

## Chile: Selected Issues

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**International Monetary Fund  
Washington, D.C.**



INTERNATIONAL MONETARY FUND

CHILE

**Selected Issues**

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Approved by the Western Hemisphere Department

June 25, 2007

	Contents	Page
I.	Introduction and Executive Summary .....	2
II.	Chile's Structural Fiscal Surplus Rule: A Model-Based Evaluation.....	3
III.	Risks in the Chilean Banking System: A Contingent Claims Approach.....	5
IV.	Credit Cyclicity—A Cross-Country Analysis .....	7
V.	Explaining Chile's Trade Performance.....	9

## I. INTRODUCTION AND EXECUTIVE SUMMARY

1. ***This Selected Issues paper presents summaries of the background work on Chile conducted by the staff over the past year.*** The topics were selected in consultation with the authorities, and have informed the ongoing dialogue between them and the staff.
  - ***The first chapter analyzes the properties of the fiscal surplus rule, a key pillar of Chile's macroeconomic framework.*** It concludes that the rule is near the volatility-minimizing efficiency frontier. Further reductions in output volatility could only be achieved by introducing higher volatility in inflation and fiscal variables.
  - ***The second chapter assesses the vulnerability of the Chilean banking system to external and domestic shocks.*** Based on Contingent Claims Analysis, it finds that banks' financial vulnerabilities have declined significantly since the 1998 financial crisis, and are now close to levels found in industrial countries. The chapter also discusses significant heterogeneity in the way banks respond to shocks.
  - ***Rapid credit growth in recent years appears related to structural factors with relatively little pro-cyclicality (Chapter IV).*** The study finds evidence that financial development can help reduce credit-induced volatility. It also suggests that credit in Chile is relatively sensitive to global financial shocks, but not to the domestic cycle.
  - ***The final chapter examines recent trade performance.*** The study finds that both exports and imports have been driven predominantly by demand factors. There is some evidence that trade liberalization has contributed to the recent trade expansion, but—in line with other studies—exchange rate effects are only found to have a marginal impact.

## II. CHILE'S STRUCTURAL FISCAL SURPLUS RULE: A MODEL-BASED EVALUATION<sup>1</sup>

2. ***Chile adopted a structural surplus rule in 2000, in part to isolate the fiscal accounts from volatility in the price of copper.*** In the past, swings in the price of copper tended to trigger a procyclical fiscal reaction as government expenditure would rise with increased revenues. By saving excess copper revenue abroad, the government now avoids overheating in a commodity-driven upswing, and the accumulated funds can then be used to prevent an undue fiscal contraction in a downswing. Likewise, the fiscal stance is adjusted for fluctuations in the regular economic cycle, independent of developments in commodity prices.

3. ***This study analyzes the efficiency of the current rule in minimizing the impact of shocks on the economy,*** and it explores whether gains could be made by adopting a more explicitly counter-cyclical response. Under the fiscal rule, the room for nominal government expenditure is determined by two variables, the government's *structural* revenues and the target for the structural surplus (1 percent of GDP until 2007; ½ percent as of 2008). With the help of two independent panels of experts, the government calculates structural revenues using a long-term reference price for copper and an estimate for potential output growth. For the purpose of the study, the rule is expressed as:

$$\frac{fs_t}{gdp_t} = fs^{rat} + d^{tax} \left( \frac{tax_t^{actual} - tax_t^{potential}}{gdp_t} \right) + d^{cop} \left( \frac{cop_t^{actual} - cop_t^{potential}}{gdp_t} \right)$$

where  $fs$  is the nominal fiscal surplus targeted in the budget, and  $fs^{rat}$  is the level of the structural surplus target. To reduce volatility from the business cycle and copper shocks, the nominal fiscal surplus is allowed to change with cyclically adjusted tax revenue and deviations of copper revenues from their long-term level. The current rule implicitly sets both  $d^{tax}$  and  $d^{cop}$  equal to one.

4. ***The analytical framework is provided by the Global Integrated Monetary and Fiscal Model (GIMF).*** The model, used here in a 2-country version (Chile and the rest of the world), shares many features with general equilibrium models introduced in central banks around the world. A key addition has been a model for the copper sector, reflecting the design of the structural surplus rule. Global copper output is modeled as an endowment, of which 38 percent is received by Chile. Copper prices fluctuate with shocks to foreign industrial demand for copper. The resulting swings in copper revenue are, in line with the Chilean situation, shared about equally between the Chilean government and foreign owners.

5. ***To assess the optimality of the parameters of the structural rule, a policymaker's loss function is defined as the weighted sum of inflation and output volatility.*** For any

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<sup>1</sup> Prepared by Michael Kumhof and Douglas Laxton.

given set of inflation and output weights in the loss function, we can compute loss-minimizing coefficients  $d^{tax}$  and  $d^{cop}$  in the fiscal rule depicted above. This traces out an efficiency frontier that represents the best possible combinations of output and inflation volatility for the given model and distribution of shocks.

6. ***The model is calibrated to Chile's historical fiscal performance.*** The adjustment in the model occurs through labor taxes, which are adjusted to achieve the desired fiscal surplus  $f_{S_t}$ . In assessing the properties of the fiscal rule, only shocks to copper prices are considered; these are calibrated to reproduce the unconditional variance and autocorrelation of international copper prices.

7. ***Key results are the following:***

- ***Chile's current rule is very close to the efficiency frontier.*** The current rule implies a relative weight on output volatility of around 0.13 in the policymaker's objective function. We find that the current rule, with weights of  $d^{tax} = d^{cop} = 1$ , performs far better than a *balanced budget* rule, which sets those weights equal to zero. A balanced budget rule would behave in a highly procyclical fashion: higher copper revenues stimulate the economy, and as tax rates are reduced to balance the budget, the economy is stimulated even more.
- ***A more countercyclical rule aimed at more aggressively stabilizing output is possible only at the expense of significantly higher volatility in fiscal variables.*** Increasing the weight on excess copper revenue ( $d^{cop} > 1$ ) would result in significantly less output volatility, but at a cost not only of an increase in inflation volatility, but also of much higher volatility in tax rates and fiscal balances. In this case, higher copper revenues would induce an *increase* in tax rates which would limit GDP growth. However, under Chile's current rule, taxes move very little at the time of the shock, and gradually fall over time as the government accumulates assets.
- ***Government assets are close to their steady state.*** The current level of government assets is close to its implied steady state level, and transition effects should thus be small. A simple manipulation of the government budget constraint shows that, in the steady state, the target for the structural surplus ratio equals the ratio of government assets to GDP, multiplied by the sum of the long-run growth rates of technology (2 percent), population (1 percent), and prices (3 percent). A target ratio of ½ percent of GDP implies a long-run level of external assets of 8–9 percent of GDP, which is roughly equal to the current amount of assets held by the government.

8. ***In summary, Chile's fiscal rule is at the economy's volatility-minimizing efficiency frontier,*** and the country's current asset stock is consistent with the recently adopted surplus target of ½ percent of GDP. Further reductions in output volatility could only be achieved by introducing higher volatility in inflation and fiscal variables.

### III. RISKS IN THE CHILEAN BANKING SYSTEM: A CONTINGENT CLAIMS APPROACH<sup>2</sup>

9. ***Chile has one of Latin America's most profitable and stable financial sectors.*** Since 2001, Chilean banks have had Latin America's lowest nonperforming loan (NPL) ratios, and returns on both assets and equity have been among the highest and most stable in the region. Even so, given the openness of Chile's economy and financial system, financial institutions remain vulnerable to external shocks. While global financial conditions are benign today, being prepared for a future shock is rightly on top of the agenda of Chile's financial supervisory and regulatory authorities.

10. ***This study applies a contingent claims analysis (CCA) to evaluate bank risk in Chile.*** The objective is to obtain a set of high-frequency indicators serving as barometers of banking risk and financial sector vulnerability. In principle, to understand day-to-day changes in the level of bank risk, the assets and liabilities of each bank would have to be assessed on a daily basis, using high-frequency information on the value and volatility of total assets, including intangible ones for which there are no observable market prices. This obviously not being feasible, CCA fulfills the same objective by combining lower-frequency balance sheet information with cutting-edge finance and risk management tools.

11. ***The CCA applies principles of corporate finance to a country's financial system.*** Similar to a commercial approach for corporate balance sheet valuation, the CCA is based on daily market prices for the value of bank equity and bank debt, as well as additional risk information imputed from the volatility of each bank's market capitalization. The study calculates the daily market value and volatility of banks' net assets using Merton's option-pricing theory. This can be employed to obtain credit risk indicators such as distance-to-default (DTD) and default probabilities. DTD is expressed as the number of standard deviations the net assets of a bank (or the aggregate banking system) are away from zero.

12. ***The results suggest that bank risk has declined significantly since 1998.*** The CCA is applied over the period 1998-2007 to seven private banks, which comprise over 70 percent of total bank assets. The results show that their financial strength, measured by DTD, has been comparable to banking systems in industrial economies. The estimated DTD and default probability measures adequately reflect the various financial stress events that the banks faced over the underlying period. Notably, volatility and default risks have declined significantly from highs in 1998, with the downward trend continuing into recent years. Moreover, CCA risk measures lead NPLs and provisioning measures by three to six months.

13. ***To determine how shifts in the Chilean economy affect bank risk, the study analyzes the relationship between macroeconomic variables and distance to default.*** The

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<sup>2</sup> Prepared by Dale Gray and James P. Walsh.

analysis first regresses each bank's DTD against a combination of 15 macroeconomic variables, including inflation, interest and exchange rates, unemployment, stock-market returns, investors' risk attitude, and copper and oil prices. While some variables, such as U.S. interest rates and oil prices, are strongly tied to the risks of many Chilean banks, no single variable is sufficient in predicting risk levels of all banks. Hence, the analysis extracts six principal components (or factors), correlated with developments in financial markets, U.S. interest rates, domestic and regional factors, and cyclical variables.

14. ***Scenario analysis using the extracted factors shows how risk levels at Chilean banks differ in relation to various adverse shocks:***

- ***Replicating the 1998 crisis.*** A shock to the financial factor of the same magnitude as the turmoil observed in 1998 causes a significant decline in the DTD of all banks within three months. For most banks, this would result in approximately a one-standard deviation decline in DTD—a higher level of risk than exists now in Chile, but well below 1998 levels.
- ***Impact of U.S. financial conditions.*** Shocks to a factor that closely tracks U.S. interest rates initially lead to a highly heterogeneous response by different banks. Within five months, however, the DTD of all the banks in the sample has declined by relatively moderate amounts.
- ***Bank heterogeneity.*** A shock to the factor representing regional economic and financial conditions also underscores bank heterogeneity. Some banks (including two of the three largest) show small and positive responses to this factor, while others (including the remaining large bank) display much lower DTD. Moreover, the reaction time in DTD measures differs substantially, with some banks reacting 2–3 months before others.

15. ***The results attest to the improvements made in insulating the Chilean financial system against financial shocks.*** Shifting to a risk-based supervisory and regulatory framework, combined with professional risk management practices at the level of the banks, has allowed Chilean banks to increase profitability while reducing risk exposures to levels comparable with advanced economies. The authorities' interest in developing the CCA as an approach to measuring risk exposures for supervisory purposes is also well placed.<sup>3</sup> The CCA can augment, and in some cases lead, traditional banking risk measures, providing time for supervisors to take appropriate measures. This makes it ideally suited for systemic risk analysis, and the extensions outlined above also allow an assessment of the impact of non-systemic shocks on individual banks.

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<sup>3</sup> D. Gray, C. Echeverría, and L. Luna (2006), "A Measure of Default Risk in the Chilean Banking System," in Central Bank of Chile, *Financial Stability Report*, Second Half 2006.

#### IV. CREDIT CYCLICALITY—A CROSS-COUNTRY ANALYSIS<sup>4</sup>

16. ***Chile has experienced rapid credit growth in recent years, albeit at a moderate pace compared to many other emerging market economies.*** In the seven largest Latin American countries, nominal credit growth to the private sector expanded by an average of 32 percent in 2006, the third year of strong credit expansion in the region. In Chile, private credit has also increased at a brisk pace (15 percent in real terms), but the acceleration of credit started earlier and has been more gradual than in many other emerging market economies. To some extent, this has reflected demand factors such as strengthening consumer confidence in the early 2000s, but supply factors have also played an important role. The market for consumer credit has been characterized by strong competition and a continuing search for market share, in particular with department stores penetrating deeper into the low-income segment.

17. ***Although financial sector risks in Chile appear contained, the role of credit for economic volatility merits attention.*** Household debt has increased only moderately, and although the increase has been larger for the poorest segment of borrowers, the latter represents only a small fraction of total debt. The share of non-performing loans (NPLs) in total loans remain in the low single digits, NPLs are fully covered by provisions, and banks enjoy strong capitalization. Even so, it is worth examining whether a credit-induced financial accelerator has contributed to increased economic volatility; how such an effect compares with that in other countries; and what factors are driving the cyclicalities of credit growth.

18. ***This study investigates the determinants of credit cyclicalities from a cross-country perspective.*** The analysis is based on credit data for 18 emerging markets and advanced countries that share some economic characteristics with Chile and where relevant data are available. The underlying assumption is that stronger procyclicality of credit implies both greater vulnerability to shocks and higher overall economic volatility. While analyzing the degree of procyclicality among sample countries, the study also explores possible relations between financial development and credit cyclicalities. To that end, a financial development index is constructed, based on a set of variables including measures of creditor rights, size of the credit market, competition, and capital market development. The study then investigates whether the index has a bearing on the behavior of credit in response to shocks to the output gap, terms of trade, global liquidity, and investors' risk appetite.

19. ***The analysis suggests that financial development matters for the cyclicalities of credit.*** Household credit in countries ranking higher on the financial development index tends to respond in a less procyclical manner to output gap and terms of trade shocks. The results are particularly robust for the sub-index capturing creditor rights. Moreover, there is some evidence that credit information can help reduce procyclicality. However, the study

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<sup>4</sup> Prepared by Ludvig Söderling.

found no link between financial development and the credit response to shocks in global liquidity and attitude toward risk.

20. ***The link between financial development and credit cyclicalities appears stronger for household credit than for corporate credit.*** This result is consistent with some of the findings in the September 2006 WEO. A plausible interpretation is that companies have more relationship-based interaction with lenders, which helps them access financing during temporary downturns. Moreover, corporations generally have better access to external financing and are hence less impacted by the domestic cycle.

21. ***The study suggests that external financial conditions are important for credit in Chile.*** Variations in global liquidity and risk attitudes accounted for about half of the volatility in household credit in the current cycle (since 2002). This could be related to a relatively high, and increasing, reliance by banks on external funding in this period. By contrast, credit appears little affected by the domestic cycle or shocks to the terms of trade. This is consistent with the notion that the recent strong credit growth in Chile partly reflects changes in fundamentals, such as structural improvements in credit supply.

22. ***A few caveats apply.*** First, placing the analysis within a financial-accelerator context implies that it does not capture potential cyclicalities coming from the demand side, i.e., from the varying willingness of agents to take on debt depending on the cyclical position of the economy. Second, factors other than financial development could affect the cyclicalities of credit, including economic structure and the exchange rate regime and degree of dollarization. Finally, limited data availability restricts the cross-country dimension and the quality of the financial index.

23. ***From a policy perspective, the question arises whether credit-induced economic volatility could be further contained.*** Notably, Chile scores relatively low in terms of credit protection: according to the World Bank's Doing Business database, legal enforcement of debt contracts is relatively slow and costly, and creditors' power to seize collateral and exercise their legal rights in cases of bankruptcy is considered weaker than in many other countries. To some extent, these weaknesses are compensated by effective information sharing on defaulting borrowers. However, as Chile aspires to close the gap with advanced countries, cross-country analysis suggests the importance of information-sharing as a substitute for strong creditor rights will eventually have to diminish.<sup>5</sup> Finally, deeper markets in securitized products and the creation of a credit derivatives market could also contribute to lower credit-induced volatility.

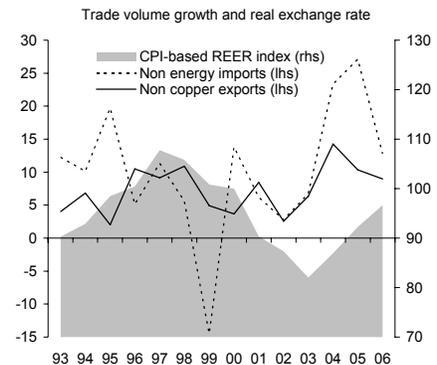
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<sup>5</sup> S. Djankov, C. McLiesh, and A. Shleifer (2005), "Private Credit in 129 Countries", NBER Working Paper 11078.

## V. EXPLAINING CHILE'S TRADE PERFORMANCE<sup>6</sup>

### 24. *Chile's external trade has grown and diversified significantly in recent years.*

Although trade remains dominated by commodities (copper exports and energy imports), trade in other goods has also increased sharply. Boosted by strong domestic demand, imports have grown by around 10-25 percent in volume terms since 2003. Non-copper export volumes have also expanded at a robust pace (5–10 percent per year), export markets are well diversified, and the global market share of Chile's non-copper exporters has only recently stabilized after increasing in both 2004 and 2005. Overall, the non-copper non-energy trade deficit has moved from an average of 2¾ percent of GDP in 2003/04 to around 4 percent of GDP in 2005 and 2006.



### 25. *Trade volumes have benefited from a growing*

*network of trade agreements that now cover more than 80 percent of Chile's external trade.* Following the association agreement concluded with Mercosur in 1996, Chile has signed bilateral trade agreements with the European Union in 2003, the United States in 2004, and China in 2006. As a result, the share of trade with countries that have a trade agreement with Chile jumped from 16 percent in 2002 to 81 percent in 2006. The share is likely to expand further as negotiations are concluded with other countries, notably Japan. This expansion has been accompanied by a drop in tariff rates. While Chile reduced its general tariff rate from 11 percent to 6 percent over 1999–2003, the large share of imports under bilateral trade agreements implies that the effective tariff rate has dropped to around 2 percent as of 2006.

### 26. *Fluctuations in the real effective exchange rate may also have affected trade flows.*

Since 2003, the price of copper—which represents about half of Chile's exports—has increased threefold, boosting Chile's terms of trade despite a sharp increase in the price of energy imports. The impact on the real effective exchange rate has been muted by the fiscal framework (saving excess copper revenues abroad) and by outward profit remittances (reflecting foreign ownership in copper mining). Since 2003, the real exchange rate has appreciated moderately (by about 20–25 percent), which may have slowed exports and boosted imports.

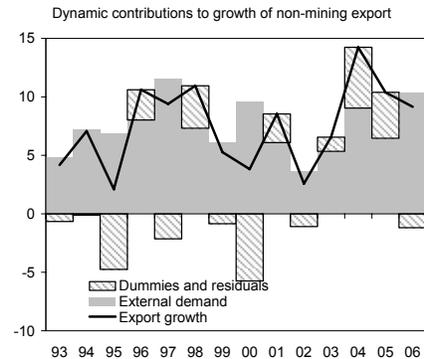
27. *This background study examines recent trade performance with a particular focus on the impact of exchange rate and trade liberalization.* The analysis must be viewed as preliminary, given the ongoing phase-in of trade agreements and continuing negotiations

<sup>6</sup> Prepared by Brieuc Monfort.

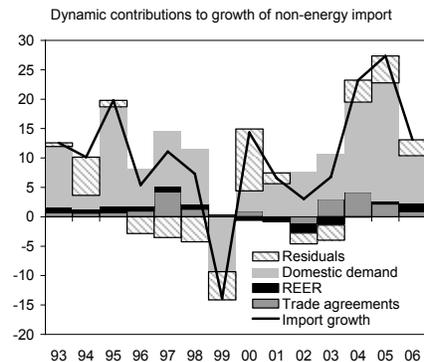
with many countries. Nevertheless, the estimation of traditional trade equations, augmented with variables representing a progressively more open trade regime, provides valuable insights into the recent performance of Chilean exports and imports.

28. ***The analysis suggests that (non-copper) export performance is primarily driven by world demand, with only a small impact of the exchange rate.*** The real effective exchange rate (REER) only appears to matter for a few sectors—including metallurgy and forestry—whereas the impact on the aggregate level is not statistically significant (see chart). This is consistent with the literature on “Dutch disease” effects in industrial countries—which generally finds the impact to be small—as well as previous empirical results on Chile.<sup>7</sup>

The export equations also find no direct link between trade liberalization and recent export growth. However, there is evidence that the elasticity of exports with respect to world demand may have increased in recent years, consistent with tighter links between Chile and its main trading partners.



29. ***There is stronger evidence that exchange rate effects and trade liberalization have helped boost imports, although domestic demand remains the dominant factor.*** The elasticity of imports to domestic demand is around unity, with the REER explaining changes at the margin. Trade liberalization may have raised import volumes by as much as 10 percent over the past five years (see chart). Cross-country analysis suggests that income and price elasticities in Chile tend to be closer to those in industrialized economies than in other economies in the region, indicating a relatively well-diversified economy able to satisfy a larger share of demand out of domestic production.



30. ***These preliminary results suggest that recent trade developments are largely a consequence of strong demand growth in Chile and its trading partners.*** While there is little evidence for exchange rate appreciation to have restrained non-copper export growth, a stronger exchange rate and trade liberalization may have contributed somewhat to faster import growth.

<sup>7</sup> See, for example, Central Bank of Chile (2003), *Central Bank of Chile: Macroeconomic Models and Projections*, Santiago.