Analysing the Distributional Impacts of Stablisation Policy with a CGE Model: Illustrations and Critique for Zimbabwe

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Acronyms

AfDB	African Development Bank
CES	Constant Elasticity of Substitution
CGE	Computable General Equilibrium
CET	Constant Elasticity of Transformation
CPI	Consumer Price Index
EIU	Economist Intelligence Unit
GDF	Global Development Finance (World Bank)
IDRC	International Development Research Centre
IFPRI	International Food Policy Research Institute
IMF	International Monetary Fund
LES	Linear Expenditure System
MPS	Marginal Propensity to Save
OECD	Organisation for Economic Cooperation and Development
PSIA	Poverty and Social Impact Analysis
SAM	Social Accounting Matrix
WDI	World Development Indicators (World Bank)

Executive Summary

Purpose

This paper looks at the use of a standard, static computable general equilibrium (CGE) model (IFPRI model) for analysing and comparing the distributional impacts of different macroeconomic stabilisation policies. The primary objective is to improve the external balance of an economy in crisis. The paper discusses how this can be achieved in the context of the particular model and identifies the limitations of the model. The country analysed is Zimbabwe, which is facing deep economic and political crisis and is in acute need of macroeconomic stabilisation. Real GDP is in a continuous decline and inflation in 2003 hit over 600%. Nearly all sectors of the economy have experienced a sharp downturn, agriculture in particular because of the land reform. The Zimbabwe dollar has been grossly overvalued, which has led to the emergence of a large parallel exchange market. Donor support and capital inflows have come to a halt and there is an acute shortage of foreign exchange.

CGE models have been used for several decades to analyse the effects of policy changes and economic shocks. They are equilibrium models that cover the changes that arise from a move from one market equilibrium to another as a result of a policy shock. CGE analysis and economic modelling have recently come to the fore with the increased advocacy of Poverty and Social Impact Analysis (PSIA) of economic policies and reform in developing countries. As studies using this methodology may increasingly influence policy, there should be general awareness among policy-makers of the advantages and disadvantages of this tool and the situations for which it is best suited.

The paper concentrates on the following policies: exchange-rate devaluation (expenditure switching) and reduction in government consumption or an increase in direct tax rates (expenditure reduction). Usually both policies can be used to alleviate an external imbalance. The paper formulates policy recommendations, where possible by comparing alternative policies. However, it also functions as a critique of features as the model arising from restrictive assumptions. Expenditure reduction alone does not improve the current account balance in the model framework; this policy does not therefore constituted a comparable alternative to devaluation, and its distributional effects can be misleading. The paper therefore also looks at the implications of combining a devaluation with different expenditure reduction policies to arrive at more balanced outcomes. By examining the results of specific policy changes, it identifies the weaknesses and strengths of the model and assesses the reliability of the distributional impacts. It also briefly discusses possible alternative assumptions.

Model and data description

The model used in this study is the IFPRI standard CGE model. This is a static, real economy CGE model that is mainly neoclassical, but can incorporate a certain degree of market rigidity. In the model, policy shocks cause changes in relative prices. Production is carried out by activities that maximise profits subject to a production function and given prices of inputs, outputs and factors. Total output is divided between domestic sales and exports, based on revenue maximisation. There is zero substitutability between factors of production (value-added) and intermediate inputs in production. Consumers maximise their utility (function of consumption), subject to given incomes and prices. Domestic goods and imports are imperfect substitutes.

In CGE models macro closure rules govern the mechanism by which the macro economic balances – the fiscal balance, the current account balance and the savings and investment balance – are achieved. In this study, government savings adjust to balance the government account, and

direct tax rates and government consumption are fixed. We apply two different savings-investment closures. In the first case savings are investment-driven (I) and marginal propensity to save (for private savings) adjusts to maintain the balance between savings and investment. In the second case investment is savings-driven (II) and marginal propensity to save is fixed. There are three savings accounts: private, government and foreign. Savings are a function of a number of factors, but investment in this model depends simply on total savings. For the external balance we use the closure, in which the real exchange rate is fixed and foreign savings adjust to maintain the balance.

We use the IFPRI 1991 social accounting matrix (SAM) for Zimbabwe as the base, but with a few alterations. The number of economic activities has been aggregated to 7 and the value of production for each activity and thus their value-added shares of total output have been adjusted in the light of events since 1991. There are 5 household groups: large-scale farm owner and manager households, large-scale farm worker households, smallholder farm households, urban high-income households and urban low-income households. Other institutions are enterprises (non-agricultural), government and the rest of the world.

Policies and results

Standard economic theory suggests that there are at least two ways to confront a current account deficit: expenditure switching and expenditure reduction policies. The latter will also directly target the fiscal balance. The aim of expenditure switching is to produce a direct impact on exports, for instance via changes in the exchange rate or tariffs. Devaluation functions as a tool to boost exports and alleviate the chronic shortage of foreign exchange in the economy. The impact of expenditure reduction on the current account can be more indirect, but by means of a fall in the price of domestically marketed goods it can improve export incentives and thus the current account balance. Expenditure reduction can also enhance the chances of achieving other policy objectives by improving the budget deficit and restoring credibility. Often the two types of policies need to be implemented simultaneously to ensure successful stabilisation.

The first experiment conducted is a real exchange-rate devaluation (increase in domestic prices of tradable goods and foreign transfers). The results suggest that devaluation is likely to be contractionary. Depending on our assumptions about investment, either private consumption or investment will fall substantially. GDP contracts, agriculture and export sectors benefit, but others lose out. The same holds for households: real incomes rise for agriculture-related households and fall for urban households, especially when we assume more market flexibility. The effects of a devaluation are somewhat extreme since, because of the nature of the macroeconomic balance rules, the adjustment to a change in the current account balance mainly takes place via a rise in private savings or a fall in investment. However, they are still quite plausible. The results suggest that, in Zimbabwe, the devaluation should be complemented with a policy that both improves the fiscal balance, which otherwise worsens slightly, and reduces some of the negative distributional impacts on the non-export sectors. However, the devaluation can lead to a higher rise in the price of necessities (e.g. fuel) than can be demonstrated by this model. Secondly, the capacity of the export sectors to respond to the devaluation may, at least in the short run, be limited.

We then experiment with a few expenditure reduction policies. Expenditure reduction may not have as large an impact as devaluation on the current account balance, but we could expect a small improvement. However, this does not occur in the model. The critique in the paper has focussed on the fact that standard expenditure reduction policies may not alleviate a current account deficit in the IFPRI model. The resulting macroeconomic responses are unrealistic and cast doubt on the model's distributional predictions.

The results suggest that the model does not allow higher taxes or lower government expenditure to exert a neutral or negative effect on private sector absorption. With investment-driven savings, an improvement in the government balance (achieved by reducing government consumption or increasing taxes) is translated into a lower marginal propensity to save, lower private savings and a

rise in private consumption. This is not entirely plausible. The outcome would appear more realistic, if the current account were to absorb some of the adjustment required to keep investment fixed. When investment is savings-driven, an improvement in the government balance is translated into higher (public and private) investment. This is also slightly counterintuitive. It induces a boost to the domestic sectors that produce investment goods. Foreign savings adjust minimally and often in an unexpected manner.

An improvement in the external balance should however be possible, however, in the current IFPRI framework. The fall in demand for domestic goods should then reduce their domestic market prices. This would lead to an increase in the relative price of export goods as compared with domestically marketed goods and could thereby even increase the value of exports. This in turn, would improve the current account balance. However, in the model there is no such impact, or it is overshadowed. In aggregate, the price for domestically marketed goods actually rises, as increases in consumption or investment increase demand for these goods and imports. Exports may even fall.

The results suggest that expenditure reduction as a tool to improve the external balance often cannot be analysed with the IFPRI model. This illustrates the limitations in using this type of model for comparing alternative stabilisation policies. We therefore cannot compare a devaluation and expenditure reduction on their own as tools to alleviate the external balance for Zimbabwe. In the model, expenditure reduction is likely to improve the external balance only if the price of exports is able to change, for instance as a result of a real exchange-rate depreciation. A change in the exchange rate will alter the price of exports relative to domestically marketed goods.

The results therefore indicate that, in the IFPRI model, for expenditure reduction to generate a reasonable outcome, it needs to be combined with a devaluation. This is carried out for a few different policy versions to arrive at more balanced outcomes and to compare a few policy alternatives. A common, agriculture-friendly prescription appears to be the combination of a devaluation with a cut in both government consumption and in tax rates. However, the results of a combined policy still rely predominantly on the outcomes of single policies, and it is not reasonable to interpret these results without understanding the impacts of individual policies.

Concluding remarks

This analysis reminds us that assumptions play a vital role in CGE models and need to be taken into account carefully before drawing conclusions about the usefulness of a policy. These are important issues also in the PSIA context, especially if the results of CGE models are being used for policy purposes. This paper has highlighted that restrictive assumptions about macroeconomic balancing mechanisms can limit the possibility to comparing alternative policies. However, some policy recommendations can still be derived from the IFPRI model; for instance, the results of a devaluation are fairly plausible. The paper also briefly discusses alternative closure rules and another more structural CGE model for Zimbabwe that might produce somewhat different results. A closure option, in which both the real exchange rate and the current account balance can adjust could be an improvement for our purpose of comparing the outcomes of policies aimed at improving the external balance. Another useful improvement would be more disaggregation on the public sector side, such as a government capital account.

Chapter 1: Introduction

This paper looks at the application of a standard, static computable general equilibrium (CGE) model for analysing and comparing the impact of different macroeconomic stabilisation policies for a country in economic crisis. The country chosen for this purpose is Zimbabwe and the main policy target is the external balance. The aim is to assess the suitability of a specific model, the standard CGE model (the International Food Policy Research Institute), for the purpose of comparing the distributional outcomes of two types of policies; expenditure reduction and expenditure switching. The paper has both an illustrative and policy prescription purpose. It illustrates how a widely used model behaves in different instances and assesses which policy prescriptions have a realistic effect in this framework. The main argument is that, in the model, expenditure switching leads to reasonable outcomes on income distribution and directly alleviates the external deficit, whereas expenditure reduction does not. This limits the range of policy options for improving the external balance that can be compared within the model framework. The critique focuses on one type of model and therefore cannot be generalised to hold for all types of CGEs. This model, however, derives its basis from the familiar neoclassical-structuralist framework of Dervis et al. (1982).

CGE models have been used for several decades to analyse the effects of a wide range of policy changes and shocks for both developing and developed countries. A few examples are adverse terms-of-trade shocks and changes in taxes, subsidies, trade policy or in domestic economic and social structure (technological change etc.). CGE models are equilibrium models that cover the changes required to move from one equilibrium to another as a result of an economic or policy shock. One advantage of these models is that they enable counterfactual analysis. In the real world a variety of policies and shocks influence economic outcomes and it is difficult to isolate the impact of a single policy. A CGE model enables us to analyse the effects of a specific policy change, isolate them from other changes and, importantly, compare the impact to the situation without the particular change. CGE models were first used to analyse less developed countries by Adelman and Robinson (1978) in Korea (Sadoulet and de Janvry, 1995).

Despite having been used for decades to analyse the distributional impacts of policies, CGE models have recently re-emerged under the spotlight in policy circles, due to the increased advocacy for Poverty and Social Impact Analysis (PSIA) of policy reforms in developing countries. The World Bank PSIA website[1] describes PSIA as an analytical approach that aims to offer guidance in policy design by carrying out an *ex ante* analysis of expected poverty and the social impact of a policy reform. It also encourages monitoring of the impacts and carrying out an *ex ante* impact assessment. Several studies undertaken in the PSIA context, in addition to the specific World Bank 123-PRSP model designed for simple PSIA analysis, rely on CGE models.[2] CGE-modelling is encouraged as a PSIA technique, as it enables *ex ante* analysis and unlike, partial equilibrium or several other less sophisticated models, takes into account the indirect effects of policies. Importantly, it also incorporates price effects.

As studies using CGE methodology may increasingly influence policy spheres, there should be general awareness among policy-makers of the advantages and disadvantages of this tool and the situations to which it is best suited. Various reviews and critiques have been written throughout the years about CGE models (for a few see de Maio et. al (1999): Robinson (1989; 2003). The fact that results based on the CGE model are sensitive to assumptions, and that assumptions can be restrictive is well recognised. It is common for CGE-based work to compare the outcome of different scenarios aimed at the same goal. The policies are usually either quite similar (for example, the effect of redistribution measures to target a certain group or fiscal measures to reduce the budget deficit) or are carried out with a wider aim in the form of a policy package (for example, general macroeconomic stabilisation). What this paper emphasises is that the ability of a

[1] http://lnweb18.worldbank.org/ESSD/sdvext.nsf/81ByDocName/PovertySocialImpactAnalysis
[2] For PSIA toolkit, see http://lnweb18.worldbank.org/ESSD/sdvext.nsf/81ByDocName/ToolsandMethods

particular type of CGE model to compare the effects of alternative policy outcomes can be limited when the policies implemented are relatively different in nature, but in practice should lead to similar outcomes.

The IFPRI standard CGE model was chosen because it is publicly available in GAMS-programming code with detailed descriptions on the IFPRI web-site.[3] This model forms the basis of much of the CGE-based policy analysis carried out at IFPRI and some others in recent years. As already mentioned, the model derives from a certain tradition, which means that a similar framework (details and number of closure options may vary) has also been used by others.[4]

Zimbabwe is a country in need of significant macroeconomic adjustment and stabilisation. A crucial problem is the lack of foreign exchange and thus the external deficit. Inflation has peaked to three digit levels, the official exchange rate is highly overvalued, a parallel market is thriving and the economy has been badly hit by the economic conditions, agriculture in particular, by the land reform. Economic reasoning suggests that there are at least two ways of confronting a current account deficit: expenditure switching and expenditure reduction policies. This assumption is entailed in basic Keynesian adjustment models, which assume that if net national saving (savings-investment) is not sufficient to finance a budget deficit, it will be financed by foreigners and *vice versa* for an improvement in the budget balance. The model is a real economy model, and therefore only certain types of stabilisation policies can be examined. The starting point of our analysis is a situation where political stability has been restored, since without it stabilisation efforts are unlikely to take place or to succeed.

The paper concentrates on analysing and comparing the impacts of a real exchange-rate devaluation (expenditure switching) and expenditure reduction in the form of cuts in tax rates or a reduction in government consumption. The latter also directly aims to improve the budget balance, which has deteriorated severely in Zimbabwe. Expenditure switching should produce a direct impact on exports, for instance via changes in the exchange rate or tariffs. The impact of expenditure reduction on the current account is more indirect. Expenditure reduction should lead to a fall in the demand for imports and domestically produced goods, which would improve the current account balance. A reduction in domestic expenditure might also induce a switch in production from domestically marketed goods towards exports, assuming the demand for exports is elastic. Expenditure switching and expenditure reduction often need to be implemented together to ensure successful stabilisation.

The results suggest that a devaluation that removes the current account balance can be contractionary. The agricultural and export sectors benefit, but others lose out and in aggregate GDP falls. Real incomes rise for agriculture-related households and fall for urban households. The result entails the assumption that the agricultural sector has the capacity to respond to the devaluation stimuli, which in reality may be limited. In practice, this will first require a political change and investment in the sector.

As already mentioned, it turns out that, because of model features, we are unable to compare expenditure reduction and switching policies as tools to improve the external balance in the model framework, since the former is unlikely to affect the external balance as expected. The result arises due to assumptions about the macroeconomic balance, especially a strong reliance on the assumption that government savings crowd out/in private savings. The model seems to ignore some economic effects, which results in quite extreme outcomes, and casts doubt on the distributional effects of expenditure reduction. This part of the analysis therefore serves as a critique and not for policy recommendation purpose.

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[3] http://www.ifpri.org/pubs/microcom/micro5.htm

[4] Large number of individual papers, but for another economy-wide modelling forum, see the MIMAP project, Siddiqui and Kemal (2002) and Pradhan and Sahoo (1998). MIMAP stands for Micro Impact of Macro Adjustment Policies, a project funded by IDRC, Canada, http://web.idrc.ca/ev_en.php ?ID=6875_201&ID2=DO_TOPIC.

For the model to generate more balanced outcomes and be used for policy prescription, expenditure reduction should be combined with expenditure switching that directly changes the prices of tradables, for instance a devaluation. The paper moves on to compare briefly the impacts of various combinations, such as a tax cut combined with devaluation or reduction in government consumption and devaluation. The outcomes of a combined policy still rely predominantly, however, on the outcomes of single policies. Alternatively, the closure rules should be changed to achieve more balanced outcomes. The paper discusses a few options and briefly describes the results of a structuralist (in contrast to the more neoclassical assumptions of the IFPRI model) model for Zimbabwe that behaves somewhat differently.

Some caution is needed about the magnitudes of change when interpreting the results. The original data set (see note 3 for data source) was based on the economic situation in 1991. As there have been changes in the economic structure, this data set was altered slightly to take this into account. However, as the data only provide an approximation of the situation, the results need to be interpreted approximately as well. The other concern is that the model does not accurately take into account the rationing, restrictions and shortages that characterise the economy.

The paper starts out by explaining the foundations of CGE models and describes the IFPRI model in some detail (Chapter 2). It continues with a brief account of the economic situation in Zimbabwe and describes the data set to be used (Chapter 3). Chapter 4 briefly discusses the economic theory behind the policies to be examined and Chapter 5 gives some of the policy results obtained by IFPRI for Zimbabwe. Chapter 6 describes the simulation results in detail. Chapter 7 briefly describes an alternative model and Chapter 8 concludes.

Chapter 2: The Model

2.1 What is a CGE model?

As already mentioned, CGE models are used to analyse the effects of policy changes and different shocks to the economy. Basically an extension of multi-sector input-output and fixed price models CGE models incorporate the indirect effects and price effects of policies. They cover the time period it takes for an economy to arrive at one equilibrium from another after a shock, so that all markets reach an equilibrium. A static model then generates a medium-term solution - a situation after initial disequilibrium, but before dynamic effects set in (Sadoulet and Janvry, 1995). The data requirement is a social accounting matrix (SAM), which is a square matrix that groups together both input-output accounts national income and product accounts. The columns of a SAM traditionally refer to the expenditure and the rows to the income of each account.

An important fact to acknowledge about these models is that the results rely quite heavily on assumptions; this will be reflected in our study. There are different schools of modelling. Traditional neoclassical CGE models are based on Walrasian general equilibrium theory. Firms maximise profits, and wages and prices adjust to equate supply and demand in factor and product markets. Factors of production are therefore fully employed. Structuralist models differ from neoclassical ones in assumptions about macroeconomic balancing mechanisms and in the way markets are cleared. They incorporate features of short-run macromodels, where there can be wage or price rigidities and an equilibrium without market clearance. In these models an equilibrium can therefore be demand-driven. In real side models there are no asset markets, money is neutral and prices are relative. In neoclassical CGE models only relative prices are determined and some price or price index is chosen as a *numéraire* against which all other prices (wages, rental rates etc.) are valued. Often this is the aggregate domestic price. Structuralist models often choose the nominal wages or the exchange rate as a *numéraire*. (Robinson, 2003).[5] The IFPRI model described below incorporates features from both structuralist and neoclassical frameworks.

Some CGE models also incorporate asset markets and financial effects. One example is the OECD maquette model (see Bourguignon et al., 1991 and Robinson, 1991); the more recent World Bank IMMPA model (Agenor et al., 2003) also relies on this type of background. Thissen (1999) surveys this literature. Some dynamism and expectations can also be introduced into CGE models, which equip them to deal better with issues such as economic growth or investment.

2.2 The IFPRI standard model

A detailed description of the IFPRI model can be found in Löfgren et al. (2002). The model is presented only briefly here. Some of the key model equations related to production and prices can be found in Appendix 1.

In the model, policy shocks cause changes in relative prices. An adjustment process leads to a new equilibrium, where demand equals supply in each market. There is no inflation as the consumer price index (CPI) is the *numéraire*, but relative prices can change. The CPI is based on composite commodity prices (a composite of imports and domestic goods).

Production is carried out by activities that maximise their profits, subject to a production function and given prices of their inputs, outputs and factors. There is perfect competition. Within each

[5] See this reference also for a concise account of a few standard CGE modelling approaches with references to appropriate literature and a brief discussion on the benefits and shortcomings.

activity, top-level production is determined according to a Leontief function. This implies zero substitutability between factors of production (value-added) and intermediate inputs in production, which introduces some rigidity to the model. Substitutability between intermediate inputs is also characterised by a Leontief function, but between factors by a constant elasticity of substitution (CES) function (see Appendix 1, equations 3 and 4). The first step in the production process is to generate aggregate marketed domestic output from the output of different activities. This aggregation is based on a CES production function, and here the demand for output of each activity is based on minimising the cost of supplying a given quantity of aggregated output. Activity-specific commodity prices will clear the market for each disaggregated commodity.

At the next stage aggregate domestic output is allocated between domestic sales and exports based on suppliers' revenue maximisation. Profits are maximised subject to given prices, fixed quantity of total output and imperfect transformability between domestic sales and exports expressed by a constant elasticity of transformation (CET) function (see Appendix 1, equations 2, 5, 6). Export supply is therefore determined by the domestic price of exports relative to the supply price of domestic goods. The domestic price of exports is simply the world price of exports adjusted by export taxes and the exchange rate. The world price is given. As there are no export taxes and the real exchange-rate is exogenous in our set-up, the domestic price of exports stays fixed unless the real exchange rate changes. The country is thereby characterised as a smalI, open price-taking economy. In the model an increase in the export-domestic price ratio generates an increase in the export-domestic demand ratio. Export demand is infinitely elastic at the given world price.

Domestic demand consists of demand by households, government consumption, investment and intermediate inputs. If a commodity is imported, domestic demand is for a composite commodity made up of imports and domestic goods. The optimal mix between the demand for imports and domestic output is based on cost minimisation (see Appendix 1, equations 1, 8, 9 for first order conditions for minimisation). Domestic output and imports are imperfect substitutes again expressed in the model via a CES aggregation function. This so-called Armington assumption generally allows a certain amount of independence of the domestic price system from the international and hinders unrealistic export and import responses to policy changes. The supply of imports is infinitely elastic at given world prices. The domestic price of imports is the given world price adjusted by the exchange rate and tariffs, both of which are exogenous in our set-up. In the domestic markets, flexible prices equate demand and supply.

Households receive income from factors of production and transfers from institutions namely the government and other households. The government receives income from taxes and transfers from the rest of the world, which it spends on consumption and transfers. The household saves, consumes, and pays direct taxes and transfers. The behaviour of the direct tax and savings shares is linked to chosen closure rules for government and savings-investment balance (see below). Household consumption is allocated across different products according to a linear expenditure system (LES),[6] which in this case simply means that consumption of individual commodities by each household is a linear function of total consumption expenditure. Different households consume different shares of each commodity and have different elasticities of market demand for each commodity. More details on the institutions will be provided in the section describing the data (Chapter 3).

The key elasticities are those for factor and intermediate input substitution in production, the elasticity of transformation (CET) for allocation of output between domestic sales and exports and the elasticity of substitution (CES) between demand for domestic and imported goods. The elasticity values used in this analysis are shown in Chapter 3.

The macro closures in CGE models govern the mechanism by which the three macro balances – the current government balance, the current account balance and the savings and investment balance – are determined. The choice of model closure rules, in other words beliefs about how an

[6]This refers to the first order conditions that result when households maximise a Stone-Geary utility function subject to a consumption expenditure constraint.

economy functions, has an important effect on the model results. Below is a brief description of these rules.

i) Government balance

The following equations relate to the government balance:

(1) $R_G = E_G + S_G$

(2) $E_G = C_G + \text{transfers}$

where R_G = government revenue, E_G = government current spending, C_G = government consumption and S_G = government savings

There are basically two closure rule options for the government balance. One is a rule where direct tax rates are fixed, but the real fiscal balance adjusts if government revenue receipts change. The other option uses flexible direct tax rates and fixed government savings. For a developing country the latter may be unrealistic (at least in the short run). This study uses the first option, as it is more realistic and because the assumption of flexible tax rates does not allow for simulations, where tax rates would be changed. The results are not fundamentally affected by this choice of closure. Government consumption is exogenous, but does not include government investment.

ii) Savings-Investment balance

The savings-investment balance is

(3) $S_{NG} + S_G + S_F = I$

where S = savings, NG =non-governmental, G = governmental, F = foreign, I = investment

There are various options for this closure in the IFPRI model, but investment will always depend solely on savings. This is characteristic of static neoclassical CGE models. Savings, on the other hand, are determined by various factors. Because of the sensitivity of the results to closures, we apply two different investment closures. In the first case (assumption set I) we assume investment-driven savings and that marginal propensity to save (private) adjusts to maintain the equality between savings and investment. In the second case (assumption set II) we assume savings-driven investment and fixed marginal propensity to save. In other words, real investment expenditure adjusts to equal the volume of savings available to finance it. An additional savings-investment closure option in the model is to assume fixed capital formation as well as fixed government consumption absorption shares, but flexible marginal propensity to save (not used in this study).

Work carried out by IFPRI on Zimbabwe mainly uses the savings-driven investment closure (see, for example, Bautista et al., 2002). Depending on the policy, the results can differ considerably under the two closures. As de Maio et al. (1999) claim in a critique of a CGE model of African economies, different closures lead to quite different welfare effects. These authors strongly criticise the use of flexible investment and mobile, fully employed factors, especially in less developed African countries. Although these assumptions may apply in the long run, in the short run they are much less likely to be valid. The welfare impacts from adopting more rigid closures and assumptions are more adverse. It is often because of short-run rigidities that much of the harm of economic reform is done to the poor. Thus, in addition to the medium- and long-term effects, it is also important to look at the short-run impacts, if possible.

iii) External balance

Foreign savings are the difference between receipts and expenditures of foreign exchange. Unless the exchange rate changes, the only variables that affect the balance are exports and imports.

Transfers between the rest of the world and domestic institutions and factors (net transfers) are fixed in foreign currency. In the model either the real exchange rate or the current account deficit adjusts to maintain the external balance. If we wish to examine the impact of a devaluation, the real exchange rate needs to be set exogenously and the current account will move to balance the external account. The external balance is determined in relation to the rest of the world as

(4) $M + \text{net transfers} - X_I = S_F$

where M = imports of goods and services, X = exports of goods and services, and S_F = foreign savings (trade deficit)

iv) Factor markets

Factor market closures determine the mechanisms that equilibrate the supply and demand of factors. In line with general equilibrium theory, each activity uses a set of factors up to the point where the marginal revenue product of each factor equals its wage. There are two wage variables: the economy-wide wage, and an activity-specific wage that is the product of the economy-wide wage and an activity specific wage or distortion term. The wages are expressed subject to the numéraire and are thereby real. This means that whenever certain wages are fixed in our analysis later on, these refer to the real wage. There are basically three closure variations: a factor is fully employed and mobile, is fully employed and immobile, or is mobile but can be unemployed.

In the first case the quantity of each factor supplied is fixed. The economy-wide wage rate varies to equate the supply and demand for factors. In the second case, each activity is forced to hire the observed quantity of a factor, which means that the demand for the factor is fixed. The economy-wide wage is fixed, but the factor supply and the activity-specific wages are flexible. In the third case, supply and demand are flexible, whereas both the economy-wide and activity-specific wages are fixed. The factor market assumptions used in this study are described in Chapter 6.

The model is a single-period comparative static model that compares one equilibrium with another. It is not possible to separate short- from long-run effects, but by applying more rigid constraints we can simulate a shorter-run impact. Some combinations of the closure options may not however, produce realistic results in a static model. As an example, let us consider an external closure of flexible foreign savings and a fixed real exchange rate. With a single-period model, we cannot account for negative welfare effects that may be caused in the future by rising foreign debt (if foreign savings adjust by an increase).

Chapter 3: Applying the Model to Zimbabwe: Background

3.1 Zimbabwe's economic situation

Zimbabwe achieved independence in 1980 and set out with the objectives of national unity and economic growth with greater equity. However, since 1997 the country has been in steady and aggravating economic decline and today real income per capita is lower than before Independence. Unemployment, according to some estimates, is as high as 70%. A recent *Economist Intelligence Unit* (EIU) country report (2003) shows that, in terms of GDP per capita (in 2001 around US$480) Zimbabwe has become one of the poorest countries in the Southern African Development Community. An economic outlook (ADB and OECD, 2003) indicates that GDP per capita has fallen to about half the African average, compared with an equal level in 1990. Real GDP per capita growth was -5% in 2000, -8% in 2001 (WDI) and is predicted to be -13% in 2003 (EIU).

There is hyperinflation. Towards the end of 2003, inflation was over 600% and is expected to rise in 2004 (EIU). Real interest rates are negative and price controls are in place on a variety of products. The Zimbabwe dollar has been grossly overvalued for a long time, which has led to the emergence of a large parallel exchange market. As the foreign-exchange shortage persists, the parallel rate flourishes at around Z$6500:US$1 (EIU, 2004). Foreign exchange controls which were abolished by the structural adjustment programmes (1991-95 and 1996-2000) have been reinstated to regulate imports. (Afdb - OECD, 2003.) The official exchange rate of Z$55:U$1 was still in place at the end of 2003, but a separate rate at Z$824:US$1 was set for selected exporters. All other export incentives (tobacco subsidies, floor price of gold) have been suspended. A new system of foreign-currency exchange has been set up recently, by which 25% of foreign-exchange earnings (previously 50%) is to be surrendered to the central bank with the official exporters' rate, and a further 25% is to be sold at an auction organised by the central bank (EIU, 2004). An important reason for clinging on to an overvalued exchange-rate has been that it gives the government the opportunity to import necessities such as food and fuel at a cheaper rate. Land reform and unfavourable conditions have driven an agricultural country to the brink of having to rely on imported food. Other necessities are also in short supply due to lack of foreign exchange. There are also fears that a devaluation might lead to even further hyperinflation.

In terms of economic activity, almost every sector but that of real estate has experienced a sharp downturn. Real estate is blooming because money that might normally have gone into savings is being channelled into property, due to low rates of return. Table 1 shows the aggregate economic structure in 2001 (WDI, 2003). Agricultural production is estimated to have declined by 13% in 2001 and by another 22% in 2002 (partly due to a drought). Auction sales for the major export crop – tobacco – were as low as 80 million kg in the 2003 season, compared with 167 million kg in 2002, and thus the lowest level of production for 20 years (EIU). The land reform has brought considerable changes and has caused the decline of export-oriented agriculture. According to Games (2002), by the end of October 2002 around 97% of the formerly white-owned commercial land had been seized by the government. Only about 600 of the 4,500 commercial farmers had been left on their land.

The volume of industrial production is also falling and the manufacturing sector's share of GDP has decreased from 22% in 1995 to 14% in 2001 (see Table 1). Currently revival is difficult, one reason being that prices often cannot be increased by firms due to the controls on a variety of industrial products. In addition, because of the slowdown in tourism, the service sector may have contracted significantly. The mining sector has already been in crisis for some years, and gold production is falling.

Due to a fairly reasonable tobacco crop and revenue from gold exports, foreign-exchange earnings were still holding up in 2002, but since then they have fallen because of the dramatic reduction in

tobacco and gold exports. As the economy contracts, export earnings are expected to fall further in 2004-5. The EIU's estimate for the current account deficit in 2003 is 10.4% of GDP, and it is predicted to be around the same level in 2004. This chronic shortage of foreign exchange suggests that it is crucial to take measures to improve the external balance. Devaluation has therefore been chosen as one of the policy reforms to be looked at in this study. An EIU report of December 2003 describes how the tobacco farmers have warned the government that, without a devaluation, what is left of the industry will soon collapse. Some claim, however, that a devaluation may not be sufficient to increase export incentives and that there is a need to focus on reviving productivity (Chitiga and Mabugu, 2001).

Table 1: Economic structure of Zimbabwe, 2001

Value added as % of GDP	
Agriculture	18
Industry	24
of which	
Manufacturing	14
Services	58

Source: World Development Indicators (WDI) 2003

Donor support cannot be relied upon as a means of generating foreign exchange, until there is a change in the political scene. Currently sources of funding for Zimbabwe are very limited. Multilaterals such as the World Bank and the International Monetary Fund have suspended project finance and balance-of-payments support to Zimbabwe (Games, 2002). The IMF has already adopted a policy of non-cooperation, because of the country's overdue financial obligations. The government has borrowed to finance the budget deficit, which has only accelerated inflation.

In addition to political tensions and the land reform, many see fiscal mismanagement as one of the key contributors to the economic decline and the failure of the adjustment programmes to deliver growth and poverty reduction. The fiscal problems have a long history. Zimbabwe is highly indebted because of an accumulation of debt during the closed economy period of the 1980s and post-Independence restructuring. The 1990 figure for total debt as a percentage of exports was 160% that for 2001 190% (GDF). Estimates of the budget deficit vary. After grants it reached 21% of GDP in 2000; the figure for 2003 was lower, around 7.5% of GDP. However, official figures for deficits tend to be underestimated as they do not include off-balance-sheet financing, such as loans to parastatals or the 'currency subsidies' currently offered to exporters (EIU, 2004).

The fiscal situation means that, in addition to improving the foreign balance and the availability of foreign exchange, efforts to improve the fiscal balance are also required. However, the government has a number of fiscal obligations. Importantly, it will need to devote funds to resettled farmers in order to revive agricultural production. The agricultural sector cannot respond easily to export incentives without resources, and the productive capacity of the manufacturing sector has been in decline for years. There is therefore a need to seek new areas of activity and specialisation as well as encouraging existing ones. Severe unemployment and decreasing real incomes also put a constraint on domestic demand that can delay adjustment. Investment opportunities may be constrained in the short run due to the foreign-exchange shortage. Before a number of more structural issues are, however, confronted, the immediate objective should be macroeconomic stabilisation. It is widely agreed that a political change is required for a credible stabilisation programme to be implemented.

This description illustrates that there may be some difficulties in using a CGE model to analyse policy impacts in Zimbabwe, as there are supply constraints and parallel exchange markets. A market equilibrium approach may seem unrealistic. This is however, a normal problem with equilibrium models. We take these problems as more or less given, and will concentrate on some of the other characteristics of the model and the central question of how well it is suited to

comparing expenditure switching and reduction polices for improving the external balance. This was taken as the main policy objective in this paper, although expenditure reduction will also directly reduce the fiscal deficit as required for stabilisation.

3.2 Data

This chapter offers a brief description of the Zimbabwe social accounting matrix (SAM) to be used in this study. We use the IFPRI 1991 SAM, but with a few alterations. This is the most recent SAM produced by IFRPI for Zimbabwe. The year 1991 was chosen as the base year, since the SAM was primarily to be used to analyse the impact of the structural adjustment programmes that started in 1991, and because the following two years were characterised by a severe drought. The original IFPRI matrix is quite detailed, as it includes a large number of sectors (and thus goods). This holds especially for agriculture. It also incorporates some informal activity, and takes smallholder un-marketed production as well as marketing margins into account. All these are important features to cater for when analysing developing countries, but they are often excluded. In particular, marketing margins are reasonably new additions to CGE models.

Although this study uses the IFPRI 1991 SAM as a basis, the data have been readjusted to correspond slightly better to the present situation. The original SAM was obtained from IFPRI,[7] but this paper uses a simplified version of this SAM as a basis,[8] in which the 27 sectors and products have been aggregated to seven. The simplified SAM also does not include marketing margins or non-marketed production. The data were first adjusted manually, but the changes made were not radical. They were then recalibrated using the IFPRI SAM balancing programme to achieve a balance in all accounts.[9] The values of production for each activity were adjusted to resemble the economic structure of 2001 (as in Table 1), so that the value-added share of a certain activity of total value-added (by all activities) changed. The shares of specific types of labour or capital in the total production of an activity remain closely alike, as do the consumption patterns of households. However, payments to different factors as a share of total factor payments (of all activities) change as the value of production and thus the values of factor and intermediate inputs change within each activity. The adjustment does not take into account patterns of change that may have occurred in the share of informal labour in each activity, which may have risen. Thus the adjustment is only a partial attempt to capture changes in the economy. However, this does not weaken the purpose of assessing the suitability of the model to compare policy options.

The current situation in Zimbabwe does have some similarities to that in 1991. The economy had only just embarked on its adjustment programme. During the 1980s Zimbabwe had a large budget deficit (on average 8.4 % of GDP annually), heavy external borrowing, slow export growth, import-protection policies, and an administered and overvalued exchange rate. (Bautista et al., 2002).

A detailed description of the original Zimbabwe data set can be found in Bautista and Thomas (1999). The SAM we use covers the following accounts:

Sectors and products
Agricultural exports (mostly large-scale production)
All other agricultural activity
Mining
Food processing
Manufacturing

[7] From Marcelle Thomas
[8] On the IFPRI website (footnote 3) as a part of a set of model input files.
[9] The objective function of the SAM balancing programme is a cross-entropy distance from the initial SAM coefficients for the entire matrix rather than for column sums. The method approximates to the restricted additive Schwarz (RAS) procedure except that the only restrictions are that column and row sums be equal. It is not necessary to know the column sums.

Heavy industry
Services (includes trade and transport)

Factors:
Unskilled large-scale farm labour
Unskilled informal labour
Unskilled formal labour
Skilled labour
Capital, agricultural
Capital, other
Land, large-scale
Land, smallholder

Institutions:
Large-scale farm owner and manager households
Large-scale farm worker households
Smallholder farm households (largest household group)
Urban high income households
Urban low income households
Enterprises (non-agricultural)
Government
Rest of the World (RoW)

Other accounts:
Savings-Investment

In addition, the matrix includes a number of tax accounts: import tariffs and direct (income) and indirect (activity revenue) taxes. The government does not have a separate capital account, so only the current account can be looked at. In 1991 (year of the data set) the current fiscal account contributed about 30 % of the overall fiscal deficit. The current government budget deficit in our data is about 2% of GDP.

The social accounting matrix in Appendix 2 gives the details on the spending and revenue of each account. The columns in each case refer to the expenditure of each account (activity, household, etc.) and the rows to revenues. There are 5 household groups. CGE models can account for welfare or income changes between household groups, but not intra-household changes. Marginal propensity to save is different for each household type, large-scale agricultural and high-income urban households have higher propensities to save because of higher incomes.

Government consumption is by far the highest for services. Government consumption can only be broken down into goods; no further specification is available. The government does not have a capital account, which means that government investment cannot be specified. It is not part of government consumption, but is captured by government savings. Government transfers to urban households are in aggregate less than those to farm households. But enterprises receive the most as a single group. Enterprises receive income from capital and government, but do not consume. Enterprises pay transfers to higher-income households, both agricultural and urban. In this aggregated data there is no home consumption.

Between 1991 and 2001 manufacturing has clearly contributed less and services more to GDP. Manufactures and industrial production as well as export agriculture were scaled down, whereas production of the service sector has been increased. Production of non-export agriculture has not changed. The export shares of each activity have been changed to match changes in production. The value-added shares used in this study are as follows: agriculture (14%), industry (33%) of which manufacturing takes up 17%, and the service sector (52%). This resembles approximately the 2001 situation (Table 1), assuming that the share of agriculture in GDP has contracted further.

Zimbabwe's export structure in 1999 was roughly the following (Hess, 2001) excluding the service sector, agriculture: 40%, manufacturing, 21%, crude materials, 15%, food exports, 16%, machinery, 5-6%, chemicals, 3%. This corresponds approximately to the export shares in our data, where we exclude services, the share of agriculture in exports is 40%, mining 16%, food processing 10% and light manufacturing 32%. If we include services, agriculture gets a share of 32%, light manufacturing 23%, and services account for 25%. The share of agricultural exports is likely to be smaller at the moment.

The current account deficit is 6% of GDP (at factor cost). This is less than the values for 2003 (see Chapter 3). Some changes may have occurred in tariffs and tax rates between 1991 and now, but tax revenue seems to have taken up a relatively similar (large) proportion of GDP over the years (EIU, 2003).

Table 2 shows the elasticity values used in this study. They are those selected by the IFPRI team and are based on careful analysis. IFPRI have done some sensitivity analysis with both higher and lower values of certain elasticities. For all of their policy simulations, the different elasticity sets produce qualitatively similar results. Some random testing showed that the directions of change will remain similar, even if the values change. Some doubts can be expressed about the values, for instance that the elasticity of transformation for manufacturing products might be lower than 4, which indicates that these products are more easily converted to external market use than, say, agricultural products.

Table 2: Key elasticities

Trade elasticities for goods	**Armington**	**CET**
Agricultural exports	4.5	2.5
Other agriculture	4.5	2.5
Mining	1.1	4.0
Food processing	1.9	4.0
Light manufacturing	2.3	4.0
Heavy industry	1.5	1.5
Services	0.8	1.0
Elasticity of substitution between factors		
Agricultural exports	0.8	
Other agriculture	0.8	
Mining	0.5	
Food processing	1.5	
Light manufacturing	0.5	
Heavy industry	1.5	
Services	1.5	

Chapter 4: The Impacts of Stabilisation Policies: Theory

Devaluation is an expenditure switching policy. It should function as a tool to boost exports and alleviate the chronic shortage of foreign exchange in the economy. The objective of a nominal devaluation is to influence the real exchange rate, and many of the effects thus relate to changes in the latter. An exchange-rate devaluation makes exports more competitive and should lead to a rise in exports and output in export-oriented sectors. A devaluation affects consumption, because of changes in relative prices. Domestic demand for domestically marketed goods generally rises and that for imports falls. Demand for domestic goods may also rise, because of a higher level of output of traded goods (if devaluation succeeds in bringing this about). The magnitude is affected by the degree of substitutability between imports and domestic goods.

In the short run, a devaluation may have undesirable welfare effects, at least in countries with Zimbabwe's characteristics. As the Zimbabwean government has imported essentials at low rates of exchange, a devaluation will increase the cost of these necessities and critical inputs as well as of other imported inputs, such as capital equipment. If the cost of transport and energy rises, consumers may actually be worse-off, at least in the short run. Real incomes may fall, due to the rising cost of imported inputs. The total impact of the presence of imported inputs is likely to be more negative, the lower the elasticity between imported inputs and primary factors. If the proportion of imported capital goods is high, investment may contract. On the other hand, if wages are fixed and prices rise, profit-earners may gain at the expense of wage-earners and we may see a rise in investment resulting from the increased profitability of capital. Kamas (1992) has shown that, for Colombia, nominal devaluation was more contractionary, the lower the elasticity of substitution between capital and labour and between imported inputs and domestic value added, and the higher the degree of wage indexation. If the nominal devaluation needed is large, it may aggravate inflation. Devaluation might thus need to be supplemented with other policies. (Agenor and Montiel, 1999). In our simulations we can only assess the impact of a real exchange-rate devaluation.

The direct impact of expenditure reduction policies, on the other hand, is to improve the fiscal balance. Improved fiscal management would enhance the chances of achieving other policy objectives and restoring credibility. The eventual failure of the 1990 trade liberalisation attempts, for instance, has been attributed to failures in addressing the fiscal deficit (Mehlum, 2002). As regards financial effects, a reduction in the budget deficit should curb inflation, especially if the government has previously resorted to monetary financing. Similarly, crowding-out effects may be alleviated. If the budget deficit is financed by domestic borrowing, there are limited investment opportunities for the private sector, because of an underdeveloped financial market and a limited supply of credit. These financial effects cannot be assessed with our real economy model, however.

Expenditure reduction can also alleviate a balance-of-payments deficit. If public expenditure is reduced or tax rates are increased, the immediate direct impact is a reduction in consumption and imports. The government consumes less, and so do consumers as disposable incomes fall. The magnitude of the impact will depend somewhat on the elasticity of demand and the extent of reliance on imports. The fall in domestic demand will lower the price for domestically marketed goods relative to that of exports, which should raise the level of exports. As imports fall and exports rise, the current account balance improves. The rise in the share of production to be exported may, however, be counteracted by a fall in total production, which would indicate that the impact on exports is ambiguous. It may also be limited, if export demand and supply are inelastic.

There can also be a monetary link between the external and the budget balance. Generally when a government budget deficit worsens, government borrowing is higher. This may lead to a rise in interest rates, and a capital inflow (assuming open capital markets) that in turn puts upward pressure on the exchange rate. Conversely, a reduction in government borrowing entailing a fall in

interest rates exerts downward pressure on the exchange rate. This will have a detrimental impact on the current account balance. We cannot assess monetary links in this study, however.

Finally, a decrease in government consumption is most likely to lead to a decline in public services, which will have a negative impact on those employed by the sector and can have negative, welfare impacts. If only inefficient consumption is reduced, the effects may not be as negative and in the medium run we may see an increase in incomes and economic activity as resources are redeployed to private activity. Tax increases are most likely to discourage consumption and private investment, and will thus achieve the objective of expenditure reduction, though to some extent this may be offset by a reduction in private savings.

Chapter 5: Previous Research with IFPRI Model

Before turning to the simulation results, a brief account is provided on the work by IFPRI on Zimbabwe. A number of reports have also been produced to analyse the impact of the 1990s liberalisation and adjustment policies with the IFPRI Zimbabwe 1991 SAM. In a recent report, these results are also used to draw lessons for the future (Bautista et al., 2002). In these simulations, a decrease in government consumption alone (so that the fiscal deficit is removed) leads to a fall in GDP and exports. Only small gains in terms of real income occur for households. However, if this is combined with trade liberalisation, maize price decontrol and a tax increase on enterprises and affluent households, GDP and export rise and the income effect is also more equitable. The simulations conclude that the negative real effects of the elimination of the fiscal deficit are alleviated by trade liberalisation.

An increase in tax rates combined with a reduction in government consumption obviously hurts those who are taxed. Bautista et al. (2002), however, believe this to be equitable as the agricultural sector is the one that should especially be encouraged and lightly taxed. In the IFPRI SAM, linkages between economic sectors are strong, and multiplier analysis suggests that a set increase in production will generate higher GDP when it is associated with agriculture (highest in the case of smallholder production). Increases in household incomes also tend to generate the largest increase in GDP if the increases are given to low-income farmer households. The analysis suggests that, in order to achieve equitable growth, policy packages should try to address the agricultural sector, in particular.

As the data are somewhat outdated and some of the model features are rigid, the most practical lessons to be learned from the IFPRI analysis for the present context probably relate to land reform. The simulations give some indication of what might have been the best ways to carry out the land reform instead of the recent illegal seizures that have had a devastating impact on the economy. As we are not discussing land reform in this study, we provide only a brief summary. A land reform that would entail the paid transfer of under-utilised land from large-scale landowners to small-scale, coupled with land taxation rates which are much higher for the large-scale than for smallholder landowners, is seen as a good option. However, for this to yield the best results in terms of growth and equity, it should be accompanied by a package of trade liberalisation, maize price decontrol and income tax adjustment.

Chapter 6: Analysis of Simulation Results

We shall now present the results of a few policy simulations with the revised data set, and discuss their validity. All of the simulations were carried out with GAMS software.

Tables 3-7 all changes in prices, incomes and values should be treated in relation to the consumer price index (CPI), which is the *numéraire* (set to 1). The model only determines relative prices. The absolute price level is not determined. All changes to be reported should therefore be interpreted as real. There is one table for each simulation, and it shows the results under both assumption sets I (savings-driven investment) and II (investment-driven savings). The results are shown as percentage changes from the base values for each simulation and each variable. The base values, which will remain the same for all simulations, are shown in Table 3. The percentage changes reported in Tables 4-7 are therefore shown with respect to these values. However for the government and the external balance, only actual values instead of percentage changes, are shown, since changes from a negative value to a positive value (or vice versa) are observed, which renders percentage calculations meaningless.

We report changes in key economic indicators and factor and institutional incomes. Institutional incomes are used as the primary distributional measure, although this will not take into account the actual spending patterns.

In our simulations we assume that skilled labour is fully employed and mobile; in other words, this means that the supply of this labour is fixed and flexible wages adjust to equalise demand and supply. This assumption is used, because there is generally a shortage of skilled workers in developing economies and particularly in present-day Zimbabwe, which is suffering from a brain drain. However, for the other labour categories unemployment is possible, which is achieved by fixing real wages (see Chapter 2). The high level of unemployment in present-day Zimbabwe will delay economic adjustment, and it needs to be incorporated into our model. We assume that land is fully used and thereby supply is fixed, but the overall returns from land vary.

If savings are investment-driven (assumption set I), we assume that capital is sector-specific but is always fully employed. This means that the demand for capital is fixed. This is more of a short-run closure, but as we make a quite clear distinction between economic activities/sectors it is not altogether unrealistic. With assumption set II (savings-driven investment), capital is mobile. All other assumptions remain the same. Assumption set I portrays a framework with market rigidities, which is quite suitable for present-day Zimbabwe, where investment opportunities are limited. Although we cannot distinguish between the short and long run, it is likely that the short-run effects are portrayed by the results of assumption set I, whereas the longer-run effects are more similar to those of assumption set II. Both sets are somewhat extreme and the impact in reality can lie between the two. Comparisons between individual policies should be made primarily within the same set of assumptions. The choice to report the results of both sets is taken partly to illustrate the model's features, and to reinforce that the features criticised are not just characteristic of a certain set of assumptions.

The first experiment to be analysed is a devaluation that would eliminate the current account deficit. We then proceed to look at the various fiscal options. This will highlight some of the problems faced in trying to compare the effects of alternative policies with the model. To end with, we look at a few policy combinations that give a more balanced result. In all the result tables which follow, the simulated percentage changes were chosen so that either the current or the budget deficit or both were completely eliminated. Therefore these percentage changes may differ between simulations, as well as, between the two assumption sets. The percentage changes in each case are shown in parentheses in the tables. In order to understand the distributional impacts of policies, it is useful to observe the origins and destinations of factor payments (from which activities to which households) from the SAM in Appendix 2.

Table 3: Base case (Zim$ billion)

GDP and national accounts	Base	Household consumption	Base
Absorption	30.6	**expenditure**	
Private consumption	20.0	Large-scale owner and manager	7.1
Fixed investment	5.5	Large-scale farm worker	0.1
Government consumption	5.1	Smallholder households	1.7
Exports	7.3	Urban high-income	9.0
Imports	-8.4	Urban low-income	2.1
Net indirect taxes	3.5		
GDP at factor cost	26.1	**Factor income**	
		Unskilled large scale farm labour	0.1
Foreign savings		Unskilled formal labour	0.8
(base value = 1.5)	1.5	Unskilled informal labour	2.2
		Skilled labour	9.8
Government savings		Agricultural capital	1.8
(base value = -0.50)	-0.5	Other capital	10.8
		Large-scale land	0.4
Quantity of aggregate value added		Smallholder land	0.1
Agricultural exports	2.0	**Income of domestic institutions**	
Other agriculture	1.7	Large-scale owner and manager	9.1
Mining	1.1	Large-scale farm worker	0.1
Food processing	1.8	Smallholder households	1.8
Light manufacturing	4.5	Urban high-income	12.3
Heavy industry	1.4	Urban low-income	2.6
Services	13.6	Enterprises	11.4

6.1 Devaluation

CGE models are not well equipped to take account of the dualism in an exchange-rate system such as that which exists in Zimbabwe. In the model the devaluation is simply treated as an increase in the domestic prices of tradable goods (see Appendix 1, equations 7 and 10) and foreign transfers. World prices are not affected. The base current account deficit figure corresponds to the amount of foreign savings shown in Table 3, in other words a deficit (despite being positive). In the model foreign savings fall as the current account balance improves (see equation 4). The results for a devaluation under both assumption sets are shown in Table 4.

6.1.1 Devaluation with set I

Under assumption set I, exports rise by 12%, whereas imports fall. As the (domestic) price of exports rises relative to the price of domestic goods, more is exported. These are predicted events. The devaluation however, generates a slump in economic activity. GDP at factor cost falls by 0.4%. GDP here is based on value-added and only values at factor cost are shown. In terms of changes in value-added, the sector for traded agricultural goods performs best. Value-added rises also in light manufacturing and mining. In all the other sectors, value-added falls, the most in percentage terms for non-export agriculture (-6%). The general explanation is that resources are diverted to the export sectors, to the extent that this is possible with limited investment opportunities (fixed investment and immobile capital). Labour is therefore the adjusting factor.

There is a rise in the relative price of intermediate products for all except other agriculture and food processing. Composite commodity prices rise for some goods, as imported goods become more expensive (not shown in table). Although the model takes no account of inflation (the absolute price level is not determined), these changes in relative prices could, however, explain

some of the fall in real value-added in the less export-oriented sectors and associated real incomes (to be explained below). Investment remains constant, but imported capital goods become more expensive. Only those activities that experience a clear rise in exports, such as large-scale agriculture, gain (activity-specific exports are not shown here).[10]

The changes in both factor and institutional incomes are shown as an aggregate for each group, not for individual households. The income values shown in both Tables 3 and 4 show gross incomes, but as tax rates remain constant, this is of no concern. Returns to both types of capital rise, but this rise is much larger to agricultural capital. Real income rises for the large-scale agricultural households and enterprises. Enterprises gain, due to rises in capital income. The relative price for large-scale agriculture products rises. Despite capital gains, large-scale farm owners lose out, as income from capital constitutes a smaller part of their factor earnings than labour income, which falls (skilled labour). As real wages for unskilled agricultural households are fixed, changes in factor incomes indicate that more or less of this type of workforce is employed. The urban unemployment problem may worsen as both heavy industry and food processing lose out. Incomes for urban households fall.

Household consumption in general falls. This could be due to rises in some relative prices, but is also because of the fall in incomes for workers within the sectors oriented more towards the domestic market. The technical explanation is that, as the current account balance improves, foreign savings fall and marginal propensity to save (MPS) must rise to finance investment, which by construction is fixed (see equation 3). The result of increased savings might be reasonable in the short run, when consumption opportunities are limited. However, in reality the negative real interest rates in present-day Zimbabwe do not exactly encourage saving and a change in interest-rate policy would be required.

As the model assumes no direct link between foreign savings and the government balance, the latter does not change noticeably. It worsens slightly. Indirect tax revenue falls as the activities that are taxed most heavily – services and heavy industry – lose out. As the volume of imports falls, so does tariff revenue.

Table 4: Devaluation

Economic effects			**Household consumption**	**I**	**II**
GDP and national accounts	**I (6.5%)**	**II (2.8%)**	**expenditure**	%	%
	%	%	Large scale owner and manager	-9.3	0.9
Absorption	-6.0	-5.9	Large scale farm worker	-1.8	5.8
Private consumption	-9.2	-0.4	Small holder households	-8.2	1.3
Fixed investment		-31.7	Urban high-income	-9.4	-1.6
Exports	12.2	10.4	Urban low income	-8.7	-1.0
Imports	-7.7	-9.4			
Net indirect taxes	-5.5	-7.0	**Income effects**		
GDP at factor cost	-0.4	-0.1	**Factor income**	**I**	**II**
				%	%
Prices of intermediate	**I**	**II**	Unskilled large-scale farm labour	4.2	5.8
aggregate	**%**	**%**	Unskilled formal labour	-2.0	-2.9
Agricultural exports	0.4	-0.7	Unskilled informal labour	-3.8	-0.2
Other agriculture	-1.0	-0.1	Skilled labour	-1.5	-1.7
Mining	2.6	-0.4	Agricultural capital	4.6	7.7
Food processing	-1.2	0.4	Other capital	0.4	-1.1
Light manufacturing	2.7	-0.1	Large-scale land	4.3	7.7
Heavy industry	3.5	-0.3	Smallholder land	-4.1	6.8
Services	2.4	0.0			

[10] Full results available from author on request

Economic effects			Household consumption	I	II
			Income of domestic	**I**	**II**
Foreign savings	**I**	**II**	**institutions**	%	%
(base value = 1.5)	0.0	0.0	Large-scale owner and manager	-2.8	0.8
			Large-scale farm worker	5.0	5.9
Government savings	**I**	**II**	Smallholder households	-2.5	1.3
(base value = -0.50)	-0.6	-0.7	Urban high-income	-2.7	-1.6
			Urban low-income	-2.7	-1.0
Quantity of aggregate	**I**	**II**	Enterprises	0.1	-1.2
value added	%	%			
Agricultural exports	7.0	3.0			
Other agriculture	-6.0	1.1			
Mining	2.1	10.7			
Food processing	-1.9	2.9			
Light manufacturing	2.2	1.1			
Heavy industry	-0.7	-22.4			
Services	-1.6	-0.1			

6.1.2 Devaluation with set II

Under assumption set II (more market flexibility), GDP falls by only 0.1% less than in case I. Agricultural activities, mining and light manufacturing benefit in terms of value-added, but export agriculture benefits the most. In contrast, value-added for heavy industry falls by as much as 22%. This is the reason for the large fall in investment. On average the prices of output, intermediate goods (in table 4 referred to as intermediate aggregate) or composite commodities do not rise. This again is due to the fall in investment, which lowers the relative price especially of goods for the domestic market. As more capital-intensive sectors lose out, investment contracts. The technical reason for the drop in investment is the fall in foreign savings or the improvement in the current account and gains in the less capital-intensive agricultural sectors. These gains are not great enough to compensate for the fall in investment.

Incomes for all farm workers or agricultural households rise. Other households and enterprises lose out. The policy is clearly biased against urban households. Despite the devaluation, the export sector is not capable of generating enough gains, as GDP still falls. The budget deficit worsens slightly, as net indirect and direct tax revenue falls. The less export-oriented sectors that now lose out were the ones with the highest activity taxes (heavy industry).

Although the changes in consumption (case I) or investment (case II) are large, partly due to balancing assumptions, the results of the devaluation are fairly plausible. They highlight that, although the devaluation improves the external balance, it may have contractionary effects if the domestic market-oriented sectors lose out significantly and the incomes of non-export-related households fall. The effects on incomes and value-added are more accentuated and less equal under assumption set II than I, since there is more flexibility to respond to incentives. However, more households gain under set II. Constraints on the movement to more export-oriented sectors have become smaller, and the relative prices for intermediate aggregates or supply do not rise.

The results suggest that devaluation should be complemented with a policy that both improves the fiscal balance and reduces some of the negative distributional impacts on the non-export sectors. There are effects that the model obviously cannot capture, such as the impact on the government as it loses access to foreign markets at an overvalued rate and assumptions about the ability of exporters to respond to incentives offered by a devaluation. The latter may in practice be even lower than we have assumed, although some of it is accounted for by the data adjustments for the shares of agriculture in total production and exports.

We have used a low value of elasticity between factors and intermediate inputs, which may to some extent lie behind the contraction of output, but this seems like a more realistic assumption of the present Zimbabwe economy. Secondly, the labour market rigidities introduced also shape the results somewhat. If we had assumed full employment and mobility for all factors, which is not, however, realistic for Zimbabwe, case II would have led to a small rise in GDP at factor cost. The results hold in general, although the magnitudes are different, if the devaluation had been smaller.

6.2 Fiscal policy

This section looks at the impacts of expenditure reduction policy and explains why this policy does not function as a tool to alleviate the problems of external balance in the model. As the model is a real one, the monetary aspects of lower fiscal deficits – the impact on inflation or interest rates – cannot be explored. Economic intuition suggests that expenditure reduction should have some impact on the current account balance as it is likely to generate a fall in imports and a rise in exports due to the fall in prices for domestically marketed goods. The impact may not however, be as large as a devaluation or another direct expenditure switching policy, since it is more indirect. The two policies looked at are a reduction in government consumption and an increase in direct tax rates. In the model these policies function to lower only the fiscal, but not the current account, deficit.

6.2.1 Government consumption

As the direct aim of expenditure reduction in the model framework is to reduce the fiscal deficit and as it is desirable to use a benchmark, the amount of reduction is chosen to be such that it eliminates the budget deficit in all cases. With our data set, a 9% reduction in government consumption is required under both assumption sets I and II. The results are shown in Table 5.

Reduction in government consumption with set I

Using assumption set I, GDP falls by 0.2%. Aggregate value-added rises for all sectors other than services. Private consumption in aggregate rises (2%). The reduction in government consumption seems to stimulate private expenditure. The fall in the value-added of the service sector (including public services) (-1%) is large enough to generate a contraction in total value-added. This means that some labour is released and may move between sectors or be left unemployed (in the groups where this is possible). Exports fall by 0.2%, but imports rise by 0.4% and so the current account balance actually worsens (to -1.6%). One reason why the quantity of exports does not change much is that the real exchange rate does not change, and therefore neither does the domestic price of exports. The closure rule for the external balance dictates that either the real exchange rate or the external balance is to be set exogenously.

In our data, government consumption (including all public expenditure other than transfers, but it cannot be broken down further) does not comprise expenditures on agricultural products. Non-agricultural activities have been more reliant on government spending and lose out. Bautista et al. (2002) reach the same conclusion; their interpretation is that it is due to the previous neglect of agricultural households. The service sector contracts, because value-added in government services falls as public expenditure is reduced. This reduction also reduces the procurement of private services as well as intermediate demand for services. The observed increase in private consumption rises most for non-export agricultural products, but as the service sector comes next, this effect does not explain the fall in value-added in the latter.

A high proportion of skilled and unskilled formal workers are employed by the service sector. This explains the fall in incomes for urban households. Factor incomes rise for agriculture-related factors (but not informal unskilled labour), but fall for others. The same holds for real household incomes.

The income changes may appear reasonable, but the fact that private consumption actually rises for all households is somewhat contradictory. Technically, this occurs because the improvement in the fiscal balance (rise in government savings) needs to be compensated with a fall in private savings and therefore marginal propensity to save in order to keep investment fixed. In the model, as export prices do not change, there is only a negligible impact on exports, and in the wrong direction. Therefore private savings and thus consumption take on the responsibility of balancing the investment account. The outcome resembles that of a closed rather than an open economy setting.

As even the standard mechanism by which government consumption might crowd-out private – the interest rate – is not included in the model, a rise in private consumption due to reduction in government expenditure seems economically unintuitive. Had there been a possibility for foreign savings to absorb some of the change from government expenditure, we might have observed somewhat different distributional effects, for instance less of a fall in service sector activity and more proportional benefits for the export sectors. Private consumption could even have fallen for some groups.

To implement the desired result, the model would have to incorporate a closure, where both the exchange rate and the current account balance are endogenous. As the real exchange rate does not change, the impact on the current account is minimal and unexpected. However, as was explained in chapter 4, the current account balance could improve, even without a change in export prices. Because of the reduction in government consumption, domestic consumption and imports might initially fall. The initial impact on imports may be small, as in our data set (see Appendix 2) the government does not import much. A test was performed, however, with a data set where the amount of imports in the economy was increased, but the impact was no different. The fall in demand for domestically marketed goods would lower the price for these goods. This would lead to an increase in the price of export goods relative to domestically marketed goods. Exports would rise, as in the model an increase in the export: domestic price ratio generates an increase in the export: domestic demand ratio (see Appendix 1, equation 6). This and the reduction in imports would improve the current account balance. All these effects should be possible within the model framework; nevertheless, the current account balance does not improve.

One reason is that closure-forced effects tend to overshadow other realistic effects. When government savings increase, the marginal propensity to save for non-governmental institutions falls. This impact counteracts the fall that should have occurred in the demand for domestically marketed goods and imports. It appears as if the rise in consumption required for an investment-savings balance takes place before the decision to divide total output between exports and domestic production is made. Domestic absorption (Table 5) and the aggregate price for domestically marketed goods rise. There is no reason for exports to rise; they may even fall.

Table 5: Reduction in government consumption (by 9%)

Economic effects			**Household consumption**	**I**	**II**
GDP and national accounts	**I**	**II**	**expenditure**	**%**	%
	%	**%**	Large-scale owner and manager	4.0	0.1
Absorption	0.1	0.4	Large-scale farm worker	4.2	0.4
Private consumption	2.4	-0.1	Smallholder households	2.5	-0.2
Fixed investment		11.1	Urban high-income	1.4	-0.2
Government consumption	-9.0	-9.0	Urban low income	0.9	-0.4
Exports	-0.2	0.4			
Imports	0.6	1.6	**Income effects**		
Net indirect taxes	0.3	1.4	**Factor income**	**I**	**II**
GDP at factor cost	-0.2	-0.1		**%**	**%**
			Unskilled large scale farm labour	2.3	0.4
Foreign savings	**I**	**II**	Unskilled formal labour	-2.1	0.0

Economic effects			Household consumption	I	II
(base value = 1.5)	1.6	1.6	Unskilled informal labour	-0.8	-0.6
			Skilled labour	-1.8	-0.3
Government savings	**I**	**II**	Agricultural capital	3.2	0.5
(base value = -0.50)	0.0	0.0	Other capital	-0.1	0.0
			Large-scale land	3.2	0.5
Quantity of aggregate value added	**I %**	**II %**	Smallholder land	4.3	0.1
Agricultural exports	0.1	0.7	**Income of domestic institutions**	**I %**	**II %**
Other agriculture	2.0	-0.5			
Mining	0.4	2.8	Large-scale owner and manager	1.7	0.1
Food processing	1.4	-0.7	Large-scale farm worker	3.0	1.0
Light manufacturing	0.7	1.8	Smallholder households	0.6	-0.2
Heavy industry	0.1	7.7	Urban high-income	-0.8	-0.2
Services	-1.1	-1.8	Urban low-income	-1.1	-0.4
			Enterprises	-0.1	0.0
Price for goods sold and produced domestically (base=1)	**I %**	**II %**			
Agricultural exports	0.46	0.26			
Other agriculture	1.55	0.10			
Mining	-0.02	-0.04			
Food processing	1.62	0.03			
Light manufacturing	-0.02	0.00			
Heavy industry	-0.74	-0.03			
Services	-1.45	-0.05			

Reduction in government consumption with set II

With assumption set II, resources released by the decrease in government spending are now channelled into investment, which rises by 11%. GDP falls by only 0.1%. Value-added rises especially for heavy industry (by 8%), but it also does so for light manufacturing (2%) and mining (3%). The agricultural export sector gains slightly, but services lose out (by 2%). Private consumption remains about the same. All households other than those related to large-scale agriculture are made worse-off in terms of real income mainly because of the contraction of the service sector and related factor incomes. The changes in incomes, however, are all in all fairly small (largest 0.4%).

Despite some increases in exports, the current account balance again worsens. The rise in investment, which increases the demand for imports and domestic market-oriented goods, again counteracts any changes in export incentives. In this case, it is possible that this result is affected by data features. If the export industry in Zimbabwe had also been more geared towards investment, the impact on the export sectors could have been more positive. However, this does not alter the fundamental critique that rises in investment as a result of expenditure reduction are implausible and give rise to distorted distributional outcomes.

What complicates matters in case II is that government investment cannot be distinguished from private investment. We cannot determine what proportion of the change in investment originates from government activities, as government expenditure in this model does not include investment. Income changes are smaller under assumption set II than I, due to the greater ability to adjust.

One might argue that the reduction in government consumption implemented here was rather large and thus gives rise to extreme results. However, the direction of change is not dependent on the amount of the reduction; only the absolute size changes. Expenditure reduction is likely to generate smaller effects on the current account than a devaluation, but in the model expenditure

reduction does not improve the external balance at all. For this reason some of the distributional effects are questionable.

6.2.2 Taxation

An increase in tax rates would be a harsh option for present-day Zimbabwe where there is already high unemployment and poverty is on the increase. It is, however, one other fiscal policy option that can be analysed with our model. We therefore start by illustrating the impacts of an increase in income-tax rates for all domestic institutions by an amount that eliminates the budget deficit. However, as an increase in government consumption did not improve the fiscal balance, it is unlikely that a tax increase will do so either. The results are shown in Table 6.

Increase in tax rates with set I

With assumption set I, the changes in economic aggregates are small. It looks as if taxation would have no impact on total consumption or the entire economy. Factor immobility or the assigned elasticity values do not explain the effect. Consumption does change for individual groups, but the changes in total seem to cancel each other out. The current account deficit remains more or less unaltered. Private savings fall because disposable incomes fall, but, as the level of investment needs to remain constant, marginal propensity to save also falls. This may then offset the fall in consumption that might otherwise result from a tax increase. As there is no change in total domestic demand, the current account balance is not affected either. This case is rather uninteresting.

Table 6: Increase in direct tax rates (13%)

Economic effects			**Income effects**		
GDP and national accounts	**I**	**II**	**Factor income**	**I**	**II**
	%	**%**		**%**	**%**
Absorption	0.0	0.0	Unskilled large scale farm labour	0.3	-0.5
Private consumption	0.0	-1.9	Unskilled formal labour	-0.1	0.5
Fixed investment		7.3	Unskilled informal labour	0.1	-0.5
Government consumption			Skilled labour	0.1	0.2
Exports	0.0	0.5	Agricultural capital	0.5	-0.8
Imports	0.1	0.5	Other capital	0.1	0.1
Net indirect taxes	0.0	0.6	Large-scale land	0.5	-0.8
GDP at factor cost	0.0	0.0	Smallholder land	0.7	-1.9
Foreign savings	**I**	**II**	**Income of domestic institutions**	**I**	**II**
(base value = 1.5)	1.5	1.5		**%**	**%**
			Large-scale owner and manager	-0.5	-1.5
Government savings	**I**	**II**	Large-scale farm worker	1.0	0.0
(base value = -0.50)	0.0	0.0	Smallholder households	0.3	-0.6
			Urban high-income	-0.3	-0.4
Quantity of aggregate	**I**	**II**	Urban low-income	0.0	-0.2
value added	**%**	**%**	Enterprises	-0.1	0.1
Agricultural exports	-0.1	1.3			
Other agriculture	0.4	-2.0	**Net Income of Domestic**	**I**	**II**
Mining	0.0	1.0	**Institutions**	**%**	**%**
Food processing	0.0	-2.5	Large-scale owner and manager	-1.6	-2.6
Light manufacturing	0.0	0.6	Large-scale farm worker	1.0	0.0
Heavy industry	0.0	5.0	Smallholder households	0.2	-0.7
Services	0.0	-0.5	Urban high-income	-1.9	-2.0
			Urban low-income	-0.6	-0.8
Household consumption	**I**	**II**	Enterprises	-2.4	-2.3

Economic effects	Income effects	
expenditure	**%**	**%**
Large-scale owner and manager	-0.2	-2.6
Large-scale farm worker	1.6	-0.5
Smallholder households	1.4	-0.8
Urban high-income	-0.4	-1.9
Urban low-income	0.8	-0.8

Table 6 reports income changes both gross and net of direct taxes. Incomes rise slightly for groups with lower tax rates – urban low-income and lower-income agricultural households – and fall for urban high-income, large-scale farm owners and enterprises. Factor incomes rise for almost all workers, but in total the changes are very small. As the increases in tax rates put a larger burden on the more heavily taxed groups, consumption for large-scale owners and managers as well as urban high-income households falls.

The effects on income net of direct taxes are somewhat larger, but in general the direction of change is similar. However, both urban low-income households and enterprises now lose out. Enterprises lose because they have high tax rates. The only groups to benefit are smallholder households and large-scale farm workers, who pay low or no taxes. The overall impacts are smaller than with a fall in government consumption (for set I).

Increase in tax rates with set II

With assumption set II, there are more effects than with set I. The improvement in the government balance once again translates into a rise in investment, by 7%. But we do now see a fall in consumption by 2%. Consumption falls for all households. Once again, because of the rise in investment, there is almost no impact on the external balance. Improvement in the balance is impaired by changes in investment, as investment increases demand for less domestically marketed goods and imports. Value-added rises especially for domestic market-oriented activities, such as heavy industry.

Factor incomes for skilled labour and other capital rise because of the rise in investment, which may explain the increase in enterprise incomes. The changes in income net of direct taxes are larger. None of the households gain and the net income for enterprises and large-scale landowner/managers, who pay higher taxes, falls by more than 2%. Set II therefore generates both larger and negative impacts for more groups. Again, the unexpected and quite large rise in investment means that changes in income might have been different, had the current account improved in response to a tax increase. Income effects are more negative than for a reduction in government consumption, but in both cases there is an unrealistic rise in investment.

6.2.3 Conclusions

On its own, fiscal contraction in the model tends, implausibly, to increase investment or consumption, depending on our assumptions about the savings-investment balance. The impact on foreign savings/current account is either negligible or contrary to what one might expect. This is partly because export prices do not change, partly because of the macroeconomic closure rules. Some sensitivity testing (not included here) confirmed that elasticity values do not explain the extreme results. If, for instance, elasticity of transformation is increased, the current account balance only worsens. In the context of the model, standard expenditure reduction fails to improve the current account balance. For this reason, the distributional outcomes of expenditure reduction can be unrealistic, which does not form a good basis for judging or recommending policies. The purpose of this section has therefore been largely to illustrate model features.

An alternative closure rule would be required for expenditure reduction to produce expected impacts, for instance one where both the real exchange rate and the current account could adjust. This might require fairly large changes to the model as a whole. In a dependent-economy neoclassical model with full employment, Devarajan and de Melo (1987) use a set of closure rules, where both the real exchange rate and the current account are endogenised. In this model foreign savings adjust to achieve the savings-investment equilibrium. The real exchange rate responds to changes in prices. The world price for imports is the *numéraire*. The model is used to analyse policy options for responding to commodity price shocks in an economy with a fixed exchange rate. The policies examined are changes in government expenditure and commercial policy. In the model a reduction in government expenditure lowers the price level, depreciates the real exchange rate and induces an improvement in the current account balance. The model is fairly simplistic, however, for instance it assumes that the current account deficit equals the budget deficit and that net private savings are zero.

6.3 Combinations

For the IFPRI model to produce more balanced policy outcomes, stabilisation needs to be viewed as a combination of policies. Expenditure reduction will need to be combined with a policy that simultaneously targets the price of exports, such as a devaluation. This section briefly describes the outcomes of policy combinations in an attempt to give a more balanced picture of the distributional consequences of stabilisation policy. However, the outcome of a combined policy still relies predominantly on the outcomes of single policies, and again the results need to be interpreted with caution. The chosen magnitudes of change are such that both the budget and the current account deficit are eliminated (see parentheses in Tables 7 and 8). The devaluation here could be interpreted as an additional artificial closure rule that introduces the missing effects of expenditure to the model, the size of which needs to be predetermined, however.

6.3.1 Reduction in government consumption combined with a devaluation

Under assumption set I, a reduction in government consumption (by 10%) is combined with a devaluation (by 7%). The results are shown in Table 7. GDP falls by 0.7%. Aggregate value-added rises for the export sectors. Private consumption falls by 7%. Service sector value-added contracts. Exports rise by 13% and imports fall by 8%. This is what we might expect if the fall in government expenditure were to generate a fall in domestic demand.

Factor incomes rise for all agriculture-related factors, and by more than with devaluation alone. They fall for other factors. Income rises only for large-scale agricultural worker households. As previously described, this group gain partly because of lower reliance on the public sector, but also because of the export incentive effect. The service sector and its employees again lose out, so the real incomes of households associated with this sector also fall. A reduction in government consumption again hurts the non-agricultural sectors.

If we take assumption set II, GDP falls by less than in case I (0.2%). Investment falls, exports rise, but imports fall. The agricultural export sector gains even more than with set I and with devaluation alone. Private consumption remains about the same. All households other than those related to large-scale agriculture are made worse off in terms of real income, mainly because of the fall in the service sector and related factor incomes. Income changes are more equitable and positive for more groups under assumption set II than I. With more flexibility, adjustment is possible.

Table 7: Reduction in government consumption combined with devaluation

Economic Effects	I	II	Household consumption	I	II
GDP and national accounts	**10%**	**12%**	**expenditure**	%	%
	%	%	Large-scale owner and manager	-5.7	1.0
Absorption	-13.0	-6.1	Large-scale farm worker	3.1	7.1
Private consumption	-7.2	-0.5	Smallholder households	-6.1	1.1
Fixed investment	0.1	-19.9	Urban high-income	-8.5	-2.0
Government consumption	-10.0	-12.0	Urban low-income	-8.2	-1.5
Exports	12.8	11.9			
Imports	-7.6	-9.3	**Income effects**	**I**	**II**
Net indirect taxes	-5.5	-5.7	**Factor income**	%	%
GDP at factor cost	-0.7	-0.2	Unskilled large-scale farm labour	7.9	6.9
			Unskilled formal labour	-4.5	-3.1
Foreign savings	**I**	**II**	Unskilled informal labour	-4.9	-1.0
(base value = 1.5)	0.0	0.0	Skilled labour	-3.6	-2.3
			Agricultural capital	8.0	8.9
Government savings	**I**	**II**	Other capital	0.3	-1.1
(base value = -0.50)	0.0	0.0	Large-scale land	8.3	8.8
			Smallholder land	0.0	7.5
Quantity of aggregate	**I**	**II**			
value added	%	%	**Income of domestic institutions**	**I**	**II**
Agricultural exports	7.6	4.1		%	%
Other agriculture	-4.0	0.5	Large-scale owner and manager	-1.0	1.0
Mining	2.7	16.0	Large-scale farm worker	7.9	6.9
Food processing	-0.6	2.2	Smallholder households	-2.0	1.1
Light manufacturing	3.1	3.6	Urban high-income	-3.8	-2.0
Heavy industry	-0.7	-14.2	Urban low-income	-4.1	-1.5
Services	-3.0	-2.4	Enterprises	0.0	-1.2

devaluation of 7% for I and 3% for II

The decline in the service sector would put basic education and health services in danger and the well-being of a number of households, especially urban households, may only worsen. But if private services, especially tourism, start to bloom again once Zimbabwe achieves stabilisation, this could alleviate the negative effects. The positive impact on the export sectors is likely to generate future gains to others as well.

6.3.2 Increase in tax rates combined with a devaluation

When an increase in tax rates is combined with a devaluation, the changes in economic aggregates are rather small, as compared with those of devaluation alone under assumption set I. This is to be expected on the basis of the results of the previous section, since changes in tax rates had a negligible impact on the economy as a whole. Thus the result resembles closely that of a devaluation, with slightly different income effects. The results are shown in Table 8. Private consumption falls by 9% and value-added rises for the export-oriented sectors. Factor incomes for agriculture -elated factors rise.

The impact on net incomes is larger, however, and all groups apart from large-scale farm workers lose out. The fall in net incomes in percentage terms is largest for urban high-income households and large- scale farm owners. Marginal propensity to save (MFS) actually rises, which seems counter-intuitive to what might be expected of an expenditure reduction policy. But this impact arises from the devaluation. The change in taxes still leads to a fall in MPS and therefore offsets some of the rise due to the devaluation. MPS rises because the fall in foreign savings is otherwise too large to maintain investment at its initial level.

With assumption set II, investment falls by 22%, and consumption by 3%. Exports rise by 11%. Consumption falls for all, apart from large-scale farm workers. Changes in income are perhaps slightly more equitable than under set I as two groups, large-scale farm workers and smallholders, gain, rather than only one. Factor incomes rise for most agriculture-related factors. Investment falls less than with devaluation alone, as the rise in tax rates under set II alone boosted investment. GDP falls by less than under set I.

The simulation results shown so far indicate that with set II, which might resemble a more longer-run scenario, the impact spreads around more equitably as more adjustment is possible and the income effects are less negative. This is encouraging, although incomes and GDP still fall in all cases relative to the base. If we compare the two fiscal options looked at so far, a fall in government consumption seems less harsh in terms of distributional impact and favours agriculture more than a rise in all income taxes. As Zimbabwe has traditionally relied on export earnings, and with the current state of this sector, a policy that encourages agriculture the most would be welcome. Both policy options hurt urban households and reduce GDP.

However, as has already been mentioned, the combinations only illustrate the added effects of two policies; this is artificial and will not eliminate the model's weaknesses. Understanding the results of the combined policies requires examination of the impacts of individual policies. If we do not consider the underlying features to be realistic, we can question the additional value of these combinations.

Table 8: Increase in direct tax rates combined with a devaluation

Economic Effects			**Income effects**	**I**	**II**
GDP and national accounts	**I**	**II**	**Factor income**	%	%
	15%	**17%**	Unskilled large-scale farm labour	5.0	5.9
Absorption	-6.1	-6.0	Unskilled formal labour	-2.2	-2.4
Private consumption	-9.2	-2.9	Unskilled informal labour	-3.6	-0.8
Fixed investment	0.1	-22.2	Skilled labour	-1.6	-1.5
Government consumption	0.0	0.0	Agricultural capital	5.1	6.7
Exports	12.2	11.1	Other capital	0.3	-1.0
Imports	-7.7	-8.8	Large-scale land	4.8	6.7
Net indirect taxes	-5.5	-6.2	Smallholder land	-3.8	3.8
GDP at factor cost	-0.4	-0.1			
			Income of domestic institutions	**I**	**II**
Foreign savings	**I**	**II**		%	%
(base value = 1.5)	0.0	0.0	Large-scale owner and manager	-3.4	-1.1
			Large-scale farm worker	5.0	5.9
Government savings	**I**	**II**	Smallholder households	-2.2	0.5
(base value = -0.50)	0.0	0.0	Urban high-income	-3.1	-2.1
			Urban low income	-2.7	-1.2
Quantity of aggregate	**I**	**II**	Enterprises	0.0	-1.1
value added	%	%			
Agricultural exports	6.9	4.7	**Net Income of domestic**	**I**	**II**
Other agriculture	-5.5	-1.5	**institutions**	%	%
Mining	2.1	12.1	Large-scale owner and manager	-4.6	-2.5
Food processing	-1.9	-0.4	Large-scale farm worker	5.0	5.9
Light manufacturing	2.2	1.9	Smallholder households	-2.4	0.3
Heavy industry	-0.7	-16.0	Urban high-income	-4.8	-4.1
Services	-1.6	-0.6	Urban low income	-3.4	-2.0
			Enterprises	-2.7	-4.1
Household consumption	**I**	**II**			
expenditure	%	%			
Large scale owner and	-9.5	-3.0			

Economic Effects		Income effects	I	II
manager				
Large scale farm worker	0.0	2.0		
Small holder households	-6.8	-2.4		
Urban high-income	-9.8	-3.9		
Urban low income	-7.9	-3.8		
devaluation of 6.5% for I and 2.8% for II				

6.3.3 Other policy combinations

As further illustrations we run a few more combined (with devaluation) policy experiments to show what the model recommends as an optimal policy. These are discussed very briefly and some of the result tables can be found in Appendix 3.

First, income-tax rates were increased only for high-income urban households and enterprises. The results are also not shown. A higher rise in tax rates was required than in the case of income tax rises for all in order to eliminate the budget balance. Secondly, the differences were quite small and the total income effects were somewhat more negative than with the across-the-board tax rate increase. This is partly explained by consumption patterns – high-income earners consume the most and thereby generate economic activity – even though total consumption did not fall more.

Two additional simulations were carried out. In the first a small increase in government consumption was combined with a larger increase in income-tax rates for all. This would give the government the option of utilising some of the tax income (table A1). The other reduced both government consumption and income taxes for all (Table A2). This is a radical public sector contraction. In both cases the amounts were once again chosen so that the budget deficit was eliminated, and both included a devaluation.

In the first case, the income effects seem to be even worse than with a rise in tax rates (and devaluation) alone, especially the net income effects. The impact on GDP is very similar. Large-scale farm workers gain more however, which is a combined result of the devaluation and the fact that they do not pay taxes, but all other households lose out more. The second simulation proves that anything associated with a fall in government consumption will benefit the agricultural sector and related households. Agricultural households seem to benefit more than with a fall in government consumption (including devaluation) alone. The impact on GDP is only slightly worse. Of all the combined policies, this would benefit large-scale agriculture the most, if this were the goal. On the other hand, however smallholders lose out in set I. But the revival of the export and large-scale agricultural sectors is likely to generate positive effects for other sectors as well.

All in all the effects appear to be milder and negative for fewer groups when government consumption is reduced than when direct taxes are increased. GDP effects are very similar in all cases. A fall in government consumption appears to favour agriculture more, especially when combined with a cut in all income-tax rates. But in all cases the adjustment has a cost. With more market flexibility, the changes in incomes are milder and less negative. Expenditure reduction in general leads to a contraction of public services. In reality this might be offset if private services, especially tourism, start to bloom again once Zimbabwe achieves stabilisation. Finally, there are likely to be benefits from public expenditure reduction that the model cannot address. Bringing down the government deficit can bring future benefits in the form of improved public debt management. The combined experiments as a group show that a policy package does not remove the criticised weaknesses of the model, but may give a more balanced picture of outcomes. However, the results still need to be explained within the context of single experiments.

6.4 Summary

The distributional impacts of the three key policy simulations are summarised below in Table 9. The effects on income are shown separately for cases I and II, and the last column inserts a few lines on the credibility of these results. The results from other simulations are no longer repeated. The conclusion will draw up a synthesis of the simulation results and reflect further on their practical relevance.

Table 9: Summary

Policy/effect	Income (I)	Income(II)	Credibility
1.Devaluation	Gains: large-scale (LS) farm worker Households and enterprises. Others lose.	Gains: all agriculture related households. Others lose.	Large downward adjustments required either in consumption (I) or investment (II), but otherwise results plausible.
2. Reduction in government consumption	Gains: all agriculture related households. Others lose.	Gains: LS agriculture related households. Others lose, but changes smaller than in I.	Current account (CA) does not respond as expected. Instead the simulation leads to implausible rise in private consumption (I) or investment (II). Distributional impacts may not be reliable.
3. Increase in income tax rates	Gains: lower-income farm worker households. Higher-income households lose.	No one gains (net income).	There is no impact on the current account, although it is expected to improve. Although in case I, there are distributional changes, there are no overall economic impacts. In case II, although there is a fall in all household incomes, investment rises. This is due to closure rules, and offsets any impact on the CA. The distributional impacts may be implausible.

Chapter 7: Another Model for Zimbabwe

This section briefly describes an alternative modelling framework for Zimbabwe, and how it reacts to expenditure reduction policies. The model originally produced by Davies et al. (see for example, 1994) and its updates have been used by a number of authors, for instance Davies, Rattso and Torvik (1998) and Chitiga and Mabugu (various single and co-authored papers), to look at the impact of various policies on the Zimbabwe economy. The model has mainly been used to simulate the effects of the 1990s Structural Adjustment Programmes, but also recently to generate policy options for the present situation (Chitiga and Mabugu, 2001). It attempts to take account of the rationing and controls in the economy. However some rationing mechanisms could also be incorporated in the IFPRI model.

The model is a real macroeconomic structuralist model that incorporates fixed nominal wages and imperfect competition, which is achieved by a mark-up above costs in some sectors. As nominal wages for some workers (unskilled) are fixed, changes in prices will impact on real wages as well as on the real exchange rate. There are similar assumptions of imperfect transformability between domestic and export output and imperfect substitution between domestic goods and imports, as in the IFPRI model. In the model an equilibrium can be demand-determined, and unemployment is possible. Adjustment also occurs through changes in relative prices and income distribution. Investment is exogenous (in many papers using the model) and savings can be 'forced' to achieve the savings-investment balance. This generally means that a fall in the real wage and therefore a rise in the price level are required for an increase in savings and output or employment. As the real exchange rate also adjusts, changes in the foreign balance adjust to retain a savings-investment balance (if the trade balance is endogenous). In a controlled-economy version of the model, foreign savings are exogenous, foreign exchange is rationed and public and private savings balance the investment account. Domestic output and demand move in line with the exogenous trade deficit. In the liberalised version, the trade deficit becomes endogenous and foreign exchange is no longer rationed.

Partly because of the limited empirical research on the distributional effects of a devaluation as well as the urgent need for a devaluation in Zimbabwe, Mabugu (2001, 2002) has used the model to look at the effects of a devaluation in present-day Zimbabwe. The model is a modified version of the Davies model, but is not presented in technical detail. In the liberalised version of the model, the devaluation leads to a higher GDP, mostly led by a rise in exports. However, the devaluation needed is so large that it sparks off further inflation or a rise in the general price level. As inflation rises, those with fixed wages – mainly unskilled workers – lose out. On the other hand, profit-earners gain. Under both regimes, the current account deficit improves. Government revenue also rises and the fiscal balance improves. If the government could then redistribute the increase in real GDP, the real short-run costs could be small. Whether this is plausible is open to question.

The impacts are somewhat different from those generated by the IFPRI model. In our simulations, incomes for various groups also fall as a result of a devaluation, but real wages are fixed for all groups other than skilled labour. The fall in incomes is generated by a general fall in output and employment and occurs more for groups associated with domestic market-oriented activities. In Mabugu (2002), as real wages are not fixed, the model can simulate a direct inflationary effect on wages. There is a negative distributional effect as the share of profit in income rises at the expense of wage-earners. Both models have some benefits. In the IFPRI model, rising import prices and improved export incentives affect output and via this route consumption and incomes. However, in our simulations, output contracts, which is the real reason for the fall in some incomes. However, in Mabugu (2002), output expands, although a devaluation can be contractionary for low values of elasticity between capital and labour and between domestic and imported intermediate inputs. In Mabugu's view, the crucial question is how wage costs would react to the situation in Zimbabwe. Allowing wages to increase would further increase inflation, reduce growth and erode the benefits of the devaluation for the external balance.

On the expenditure reduction front, Mabugu (2001), for instance, looks at the impact of a rise in indirect taxes (in combination with a reduction in import tariffs), and Davies et al. (1994) examine a switch in public sector resource use from consumption to investment. Both policies under the controlled regime lead to more import rationing, lower exports and a contraction in the economy. The results arise partly because of the rationing constraints. In a more liberalised economy, the impacts of an increase in indirect taxes are similar, but arise because of conventional multiplier effects. Mabugu (2002) combines a devaluation and tariff reform with a reduction in government consumption. The aim is primarily to influence the fiscal balance. But as the model set-up allows real exchange rate to change, a reduction in government consumption could also produce an improvement in the external balance. In the model, a reduction in government consumption leads to a fall in GDP and demand. The price level falls. Imports fall because of the reduction in output, but as the real exchange rate depreciates, exports can rise. It is not entirely clear whether the trade balance improves, but the foreign-oriented sectors and related households seem to gain from the expenditure reduction. Service sectors and domestic-oriented tourism, on the other hand, are badly hit by the fall in demand. The savings-investment equilibrium is achieved through changes in both domestic and foreign savings, in a way that appears more balanced than in the IFPRI model.

Further inspection and actual scenario-running with the model would be required for us to draw firmer conclusions on the suitability of the structural model for comparing policy options to improve the external balance and their distributional outcomes. If however, the model described above does allow a more diverse category of policies and expenditure reduction succeeds in improving the trade balance, it might be more suitable for our purpose of comparing different stabilisation options. However, its features can also be subject to criticism. One general critique of structural models is that a fall in real wages is often required for an increase in employment (see Robinson, 2003).

Chapter 8: Conclusions

The purpose of this paper has been to assess the suitability of a standard CGE model (IFPRI) to compare the distributional implications for applying it to stabilisation policy options for Zimbabwe. The main aim has been to target the external balance. Two standard policy options, expenditure switching (devaluation) and expenditure reduction (reduction in government consumption, rise in tax rates), were chosen. Because the model cannot account for monetary factors, we have only been able to look at certain stabilisation policies.

The effects of a devaluation are somewhat extreme since, because of the savings-investment closure, most of the adjustment comes from an increase in private savings or a fall in investment. Although the changes required in investment and savings are large, the effects of a devaluation are still quite plausible. The results suggest that a devaluation is likely to be contractionary. GDP falls, agriculture and the export sectors benefit, but the others lose out. The same holds for households: real incomes rise for agriculture-related households and fall for urban households, especially when we assume more market flexibility. It may be that the increased export income will in future generate a rise in GDP, and through this route also benefit the non-export sectors and related income groups.

The results indicate that it would be worthwhile finding a policy that would benefit the domestic sector and combine this with a devaluation. Devaluation should be complemented with a policy that both improves the fiscal balance and reduces some of the negative distributional impacts on the non-export sectors. As capital inflows are unlikely to revive for a while, the need for fiscal restraint is even greater. Aid inflows would be an option for stimulating the domestically-oriented economy, indicating that a move towards an improved political climate will be an important step in the stabilisation process. In practice, a devaluation can be inflationary, but this cannot be adequately tested by the model, as it is a real economy model where the consumer price index functions as a *numéraire*. The result also assumes that there is capacity in the agricultural sector to respond to stimuli, which in reality may be limited.

The critique in this paper has focused on the fact that standard expenditure reduction policies do not alleviate a current account deficit in the IFPRI model. The resulting macroeconomic responses are unrealistic and cast doubt on the model's distributional predictions. The results suggest that the model does not allow higher taxes or lower government expenditure to exert a neutral or negative effect on private sector absorption. This paper has offered one explanation for this - restrictive model assumptions. With investment-driven savings, an improvement in the government balance (equal to less negative government savings) is translated into a lower marginal propensity to save, lower private savings and a rise in private consumption. When investment is savings-driven, an improvement in the government balance is translated into higher (public and private) investment and stimulates domestic activity. Foreign savings that form part of total savings adjust minimally and often in an unexpected manner.

Although an improvement in the external balance could be possible even within the current framework, the effect is overshadowed because of forced balancing effects. Rises in consumption or investment required to achieve the savings-investment balance counteract the fall that should have occurred in the demand for domestically marketed goods and imports. It appears that this rise in consumption takes place before the decision to divide total output between exports and domestic production is made. In aggregate the price for domestically marketed goods actually rises, which may even reduce exports. In the model expenditure reduction improves the external balance only, if the price of exports is changed, for instance by real exchange-rate devaluation. Expenditure reduction as a tool to improve the external balance often cannot be analysed with the IFPRI model. This illustrates the limitations of using this type of model for comparing alternative stabilisation policies.

We then combined a few policies to arrive at a more realistic picture of the distributional impact of stabilisation, but we still need to acknowledge that this will not change the underlying model, and the value of the results in policy terms may remain questionable. Whether the results shown here would really serve in policy analysis for Zimbabwe is therefore questionable. A common, agriculture-friendly prescription appears to be the combination of a devaluation with a cut in both government consumption and tax rates. The model's results indicate that a fall in government consumption (combined with a devaluation) seems less harsh in terms of distributional impacts and favours agriculture more than a rise in income tax rates.

A closure that allows both the real exchange rate and the current account to change would be required for expenditure reduction to improve the external balance. This could, however, require other major changes. We have briefly mentioned one neoclassical model where the effect is possible, but the model is fairly simple and assumes zero net private savings. The structural model presented in Chapter 7 might also produce the desired effects, although a further investigation of its features would be required to assess the validity of its prescriptions. Another enhancement of the IFPRI model would be more disaggregation on the public sector side, such as a government capital account. This would provide more dimensions to the fiscal analysis.

We may have other reservations about the suitability of the model to the Zimbabwe case. These have not been the focus of this study, but, as has been mentioned, because of the changes in land utilisation and economic structure, many of the reforms or policy changes discussed in this study (such as devaluation) may have only a limited impact, unless productive capacity is increased, support is given to farmers or other export incentives are provided. The data set used in this study is also rather basic and aggregated.

Although we have concentrated on only one model, one conclusion to be reached is that the use of CGE model results for policy purposes can only be appropriate if we agree that the model's assumptions about economic behaviour portray, at least to some extent, those of the relevant country If they do not do so, the distributional impacts can be unrealistic and the results of little use. This is also important in the PSIA context, especially if CGE model results are used to guide policy formulation. Restrictive assumptions can reduce the model's capacity to compare alternative policies.

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Data sources: IFPRI Social Accounting Matrix, source:
http://www.ifpri.org/pubs/microcom/micro5.htm
World Development Indicators 2003 CD-Rom; Global Development Finance 2003

Appendix 1: Some key model equations

(1) Absorption

$$PQ_c \cdot (1 - tq_c) \cdot QQ_c = PD_c \cdot QD_c + PM_c \cdot QM_c$$

(2) Marketed Output Value

$$PX_c.QX_c = PD_c \cdot QD_c + PE_c \cdot QE_c$$

(3) CES technology: Activity Production Function

$$QA_a = \rho\alpha_a^a(\delta_a^a \cdot QVA_a^{-\rho_a^a} + (1 - \delta_a^a) \cdot QINTA_a^{-\rho_a^a})^{-\frac{1}{\rho_a^a}}$$

The parameter ρ refers to a transformation of the elasticity of substitutability between aggregate intermediate input and value-added, δ is a CES activity function share parameter and α is an efficiency parameter in the CES activity function.

(4) CES technology: Value-Added – Intermediate-Input Function

$$\frac{QVA_a}{QINTA_a} = \frac{PINTA_a}{PVA_a} \cdot \frac{\delta_a^a}{1 - \delta_a^a}^{\frac{1}{1+\rho_a^a}}$$

(5) Output Transformation (CET) Function

$$QX_a = \alpha_c^t(\delta_c^t \cdot QE_c^{\rho_c^t} + (1 - \delta_c^t) \cdot QD_c^{\rho_c^t})^{\frac{1}{\rho_c^t}}$$

Here ρ refers to a transformation of the elasticity of substitutability between aggregate intermediate input and value-added, δ is a CET function share parameter and α is an efficiency parameter in the CET function.

(6) Export-Domestic Supply ratio

$$\frac{QE_c}{QD_c} = \left(\frac{PE_c}{PD_c} \cdot \frac{1 - \delta_c^t}{\delta_c^t}\right)^{\frac{1}{\rho_c^t - 1}}$$

(7) $PE_C = pwe_c \cdot (1 - te_c) \cdot EXR$

(8) Composite Supply (Armington) Function

$$QQ_a = \alpha_c^q(\delta_c^q \cdot QM_c^{-\rho_c^t} + (1 - \delta_c^q) \cdot QD_c^{-\rho_c^q})^{-\frac{1}{\rho_c^q}}$$

Here ρ refers to a transformation of the elasticity of substitutability between imports and domestic goods, δ is an Armington function share parameter and α an efficiency parameter in the Armington function.

(9) Import-Domestic Demand Ratio

$$\frac{QM_c}{QD_c} = \frac{PD_c}{PM_c} \cdot \frac{\delta_a^q}{1 - \delta_a^q}^{\frac{1}{1+\rho_a^q}}$$

(10) $PM_c = pwm_c \cdot (1 - tm_c) \cdot EXR$

PX_c	= Price of domestic output (LCU)	
PQ_c	= Price of composite commodity	
PD_c	= Price for commodity produced and sold domestically	
PM_c	= Domestic price of imports (LCU)	
PE_c	= Domestic price of exports (LCU)	
PVA_a	= Aggregate value-added price	
$PINTA_a$	= Aggregate Intermediate Input Price	
pwe_c	= World price of exports (Ex)	
pwm_c	= World price of imports (Ex)	
QX_c	= Aggregate quantity of domestic output	
QQ_c	= Quantity of composite commodity	
QD_c	= Quantity of domestic output sold domestically	
QM_c	= Quantity of imports	
QE_c	= Quantity of exports	
QVA_a	= Aggregate value-added	
$QINTA_a$	= Aggregate intermediate input	
EXR	= The real exchange rate	(Ex)
tm_c	= Tariff rate	(Ex)
tq_c	= Rate of sales tax	(Ex)
te_c	= Export tax rate	(not in dataset)

Ex = exogenous
LCU = local currency unit

The domestic price of imports and exports is fixed unless EXR changes.

Appendix 2: Zimbabwe Social Accounting Matrix (Zim$ billion)

	AAGEX	AAGFO	AMINE	ANAFO	ANALM	ANAHI	ANASE	CAGEX	CAGFO	CMINE	CNAFO	CNALM	CNAHI	CNASE	LABUSKLS	LABUSKF	LABUSKIF	LABSK
AAGEX								3.624										
AAGFO									3.471									
AMINE										2.097								
ANAFO											5.101							
ANALM												11.828						
ANAHI													3.915					
ANASE														21.486				
CAGEX				0.331	1.032		0.009											
CAGFO	0.007	0.247		1.012	0.13		0.104											
CMINE			0.082	0.037	0.804	0.282	0.125											
CNAFO	0.051	0.312		0.213	0.034		0.15											
CNALM	0.331	0.337	0.446	0.36	2.724	1.308	4.135											
CNAHI	0.027	0.035	0.04	0.022	0.073	0.255	0.286											
CNASE	1.162	0.725	0.349	1.345	2.075	0.428	2.53											
LABUSKLS	0.063	0.038																
LABUSKF			0.034	0.028	0.148	0.072	0.479											
LABUSKIF	0.093	0.547			0.33	0.052	1.17											
LABSK	0.405	0.127	0.297	0.225	1.519	0.681	6.574											
CAPAGR	1.063	0.769																
CAPOT			0.762	1.56	2.528	0.624	5.338											
LANDLS	0.282	0.139																
LANDSH	0.054	0.079																
HLSUPP																		0.825
HLSLOW															0.101			
HSHHLD																	0.713	
HURBUPP																		8.975
HURBLOW																0.762	1.478	
ENTR																		
YTAX																		
ATAX	0.087	0.117	0.086	-0.033	0.43	0.214	0.585											
TAR								0.005	0.008	0.027	0.045	1.845		0.047				
GOV																		
ROW								0.016	0.033	0.103	0.178	7.644		0.397				0.028
SI																		
TOTAL	3.624	3.471	2.097	5.101	11.828	3.915	21.486	3.645	3.511	2.227	5.324	21.317	3.915	21.93	0.101	0.762	2.191	9.828

	CAPAGR	CAPOT	LANDLS	LANDSH	HLSUPP	HLSLOW	HSHHLD	HURBUPP	HURBLOW	ENTR	YTAX	ATAX	TAR	GOV	ROW	SI	TOTAL
AAGEX																	3.624
AAGFO																	3.471
AMINE																	2.097
ANAFO																	5.101
ANALM																	11.828
ANAHI																	3.915
ANASE																	21.486
CAGEX							0.084								2.189		3.645
CAGFO					0.439	0.036	0.789	0.195	0.472						0.11	-0.03	3.511
CMINE															0.896		2.227
CNAFO					1.558	0.021	0.222	1.848	0.497					0.035	0.549	-0.166	5.324
CNALM					2.456	0.029	0.358	3.485	0.687					0.228	1.738	2.695	21.317
CNAHI					0.103	0.002	0.011	0.367	0.065					0.018	0.02	2.59	3.915
CNASE					2.554	0.011	0.278	3.059	0.358					4.822	1.845	0.389	21.93
LABUSKLS																	0.101
LABUSKF																	0.762
LABUSKIF																	2.191
LABSK																	9.828
CAPAGR																	1.831
CAPOT																	10.812
LANDLS																	0.421
LANDSH																	0.133
HLSUPP	1.588		0.421							5.535				0.62	0.108		9.098
HLSLOW																	0.101
HSHHLD	0.244			0.133				0.084	0.189					0.471			1.832
HURBUPP										3.256				0.104			12.335
HURBLOW		0.125												0.23			2.595
ENTR		10.687												1.183			11.87
YTAX					0.703		0.023	1.287	0.118	1.693							3.824
ATAX																	1.486
TAR																	1.977
GOV											3.824	1.486	1.977		0.315		7.603
ROW										0.52				0.395			9.313
SI					1.285	0.003	0.068	2.011	0.209	0.865				-0.504	1.541		5.478
TOTAL	1.831	10.812	0.421	0.133	9.098	0.101	1.832	12.335	2.595	11.87	3.824	1.486	1.977	7.603	9.313	5.478	206.983

Abbreviations in the Social Accounting Matrix

Activities

AAGEX	Export agriculture
AAGFO	Other agriculture
AMINE	Mining
ANAFO	Food processing
ANALM	Light manufacturing
ANAHI	Heavy industry
ANASE	Services

Goods

CAGEX	Export agriculture
CAGFO	Other agriculture
CMINE	Mining
CNAFO	Food processing
CNALM	Light manufacturing
CNAHI	Heavy industry
CNASE	Services

Factors

LABUSKLS	Unskilled large-scale farm labour
LABUSKF	Unskilled formal labour
LABUSKIF	Unskilled informal labour
LABSK	Skilled labour
CAPAGR	Agricultural capital
CAPOT	Other capital
LANDLS	Large-scale land
LANDSH	Small-holder land

Institutions

HLSUPP	Large-scale owner and manager
HLSLOW	Large-scale farm worker
HSHHLD	Small-holder households
HURBUPP	Urban high-income
HURBLOW	Urban low-income
ENTR	Enterprises

Other

YTAX	Income tax
ATAX	Activity tax
TAR	Tariffs
GOV	Government
ROW	Rest of the World
SI	Savings and Investment

Appendix 3: Additional Policy Experiments

Table A1: Increase in government consumption and direct tax rates and devaluation

Economic Effects			**Income effects**		
GDP and national accounts	**I**	**II**	**Factor income**	**I**	**II**
	%	%		%	%
Absorption	-6.2	-6.1	Unskilled large-scale farm labour	4.0	5.0
Private consumption	-9.9	-3.3	Unskilled formal labour	-1.6	-2.2
Fixed investment	0.1	-23.3	Unskilled informal labour	-3.3	-0.7
Government consumption	2.5	2.3	Skilled labour	-1.1	-1.3
Exports	12.2	11.1	Agricultural capital	4.3	6.3
Imports	-7.9	-9.0	Other capital	0.3	-1.0
Net indirect taxes	-5.7	-6.4	Large-scale land	4.0	6.4
GDP at factor cost	-0.3	-0.1	Smallholder land	-4.5	3.8
Foreign savings	**I**	**II**	**Income of domestic institutions**	**I**	**II**
(base value = 1.5)	0.0	0.0		%	%
			Large-scale owner and manager	-4.0	-1.5
Government savings	**I**	**II**	Large-scale farm worker	4.0	5.0
(base value = -0.50)	0.0	0.0	Smallholder households	-2.3	0.4
			Urban high-income	-2.9	-2.2
Quantity of aggregate	**I**	**II**	Urban low-income	-2.4	-1.1
value added	%	%	Enterprises	0.0	-1.1
Agricultural exports	6.8	4.8			
Other agriculture	-6.0	-1.9	**Net Income of domestic**	I	II
Mining	1.9	11.5	**institutions**	%	%
Food processing	-2.3	-0.8	Large-scale owner and manager	-5.90	-3.06
Light manufacturing	2.0	1.6	Large-scale farm worker	4.95	5.94
Heavy industry	-0.8	-16.7	Smallholder households	-2.71	0.29
Services	-1.3	-0.3	Urban high-income	-5.46	-4.43
			Urban low-income	-3.50	-2.05
Household consumption	**I**	**II**	Enterprises	-3.49	-4.58
expenditure	%	%			
Large-scale owner and manager	-10.6	-3.1			
Large-scale farm worker	-1.0	5.1			
Smallholder households	-7.2	0.1			
Urban high-income	-10.3	-4.4			
Urban low-AQ3income	-8.0	-2.0			

I: rise in government consumption: 2.3%, in taxes: 20%, devaluation: 7%

II: rise in government consumption: 2.5%, in taxes: 19%, devaluation: 2.8%

Table A2: Reduction in government consumption and direct tax rates and devaluation

Economic Effects			**Income effects**		
GDP and national accounts	**I**	**II**	**Factor income**	**I**	**II**
	%	%		%	%
Absorption	-6.4	-5.9	Unskilled large-scale farm labour	8.9	7.9
Private consumption	-5.0	0.7	Unskilled formal labour	-6.2	-3.4
Fixed investment	0.1	-17.8	Unskilled informal labour	-5.6	-1.0
Government consumption	-18.0	-18.0	Skilled labour	-5.1	-2.7
Exports	12.5	11.9	Agricultural capital	11.0	9.8
Imports	-7.1	-7.5	Other capital	0.3	-1.2
Net indirect taxes	-5.2	-5.3	Large-scale land	10.7	9.7
GDP at factor cost	-0.9	-0.3	Smallholder land	3.0	8.3
Foreign savings	**I**	**II**	**Income of domestic institutions**	**I**	**II**
(base value = 1.5)	0.0	0.0		%	%
			Large-scale owner and manager	1.0	2.1
Government savings	**I**	**II**	Large-scale farm worker	8.9	7.9
(base value = -0.50)	0.0	0.0	Smallholder households	-1.6	1.4
			Urban high-income	-4.2	-1.9
Quantity of aggregate	**I**	**II**	Urban low-income	-5.0	-1.7
value added	%	%	Enterprises	0.0	-1.2
Agricultural exports	7.8	3.7			
Other agriculture	-2.5	1.6	**Net Income of domestic**	**I**	**II**
Mining	2.9	17.5	**Institutions**	%	%
Food processing	0.6	3.5	Large-scale owner and manager	1.97	2.92
Light manufacturing	3.6	4.4	Large-scale farm worker	8.91	7.92
Heavy industry	-0.6	-12.7	Smallholder households	-1.38	1.47
Services	-4.0	-3.3	Urban high-income	-2.91	-0.90
			Urban low-income	-4.51	-1.25
Household consumption	**I**	**II**	Enterprises	2.12	0.27
expenditure	%	%			
Large-scale owner and manager	-2.1	2.9			
Large-scale farm worker	5.1	7.1			
Smallholder households	-4.9	1.4			
Urban high-income	-6.9	-0.8			
Urban low-AX3income	-7.9	-1.2			

Case I: fall in government consumption: 18%, in taxes: 12%, devaluation: 7%

Case II: fall in government consumption: 18%, in taxes: 9%, devaluation: 3%