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Macroeconomic Impacts of External Shocks and Anti-Shock Policies in Bolivia: A CGE Analysis

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External Shocks and Anti-Shock Policies: A CGE Analysis for Bolivia*

Abstract:

Bolivia's mid-term growth prospects are promising but these prospects could be lost, due to social unrest and political instability, if the country does not solve its short-term economic problems, resulting from both external shocks and internal factors. Against this background, this paper analyzes whether the Bolivian economy has any possibility at all to apply anti-shock policies in order to cushion the short-term effects of shocks. For this purpose, a recursive-dynamic CGE model is described which includes both real and financial sectors and which captures the particular features that characterize the functioning of the Bolivian economy. The model is then used to evaluate the effects of external shocks and to test the effectiveness of different policies.

Keywords: Macroeconomic adjustment, CGE model, Bolivia,
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1. INTRODUCTION

Bolivia began its macroeconomic reforms in 1985, after a period of rapidly deteriorating economic conditions. These reforms redefined the role of government, turned the economy toward a free market direction, and promoted the opening to the rest of the world. Public actions were established to liberalize markets for goods and factors, open the economy to foreign trade and liberalize the financial system (Republic of Bolivia 2001: 18ff.). In the 1990s, macroeconomic stability provided an adequate economic environment to deepen structural reforms through the privatisation and capitalization of public enterprises, the reform of the pension system, the popular participation and administrative decentralization programs, and the education reform.

The results of 15 years of macroeconomic reforms are mixed, however (CEPAL et al. 2000). On the one hand, price stability was maintained throughout the whole period and GDP growth averaged about 4 percent per year during most of the 1990s. Per capita income rose on average by 2 percent per year. Due to the sectoral reforms implemented, investment especially in the hydrocarbons sector has substantially increased in the last years, opening up a significant growth potential for exports and income generation around this industry. On the other hand, Bolivia has recently demonstrated to be extremely vulnerable to the external shocks that occurred during the various international financial crises. The country's export structure is still dominated by a few primary commodities and therefore subject to the international development of specific markets, while imports are concentrated on capital goods and intermediates with limited domestic import substitution possibilities.

The export potential that the country has developed around the natural gas industry is certainly encouraging, because it opened export opportunities to the largest energy market of the southern cone (Andersen, Meza 2001, and

Andersen, Faris 2001). Additionally to the natural gas exports currently undergoing within the export contract signed between Bolivia and Brazil, there is the potential to develop electricity exports through the construction of several thermal-electrical plants. Finally, in the long run there is also the potential to develop the petro-chemical industry, that could bring about a significant increase in the availability of investment resources, as well as in export revenues.

However, since 1999 the Bolivian economy has been exposed to a severe economic crisis, characterized by a significant slow down in economic growth, high unemployment rates, credit crunch and increased arrears in banks' portfolios (Orellana, Mollinedo 1999).

The causes of the economic crisis can be found in both external shocks, such as terms of trade deterioration, capital outflows, and policies followed by neighbouring countries, like the devaluation of the Brazilian Real, as well as in internal factors, like the eradication of surplus coca crops and the customs reform, that have reduced income flows and employment in these activities. The wide-spread perception among different Bolivian economic actors is that, if the country does not solve its short term economic problems, the positive long term perspectives could be lost because of the social and political instability that may result from the economic crisis.

Government authorities have constantly argued that the scope to design anti-shock macroeconomic policies is severely constrained in Bolivia (Banco Central de Bolivia 2001). The high degree of dollarization of the economy, the openness to foreign trade and capital flows, the administered exchange rate system (crawling peg) and the large existing fiscal deficit would reduce the ability to apply anti-shock policies because they hamper the effectiveness of

monetary and exchange rate policies, and restrict the possibility to apply a more expansive fiscal policy.

This paper analyses whether the Bolivian economy has, indeed, no room at all to apply anti-shock policies in order to cushion the short term effects of shocks. For this purpose, a recursive-dynamic computable general equilibrium (CGE) model for the Bolivian economy is used, which includes the real and financial sectors. The model captures the particular features that characterize the functioning of the Bolivian economy, such as the existing high degree of dollarization, the strong dependence of foreign trade on commodity exports, the financial market segmentation, the dual nature of the productive sector, etc. The model is used to evaluate the macroeconomic effects of external shocks. Moreover, the effectiveness of different policies to cushion such shocks and the impacts of the debt relief within the HIPC (highly indebted poor countries) initiative for Bolivia, are also tested through counterfactual simulations.

2. RECENT ECONOMIC DEVELOPMENTS

2.1 External Shocks and Contagion Mechanisms

The Bolivian economy has demonstrated to be extremely vulnerable to external and internal shocks, that hit the country in the last three years. At the international front, the continuous deterioration of the country's terms of trade has affected export performance which largely stagnated over the last three years (UDAPE 2001).

Additionally, the real effective exchange rate constantly appreciated during the second half of the 1990s (UDAPE 2001), as the stabilization programs pursued by neighbouring countries were almost completed at that time, and as they started using more active exchange rate policies. For example, the large devaluation of the Brazilian Real, at the beginning of 1999, appreciated the

effective real exchange rate by almost 7 percent - the bilateral exchange rate with Brazil appreciated by 30 percent in January 1999. Although the Central Bank of Bolivia accelerated the nominal rate of devaluation, it took more than a year to recover to the previously existing real exchange rate level.

Capital flows volatility also had an impact on the Bolivian economy. Starting from 1997, there has been a substantial increase in the level of capital inflows, mostly in the form of foreign direct investment (FDI) flows arising from the privatization of public enterprises. FDI flows have averaged US$ 800 million per year between 1997 and 2000. They peaked in 1999 at a level above US$ 1.0 billion and decreased by 30 percent in 2000, as investment plans of the former public enterprises had been almost completed. Official flows received by the public sector remained relatively constant during the second half of the 1990s, although they have slightly decreased in the last two years. The most striking phenomenon was the large level of private capital outflows observed in the last two years, averaging US$ 300 millions a year. These outflows mainly resulted from an attempt of private banks to reduce their exposure to the Bolivian financial market, due to the increased risk perception of banks about Bolivia's economic and financial future. As a result, capital flows volatility has figured cyclical swings in the Bolivian financial system, consisting of a credit boom that took place in years 1997 and 1998, followed by a credit crunch in 1999, 2000 and part of 2001.

Besides these external shocks, there have been a number of internal factors that also had a pro-cyclical impact on the behaviour of the Bolivian economy. It is estimated that the successful eradication of coca crops has eliminated an activity that generated income flows ranging between US$ 200 and US$ 400 million a year. The customs reform carried out in 1999 might have also reduced income flows generated around smuggling activities. Finally, some specific features of the Bolivian economy, such as the high degree of dollarization and

the existence of a large fiscal deficit may have constrained the effectiveness of counter-cyclical policies, and thus may have limited the ability of policy makers to reverse the negative impacts of external and internal shocks.

2.2 Constrained Capacity to Device Anti-Shock Policies

Bolivian policy makers argue that, given the characteristics of the Bolivian economy, there is limited scope to implement policies in order to reduce the negative impacts of shocks on production, employment and income distribution. First of all, the high degree of asset and liability dollarization that characterizes the Bolivian economy, limits the capacity to use a more active exchange rate policy. The pass-through coefficient of devaluation into domestic prices was calculated to be as high as 0.6 in the early 1990s. Although this coefficient is believed to be lower now because the devaluation rate is much lower and stable, it is expected that a large devaluation will bring about large domestic price increases and that nominal devaluation will therefore have limited effects on the real exchange rate (Cupé 2002). Thus, a larger devaluation of the nominal exchange rate, or floating the exchange rate as in Chile and Colombia after the devaluation of the Brazilian Real, and more recently in Argentina, is not expected to produce positive effects on the Bolivian economy.

Secondly, the monetary supply is considerably endogenous in Bolivia, as there is an administered exchange rate system and a significant openness of the trade and capital accounts. Therefore, any attempt to implement a more active monetary policy would only produce foreign exchange losses, leaving the quantity of money unchanged (Orellana, Mollenido 1999) .

Finally, fiscal policy response capacity is also regarded as being quite limited, as the Bolivian government has to comply with the macroeconomic targets agreed within the financial program signed with international organizations,

such as the IMF (Banco Central de Bolivia 2001). The transition costs of the pension reform carried out at the end of 1997, have increased the fiscal deficit to 4 percent of GDP while the customs reform undertaken by the government in 1999 has not produced the expected increases in tax collection. Additionally, the decentralization of the public administration has partly delegated the decision-making process of public investment to local governments, thereby reducing the control of the Central Government on the level of overall public investment. In 1999 and 2000, the high indebtedness of municipalities constrained public investment, which in turn contributed to deepen the reduction in aggregate demand.

3. A General Equilibrium Model of Bolivia

The analytical model used for our simulation analysis of external shocks and anti-shock policies belongs to a class of policy planning models developed by Bourguignon, Branson, and de Melo (1989), Rosenzweig and Taylor (1990) and Jemio (1993, 2001a). One distinguishing characteristic of these models is the combination of the explicit microeconomic optimizing behavior of computable general equilibrium models and the asset portfolio behavior of macroeconomic models in Tobin's tradition. As a result, these models are able to capture both, the short-run macroeconomic, sectoral, and institutional effects of external shocks and stabilization programs resulting from portfolio shifts as well as the medium to long-run effects of structural adjustment policies that affect relative prices. A full description of the model and of its various closures can be found in Jemio (2001a, b). Functional forms and equations are given in Appendix A. The presentation here focuses on the essential features of the model, on the main behavioral patterns included and on the closure rules of the model.

3.1 Goods and Factor Markets

The assumptions about goods and factor markets are familiar from the literature on CGE models. Because the model is short-run capital, once installed, is fixed within the period. The technology for gross output assumes a CES production function in the case of agriculture, petroleum, natural gas, mining and modern services. The prices in these sectors are assumed to follow world market prices and any gap between demand and supply is cleared through exports (or imports). The CES production functions also determine the demand for capital, labor, and imported intermediate inputs in these sectors with identical substitution elasticities between inputs. The other three sectors are either dominated by modern, oligopolistic firms (manufacturing, construction) or are urban informal services sectors which both engage in mark-up pricing. All these sectors are characterized by excess capacity so that supply can adjust to demand. However, since the demand for labor and for imported intermediates is assumed to hold a fixed relationship to the level of output in manufacturing and construction, output adjustment in these two sectors only takes place until a maximum level of output has been reached. This maximum is determined by import capacity (foreign-exchange constraint) or by the maximum supply of (skilled) labor. If any of these constraints is hit, prices (and mark-up rates) will adjust to close the supply-demand gap. Informal services do not use imported intermediates. Furthermore, workers in this sector are considered as self-employed which are remunerated on the basis of their per-capita output, which depends on demand. Over one year, the number of workers is given, and if demand slackens, the adjustment will be through a reduction of output, thereby reducing per-capita output and income.

Import supply and export demand are perfectly elastic, so that the foreign terms of trade are exogenous. Import demand is assumed to be largely income or output related with limited price substitution. Demand for intermediate imports is part of the CES production function in sectors with production functions, and holds a

fixed relation to output in the mark-up sectors. Imports of investment goods are a fixed proportion of total investment with the proportion determined by the base year data. The imports of consumer goods are determined through a Linear Expenditure System (LES) and depend on income and relative prices.

3.2 The Financial Sector

To capture the institutional and distributional implications of external shocks and domestic policies, the Bolivia model distinguishes nine types of financial units: Households, corporations, state enterprises, government, foreign sector, Central Bank, commercial banks, other financial institutions, and the pension funds. Their saving, investment and portfolio behavior is encapsulated in the accounting identity embodied in the capital account of the Social Accounting Matrix (SAM) of each unit, according to which for each unit:

$$\text{total assets} = \text{total liabilities} + \text{net wealth}$$

Five types of assets/liabilities are distinguished in the Bolivia model, each of them with a different rate of return (or cost) (except domestic currency): physical capital, public assets/liabilities (including deposits in and loans from the Central Bank), domestic currency, private assets/liabilities (including deposits in and loans from the private domestic financial system), and foreign assets/liabilities (including deposits abroad, foreign reserves, and external debt).

Financing constraints are assumed to differ by institution. In Bolivia, interlocking ownership patterns between commercial banks, non-bank financial institutions and private corporate firms have generally turned the latter into the preferred borrowers of the banking system, leaving households and unincorporated businesses as residual borrowers. It is, therefore, assumed that the accumulation balance adjustment of the household sector (which includes unincorporated businesses) follows the *prior-savings approach.* The realized level of investment

and the accumulation of other financial assets adjust to the availability of funds to households, the latter being determined by household savings and rationed credit supplies from the banking system. Households, however, do choose their portfolio structure following profitability criteria.

On the other hand, private companies as well as state enterprises and government can decide on their level and structure of assets while finance is, at least in principle, secured (*investment-leading-savings approach*). However, their level of physical and financial investment may be constrained by their own savings capacity, foreign-exchange availability and the credit-creating capacity of the banking sector. Savings capacity is a function of company profits and government revenues, respectively, while bank credit availability is strongly dependent on deposit demand of households. The latter may be crowded out by a high relative profitability of foreign assets and thereby crowd out investment of private companies if their investment finance budget constraint becomes binding. The *foreign-exchange constrained* investment level is a function of import capacity and is thus determined along with the external balance and other claims on import capacity (consumption demand and intermediate imports).

The credit availability to finance investment demand depends on foreign capital inflows, asset demand of each agent (i.e. their portfolio choice between different types of assets, including money and bank deposits) and reserve and credit management by the Central Bank. Following Bourguignon et al. (1989) and Jemio (2001a), most asset demand functions are of a CES-type with the desired asset structure being a function of relative profitability of the different types of financial assets in the system. The demand for assets defines the total demand for liabilities, thereby implicitly assuming a system of supply-led finance (credit rationing) and perfectly elastic liability demand. However, for each institution a

specific closure rule applies which defines the effective budget constraint applicable in each case.

The budget constraints of four institutions are interdependent through the process of financial intermediation. Companies cannot borrow unlimitedly from commercial banks and other financial institutions. The credit-creating capacity of the latter is constrained by reserve requirements, the bank's deposits and other liabilities, but their accounts are closed by Central Bank credits to commercial banks. Since the latter in turn is restricted by the foreign-exchange reserves of the Central Bank and since the government is assumed to be a preferential borrower of the Central Bank, the credit-creating capacity of commercial banks and thereby investment of private companies are *budget constrained* by monetary control of the Central Bank and government demand for Central Bank credits. The latter is, of course, a crowding-out mechanism operating in the system.

State enterprises and the government have exogenous physical investment demand functions, which therefore can be used as a policy variable in the model. Critics of World Bank/IMF supported programs point out that excessive reductions in government expenditures focus disproportionately on capital expenditures, and within current expenditures, disproportionately on health and education expenditures. In an analysis with a macroeconomic focus, it is not possible to capture meaningfully a direct link between type of government expenditure, productivity, and income distribution. Thus, we treat productivity growth and human capital accumulation as exogenous and invariant between simulations although it would be possible to link them with say public and/or private investment if sufficient evidence were available.

Institutional investment, and thereby growth, is thus modeled within the boundaries of financing and foreign-exchange constraints. In this way the model can be seen as a multi-sector and multi-institution general equilibrium version of

a Three-Gap model (e.g.Taylor 1990): investment finance (savings and credits) and foreign-exchange gaps are defined specifically for each institutional sector and the impact of financial intermediation and relative prices and profitability on investment possibilities will also differ for each institutional agent. The important role of the Central Bank in the closure of the balances of the financial system makes reserve management and thus monetary control a central instrument capable of influencing one (and only one) of the constraints (i.e. the institution-specific budget constraints) on investment and growth in the Bolivian economy.

3.3 Policy Variables

The model system described above defines an economic system characterized by institutions, each with their own behavioral rules, and by a set of markets, some of which are segmented and imperfect. The effectiveness of policy interventions will be influenced by this institutional context and by the assumed sectoral adjustment behavior. Moreover, the effectiveness of domestic policies will be affected by external shocks, such as changing world market prices for exports and/or imports and changing international interest rates, as well as the rest of the world's decisions about foreign direct and foreign portfolio investment in Bolivia and the provision of development aid and/or concessional lending etc. Key domestic policy instruments in the model are: the nominal exchange rate; the minimum level of Central Bank reserves, which will determine the amount of credit that will be made available to domestic financial institutions; the interest rate charged by the Central Bank; the level of government consumption and investment expenditures; and tax rates. Here, we will have a closer look at exchange rate policy and fiscal expenditure policies.

In the Bolivia model, exchange rate policies will affect the trade balance and thereby import capacity, but will also affect domestic prices and the accumulation balances of the domestic institutions. The responsiveness of export supply and

import demand depends on their respective price elasticities. Since domestic and foreign goods are assumed imperfect substitutes, trade balance effects may not be at the center of the adjustment process following a devaluation. Accumulation balances play, however, a central role in the adjustment process. With passive monetary policies, the monetary base will expand with a devaluation (through the domestic currency value of Central Bank reserves) and thereby domestic credit supplies which will alleviate budget constraints on domestic investment. A similar effect on budget constraints will result as long as net capital transfers from abroad (net new lending less interest payments) are positive and further because it will induce a return of capital exports. A devaluation may also lead to a widening of the domestic-currency fiscal balance, particularly in the case where there is a large public external debt burden. The model simulations will have to show, however, after taking account of all general-equilibrium effects, whether there is actually such a trade-off between trade-balance and fiscal-balance objectives when applying exchange-rate policies in an isolated manner. A devaluation will also affect private savings through asset revaluation and thus will have wealth effects. Firms with a negative net foreign asset position will see their domestic-currency debt-servicing obligations increase. Enterprise savings may be further eroded if increased import costs cannot be passed on to final prices. Households with a positive net foreign asset position (capital exports) will witness an increase in wealth through asset revaluation after a devaluation.

Expansionary fiscal policies (increase in current and/or investment spending or decline in tax rates) are likely to have a positive effect on output and employment through aggregate demand effects, but may crowd out private investment as it will raise Central Bank lending to the government and limit the credit supply for other domestic institutions.

Table 1— Parameter and Elasticity Specification

		AG	MN	PT	GN	MF	CT	SM	SI
Production, Technology and Factor Incomes									
Indirect Tax Rates	txi_j	0.002	0.020	0.138	0.112	0.021	0.022	0.062	0.000
Capital-Labour Substitution	ρ_j	0.65	0.65	0.65	0.65	–	–	0.65	–
Distributive Shares of Capital in Total Output:									
➢ Corporate Capital	$\beta_{CP,j}$	0.02	0.17	0.15	0.40	0.05	0.07	0.08	0.00
➢ Unincorporated Capital	$\beta_{UP,j}$	0.60	0.34	0.00	0.00	0.14	0.14	0.19	0.54
Labour-Output Coefficients	β_i	0.12	0.12	0.08	0.05	0.12	0.22	0.29	0.22
Labour Market									
Labour-Force Growth	n	0.023							
Wage Indexation Function:									
➢ Price Adjustment	wcf_1	0.50							
Foreign Trade									
		AG	**MN**	**PT**	**GN**	**MF**	**CT**	**SM**	**SI**
Price Elasticity of Export Demand	ε_i	0.65	0.65	0.65	0.65	0.65	0.00	0.65	0.00
Price Elasticity of Import Demand:									
➢ Intermediate Goods	ρ_j	0.65	–	0.65	0.65	0.65	0.65	0.65	–
➢ Consumer Goods		Implicit in LES functions for all goods							
➢ Capital Goods		Zero for all goods							
Households									
Marginal Savings Rates:									
➢ Income	$\wedge_1$	0.07							
➢ Wealth	$\wedge_2$	-0.04							
Direct Tax Rates	txd_h	0.005							
Portfolio Demand	$\sigma_{h,k}$	0.70							
Corporate Firms									
		Private (CE)	State (SE)						
Direct Tax Rate	txd_k	0.24	0.87						
	$\sigma_{h,k}$	0.70	0.70						
Government									
Portfolio Demand	$\sigma_{GV,k}$	0.70							

The variables refer to parameters and elasticities defined by the functional forms in the Appendix A. All parameter values remain unchanged across the simulations.
AG=agriculture; **MN**=mining; **PT**=petroleum; **GN**=natural gas; **MF**=manufacturing; **CT**=construction; **SM**=modern services; **SI**= informal services.

3.4 Model Calibration

The base-year calibration procedure follows that common to CGE application: initial prices and quantities are combined with parameters and elasticities to calculate share parameters and exogenous constants that validate the base-year values of the 1998 SAM for Bolivia (Appendix B). The presence of assets in the model complicates calibration since income flows (and hence savings decisions) depend on incomes earned from assets. The structure of the SAM, showing beginning and end-year stocks of asset/liability holdings, already recognizes this complication. The model was calibrated for the end-of-year portfolio holdings of all institutions.

Also for the derivation of the main parameter values, the typical applied CGE modeling strategy was followed in which most of the average spending propensities were directly derived from the SAM, while the elasticities reflect a combination of econometric estimates derived from Jemio (1993, 2001a). Table 1 shows the key parameter values.

Once the model was calibrated, the dynamic model was used to produce a base run of the model over a period of 10 years. This base run serves as a benchmark in the analysis of the outcomes of the simulations.

4. SIMULATION RESULTS

4.1 The Base Run

The Bolivia model has its own dynamics. This means that even in the case when it is not subject to a particular external shock or policy intervention, it will still exhibit a dynamic trend over time, since some exogenous variables are determined endogenously in previous periods. For instance, output in some sectors is determined by the sector's current physical capital stock, which in turn depends on past values for savings, investment and depreciation. Other variables,

such as investment undertaken by government, public enterprises and companies, depend on lagged values of the same variable, bringing about a knock-on effect that passes from one period to the other. Moreover, company investment is crowded-in by past government investment into infrastructure but is crowded-out by public sector credit demand in previous years. Most of the financial portfolio decisions made by institutions in a particular period are determined by the institutions' current wealth, asset and liability stock values, which in turn are determined by past savings, revaluation and net acquisitions of assets and liabilities.

Thus, the results from simulations of shocks and/or policies reflect not only the impacts of these shocks and/or policies but also the effects of the model's own dynamics. In order to isolate own dynamics, a benchmark simulation of the model has been run with no shock or policy. The results obtained show what would be the pattern followed by the different variables only considering the model's own dynamics. The impacts of shocks and policies can then be identified by looking at the deviations from the patterns obtained in the benchmark simulation.

For this base run, most of the external variables (such as world prices and world interest rates) are kept at their base-year levels. Moreover, it is assumed that policy variables follow a stable pattern over the time horizon. The exchange rate for instance, is devalued by 6 percentage points a year and government spending is allowed to grow by 2 percent per year in real terms.

The results of the base run simulation are quite satisfactory in that they depict trends in the main variables which correspond to official projections. Thus, the model seems to capture the main characteristics of the Bolivian economy well.

The base run simulation captures, first, the high dependency of Bolivia's macroeconomic performance on foreign borrowing, especially on public sector's indebtedness, and secondly, the fact that the government's access to external non-concessionary borrowing will tend to decrease in the long run. The latter is brought into the base run simulation by exogenously decreasing foreign borrowing by the government continuously over the whole period of the simulation. As a result of that, the model endogenously produces decreasing growth rates of GDP. Total GDP grows by around 4.3 percent per year at the beginning of the base-run simulation and by 3.3 percent at the end.

In the base run, real GDP growth rate fluctuates around 4 percent. The Bolivian economy has been growing at this rate over the 1990s, and it is believed that this rate represents the country's long-term growth rate, if the current economic structure is maintained. The growth pattern is caused mainly by the stable growth observed in private and government consumption. Exports grow at 7 percent per year, mainly as a result of increasing gas exports, and imports at 3 percent. Investment shows decreasing growth rates over time. As a result of the higher growth rates of exports compared to those of imports, the current account deficit is reduced continuously from 8 percent of GDP in the base year to 3 percent in year ten.

The fiscal deficit is reduced as well over time, because government expenditures grow at a lower pace than revenues. Government investment, due to diminished foreign capital inflows, reduces its share in total GDP slightly from 6.5 percent in the first year of the simulation to 5.6 percent of GDP in the tenth year.

Total investment, as a percentage of GDP decreases from 25 to 21 percent of GDP over the ten years. Domestic savings share in total GDP goes up continuously, increasing from 15 percent of GDP to 20 at the end of the simulation period. External savings on the other hand, decrease as a share of GDP

from 8 percent of GDP to 3 percent. This happens because, as explained before, external loans – especially those received by the government – are assumed to decline in the long-run.

Inflation exhibits a slightly increasing trend over the years fluctuating between 1.7 and 4.6 percent during the whole period of the simulation.

Unemployment steadily increases from 3.6 percent of labour force in the first year to almost 8 percent in the tenth year. This can be traced back to the lower growth rates exhibited by the economy at the end of the simulation period.

4.2 Terms-of-Trade Shock

The first shock to be evaluated through the Bolivia model is a 10 percent reduction in world prices of Bolivia's primary commodity exports: agricultural products, mining products, petroleum, and natural gas. The export price shock is assumed to take place in the second year of the simulation period and world prices are maintained at that lower level over the following eight years.

These export price reductions lead to a deterioration of the terms of trade (at given world prices for imports) and to reductions in real absorption and GDP (Figure 1). The GDP declines by 2.5 percent compared to the base run in the first year after the shock and increases only slightly afterwards (Figures 1a and 1b). These reductions follow primarily from lower export revenues in the primary sector. Although disabsorption reduces import expenditures as well, the current account deficit as share of GDP increases initially by more than 1 percent and improves only slightly during the following seven years. Thus, real absorption is reduced by about 1.5 percentage points of GDP in the first year after the shock. Since part of the domestic-currency foreign financing of the current account is spent on domestic goods, inflation is only 2 percentage points lower in the shock year and recovers almost to its initial level starting from the fifth year (Figure 1g).

Moreover, the reduction of the domestic price level (as reflected by the change of the inflation rate) is only slightly higher than the (exogenously given) devaluation of the nominal exchange rate implying an almost negligible real devaluation over time (Figure 1h). The same holds true for real wages (Figure 1i) since nominal wages are only partially indexed to the domestic consumer price index. However, the unemployment rate increases by about 2.5 percent relative to the base run as a result of lower economic activities.

Which demand components bear the brunt of adjustment depends on policy, on the one hand, and their degree of import dependency, on the other. Since the government, private corporations, and state enterprises, by assumption, can realize their investment plans, and since the government is assumed to realize its consumption plans as well, the total brunt of adjustment falls on household consumption and unincorporated investment. The overall investment share is 1 percent higher than in the base run (Figure 1f). Absolutely lower tax revenues and relatively higher public investment and consumption expenditures (in relation to GDP) increase the fiscal deficit´s share in GDP (Figure 1d). Thus, the increase in investment is partially financed by capital inflows and partially by forced savings of the household sector.

4.3 Reduction in Capital Inflows

The second shock analysed through the Bolivia model is a reduction of both foreign direct investment (FDI) and foreign portfolio investment (FPI) from initially 874 to 819 million US Dollar and from 162 to 53 million US Dollar, respectively (see Table 2). As in the case of the terms-of-trade shock, the reduction in external capital inflows is assumed to take place in the second year (i.e. year 2000) of the simulation period and to remain at that lower level over the rest of the period. Starting from years 2003 and 2004, these were also the FDI and

FPI figures assumed for the base run. Thus, this simulation is designed to reflect the tremendous observable capital outflow mentioned in the introductory chapter.

Compared to the terms-of-trade shock analysed previously, the reduction in the level of capital inflows has only weak recessive effects on the economy. If no anti-shock policy is applied, output growth, domestic savings, employment, inflation and real wages differ only slightly from the base run (Figures 1a, 1b, 1e, 1j, and 1i). However, in comparison to the terms-of-trade shock, domestic private and public investors now face a foreign-exchange constraint. Neither private corporations and state enterprises nor the government can realize their investment plans because they lack the necessary foreign exchange to import complementary capital goods. As a result, total investment is slightly lower compared to the base run (Figure 1 f). Moreover, as the tax revenues decrease only marginally and lower public investment expenditures just compensate higher public consumption expenditures the public deficit increases only slightly.

The external shock affects various sectors differently. First, the output of the construction sector falls by more than 0.7 percentage points due to lower levels of investment demand. Secondly, the production of some mark-up sectors, such as manufacturing and informal services, is reduced as a result of lower private consumption demand. Moreover, the output of manufacturing and modern services also decrease because both sectors lack the foreign exchange necessary to import intermediate inputs which are difficult to substitute by local production. As a result, although the consumption demand for these sectors' output declined, part of it could not be satisfied and adjustment takes place through higher prices.

4.4 Devaluation

Exchange rate policy and in particular devaluation is currently an issue of high controversy among economic analysts and policy makers in Bolivia. Central Bank

officials, for instance, argue that they are trying to optimise the exchange rate devaluation in order to recover and maintain international competitiveness in reaction to the changing international economic environment. A larger devaluation, according to the Central Bank, would not only have very limited positive effects on export expansion and import substitution, but also would cause significant negative impacts. The high degree of dollarization in the economy causes a high pass-through effect of devaluation on domestic prices (0.5 according to latest estimates) thereby making nominal devaluation ineffective in reaching a significant real devaluation. Moreover, because of the high degree of asset and liability dollarization existing in the financial system, larger devaluations would have quite damaging effects on the balance sheets of the productive companies, which have high levels of dollar denominated debts and receive incomes denominated in domestic currency. Proponents of larger devaluations, on the other hand, argue that the exchange rate policy conducted by the Central Bank is far too conservative, as there would be room for a more aggressive devaluation policy that would strengthen economic competitiveness and favour growth (Schweickert 2001).

The effects of a change exchange rate policy was tested by increasing the rate of devaluation (crawling peg), from 6 percent per year in the base run, to 8 percent per year in the simulation exercise. The results are quite illustrative and show that a larger devaluation may help to put the Bolivian economy on a more expansionary path (Figures 2a and 2b).

The exchange rate adjustment affects the trade balance and balance of payments current account (Figure 2c) and thereby import capacity. The response of exports and import demand to the devaluation depends on the respective price elasticities. Since import demand in Bolivia is concentrated in sectors with low substitution possibilities (more than 75 percent of total imports are intermediate goods and

capital goods as well as non-factor services connected to import trade; Thiele and Piazolo 2002), trade balance effects resulting from import substitution may not be at the centre of the adjustment process following a devaluation. Export supply which is concentrated in the primary agricultural and extracting sectors as well as the consumer goods industry is generally more price sensitive. Yet, most exports of gas, which are expected to dominate Bolivia´s export structure in the future, are determined by a long-run contract with Brazil (Andersen and Faris 2001). Nevertheless, improvements in the trade balance and higher real GDP mostly result from export expansion, not from import substitution. This model result is as expected.

However, other model results run counter beliefs of policy makers in Bolivia. According to their view, a larger devaluation would be more inflationary due to rising intermediate input costs and, due to the large external government debt overhang, would lead to a widening of the domestic-currency fiscal deficit and consequently crowd out private investment. The CGE simulation confirms the inflation hypothesis (Figure 2g), but does not show any contractionary effects in the short run. Price increases are, as expected, most pronounced in those sectors which are non-traded but import dependent (i.e. with a high share of imported intermediares in total sectoral intermediate demand). In Bolivia, as in other countries, these are utilities, construction and informal and public services. Figures 1a and 1b show a strong expansionary effect of a devaluation in the short run. Over the medium run, the expansionary effect diminishes and the Bolivian economy returns to a lower growth path. The main cost of the larger devaluation is higher prices (Figure 2g), but at higher levels of growth and investment (Figure 2f). The inflationary impact tends to remain below the rate of devaluation, meaning that the nominal devaluation appears effective in achieving a real devaluation (Figure 2h), thereby stimulating export growth. The growth in commodity exports and the accompanying rise in foreign-exchange earnings have

a positive impact on overall growth, but export growth is not the only determinant to explain the economic expansion.

Two other interactions seem to support the initial output expansion. One is the effect of a devaluation on the domestic credit supply through the monetization of foreign capital inflows and broadening of the domestic-currency value of foreign-exchange reserves. With passive monetary policies, the monetary base will expand with the devaluation through the domestic-currency value of Central Bank international reserves and thereby domestic credit supply which will alleviate budget constraints on domestic investment (Wiebelt 1996). The effect of rising domestic-currency value of external debt servicing costs is clearly present in the simulation, but it appears that this effect is outweighed by the second effect consisting of the general-equilibrium effects on domestic incomes and thus tax-revenues, such that the fiscal balance improves (Figure 2d), allowing the government to sustain its level of savings. Given the low incidence of direct taxation in Bolivia (Thiele and Piazolo 2002), this type of income redistribution does little to strengthen the Treasury. The increase in tax revenues is mainly derived from more indirect taxes that can be collected thanks to the economic expansion. In addition, domestic budget constraints are alleviated further through a return of capital exports due to the real-exchange rate depreciation.

What then causes the downturn of growth in the medium run? This can be analysed by looking at the constraints on institutional investment. If the policy of gradual exchange-rate adjustment is sustained in the medium to long run, economic expansion is supported by the monetization of foreign exchange inflows. Thus, private corporate investment is not constrained by a budget constraint of available investment finance, but rather by a foreign exchange constraint. The devaluation stimulates domestic activity and thereby import demand (through the income-absorption effect which, given the low import

substitution possibilities in domestic production, is not offset by the substitution effect), which eventually crowds out both private firm and government investment as exports do not respond sufficiently strong to meet increased demand for foreign exchange (higher imports and debt servicing). The government appears to command enough domestic resources to finance public investment, but lacks the foreign exchange to both service debt obligations and import the capital goods required to reach its desired level of investment. The government is thus facing an internal transfer problem, similar to the one in the case of lower foreign capital inflows. The foreign-exchange constraint of the government does not spill over to private companies in the case where the gradual devaluation is stopped after the third year (broken lines). In that case, after the initial expansionary period, private firms however start to face a budget constraint as the expansionary effect on domestic credit supply is halted.

4.5 Fiscal Expansion

Fiscal policy has also been an issue of great controversy in Bolivia during the last few years, when the economy started experiencing the effects of the international crisis. Policy makers argued that there is not much room to implement anti-shock fiscal policies, given the limited scope to increase government consumption and investment. Rather, the need to reduce the large fiscal deficit resulting from the pension reform, within the financial programmes signed with the IMF, imposes tight restrictions on fiscal expansion. Critics on the other hand, argue that although the pension reform has increased the fiscal deficit, pension costs do not have a macroeconomic impact on aggregate demand. Thus, the government should renegotiate the financial programmes with the IMF in order to conduct a more expansionary fiscal policy.

This policy option has been tested through the CGE model by an increase in the rate of growth of government consumption and an increase in the rate of growth

of government investment (Figure 2: broken lines), compared to growth rates of both variables in the base run.

Fiscal expansion has a cyclical effect on economic growth, as the growth rate of GDP are between 0.3 and 0.6 percentage points higher than in the base run during the first year after the policy intervention (Figure 3a), but are lower during all following years in the case of current expenditure expansion years. GDP growth is also lower in the second year after the policy intervention for the government investment programme. However, in this case, the growth momentum is regained after the fourth year and the growth rate is 0.2 percentage points higher over the rest of the simulation period. Thus, a first important conclusion is that fiscal expansion can have significant permanent effects on GDP growth only if the fiscal expansion is either financing a government investment programme or if rates of growth of government current expenditures are continuously accelerated. As can be seen from the changes in the fiscal balance (Figure 3d), the latter policy is obviously not sustainable in the long run.

The fiscal expansion also tends to widen the external deficit, as larger government expenditures increase domestic absorption, domestic prices, exchange rate appreciation, and the current account deficit (Figures 3g, 3h, and 3c).

Real wages tend to fall under both types of policy interventions (Figure 3i) as nominal wages are only partially indexed to the domestic consumer price index. The reduction in real wages and the expansion in economic activity have a positive and significant effect on reducing the rate of unemployment (Figure 2j) in the case of a government investment programme.

4.6 The HIPC Program

In June 2001, Bolivia met the conditions for its completion point under the enhanced framework of the Heavily Indebted Poor Countries (HIPC) Initiative (IMF 2001). As a result of HIPC assistance and bilateral debt relief already committed, Bolivia´s total external debt is reduced by one-half; with possible additional bilateral forgiveness, cancellation could reach 58 percent. This will obviously give the government more flexibility to implement its Poverty Reduction Strategy and to undertake more effective anti-shock policies.

The impacts of the enhanced HIPC program has been tested through the CGE model. In this policy simulation exercise, the debt relief to be obtained under the HIPC II programme was accompanied by a fiscal expansion in about the same amount of the debt relief obtained. The additional assumptions are: the government uses half of these resources to expand current expenditures and the other half to finance additional investment. The debt relief program effectively takes place starting from year 2001 (year 3 in the simulation exercise). The results obtained in the simulations were the following:

The rate of growth of GDP has a more pronounced cyclical behaviour than that observed in the fiscal expansion scenario (Figure 4a). In year 3, when the debt service relief is introduced, the rate of growth of GDP is almost 1.5 percentage points higher than in the base run scenario. In the following years however – years 4 to 6 – GDP grows at a slower pace than in the base run. Eventually, starting from year 7, GDP growth stabilises slightly above the trend observed in the base run. This behaviour confirms the cyclical impact that a fiscal expansion has on GDP growth.

The impact on the fiscal balance is also significant (Figure 4d). Initially, the fiscal deficit falls as the debt relief obtained is higher than the real expansion of

government expenditures, due to the differential existing between exchange rate devaluation and domestic price increases, that yields an initial saving for the government. Between years 4 and 8 the deficit is slightly higher than observed in the base run, but the long-term trend is towards an improvement in the fiscal balance. The larger outlays that the government exhibits due to the fiscal expansion are being financed by the resources released through the debt relief obtained under the HIPC initiative, and the larger tax revenues resulting from higher activity levels.

The debt relief has large impacts on the external balance as well (Figure 4c). The current account deficit is reduced sharply by 0.5 percent in the year the debt relief effectively begins. Thereafter, the gains attained in reducing the deficit become smaller between years 4 and 7. The long term trend, however, is towards an improvement in the external balance. The initial improvement in the current account deficit is entirely accounted for by the debt relief.

In the HIPC scenario, the crowding-out effect of the fiscal expansion is not big enough to off-set the large increase in fiscal investment (Figure 4f). The resources available as a result of the HIPC initiative, ameliorate the crowding-out effects of greater government expenses, as the pressure on loanable funds is largely reduced. As a result, investment increases sharply in the year in which the HIPC initiative effectively begins, and stays at that higher level throughout the whole period of the simulation exercise.

The largest impacts of the HIPC initiative are felt on the labour market. The effects of fiscal expansion on real wages are as expected (Figure 4i). The higher initial inflation rate resulting from an increased domestic absorption (Figure 4g) depresses real wages slightly. As inflation is controlled in subsequent years, real wages begin to recover until converging in year 6 to the base run level. Unemployment on the other hand, falls sharply during the year of the fiscal

expansion - by almost 3 percent of the labour force -, grows between years 3 and 6, and begins to fall thereafter as the rate of growth of GDP stabilises at a rate higher than the one observed in the base run. Thus, the HIPC programme is expected to have significant macroeconomic impacts as was evidenced through the simulation exercises. The most significant impacts are on GDP growth, fiscal and external balances, and on the functioning of the labour market.

5. CONCLUSIONS

This paper has addressed the question whether and how Bolivian economic policy makers can cushion the short-term effects of adverse external shocks, such as falling world market prices for major export commodities or decreasing direct and portfolio investment inflows. That question is currently hotly debated within the country. Sceptics argue that there is no room to apply anti-shock policies because the structural characteristics of the Bolivian economy severely hamper the effectiveness of monetary, exchange rate, and fiscal polices. Despite putting forward structuralist arguments, their conclusions are almost exclusively derived from theoretical models or reduced-form (regression) analysis, at best, without really taking into account the structural features characterizing the Bolivian economy.

This paper followed a different approach. In order to analyse quantitatively both the vulnerability of the Bolivian economy to external shocks and its possibilities to minimize adjustment costs, a recursive-dynamic computable general equilibrium (CGE) model has been used that captures the most important structural characteristics and interdependencies of the economy. Thus, our analysis discloses the most important transmission effects working in the economy – effects which are typically obscured in reduced-form analyses. The base-run results from the model suggest that the model captures quite well the

underlying long-run dynamics of the Bolivian economy in terms of growth rates, fiscal and external balance and other macroeconomic aggregates.

Counterfactual simulations of decreasing world market prices for Bolivia's major export commodities and reduced inflows of foreign direct and portfolio investment indicated that the Bolivian economy is highly vulnerable to external shocks. Moreover, spontaneous adjustment is severely restricted due to limited substitution possibilities in goods and factor markets as well as institutional restrictions on portfolio choice. This was shown in particular by the simulation of the impact of the terms-of-trade shock, which involves considerable losses of domestic absorption and reductions in economic growth. The structural characteristics of the economy also affect the outcome of anti-shock policies. This was most visibly shown in the simulation of the expansionary fiscal policy. Such a policy would obviously become unfeasible because of its implications for the balance of payments and the fiscal balance. By contrast, a devaluation of the Boliviano would not only increase growth and employment but would also lead to improvements in the fiscal and external balance. Obviously, the fears of sceptics against devaluation as a device to minimize the short-term adjustment costs of adverse external shocks are not justified. Despite several structural rigidities of the Bolivian economy, a nominal devaluation leads to a real devaluation that is sufficiently strong to induce a reallocation of resources necessary for effective adjustment. Finally, a first simulation of the HIPC II initiative, that combined debt relief with a fiscal expansion, has shown that the initiative is expected to have significant macroeconomic impacts: higher growth rates, lower fiscal and external deficits, and lower unemployment.

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Figure 1 — Terms of Trade Shock and Reduction of Capital Inflow

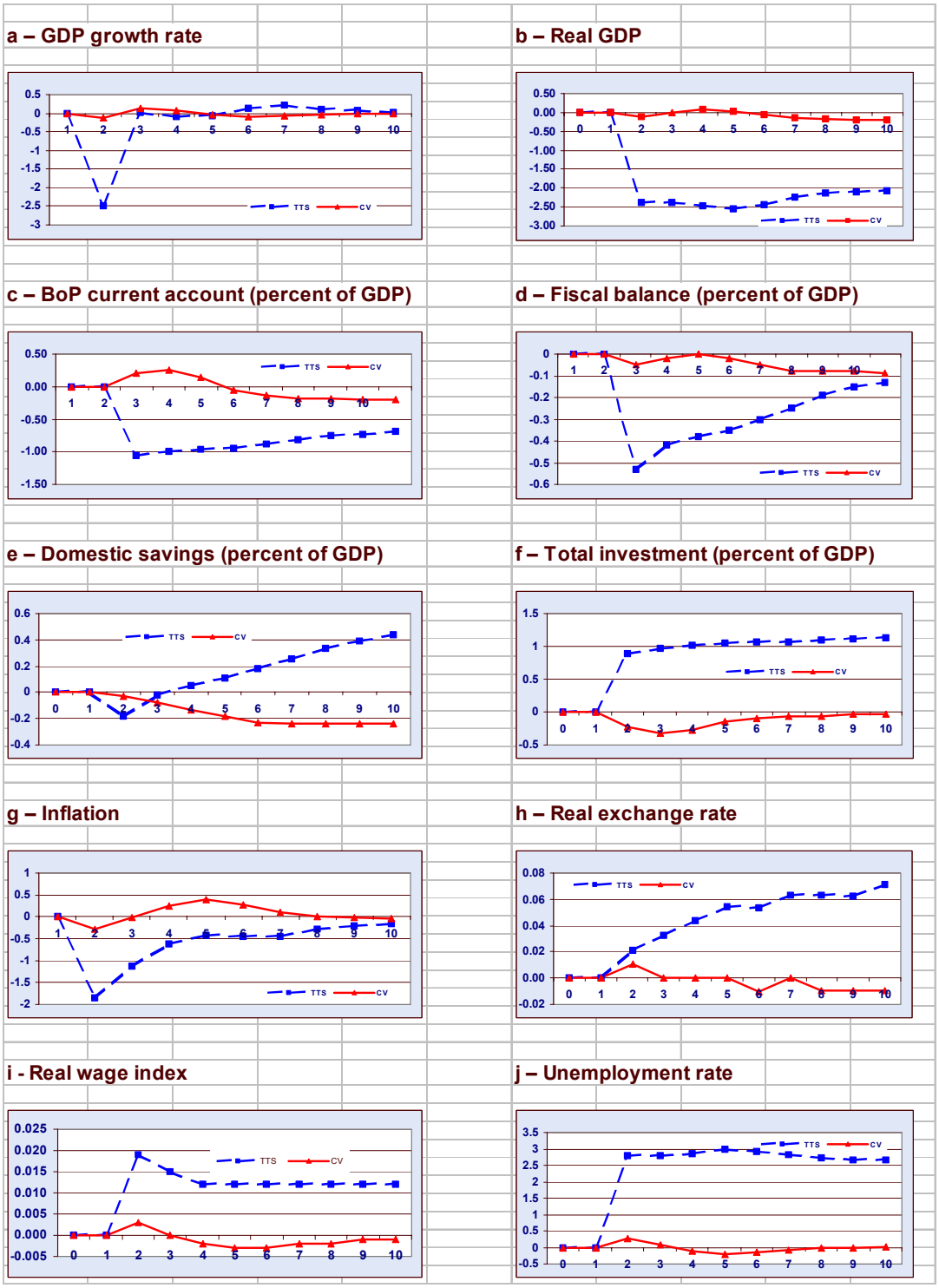
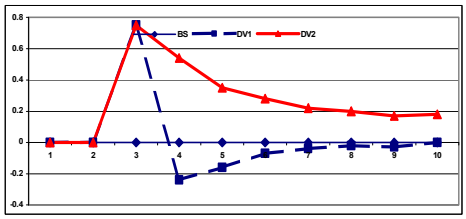
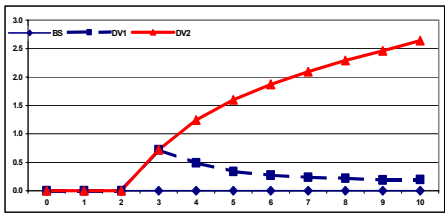
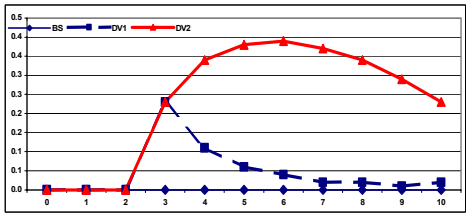


Figure 2 — Devaluation

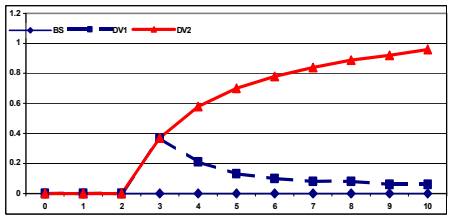




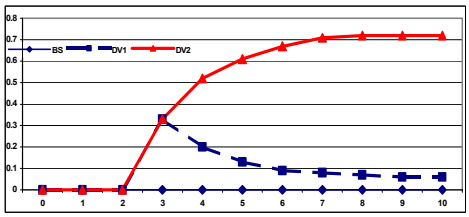
c – BoP current account



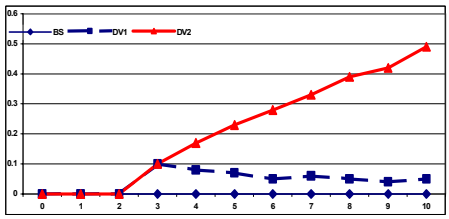
d – Fiscal balance



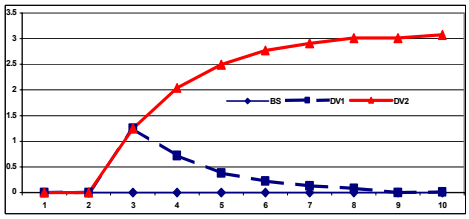
e – Domestic savings



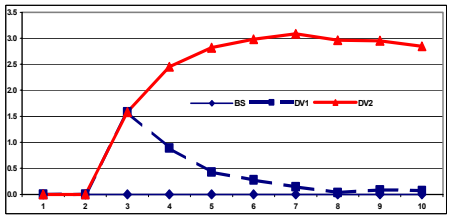
f – Total investment



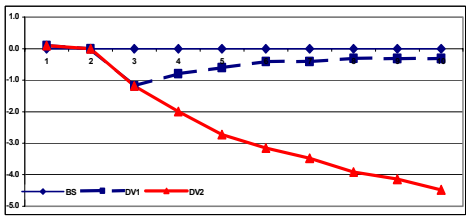
g – Inflation



h – Real exchange rate



i – Overall real wage index



j – Unemployment rate

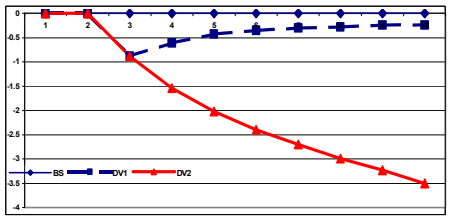
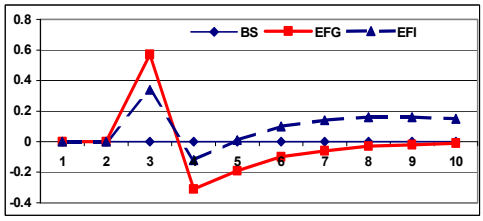
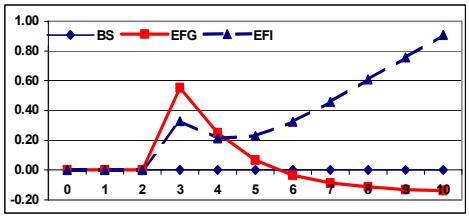
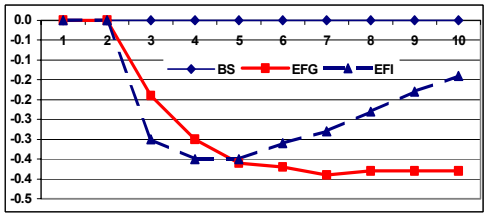


Figure 3 — Fiscal Expansion

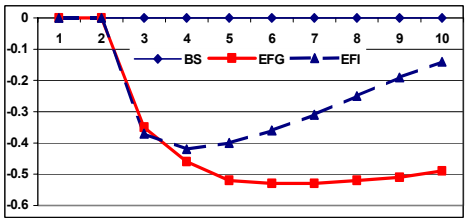




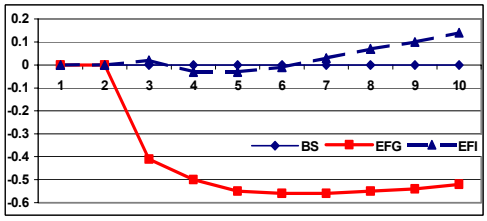
c – BoP current account



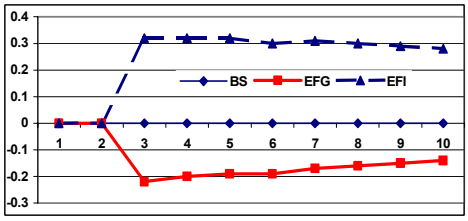
d – Fiscal balance



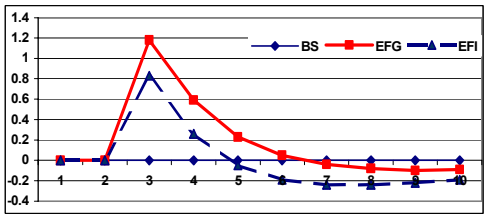
e – Domestic savings



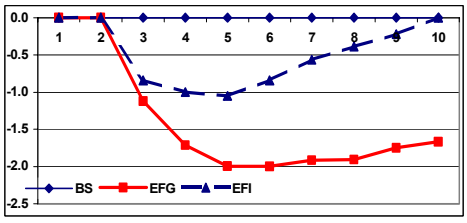
f – Total investment



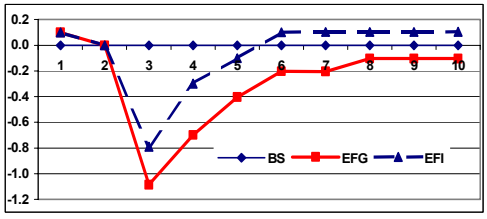
g – Inflation



h – Real exchange rate



i – Overall real wage index



j – Overall unemployment rate

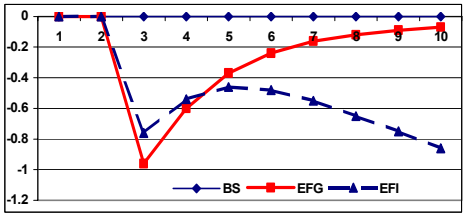
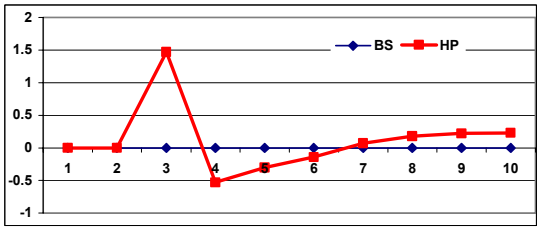
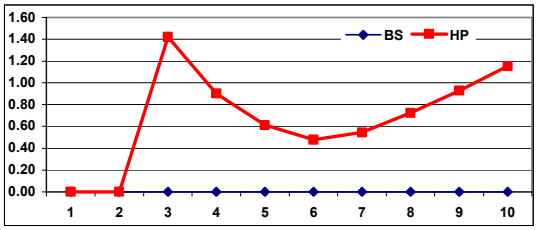


Figure 4 — HIPC Programme

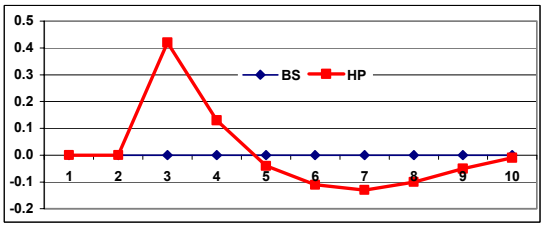
a – GDP growth rate



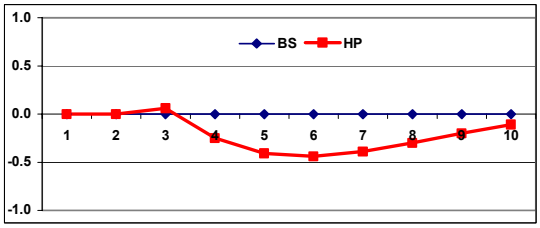
b – Total GDP



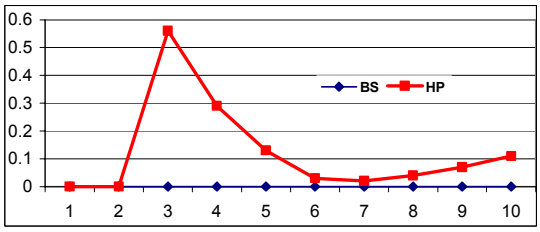
c – BoP current account



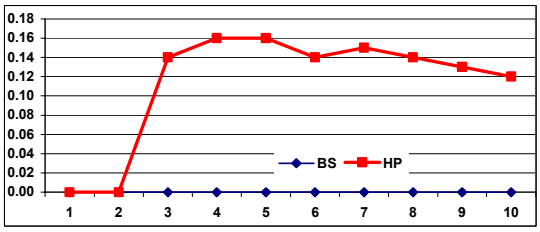
d – Fiscal balance



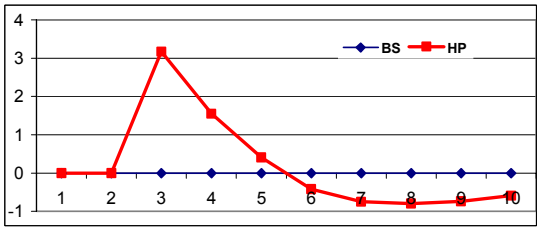
e – Domestic savings



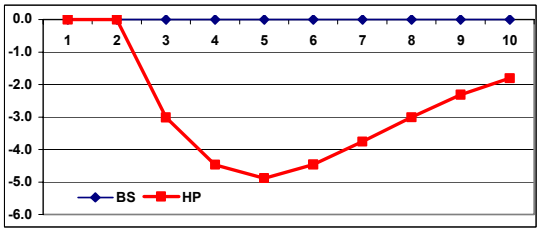
f – Total investment



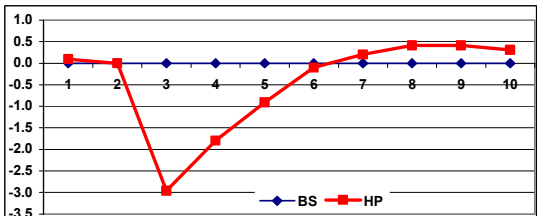
g – Inflation



h – Real exchange rate



i – Overall real wage index



j – Overall unemployment rate

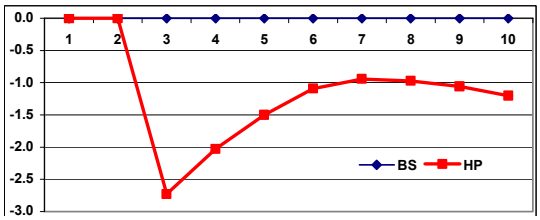


Table 2 - Simulation data for base run and capital-inflow experiment

Period	0	1	2	3	4	5	6	7	8	9	10
Year	1998	1999	2000	2001	2002	2003	2004	2005	2006	2007	2008
Government consumption	5782	5897	6015	6135	6258	6384	6511	6641	6773	6908	7046
Government investment	2798	2854	2911	2969	3029	3089	3151	3214	3278	3344	3411
Net factor income from abroad	135	100	90	80	70	60	60	60	60	60	60
Gas exports	309	191	350	625	1086	1574	1863	2239	2239	2239	2239
Current transfers from abroad											
State enterprises	29	0	0	0	0	0	0	0	0	0	0
Government	1786	1686	1586	1486	1386	1286	1186	1086	1086	1086	1086
External debt											
Private corporations	4906	4806	4706	4706	4606	4506	4506	4506	4506	4506	4506
State enterprises	53	0	0	0	0	0	0	0	0	0	0
Government	1244	1144	1044	944	844	744	644	544	444	344	244
Central Bank	-265	-165	-65	0	0	0	0	0	0	0	0
Commercial banks	892	792	692	592	492	392	292	292	292	292	292
Other financial institutions	-2	0	0	0	0	0	0	0	0	0	0
Reduction in foreign direct and foreign portfolio investment											
Private corporations	4906	4806	**4506**	**4506**	**4506**	4506	4506	4506	4506	4506	4506
Commercial banks	892	792	**292**	**292**	**292**	**292**	292	292	292	292	292

Appendix A: Mathematical Structure of the Bolivia Model

I. BASIC NOTATION

i) Productive sectors:

- generic notation (i or j)
- individual notation: agriculture (AG), mining (MN), petroleum (PT), natural gas (GN), manufacturing (MF), construction (CT), modern services (SM), informal services (SI).

ii) Factors of production:

- generic notation (f)
- individual notation: labour (LB), unincorporated profits (UP), corporate profits (CP).

iii) Institutions:

- generic notation (k)
- individual notation: households (HH), unincorporated enterprises (UE), corporate enterprises (CE), public enterprises (SE) and government (GV).

iv) Households:

- generic notation (h)

v) Financial institutions:

- generic notation (k)
- individual notation: central bank (CB) and private financial institutions (PB).

vi) Rest of the World (RW).

II. MODEL EQUATIONS

1. Supply Demand Balances

$X_i \equiv XD_i + E_i$ — Domestic output (X_i) is equal to domestic absorption (XD_i) plus exports (E_i)

$XD_i \equiv \Sigma a_{i,j}.X_j + C_i + G_i + \Sigma\lambda_{i,k}.IR_k + \Delta SK_i$ — Domestic absorption specification

$E_i = E_{i0}.(PE_i/P_i)^{\varepsilon_i}.X_i$ — Exports are responsive to changes in relative prices. E_{i0} is the level of exports in the base year and ε_i is the export demand elasticity)

2. PRICE EQUATIONS FOR ALL SECTORS

$P_j = (PD_j.XD_j + PE_j.E_j)/X_j$ — Composite prices

$PE_j = e.PW_j$ — Export prices

$PD_{MP} = e.PW_{MP}$ — Domestic price of imports

$PD_{MN} = PE_{MN}$ — Domestic prices in the coca, hydrocarbons and mining sectors are determined by international prices

3. CORPORATE AND UNINCORPORATED CAPITAL

$KC = K_{CE} + K_{SE} + K_{GV}$ — Corporate capital defined as that belonging to companies, state enterprises and government

$KU = K_{HH} + K_{GV}$ — Unincorporated capital is defined as that belonging to households. Government capital (e.g. infrastructure) has a crowding-in effect on households' production

4. OUTPUT AND PRICE ADJUSTMENT

a) Sectors with Production Functions

$$P_j = \{(1+txi_j).[\Sigma(PD_i/P_j^{\rho j}).a_{i,j} + ß_{CP,j}.(rc_j.P_j)^{1-\rho j} + ß_{UP,j}.(ru_j.P_j)^{1-\rho j} + ß_{LB,j}.(w)^{1-\rho j} + a_{MP,j}.(PD_{MP})^{1-\rho j}]\}^{1/(1-\rho j)}$$

CES cost functions for sectors with production functions

$KU = ß_{UP,j}.(ru_j)^{-\rho j}.X_j$ — Demand for unincorporated capital

$KC = ß_{CP,j}.(rc_j)^{-\rho j}.X_j$ — Demand for corporate capital

$L_j = ß_{LB,j}.(w/PD_j)^{-\rho j}.X_j$ — Demand for labour in sector j

$M_j = a_{MP,j}.(PD_{MP}/PD_j)^{-\rho j}.X_j$ — Demand for imported intermediate inputs in sector j

$\Gamma_j = (rc_j.KC + ru_j.KU)/(KC + KU)$ — Profitability of total physical capital in sector j

$(\tau_j/((1+\tau_j) = [\Gamma_j.(1+txi_j)].[(KU+KP)/X_j]$ — Mark-up rate determination for sector j

b) Mark-Up Sectors

$P_j = (1+txi_j).(1+\tau_j).[\Sigma PD_i.a_{i,j} + w.b_j]$ — Price functions for mark-up sectors

$(X_j^{max} - X_j).(\tau_j - \tau_{0j}) = 0$ — Output - mark-up determination

$X_j \le X_j^{max}$ and $\tau_j \ge \tau_{0j}$ — Additional constraints to the previous equation.

$X_i^{max} = X0_i.(CM/CM0)$ — Maximum level of output for the mark-up sectors are set by the minimum bind between the 'exchange-gap' and the maximum labour supply

$L_j = ß_{LB,j}.X_j$ — Demand for labour in sector j

$M_j = a_{MP,j}.X_j$ — Demand for imported intermediate inputs

$\Gamma_j = (\tau_j/((1+\tau_j).(1+txi_j))).(X_j/(KU+KP))$ — Profitability of total physical capital in sector j

$ru_j = [(\kappa_{u,j}.KU)/(\kappa_{u,j}.KU + \kappa_{c,j}.KC)].[(KU+KC)/KU].\Gamma_j$ — Sectoral profitability of unincorporated capital

$rc_j = [(\kappa_{c,j}.KC)/(\kappa_{u,j}.KU + \kappa_{c,j}.KC)].[(KU+KC)/KC].\Gamma_j$ — Sectoral profitability of corporate capital

5. INCOME DISTRIBUTION

a) Factorial Income Distribution

$Y_{LB} = \Sigma w.L_j + e.RFA$ — Labour income (wage earnings plus remit. from abroad)

$Y_{UP} = \Sigma(ru_j.P_j.KU)$ — Unincorporated capital income

$Y_{CP} = \Sigma(rc_j.P_j.KC)$ — Corporate capital income

b) Income Distribution to Institutions

$GY_{kf} = [\gamma_{kf}.K_{kf}/(\Sigma\gamma_{kf}.K_{kf})].Y_{CP}$ — Distribution of corporate profits to institution kf (kf = CE and SE), according to their physical capital endowment

6. RATES OF RETURN PER TYPE OF ASSET

a) Basic Rates of Return Indexes

$rpc_c = [1 + ((\Sigma rc_j.P_j)/\Sigma P_j)]/[1 + ((\Sigma rc_{0j}.P_{0j})/\Sigma P_{0j})]$ — Profitability of corporate physical capital

$rpc_u = [1 + ((\Sigma ru_j.P_j)/\Sigma P_j)]/[1 + ((\Sigma ru_{0j}.P_{0j})/\Sigma P_{0j})]$ — Profitability of unincorporated physical capital

$rg = (1+i^a)/(1+i^a_0)$ — Profitability on public domestic assets (government's bonds and loans from central bank) (i^a = administered interest rate)

$rp = (1+i)/(1+i_0)$ — Profitability of private domestic assets (deposits in private banks and private banks loans) (i = rate of interest determined in the market)

$re = (1+i^*)/(1+i_0{}^*)$ — Return on foreign assets/liabilities (i.e. banks' reserves, foreign debt)

b) Allocation of Each of the Basic Rates of Return to the Different Financial Transactions and to Physical Capital

$rf_{RW,k} = (e/e_{t-1}).re$	The official exchange rate (e) applies for all ROW's claims on all domestic institutions (e.g. external debt)
$rf_{kz,RW} = (e/e_{t-1}).re$	For domestic agents' official holdings of foreign exchange (e.g. banks' reserves) (kz = all institutions excluding households)
$rf_{HH,RW} = (e^P/e^P_{t-1}).re$	The parallel exchange rate (e^P) applies for domestic agents' holdings of foreign exchange (e.g. capital export)
$rf_{ks,kn} = rg$	rg applies for assets held by state institutions (e.g. Central Bank credit) (ks = SE, GV and CB, and kn = all domestic institutions)
$rf_{kp,kx} = rp$	rp applies for assets held by private institutions (e.g. bank deposits) (kp = HH, CE and PB; and kx = HH, SE, and PB)
$rf_{kp,GV} = rg$	rg applies to bonds issued by the government
$rf_{kp,CB} = 1$	currency's rate of return is set to be 1
$rf_{HH,CE} = rpc_c$	Households' demand for shares depend on companies' profitability
$rf_{kc,CE} = rp$	rp applies for the corporate sector's claims on companies (e.g. bank credit) (kc = CE and PB)
$rk_{HH} = rpc_u$	Return on unincorporated capital applies for households
$rk_{kk} = rpc_c$	Return on corporate capital applies for companies, state enterprises and government

c) Weighted Average Rates of Return for Each Agent's Asset Portfolio

$ra_{kw} = [\Sigma\alpha_{kw,k}.(rf_{kw,k})^{\sigma k}]^{(1/\sigma k)}$	Weighted profitability of ROW and financial institutions' portfolio (kw = RW, CB and PB)
$ra_{kd} = [\Sigma\alpha_{kd,k}.(rf_{kd,k})^{\sigma k} + \alpha_{k,K}.(rk_{kd})^{\sigma k}]^{(1/\sigma k)}$	Weighted profitability of non-financial institutions' portfolio (kd = HH, CE, SE and GV)

7. COMMON ACCUMULATION BALANCES FOR ALL SECTORS

$ASS_k \equiv LBT_k + WTH_k$	Stock balances

a) Non-Financial Institutions (k = HH, CE, SE and GV)

Assets

$ASS_k \equiv \Sigma AA_{k,l} + KN_k$	Asset structure
$KN_k \equiv KN_{k(t-1)} + IN_k + STK_k$	Nominal capital definition
$IN_k \equiv \Sigma(\lambda_{i,k}.PD_k).IR_k$	Nominal investment definition
$K_k \equiv (1\text{-}dr).K_{k(t-1)} + IR_k$	Physical capital stock hold by each agent at the end of the period. (i.e. dr = depreciation rate)

Liabilities

$LBT_k \equiv \Sigma AA_{l,k}$	Liability structure

Net Wealth

$WTH_k \equiv WTH_{k(t-1)} + SV_k + REV_k$	Net Wealth definition
$REV_{HH} = ((e\,^{p}\text{-}e\,^{p}_{t-1})/e\,^{p}_{t-1}).AA_{HH,RW}$	Revaluation of HH's foreign assets
$REV_k = ((e\text{-}e_{t-1})/e_{t-1}).(-AA_{RW,k(t-1)})$	Revaluation of CE, SE and GV's net wealth comprise only that due to CE's external debt

b) Financial Institutions (k = CB and PB)

Assets

$ASS_k \equiv \Sigma AA_{k,l}$	Asset structure

Liabilities

$LBT_k \equiv \Sigma AA_{l,k}$	Liability structure

Net Wealth

$WTH_k \equiv WTH_{k(t-1)} + REV_k$	Net Wealth definition
$REV_k = ((e\text{-}e_{t-1})/e_{t-1}).(AA_{k,RW} - AA_{RW,k})$	Net revaluation of financial institution k's foreign asset-liability stocks

c) Rest of the World

Assets

$ASS_{RW} \equiv \Sigma AA_{RW,l}$	Asset structure

Liabilities

$LBT_{RW} \equiv \Sigma AA_{l,RW}$	Liability structure

Net Wealth

$WTH_{RW} \equiv WTH_{RW(t-1)} + SAV_{RW} + REV_{RW}$	Net Wealth definition
$REV_{RW} = -\Sigma REV_k$	Net revaluation for the Rest of the World's assets-liabilities

8. HOUSEHOLDS' BALANCES (HH)

a) Income and Savings

$GY_{HH} = Y_{LB} + Y_{UP} + DIV_{HH} + \Sigma CT_{k,HH}$	Households' gross income, including labour income, unincorporated profits, distributed profits (DIV) and current transfers to households ($CT_{k,H}$ from state enterprises, government and from the rest of the world)
$YD_{HH} = (1\text{-}txd_{HH}).GY_{HH} - \Sigma CT_{HH,CE}$	Disposable income per household category after direct taxation and current transfers to companies ($CT_{HH,CE}$; i.e. interest payments)
$CT_{HH,CE} = rf_{CE,HH}.\ \xi_{HH,CE}.AA_{PB,HH(t-1)}$	Interest payments by households to companies (i.e. private banks)
$SV_{HH} = \Lambda_1.YD_{HH} - \Lambda_2.(WTH_{HH(t-1)} + REV_{HH})$	Savings by households are determined as an incomplete attempt by households to adjust their net wealth to a prop. Λ_1 of their disposable income ($\Lambda_1 > 0$; and $\Lambda_2 < 0$)
$NC_{HH} = YD_{HH} - SV_{HH}$	Households' nominal consumption as function of disposable income
$C_i = \Theta_i + \mu_i.((NC_{HH} - \Sigma PD_i.\Theta_{i,})/PD_i)$	LES type consumption demand (including consumption of imported goods)

b) Portfolio Determination

$AA_{HH,k} = \alpha_{HH,k}.(rf_{HH,k}/ra_{HH})^{\sigma}.ASS_{HH}$

Households can only determine their asset-portfolio composition. HH's demand for financial assets are determined through this set of equations. Households' demand for physical capital, is implicitly determined and does not need to be explicitly specified

9. COMPANIES' BALANCES (CE)

a) Income and Savings

$YBT_{CE} = GY_{CE} + \Sigma CT_{h,CE} + CT_{SE,CE} + CT_{RW,CE}$

$- DIV_{HH} - CT_{CE,SE} - CT_{CE,RW}$ — Companies' incomes before taxation

$DIV_{HH} = \zeta \, . \, GY_{CE}$ — Distributed profits to households as function of companies gross profits

$CT_{CE,SE} = rf_{SE,CE}.\xi_{CE,SE}.\Sigma\Sigma AA_{kg,kc(t-1)}$ — Current transfers from companies (i.e. firms and private banks (kc)) to state enterprises (i.e. state firms and central bank (kg)) mostly due to interest payments

$CT_{CE,RW} = rf_{RW,CE}.\xi_{CE,RW}.\Sigma AA_{RW,kc(t-1)}$ — Interest payments due to the corporate private sector's external debt

$SV_{CE} = YBT_{CE} - txd_{CE}.GY_{CE}$ — Companies' savings

b) Investment Demand

$IR_{CE} = \min(IRF_{CE}, IRE_{CE})$

CE's real investment is given by the minimum among: CE's investment demand function (IRF), CE's foreign-exchange-constrained investment level (IRE), and CE's budget-constrained investment level (IRB)

$IRF_{CE} = IR_{CE} + \chi_1.IR_{CE(t-1)}$

$+ \chi_2.(GDP\text{-}GDP_{t-1}) + \chi_3.DFI$

CE's investment demand function is dependent on CE's investment in the previous period, on an accelerator term reflected by changes in GDP and on the level of direct foreign investment (DFI)

$IRE_{CE} = IR0_{CE}.(CM/CM0)$ — CE's foreign-exchange-constrained investment depends on the current import capacity (CM)

c) Portfolio Determination

$AA_{CE,k} = (\alpha_{CE,k}/\alpha_{CE,K}).(rf_{CE,k}/rk_{CE})^{\sigma}.KN_{CE}$ — CEs' financial portfolio structure is determined as function of CE's capital stock (KN_{CE}). In this way, changes in KN_{CE} (given by CE's investment) will bring about changes in CE's level of working capital

10. PUBLIC ENTERPRISES' BALANCES (SE)

a) Income and Savings

$YBT_{SE} = GY_{SE} + CT_{CE,SE} - \Sigma CT_{SE,kl}$ — SE's income before taxation (kl = HH, CE and RW)

$CT_{SE,HH} = \Psi_{SE.HH} \, . \, GY_{SE}$ — SE's transfers to households as function of SE's gross profits

$CT_{SE,CE} = rf_{PB,SE}.\xi_{SE,CE}.\Sigma\Sigma AA_{kc,kg}$ — Current transfers from state enterprises (i.e. state firms, central bank and development banks (kg)) to companies (i.e. firms and private banks (kc)) mostly comprise interest payments

$CT_{SE,RW} = rf_{RW,SE}.\xi_{SE,RW}.\Sigma AA_{RW,kg}$ — Interest payments due to the corporate public sector's external debt

$SV_{SE} = YBT_{SE} - txd_{SE}.GY_{SE}$ — Public firms' savings

b) Investment Demand

$IR_{SE} = \min(IRF_{SE}, IRE_{SE})$ — SE's real investment is given as the minimum among SE's IRF, IRE, and IRB

$IRF_{SE} = IR0_{SE}$ — SE's investment demand function only imposes a ceiling on SE's investment. This ceiling is given by SE's investment in the base year

$IRE_{SE} = IR0_{SE}.(CM/CM0)$ — SE's foreign-exchange-constrained investment

c) Portfolio Determination

$AA_{SE,k} = (\alpha_{SE,k}/\alpha_{SE,K}).(rf_{SE,k}/rk_{SE})^{\sigma}.KN_{SE}$ — SEs' financial portfolio structure is determined in relation to their capital stock (KN_{SE})

11. GOVERNMENT'S BALANCES

a) Incomes and Savings

$SV_{GV} = GRV - GEX$ — Government savings equal to the difference between its revenues and expenditures

$GRV = \Sigma(txi_j/(1+txi_j)).P_j.X_j$

$+ txd_{HH}.GY_{HH} + txd_{CE}.GY_{CE}$

$+ txd_{SE}.GY_{SE} + e.CT_{RW,GV}$ — Government's revenues

$GEX = PD_{SM}.G + CT_{GV,HH} + CT_{GV,RW}$ — Government's expenditures

$CT_{GV,HH} = \Psi_{GV.HH}.PD_{SM}.G$ — Current governmental transfers to households

$CT_{GV,RW} = rf_{RW,GV}.\xi_{GV,RW}.AA_{RW,GV}$ — Interest payments due to the government's external debt

b) Investment Demand

$IR_{GV} = \min(IRF_{GV}, IRE_{GV})$ — GV's real investment is given as the minimum among GV's IRF, IRE, and IRB

$IRF_{GV} = IR_{GV} + \varphi.\Delta F_{GV}$ — GV's investment demand function comprise an autonomous investment term plus another part that is function of the current capital inflows to the government

$IRE_{GV} = IR0_{GV}.(CM/CM0)$ — GV's foreign-exchange-constrained investment

c) Portfolio Determination

$AA_{GV,k} = (\alpha_{GV,k}/\alpha_{GV,K}).(rf_{GV,k}/rk_{GV})^{\sigma}.KN_{GV}$ — GVs' financial asset portfolio structure is determined based on the level of physical capital stock (KN_{GV})

12. PRIVATE FINANCIAL INSTITUTIONS (PB)

$AA_{PB,ka} = \alpha_{PB,ka}.(rf_{PB,ka}/ra_{PB})^{\sigma}.ASS_{PB}$ — As explained before, PBs determine all its assets but credit to companies, government, and state enterprises ($AA_{PB,CE}$) which is implicitly determined in these agents' accumulation balances. CE's balance closure however takes place through a variable in LBT_{PB} (i.e. credit from the central bank) (ka = HH, PB,CB and RW)

13. CENTRAL BANK (CB)

$AA_{CB,kq} = \alpha_{PB,kq}.(rf_{PB,kq}/ra_{PB})^{\sigma}.ASS_{PB}$ — As discussed previously, CB can only partially determine their portfolio as credit private banks have been implicitly determined within PS's balances. CB's balance adjustment eventually takes place though its foreign-exchange reserves (kq = HH, CE, GV,SE and CB)

14. EXTERNAL BALANCE

a) Current Balance

$SV_{RW} = RWRV - RWEX$ — External savings (current account balance)

$RWRV = PD_{MP}.(\Sigma M_j + C_{MP,HH}$

$+ \Sigma\Theta_{MP,k}.IR_k + \Delta SK_{MP})$

$+ \Sigma CT_{k,RW}$ — Payments to the rest of the world

$RWEX = e.\Sigma PW_i.E_i + e.RFA + e.\Sigma CT_{RW,k}$ — Payments from the rest of the world

b) Capital Account

$AA_{RW,k} = (e/e_{t-1}).AA_{RW,k(t-1)} + e.\Delta F_k$ — RW's assets comprise domestic agents' external debt. Capital inflows within the period (ΔF) are determined exogenously

c) Import Capacity

$MC = \Sigma PW_i.E_i + RFA + \Sigma CT_{RW,k} - PW_{MP}.[C_{MP,HH} + \Sigma M_j$

$+ \Sigma\Theta_{MP,k}.IR_k + \Delta SK_{MP}] - \Sigma(CT_{k,RW}/e)$

$+ \Sigma[(AA_{k.RW(t-1)}/e_{t-1}) - AA_{k,RW}/e]$

$- [AA_{CB.RW(t-1)}/e_{t-1}) - MIRES] + \Sigma\Delta F_k$ — Capacity to import non-ompetitive goods; i.e. intermediate for the mark-up-sectors and capital goods for the investment of CE, GV and SE (MIRES = minimum desired Central Bank's foreign reserves)

15. STOCK CHANGES

$\Delta SK_i = \Phi_i.X_i$ — Changes of stocks by activities depend on each sector's level of production (i = all commodities but imports)

$SK_{MP} = \Phi_{MP}.(\Sigma M_j + \Sigma C_{MP,h} + \Sigma\Theta_{MP,k}.IR_k)$ — Changes of stocks for imported commodities depend on total imports

$STK_k = \gamma_k.\Sigma PD_i.SK_i$ — Stock changes are allocated among agents according to a fixed proportion γ_k

16. LABOUR MARKET

$w = cw_0 + cw_1.CPI - cw_2.U + cw_3.w_{t-1}$	Nominal wage rate is a function of the consumer price index (CPI), unemployment rate (U) and the wage rate in the previous period (w_{t-1})
$TLD = \Sigma\lambda_i.L_i$	Total labour demand
$TLS = TLS_0.(1+n)^t$	Total labour supply
$U = (TLS - TLD)/TLS$	Unemployment rate
$CL = TLS - \Sigma\lambda_{iq}.L_{iq}$	Maximum labour supply to the mark-up sectors (iq = sectors with production functions)

III. LIST OF VARIABLES, PARAMETERS AND COEFFICIENTS

1. Endogenous Variables

Variable	No. of cases	Description
X_i	8	total production by activities.
XD_i	8	domestic absorption.
E_i	8	exports by activities.
P_i	8	composite price per activity.
PE_i	8	export price per activity.
PD_i	9	domestic price per activities and for imported commodities.
KC	1	corporate capital stock.
KU	1	unincorporated capital stock.
K_k	4	capital stock held by agents.
ru_i	8	profitability of unincorporated capital per activity.
rc_i	8	profitability of corporate capital per activity.
L_i	8	employment by activities.
M_i	8	demand for imported inputs by activities.
Γ_i	8	profitability of total capital per activity.
τ_i	8	mark-up rate per activity.
X_i^{max}	3	maximum output in the mark-up sectors.
Y_f	3	total income by productive factor categories.
GY_k	2	allocation of corporate profits to institutions.
rpc_f	2	profitability per category of physical capital.
rg	1	profitability of public bonds.
rp	1	profitability of private domestic assets.

re	1	profitability of external assets.
$rf_{k,l}$	49	profitability of financial assets.
rk_k	4	profitability of capital by agents.
ra_k	7	average portfolio profitability by agents.
ASS_k	7	total assets by agents.
LBT_k	7	total liabilities by agents.
WTH_k	7	total wealth by agents.
KN_k	4	nominal value of physical capital by agents.
$AA_{k,l}$	49	financial assets issued by agent l and held by agent k.
IN_k	4	nominal investment by agent k.
IR_k	4	real investment by agent k.
SV_k	5	savings by agent.
REV_k	7	net revaluation of assets per agent.
GY_{HH}	1	households' gross income.
YD_{HH}	1	disposable income by households.
NC_{HH}	1	nominal consumption by households.
C_i	9	real consumption of commodity i by households.
YBT_k	2	income before taxes by companies (i.e. CE and SE).
DIV_{HH}	1	distributed corporate profits to households.
$CT_{k,l}$	9	current transfers from agent k to agent l.
IRF_k	3	investment demand by economic agents.
IRE_k	3	foreign-exchange constraint investment by agent.

Variable	**No. of cases**	**Description**
GRV	1	government revenues.
GEX	1	government expenditures.
RWRV	1	rest of the world revenues.
RWEX	1	rest of the world expenditures.
MC	1	maximum capacity to import.
ΔSK_i	9	changes of stock by commodities.
STK_k	4	changes of stocks by agents.
w	1	nominal wage rate.
TLD	1	total demand for labour.
TLS	1	total supply of labour.
U	1	unemployment rate.
e^P	1	parallel exchange rate.

2. Exogenous Variables

G	1	government final consumption.
e	1	official exchange rate.
PW_i	8	world price for commodities.
RFA	1	remittances from the ROW.
ia	1	interest rate on government bonds.
i	1	market interest rate.
i*	1	world interest rate.
ΔF_k	6	capital inflows received by agent k during the period.
$CT_{RW,k}$	3	current transfers from the rest of the world.
MIRES	1	minimum (or target) level of exchange reserves.
$K_{k(t-1)}$	4	capital stock at the beginning of the period.
$WTH_{k(t-1)}$	7	net wealth by agent at the beginning of the period.
$AA_{k,RW(t-1)}$	4	holdings of foreign exchange by agent.
$AA_{RW,k(t-1)}$	6	external debt by institution.
$e_{(t-1)}$	1	official exchange rate in the previous year.
$e^p_{(t-1)}$	1	parallel exchange rate in the previous period.
$IR_{CE(t-1)}$	1	companies' investment in the previous period.
w_{t-1}	1	wage rate in the previous period.
DFI	1	direct foreign investment flow within the period

3. Parameters

E_{i0}	6	exports by activity in the base year.
ε_i	6	export elasticity by activity.
$\lambda_{i,k}$	28	coefficients linking investment by agents and by commodities.
ρ_i	5	constant elasticity substitution coefficient among factors for activities with production functions.
$a_{i,j}$	72	input-output coefficients.
b_i	8	labour-output coefficient for all sectors.
txi_i	8	indirect tax rate per activity.

Variable	No. of cases	Description
τ_{i0}	3	mark-up rate in the base year for the mark-up sectors.
$\kappa_{u,j}$ and $\kappa_{c,j}$	6	profit-capital coefficient for unincorporated and corporate capital.
γ_k	4	profit-capital coefficient for economic agents.
$\alpha_{k,l}$	49	portfolio shares for economic agents.
σ_k	7	elasticities of substitution for agents portfolios.
txd_k	4	direct tax rate per agent.
Λ_1 and Λ_2	2	households' propensities to save, out of income and out of net wealth.
Θ_i	9	households' floor consumption levels by commodity.
μ_i	9	households' marginal budget shares by commodity.
$\xi_{k,l}$	6	implicit interest rate by agents.
ζ_{HH}	1	distributed profit coefficients by companies to households.
Ψ_{HH}	1	current transfers to households as a share of government final demand.
χ_1, χ_2,χ_3	3	investment demand coefficients for companies.
φ	1	investment demand coefficient for government.

Appendix B: A Social Accounting Matrix for Bolivia 1998

The Social Accounting Matrix (SAM) is a summary table that integrates the accounts of production and income generation with accounts of income distribution to social groups and with accounts for the major elements of final expenditures. This presentation has the advantage that the interrelationships between the structure of production, income distribution, employment, capital accumulation and financial intermediation can be identified.

The SAM emphasizes the links between the principle economic agents in the process of production, income formation and capital accumulation. The principle agents in the SAM are (1) households and unincorporated businesses, (2) private corporations, (3) government enterprises, (4) government, (5) financial institutions, and (6) the rest of the world. These agents are involved in eight production activities and in the use of eight types of domestically produced commodities: agriculture, mining, petroleum, natural gas, manufacturing, construction, modern (formal) services, and traditional (informal) services. The SAM that has been prepared for Bolivia gives more detail, e.g. breaking down households into many subgroups and specifying production sectors with more disaggregation. Yet, the presentation here gives fuller weight to the processes of capital accumulation and financial intermediation. The advantage of this is that it allows for the explicit analysis of flows of external and domestic finance and their relationships with the structure of production, income distribution and accumulation. It also makes it possible to include fully specified portfolio behavior in the CGE model.

In Table A1, the SAM is presented. Because of its size, the table had to be split over two pages, but it should be clear that the two parts form one complex matrix. It can be observed that the major breakdown of the SAM is into a matrix of current transactions (row/columns 11 to 28) and a matrix of capital transactions (row/columns 29 to 58). Within these two matrices some blocks can be identified.

In the matrix of current transactions four blocks can be distinguished: Block 1 (rows/columns 11 to 19) contains the input-out relationships between the sectors of production with domestically produced intermediates recorded in rows/columns 11 to 18 and imported intermediate inputs in row 19; together they describe the technical production structure and the interdependencies among the productive sectors.

Block 2 is the value-added block. Value added at factor costs is broken down over wage payments (row 20) and profits (the latter is further disaggregated into the gross operating surpluses of the unincorporated sector (row 21) and that of (private and state) corporations (row 22). Adding indirect taxes (row 26) leads to value added at market prices. Adding vertically leads to total output or supply.

Block 3 shows how the current income is distributed and redistributed. First, there is the distribution of the income of the factors of production to the economic agents or institutions (cells 23, 20 to 25, 22). The other element in this block is the current transfers among these institutions, such as interest and dividend payments, direct tax payments, government subsidies and current transfers with the rest of the world (rows/columns 23 to 27).

Block 4 is the last block in the current transaction sub-matrix. It includes domestic consumption demand for the commodities of the eight sectors (split over households (column 23) and government (column 26) consumption. Part of the consumption demand is satisfied through import of consumption goods (cells 19,23 and 19, 26). The foreign demand for domestic commodities (export of goods and services is included in column 27. This block shows how current income is spent on current consumption. The difference between current income and current spending are the savings.

These savings provide the link to the sub-matrix of capital transactions. In the matrix of capital transactions three blocks have been separated. Savings of the various institutions are given in block 5, including foreign savings (cell 37,27). These savings are used to finance investments. In block 6 capital formation of each institution is given.

Together with block 4, block 6 also adds up to total final demand, which is composed of consumption by households (column 23) and government (column 26), exports (column 27), and investment (columns 28 and 29 to 32). Together with the intermediate demand of block 1, final demand adds up to total demand.

Conceptually, this is were most SAMs stop. The Bolivian SAM tries to make the financial linkages in the economy, and of the economy with the rest of the world, more explicit. It is clear that for each individual agent, investments and savings do not match. This gap has to be filled. The flow-of-funds block of the SAM, block 7, shows how this is done. In block 7 there is a sub-block of direct capital transactions among institutions (rows/columns 29 to 32). E.g. households provide

share capital to private corporations (cell 30,29). Corporations may provide credit to each other and to state enterprises, etc. The rest of the flow-of-funds block shows the patterns of financial intermediation, i.e. the flows of funds that occur through financial institutions. Adding block 5 and block 7 horizontally gives the total sources of funds for each of the institutions and, adding up vertically, gives the total uses of these funds.

It should be noted that the concepts presented so far include only the flows of income and expenditures and of financial transactions. To be able to model portfolio behavior of the various agents in the model, it is necessary to add the estimates of the stocks of real and financial assets and liabilities. In Table A1, the block between the rows 1 to 11 and the columns 29 to 37 records the stocks of the various assets and liabilities of the different institutions (including financial institutions) at the beginning of the period (i.e. 1.1.1998). The rows 49 to 58 and columns 29 to 37 provide the same information at the end of 1998 (i.e. 31.12.1998). The difference in the stocks are to be explained by savings during the period, by the acquisition of real and financial assets and the incurrence of liabilities and by the revaluation of assets or liabilities.