscal Responsibility Funds (AFCFRF) of the MoF, to advise MoF on investment regulations and other decisions related to the two SWFs.

The latter law does not impose any specific fiscal rule on the government. It rather implies a requirement to adopt and implement a fiscal policy framework aiming at fiscal sustainability, based on a distinction between actual and cyclically-adjusted government balances. This provides sufficient flexibility to new governments to define the explicit formula for the fiscal rule they commit to at the start of their administration. Finally, the law does not impose restrictions on the government on how budget deficits are financed, maintaining MoF discretion on deciding between issuing public debt, using ESSF savings or selling government financial or non-financial assets.

Financial Management of the Budget

International best practice of budgetary management is based on having in place several core elements for efficient financial management by the MoF (Ter-Minassian, 2011). They include strong constitutional and legal powers granted to the MoF on legal initiatives with budgetary impact; strong political power of the MoF in adopting and implementing the budget in relation to

other ministries, regional and municipal governments, independent government agencies and public enterprises; high technical capacity for MoF's budgetary planning and ensuring its consistency with the government's fiscal policy objectives; efficient legislative approval of the budget, limiting the possibility of legislative amendments that contradict government fiscal policy; and significant capacity in monitoring and obtaining early information on budget and in implementing budgetary corrections of observed deviations. International evidence shows that countries that meet the latter requirements attain better performance in budget execution, stability, and sustainability of fiscal policy (Alesina and Perotti, 1996; Stein et al., 1998; Alesina et al., 1999; Ter-Minassian, 2010).

Chile's legislation broadly satisfies broadly the latter elements. Its strong presidential system empowers the government with budgetary initiative (not shared with congress) and strong control over budget design and negotiation with Congress.¹⁷ The executive holds the sole power of tax initiative. Congress lacks line-item veto and is only entitled to vote for or against the Government's proposed budget bill. Congress also lacks in-house capabilities to assess and evaluate in depth current fiscal policy, projections in the budget bill, and underlying macroeconomic assumptions.

However, significant budget negotiations take place between the government represented by the MoF and congress before the budget comes to vote. The latter negotiations tend to focus on budget (i.e., spending) composition rather than on taxation or the overall resource constraint, not least because of the constraints imposed by the fiscal rule on the budget's overall resource envelope.

Budget Planning Horizon

Many countries are reforming their budget planning, shifting from one-year to multi-year horizons. This change is aimed at achieving greater transparency, consistency, and intertemporal sustainability of fiscal policy; reducing government short-term bias in public spending decisions; and committing to a path of gradual correction of initially unsustainable fiscal positions. Adopting explicit multi-year budgetary and fiscal targets contributes to additional potential gains in fiscal policy sustainability and credibility, as well as in macroeconomic stability.

¹⁷ See Chumacero et al (2007).

Chile has in place a one-year budgeting framework. However, the aforementioned 2006 Fiscal Responsibility Law includes two provisions that require governments to adopt a fiscal policy that is, at least in principle, consistent with a horizon that exceeds one year: i) the requirement imposed on each new administration to present its four-year fiscal policy framework and its implications for the cyclically-adjusted government balance, and ii) the requirement of the MoF to submit annually, together with the draft budget law, a medium-term budget projection.

As discussed below, Chile's fiscal rule introduces an additional dimension of multi-year planning, as it requires medium-term projections for GDP and the copper price for next year's budget calculation.

Among the duties of Chile's Independent Fiscal Council (IFC) is preparation of long-term projections for government accounts and budgets, based on a systematic assessment of fiscal sustainability and a regular evaluation of long-term consequences of fiscal decisions with budgetary implications. Required by the 2006 Law, the AFCFRF regularly commissions an actuarial study of the contingent liabilities derived from the government's pension subsidies in order to assess if the latter are matched by Pension Reserve Fund assets.

Rules for Management of Government Assets and Liabilities

While some governments have adopted a consistent and rule-based framework in managing their overall financial assets and liabilities, most have limited such policy to one part of their balance sheet, focusing only on rule-based financial management of some of their assets (in particular, SWF assets) and/or part of their liabilities (in particular, public debt). Chile (like most countries) lacks both a policy and an institution that focuses on consistent management of all government financial assets and liabilities, with explicit financial objectives linked assessments of risk, return, liquidity, or benchmarking. No comprehensive management of the government's total balance sheet, including financial and non-financial assets, as well as implicit and contingent financial liabilities, has been adopted.

Sovereign Wealth Funds

Many commodity-exporting countries have adopted SWFs to save their budget surpluses in these funds, usually invested in internationally diversified portfolios. This is observed in countries with

and without fiscal rules. In countries with fiscal rules, accumulation into SWFs and withdrawals from them are largely determined by the rules.

The two Chilean SWFs were legally established by the 2006 Fiscal Responsibility Law, as discussed above.

Requirements on Budget Accountability and Provision of Information on Financial Management

Most governments have improved transparency and accountability of their fiscal policy and financial management. This trend responds to the growing political and academic consensus on the democratic and economic efficiency gains of fuller accountability and transparency in fiscal policy.

The International Budget Partnership compiles the Open Budget Survey, an international comparative database on partial and aggregate measures of global transparency and accountability of the budgets of central governments in the world. In its 2017 version, Chile ranks in 35th place among 115 countries.

In Chile, transparency in the forecasts of the two key variables for the budget—future GDP growth and copper prices—was ensured almost from the start of the fiscal rule, as projections for the two latter variables made by two ad hoc committees were made public (more on them below). However, mapping of the latter projections into actual MoF budget calculations cannot not be easily replicated by analysts. Some improvements in the provision of information regarding calculation of the cyclically-adjusted balance were implemented in the 2010 Report of Public Finances for the Budget Law, which was consistent with the recommendations provided by the Advisory Committee on Fiscal Policy (2010, 2011). However, it is still not fully possible to replicate the MoF calculation of CAB as of today.

Regarding SWFs, international heterogeneity in their management and investment accountability and transparency is large as reflected by the annual rankings of SWF published by the Sovereign Wealth Fund Institute. In its 2019 version, both Chilean SWFs rank in first place (together with 13 other SWFs) in transparency, among 88 included funds.

Therefore, the current state of transparency and accountability of Chile's government accounts is moderately high but there is significant room for further improvement, particularly in budgetary transparency.

Budget Planning and Execution

The responsibility of proposing the resource allocation of government expenditures relies entirely on the MoF but the budget has to be approved annually by Congress. MoF and more specifically the Budget Office (DIPRES) is responsible for preparing the annual budget and enforcing its execution. However, the MoF has a margin of flexibility to manage budget execution during the year.

Every year, the MoF reports on the fiscal stance to Congress and presents the budget for the following fiscal year. The budget discussion between the MoF and Congress is subject to the following restrictions:

- (i) Congress has a mandatory 60-day limit for approving the budget bill. Failure to do so results on automatic approval of the Government's budget proposal.
- (ii) The income calculation is made known to Congress but is not voted on.
- (iii) Tax legislation is understood as having a permanent nature and cannot be altered by the (annual) budget law.
- (iv) Congress does not have the ability to raise spending or introduce new spending items. It can only approve or lower the spending outlays proposed by the Government. However, in a strict interpretation of the Constitution, Congress cannot cut or lower them when those cuts preclude exercise of Government functions. Congress cannot cut the proposed outlays for spending items allocated to cover commitments derived from permanent laws (pension payments, salaries to tenured public personnel, debt service, etc.).

At the start of a new Government administration, the MoF is required to present a fiscal policy plan that defines numerical annual targets of the CAB for the administration's four-year period.

External Control and Auditing

External control and auditing of government accounts and budget execution is performed by congress, the government's general comptroller or auditor, and fiscal councils and committees. In most countries, congress and especially the general comptroller exercise traditional accounting, financial, and managerial control of budget execution and government accounts. More recently,

countries are adopting fiscal councils, which are empowered to provide an economic assessment of fiscal policy design and execution, as discussed below.

Government accountability of budgetary compliance in Chile is limited to a large extent to oversight and control by the General Comptroller's Office (*Contraloría General de la República*). This institution focuses on accounting, procedural, and legal compliance by the government in its implementation of fiscal policy and execution of the budget. This oversight and control function by the General Comptroller is exercised for all levels of government. In this way the Comptroller's Office contributes decisively to limiting the extent of illegal government actions and government corruption.

However, other than the future work by the recently established independent fiscal council, there is almost no substantive ex-ante, real-time or ex-post evaluation of fiscal policy implementation and its compliance with the fiscal rule, of government spending (either mandatory or discretionary), and of the efficiency and effectiveness of government programs and tax collection efforts. There are very few resources spent by Congress, political parties, think tanks or academia in conducting a systematic evaluation of fiscal policy and its results. The only exceptions to this dearth of fiscal policy evaluation are a few academic papers and some exceptional initiatives at the MoF to assess partial aspects of fiscal policy.

Fiscal Council

Independent fiscal councils are permanent government or congressional agencies established to monitor budget preparation and execution, assess assumptions and projections required for the budget, assess and recommend on fiscal policy and budgetary management, assess the long-term sustainability and optimality of fiscal policy, as well as its macroeconomic and distributional effects, assess and recommend policies on government asset and liability management, recommend budgetary corrections when facing deviations in budget execution, and recommend improvements in budget transparency (Debrun and Kumar, 2007; Debrun et al., 2009; Ter-Minassian, 2011; Calmfors and Wren-Lewis, 2011).

Chile's MoF established by ministerial decree an Advisory Fiscal Council (AFC) in 2013, with a narrow set of functions. They comprise the following: i) assessment and aggregation of projections of trend GDP growth by ACTGDP and the reference copper price by ACRCP; ii) assessment of the detailed calculation of the budget, based on the projection of the cyclical

component of government revenue; iii) assessment of changes to the CAB calculation introduced by the MoF; and iv) advice on fiscal policy issues, on request by the MoF.

The five non-remunerated council members were selected by the Minister of Finance for overlapping terms and invited to the MoF to 4-7 meetings per year. AFC lacked independent staff and financial resources. However, its experience was useful in defining a broader role for the subsequent Independent Fiscal Council (IFC).

Congress enacted Law 21148 in 2019 that established Chile's IFC. This institution started in April 2019, replacing the previous AFC. Its five remunerated members, who serve overlapping terms, are nominated by the Government and approved by Congress.

The IFC has been endowed with a broader set of tasks, taking over the four functions of AFC and adding several more. Its nine functions are: i) evaluation and monitoring of DIPRES calculations of cyclical adjustments of government revenue; ii) monitoring and evaluation of the projections prepared by ACTGDP; iii) submission of proposals of methodological changes to the calculation of the CAB; iv) expression of opinions regarding deviations in government compliance with the CAB target and presentation of proposals for amending such deviations; v) evaluation of the medium and long-term sustainability of public finances and publication of its findings; vi) advise of the MoF on fiscal issues related to the Council's functions, at the request of the Minister; vii) preparation of research and analysis of fiscal issues related to the Council's functions and their publication in reports delivered to Congress; viii) outsourcing of studies and reports on issues related to the Council's functions; and ix) proposal of substitute members to fill possible vacancies of the advisory committees ACTGDP and ACRPC.

While Chile's new IFC has a broader and more significant role than its predecessor, the AFC, its tasks are still relatively modest in comparison to large and influential fiscal councils or congressional budget offices in other countries. In addition, the IFC's annual budget and its staffing are proportionately small.

Table A1. Variable Definitions and Sources

Variable	Definition	Source
Ex ante Projected Reference (or Long-Term) Copper Price	Data for year t are projected in year $t - 1$ by the Advisory Committee of Long-Term Copper Price.	Acta del Comité Consultivo del Precio de Referencia del Cobre
Ex ante Projected Copper Price	Data for year t are projected in year $t - 1$ by the Budget Office (DIPRES), Ministry of Finance of Chile	Informe de Finanzas Públicas. Proyecto de Ley de Presupuestos del Sector Público
Ex ante Projected Trend GDP Growth	Data for year t are projected in year $t - 1$ by the Advisory Committee of Trend GDP	Acta del Comité Consultivo del PIB Tendencial (various issues)
Ex ante Projected GDP Growth	Data for year t are projected in year $t - 1$ by the Budget Office (DIPRES), Ministry of Finance of Chile	Informe de Finanzas Públicas Proyecto de Ley de Presupuestos del Sector Público
Ex ante Projected Output Gap*, **	Data for year t are projected in year $t - 1$ by the Budget Office (DIPRES), Ministry of Finance of Chile	Informe de Finanzas Públicas Proyecto de Ley de Presupuestos del Sector Público
Ex ante Projected Actual Government Balance	Defined as the difference between government revenue and expenditure, expressed as a ratio of GDP and announced by Budget Office (DIPRES), Ministry of Finance of Chile	Actualizaciones de Proyecciones Fiscales 2019-2024, December 2019
Ex ante Projected Cyclical Adjusted Balance Target	Defined as the difference between the Ex ante Projected Actual Government Balance and the Ex-ante Projected Cyclical Adjusted Balance Target, expressed as a ratio of GDP and announced by Budget Office (DIPRES), Ministry of Finance of Chile	Informe de Finanzas Públicas Proyecto de Ley de Presupuestos del Sector Público
Actual GDP Growth	Data for year t are the effective value of the GDP growth at year t .	Actualizaciones de Proyecciones Fiscales 2019-2024, December 2019 y Informe de Finanzas Públicas: Primer Semestre 2020.
Actual Copper Price	Data are the actual average value of the copper price at year t	Bloomberg
Actual Government Balance	Defined as government revenue less expenditure, expressed as a ratio of GDP. Series for 1990-2019 computed by Budget Office (DIPRES), Ministry of Finance of Chile.	Actualizaciones de Proyecciones Fiscales 2019-2024, December 2019
Ex Post Estimated Trend GDP Growth	Estimate based on historical 1960-2019 data by the Budget Office (DIPRES), Ministry of Finance of Chile	Actualizaciones de Proyecciones Fiscales 2019-2024, December 2019 Informe de Finanzas Públicas: Primer Semestre 2020.
Ex Post Estimated Output Gap*	Estimates based on historical 1960-2019 data, by Budget Office (DIPRES), Ministry of Finance of Chile	Actualizaciones de Proyecciones Fiscales 2019-2024, December 2019 and Informe de Finanzas Públicas: Primer Semestre 2020.
Ex post Cyclical Adjusted Government Balance	Data for year t are calculated in year $t + 1$ by the Budget Office (DIPRES), Ministry of Finance of Chile.	Indicador del Balance Cíclicamente Ajustado.
Ex post Estimated Cyclical Balance Component	Computed as the difference between the Actual Government Balance and the Ex post Estimated Cyclically Adjusted Budget Balance, expressed as a ratio of GDP.	Informe de Finanzas Públicas: Primer Semestre 2020

Notes: (*) Output gaps are computed as (Trend GDP–Actual GDP)/Trend GDP. (**) Value used for Output Gap for year 2010 corresponds to the review of the Output Gap value by the “Comité Asesor para el diseño de una política fiscal de balance estructural de segunda generación para Chile (2011).” This is because the value of 8.3 percent presented in the 2009 “Informe de Finanzas Públicas Proyecto de Ley de Presupuestos del Sector Público” is not consistent with the value of the Ex ante Projected Trend GDP Growth nor with the value of the Ex ante Projected GDP growth presented in the “Informe de Finanzas Públicas Proyecto de Ley de Presupuestos del Sector Público” for that year. (***) Copper prices are measured in U.S. dollars per pound.

Table A2. Descriptive Statistics of Key Macro and Budget Variables, 1990-2019

Variable	Period	Full sample		Pre-fiscal rule		Post-fiscal rule	
		Avg.	s.d	Avg.	s.d	Avg.	s.d
Copper Revenue (% of GDP)	1990-2019	2.51	2.12	1.80	1.18	2.95	2.45
Non-Copper Revenue (% of GDP)	1990-2019	19.0	1.23	19.32	0.81	18.82	1.42
Ex ante Projected Trend GDP Growth (%)	2003-2019	4.27	0.83	-	-	4.27	0.83
Ex post Estimated Trend GDP Growth (%)	1990-2019	4.66	1.62	6.52	0.96	3.68	0.82
Ex ante Projected GDP Growth (%)	2001-2019	4.53	1.11	-	-	4.53	1.11
Actual GDP Growth (%)	1990-2019	4.55	2.76	6.03	3.07	3.69	2.22
Ex ante Projected Output Gap (%)	2001-2019	2.15	1.51	-	-	2.15	1.51
Ex post Estimated Output Gap (%)	1990-2019	0.05	2.86	-1.91	2.73	1.18	2.30
Ex ante Projected Copper Price (US\$/lb)	2001-2019	2.26	1.01	-	-	2.26	1.01
Actual Copper Price (US\$/lb)	1990-2019	1.95	1.10	0.99	0.19	2.51	1.01
Ex ante Projected Government Balance (% of GDP)	2001-2019	-0.04	2.33	-	-	-0.04	2.33
Actual Government Balance (% of GDP)	1990-2019	0.65	2.84	1.23	1.47	0.32	3.39
Ex ante Projected Cyclical Adjusted Government	2001-2019	-0.23	1.15	-	-	-0.23	1.15

Balance (Target) (% of GDP)							
Ex post Estimated Actual Cyclical Adjusted Government Balance (% of GDP)	2001-2019	-0.37	1.33	-	-	-0.37	1.33
Ex ante Projected Cyclical Balance Component (% of GDP)	2001-2019	0.19	1.82	-	-	0.19	1.82
Ex post Estimated Cyclical Balance Component (% of GDP)	2001-2019	0.69	2.77	-	-	0.69	2.77
Government Revenue Growth Rate (%)	1991-2019	5.61	9.75	4.79	5.74	6.04	11.44
Expenditure Growth Rate (%)	1991-2019	6.07	2.88	6.16	2.16	6.03	3.25
Sovereign Premium EMBI (bps)	1999-2019	148.57	43.80	185.00	16.97	144.74	44.19

Table A3. Correlations between Committee Forecasts and Actual Variables, 1990-2019

Variables		Correlation Coefficient
Ex ante Projected Trend GDP Growth	Ex post Estimated Trend GDP Growth	0.68
Ex ante Projected GDP Growth	Actual GDP Growth	0.53
Ex ante Projected GDP Growth	Previous Year GDP Growth	0.61
Ex ante Projected Output Gap	Ex post Estimated Output Gap	0.48
Ex ante Projected Copper Price	Actual Copper Price	0.81
Ex ante Projected Copper Price	Previous Year Copper Price	0.96
Ex ante Projected Long-Term Copper Price	Actual Copper Price	0.51
Ex ante Projected Long-Term Copper Price	Previous Year Copper Price	0.72
Ex ante Projected Government Balance	Actual Government Balance	0.64
Ex ante Projected CAB (Target)	Ex post Estimated CAB	0.57
Ex ante Projected Cyclical Balance Component	Ex post Estimated Cyclical Balance Component	0.65
Ex ante Projected Output Gap	Ex post Projected Copper Price Gap	0.24

Sources and notes: The Ex ante Projected Copper Price Gap is defined as: (Ex ante Projected Long-Term Copper Price–Actual Copper Price)/ Ex ante Projected Long-Term Copper Price. The source is the data presented in Figures 2-12.

Appendix B. Data Sources and Definitions

1. Macroeconomic data were obtained from the World Development Indicators database from The World Bank (2020).

The variables considered in the empirical analyses include the Dependency Ratio (defined as 100-Population ages 15-64 (% of total population)), Net barter terms of trade index (2000 = 100), the cyclical component of log Real GDP and log Terms of trade obtained using the Hodrick-Prescott filter. Data are available for 213 countries covering the period 1961-2018.

2. Public Investment data were obtained from IMF (FAD Investment and Capital Stock Database 2019), OECD (OECD National Accounts Statistics: National Accounts at a Glance) and the Ministry of Finance of Chile (Estadísticas de las Finanzas Públicas, various issues)

The IMF database measures public investment using gross fixed capital formation (GFCF) of the general government (i.e., central plus subnational governments) for 142 countries covering the period 1960-2017. This approach allows for the use of the comparable data available for a large number of countries but ignores alternative modes by which governments support overall investment including: i) investment grants, which are transfers from central and/or subnational governments to public and private entities outside the general government to support investment in fixed assets; ii) loan guarantees; iii) tax concessions, such as those for mortgage interest, research and development, and municipal bonds; iv) the operations of public financial institutions, such as development banks, which provide long-term funding at subsidized rates; v) government-backed saving schemes; vi) private sector provision of infrastructure services (e.g., through PPPs); and (vii) entities controlled by the public sector—but outside the general government—such as SOEs and parastatals. The IMF database was supplemented using information from the OECD and the MoF.

3. Public Debt data were obtained from Mbaye et al (2018).

This database defines debt as the gross outstanding stock of all liabilities that are debt instruments for 190 countries covering the period 1970-2017. Based on this definition, debt statistics should ideally include loans, debt securities, special drawing rights; currency and deposits; other account payables; and insurance, pension, and standardized guarantee schemes. In practice, however, only a handful of countries provide exhaustive coverage of sovereign and private debt instruments. The

measure of public debt is, thus, gross as it does not take into account public assets such as those in sovereign wealth funds.

4. *Terms of Trade data were obtained from Gruss and Kebhaj (2019).*

This database estimates country-specific commodity price indices for 182 economies covering the period 1962-2018. For each country, the change in the international price of up to 45 individual commodities is weighted using commodity-level trade data. Available indices are constructed using, alternatively, fixed weights and time-varying weights. We use the Commodity Terms of Trade Index (xj-mj weighted by GDP; defl.; 2012m6=100).

The complete database comprised 152 countries and covered the period 1970-2017. However, countries that had implemented fiscal rules at the national level were excluded from the pool of donors as they are treated units. Data on fiscal rules were obtained from Schmidt-Hebbel and Soto (2018). Likewise, in order to have a pre-fiscal rule period sufficiently long to provide for a consistent estimate of the time-varying effects we excluded countries without data 10 years prior to the implementation of the Chilean fiscal rule in 2001. We furthermore also excluded countries without full data 10 years after the enactment of the rule in Chile.

Table A2.1 Models Results

	Public Investment		Fiscal Balance		Public Debt	
	Treated	Synthetic	Treated	Synthetic	Treated	Synthetic
Dependency Ratio	3.59	3.68	3.58	3.56	35.72	35.28
Terms of Trade	4.52	4.55	92.2	102.9	4.52	4.51
Business cycle	-0.004	-0.004	0.002	0.001	0.002	0.001
Terms of Trade Shocks	0.002	0.001	-0.0004	-0.0003	-0.0004	0.0004
Private Investment	11.15	13.59	-	-	-	-
Public Debt	-	-	35.2	28.8	-	-
Public Investment	-	-	-	-	5.06	5.20
RMSPE	0.973		1.081		4.76	
Main Donors	UAE, Saudi Arabia, Bahamas, Albania, Barbados		Thailand, UAE, Dominican Republic, Korea, Lebanon, St Lucia		Thailand, UAE, China, Saudi Arabia, Guatemala, Lebanon, Vietnam	

Appendix C. A DSGE Model to Analyze the Effect of the Fiscal Rule on the Chilean Economy

This appendix presents the structure of the DSGE model used in Section 4 of the paper.

The Household Problem

The economy is inhabited by two type of households who maximizes the following expected utility function, conditional on the set of information available at time $t = 0$:

$$E_0 \sum_{t=0}^{\infty} \beta^t u(c_t) \quad (1)$$

where $u(c_t) = \frac{c_t^{1-\gamma}}{1-\gamma}$. Consumption is subject to VAT. This tax—currently set at 19 percent in Chile—is crucial for complying with the fiscal rule as it represents around 50 percent of all tax revenue of the government.

The representative household of one group (Ricardian consumers) is the sole owner of capital in the economy and consequently receives the after-tax return on investment. The household also collects the after-tax profits from exporting y_{1t} at price p_t . Good 2 is the numeraire so we define p_t as the terms of trade or the relative price of commodity 1 to commodity 2. The representative household of the other group does not own any capital and does not have access to the credit market, but she is the recipient of government transfers. Given that leisure/labor is not in the utility function, we assume that each household in each group has one unit of labor to be offered inelastically in the labor market. There are a number of $0 < \chi < 1$ of hand-to-mouth consumers. We, thus, abstract from unemployment issues and normalize total employment at 1, such that χ units of labor are supplied by the hand-to mouth households and $1 - \chi$ by Ricardian households. Real wages are, nevertheless, endogenous. Finally, the hand-to mouth household is given a lump-sum transfer by the government, which we denote by T_t .

The budget constraint of the Ricardian representative agent, expressed in units of good 2, is:

$$(1 - \tau_k)r_t k_t + (1 - \chi)(1 - \tau_l)w_t + (1 - \tau_1)p_t y_{1t} = (1 + \tau_c)c_{Rt} + i_t + \frac{\theta}{2} \left(\frac{i_t}{k_{t-1}} - \delta \right)^2 \quad (2)$$

where c_{Rt} stands for consumption of the Ricardian consumer, τ_k , τ_l , τ_c , and τ_1 stand for tax rates on the return of capital, the wage bill, consumption, and profit of the mining sector, respectively.

Variables r_t , l_t , T_t are the real rent of capital, the real wage, and the transfer received from (or given to) the government, respectively. Variable k_t is the capital stock at time t , i_t denotes private investment and δ is the depreciation rate. The household saves and smooths consumption intertemporally by purchasing domestic capital units (i.e., it does not have access to international financing). She invests in capital and it pays a quadratic cost of adjustment, where θ is the size of the adjustment costs.

The private capital evolves over time according to the following dynamic equation:

$$k_{t+1} = k_t(1 - \delta) + i_t \quad (3)$$

The hand-to-mouth representative agent faces the following constraint:

$$\chi (1 - \tau_l)w_t + T_t = (1 + \tau_c)c_{Nt}$$

where c_{Nt} stands for consumption of hand-to-mouth consumers. Total consumption is given by:

$$c_t = \chi c_{Nt} + (1 - \chi)c_{Rt}$$

Firms

Being an endowment, the firm producing the exportable natural-resource does not hire any input. The firm does not affect the international price of its exports. Real profits in Sector 1 (π_{1t}) expressed in terms of the importable good are:

$$\pi_{1t} = p y_{1t} \quad (4)$$

The firm in Sector 2 is price taker since it competes with imports. It uses a Cobb-Douglas production function $y_{2t} = A_t k_t^\alpha l_t^{1-\alpha} g_t^\lambda$ and maximizes profits hiring capital and labor and taking as given the public investment (i_{gt}). The latter enters the production function as a positive externality. Real profits are given by:

$$\pi_2 = A_t k_{t-1}^\alpha L_t^{1-\alpha} i_{gt}^\lambda - r_t k_{t-1} - w_t \quad (5)$$

where A is a productivity parameter and $0 < \alpha, \lambda < 1$.¹⁸ Productivity levels in Sector 2 evolve according to:

$$A_t = A_0 e^{z_t} \quad (6)$$

¹⁸ Sector 2 has constant returns to scale; therefore, profits will be zero in equilibrium.

where z_t is a productivity shock that follows an AR(1) process.

$$z_t = \rho_z z_{t-1} + \varepsilon_{zt} \quad \varepsilon_{zt} \sim N(0, \sigma_z^2) \quad (7)$$

Note that, since good 2 is the numeraire, the GDP of the economy is equal to

$$y_t = p_t y_{1t} + y_{2t} \quad (8)$$

The Government

We use a stylized version of the government in order to highlight the trade-offs it faces when abiding by the fiscal rule. Government expenditures (s) includes public investment (i_g), government transfers (T) to households and government expenditures that are not valuable for the private sector (g). For simplicity, we also assume that public investment depreciates completely in every period (depreciation rate equal to 1). Total government outlays include an adjustment cost in public investment given by the parameter ψ

$$s_t = T_t + g_t + i_{gt} \left(1 + \frac{\psi}{2} \left(\frac{i_{gt}}{i_{gt}^{ss}} - 1 \right)^2 \right) \quad (9)$$

where i_{gt}^{ss} stands for public investment in a steady state.

With regards to financing, the government collects taxes from labor (τ_l), private capital (τ_k), consumption (τ_c) and profits of the natural resource sector (τ_1). It can also finance expenditures by selling bonds b_t in the international market with endogenous return R_t , which we discuss below.

The intratemporal budget constraint of the government expressed in units of good 2 is:

$$\tau_1 p_t y_{1t} + \tau_k r_t k_t + \tau_l w_t l_t + \tau_c c_t + b_{t+1} - b_t = g_t + T + R_t b_t \quad (10)$$

Since there is no private access to the international financial sector, the government is the sole tenant of foreign debt. We assume that the return rate of government bonds is given by the international rate \tilde{R} plus a risk premium that is a function of the ratio of the sovereign debt to GDP.¹⁹

$$R_t = (1 - \rho_R) \tilde{R} + (1 - \rho_R) \phi \frac{b_t - \tilde{b}}{y_t} + \rho_R R_{t-1} + \varepsilon_{R,t} \quad (11)$$

¹⁹ This is one of the ways derived by Schmidt-Grohé and Uribe (2003) to close an open economy model.

Beyond the intratemporal budget constraint, the government has to obey the fiscal rule. The Chilean fiscal rule implemented in 2001 was based on targeting the structural balance. The structural balance isolates the cyclical effects on the fiscal balance to estimate the long-term stance of government finances (as opposed to targeting a particular, short-term objective) and determine the sustainable level of expenditures that matches the rule target. In order to estimate its long-term stance, the government must consider two elements. First, that tax revenues correspond to those collected when GDP is at its long-term trend level. This forces the government to save any transitory tax surplus collected from the domestic economy. Second, that the prices of copper and molybdenum correspond to those of their long-run equilibrium. This forces the government to save any transitory commodity price boom.

The formula for the structural balance (B_t^*) is adapted from the original Rodríguez, Tokman and Vega (2006) specification as:

$$B_t^* = B_t - (\tau_k r_t k_t + \tau_l w_t l_t + \tau_c c_t) + \left[(\tau_k r_t k_t + \tau_l w_t l_t + \tau_c c_t) \left(\frac{\tilde{Y}_t}{Y_t} \right)^\eta \right] - \tau_1 p_t y_{1t} + \tau_1 \tilde{p}_t y_{1t} \quad (12)$$

where B_t is the effective balance, Y_t correspond to GDP, \tilde{Y}_t is trend GDP, \tilde{p}_t represents the long-run price of natural resources, and η is the elasticity of tax collection respect to GDP, which is assumed to be equal to 1. The actual balance is adjusted by net non-mining tax revenues in period t and by tax revenues from private mining-companies in period t plus the revenues from the public company.

Given that $B_t = b_{t+1} - b_t$ and assuming a target of structural balance equal to zero, we can obtain an expression for total government's outlays from combining (10) and (12):

$$g_t + T_t + i_{gt} + r_t b_t = (\tau_k r_t k_t + \tau_l w_t l_t + \tau_c c_t) \left(\frac{\tilde{Y}_t}{Y_t} \right)^\eta + \tau_1 \tilde{p}_t y_{1t} \quad (13)$$

The fiscal rule places no restrictions on the composition of government outlays but only on the total. We need two additional equations in order to solve the model. The first one is that we observe in the data that government outlays, different than public investment, react to the cycle. We impose the following empirical condition:

$$\frac{T_t + g_t}{y_t} = 0.02 + 0.9 \frac{T_{t-1} + g_{t-1}}{y_{t-1}} - 0.4 \log \left(\frac{y_t}{\tilde{y}_t} \right) + 0.4 \log \left(\frac{y_{t-1}}{\tilde{y}_{t-1}} \right) \quad (14)$$

where \tilde{y}_t corresponds to the trend output estimated by the National Productivity Commission. The second equation is a closing equation for the model that describe the dynamic of government outlays:

$$\log s_t = \log \tilde{s}_t + 0.3(\tilde{b}_t - b_t) \quad (15)$$

where the variables with \sim are the steady state values.

External Sector

Given that output of sector 1 is constant over time (\tilde{y}_1), all foreign shocks come from changes in the terms of trade. Terms of trade follows an AR(1) stochastic process:

$$\ln p_t = (1 - \rho_p) \ln \tilde{p}_t + \rho_p \ln p_{t-1} + \varepsilon_{pt} \quad \varepsilon_{pt} \sim N(0, \sigma_p^2) \quad (16)$$

where ε_{pt} is an i.i.d. normal distributed disturbance and ρ_p is the autocorrelation coefficient.

The current account of the economy is given by

$$CA \equiv -(b_t - b_{t-1}) = p_t \tilde{y}_1 + y_{2t} - \left(c_t + i_t + \frac{\theta}{2} \left(\frac{i_t}{k_{t-1}} - \delta \right)^2 + s_t - T_t \right) - R_{t-1} b_t \quad (17)$$

The Decentralized Equilibrium

Here we describe the decentralized equilibrium of this economy, where households and firms take as given the action of the government. The vector of the state variables is given by $v = \{k, p, z, R\}$.

The competitive equilibrium is defined as a set of allocations rules $c = c(v)$, $k_{t+1} = k'(v)$, $l = l(v)$ and a set of pricing function $r = r(v)$, $w = w(v)$, such that:

- Households solve the problem (1) subject to (2) and (3), taking as given vector v and the functions $r(v)$, $w(v)$.
- Firms of the import competition sector solve problem (5), taking as given vector s and the functions $r(v)$, $w(v)$.
- The economy-wide resource constraint holds in each period and is given by (15).

Calibration of the Model

Table A3.1 shows the value of the parameters used in the calibration of the model and simulation of the shocks. A time period is defined as a quarter. The tax rates correspond roughly to the average

tax rates of the Chilean economy. The tax rate on capital has changed from 0.17 to 0.27 during the period of the operation of the fiscal rule. The stochastic process for technological shock z was estimated using data on TFP from DIPRES. The stochastic process of the terms of trade was estimated using terms of trade for Chile obtained from the World Bank. The parameters of the stochastic process for the interest rate were taken from Chumacero et al. (2004).

Table A3.1. Calibration Parameters

Preference parameters	Steady States values mining sector
$\gamma=1.1; \beta=0.99, \chi = 0.4$	$\widetilde{y}_1 = 1; \widetilde{p} = 1$
Technology parameters	Stochastic process
$\alpha = \frac{1}{3}; \lambda = 0.05$	$\rho_z = 0.86;$ $\rho_p = \rho_R = 0.9$
$A_0 = 3, \delta = 0.06$	$\sigma_z = 0.09; \sigma_p = 0.32$
$\psi = \theta = 0.025$	$\sigma_R = 0.001$
Taxes	External sector
$\tau_l = 0.1; \tau_k = 0.2$	$\widetilde{b} = 3; \widetilde{R} = 0.03$
$\tau_c = 0.19; \tau_1 = 0.05$	$\phi = 1.2$