Trade and Agricultural Policy Reforms in Zimbabwe: A CGE Analysis

Romeo Bautista
International Food Policy Research Institute

Marcelle Thomas
International Food Policy Research Institute

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ABSTRACT

Using an agriculture-focused CGE model for Zimbabwe and a 1991 Zimbabwe Social Accounting Matrix as database, this paper examines quantitatively the income and equity effects of trade liberalization in isolation and in conjunction with potentially complementary changes in fiscal and land policies. Several features of the Zimbabwe economy structure, such as a dual agrarian production sector and highly segmented factor markets are modeled along side specific aspects of economic policy existing in the pre-reform benchmark year (1991).

"Policy experiments" include trade policy reform, land reform, maize market decontrol and income tax adjustment. These comparative results from counterfactual simulations based on the Zimbabwe CGE model illuminate the greater effectiveness of trade policy reform in promoting overall growth and equity when linked to complementary fiscal and sectoral reforms aimed at reducing poverty.

TRADE AND AGRICULTURAL POLICY REFORMS IN ZIMBABWE: A CGE ANALYSIS

Romeo M. Bautista and Marcelle Thomas [1]

INTRODUCTION

As in most low-income developing countries, agriculture and the rural sector have a predominant weight in the Zimbabwean economy. Agriculture accounts for about 70 percent of total employment and for 40-45 percent of the country's merchandise exports. It is also the source of principal raw materials for 60 percent of manufacturing production in Zimbabwe. The low agricultural share in gross domestic product (GDP) of around 16 percent is striking, which reflects the low incomes received by farmers, particularly those in the semi-arid, low-productivity communal and resettlement areas. Poverty incidence is markedly higher in the rural than in the urban population - 31 versus 10 percent in 1990-91 (World Bank 1995a). The rural sector, in which around three quarters of the total population reside, accounts for the overwhelming majority of Zimbabwe's poor (88 percent). Equitable growth is a particularly important, if not an overriding, development policy objective for Zimbabwe, given its recent history of sluggish economic growth and persisting income inequities (Muir-Leresche 1985, Rukuni 1994, World Bank 1995b). Any assessment of policy reforms undertaken in Zimbabwe needs to examine whether the objective of economic growth coupled with equity has been promoted.

The next section describes briefly the structure and features of the Zimbabwe CGE model, whose underlying accounting framework and benchmark data derive from a Zimbabwe SAM for 1991 (Thomas and Bautista, 1999). This is followed by a description of the model experiments, which simulate various policy reform packages relevant to Zimbabwe. Finally, the simulation results are presented and interpreted, especially those concerning the effects on aggregate household income and on the real incomes of specific household groups.

THE ZIMBABWE CGE MODEL

The CGE model for Zimbabwe is primarily aimed at providing a policy simulation laboratory in which exogenous changes in the policy environment can be analyzed for their economy-wide effects, particularly on the real incomes of various household groups. Some of its distinctive features, which represent a significant departure from earlier work,[2] are an explicit focus on agriculture, a special attention to the distribution of rural and urban household incomes, and a detailed specification of factor markets. Specific aspects of the policy environment in the pre-reform benchmark year are also taken into account in the base model, such as the administered setting of the foreign exchange rate, quantitative import restrictions, and government-determined producer price of the staple crop, maize.

The Zimbabwe CGE model distinguishes among 27 commodities: 13 agricultural (maize, wheat, other grains, horticulture, coffee, tea, groundnuts, cotton, sugar, tobacco, other crops, cattle, and other livestock), three other primary-producing (fishery, forestry, and mining), six manufacturing (grain milling, other food processing, textiles, other light manufacturing, fertilizer, and other manufacturing), and five tertiary (electricity, construction, trade and transport, private services, and public services). Zimbabwe's agricultural economy

is extremely dualistic, warranting a distinction between the modern, large-scale commercial (LSC) farm sector and the traditional, smallholder (mostly communal) farm sector (Muir 1994). These two farm sectors differ widely in land quality, production technology, infrastructure development, level of rainfall, crops planted, and household income. Consistent with the distinction made in the benchmark SAM between activities and commodities, the Zimbabwe CGE model differentiates between smallholder and LSC production of the following commodities: maize, other grains, horticulture, groundnuts, cotton, other crops, cattle, other livestock, and forestry. Outside agriculture, the commodity disaggregation is identical to the activity disaggregation.

The factor classification assumes segmented factor markets, between agriculture and non-agriculture, and within agriculture between the two farm sectors. There are four labor categories, namely, LSC-farm unskilled workers, formal unskilled workers, informal unskilled workers, and skilled workers. For historical and institutional reasons, the unskilled labor market in the LSC farm sector is isolated.[3] It is assumed that unskilled workers in LSC farms stay within this sector, and are allocated among the different production activities based on their marginal value-added in those activities. The average wage rate for LSC farm workers is determined through supply-demand equations that are independent of labor-market conditions elsewhere in the Zimbabwean economy. Smallholder farm and informal non-agricultural workers are linked to the formal, non-agricultural unskilled labor market. Minimum wage requirements and strict anti-dismissal rules artificially raise the real wages for unskilled formal workers in the non-agricultural sectors (World Bank 1995b), resulting in excess labor supply. The scarcity of formal-sector jobs forces many unskilled laborers to work in the lower-paying informal non-farm sector and smallholder farms. Given the exogenous wage rate, formal unskilled-labor employment in the non-agricultural sector is demand-determined. Subtracting this from the fixed total supply of unskilled workers (net of those working in LSC farms) yields the supply of unskilled workers for smallholder farm and informal non-agricultural production. Demand for the latter workers is determined by their marginal products, and the market-clearing wage rate is inevitably lower than the exogenously determined formal-sector wage rate. Skilled workers, including those occupying management positions in LSC farms and in the non-agricultural sectors, are relatively scarce in Zimbabwe (Davies *et al.* 1994,157). They are assumed in the model to be fully employed, and mobile across sectors. However, there are intersectoral differences in skilled labor wage rates, the average rate determined by equating the fixed supply with total demand.

Land appears as a factor of production in the crop sectors only and land market segmentation between smallholder and LSC farms is assumed in the model. Within each farming system, land is allocated among the various crop sectors according to its marginal value-added in those sectors.

Capital markets are segmented into three categories: smallholder agriculture, LSC agriculture, and the non-agricultural sector. Given the medium-term perspective of the present study, it is assumed that capital is mobile across sectors within each capital market category.

The model differentiates among five household groups: LSC owner/manager, LSC farm-laborer households, and the smallholder households, which comprise the third rural household group. In urban areas, distinction is made between high-income (non-agricultural capitalist and skilled worker) and low- income (informal and unskilled worker) households. The induced relative income changes in the five household groups provide the basis for

assessing the equity impact of policy experiments in the CGE model.[4]

Consumption demand by households is determined by the linear expenditure system (LES), in which the marginal budget share is fixed and each commodity has a minimum consumption (subsistence) level. The model takes account of home consumption of the following smallholder farm products: maize, other grains, horticulture, groundnuts, cattle, other livestock, and forestry. Home-consumed goods are valued at producer prices, while marketed goods are valued at purchaser prices.

The model structure explicitly treats marketing margins – at differing rates for domestic, export, and imported commodities. Marketing margins combine trade and transport costs. They represent real costs associated with the distribution of products from their point of production or port of importation to the point of purchase. In agriculture, these costs are dominated by the high cost of transport related to poor roads, isolated areas, and limited transport equipment (Jayne et al. 1990). In manufacturing, the high risk environment due to unreliable delivery schedules and deficiencies in contract enforcement accounts heavily for the marketing cost.

The production technology is represented by a set of nested CES (constant-elasticity-of-substitution) value-added functions and fixed (Leontief) intermediate input coefficients (Figure 1). Imperfect substitutability is assumed between smallholder and LSC farm products of the same commodity. Domestic prices of commodities are flexible, varying to clear markets in a competitive setting where individual suppliers and demanders are price-takers. The important exception is maize, for which, the producer price in the base model reflecting pre-reform conditions, is exogenously determined by the Grain Marketing Board (GMB).

Following Armington (1969), the model assumes imperfect substitutability, in each sector, between the domestic product and imports. What is demanded is the composite consumption good, which is a CES aggregation of imports and domestically produced goods. It is assumed in the base model that the foreign exchange rate is fixed and that quantitative import restrictions, which characterized Zimbabwe's trade regime in 1991, lead to a difference between desired imports and actual imports. The domestic price of sectoral imports is unaffected by supply scarcity under the assumption of "fixprice" rationing (Dervis *et al.* 1982, 293), which is reasonable for imports of producer goods (comprising the bulk of Zimbabwe's imports in 1991) and other imported products not being resold in the domestic market. For export commodities, the allocation of domestic output between exports and domestic sales is determined on the assumption that domestic producers maximize profits subject to imperfect transformability between these two alternatives. The composite production good is a CET (constant-elasticity-of-transformation) aggregation of sectoral exports and domestically consumed products. In the case of maize, in view of the GMB's role in the grain market, the base model assumes perfect substitutability between domestic sales and exports. These assumptions of imperfect substitutability and transformability grant the domestic price system some degree of autonomy from international prices and serve to dampen export and import responses to changes in the producer environment. Such treatment of exports and imports provides a continuum of tradability and allows two-way trade at the sectoral level -- which reflects the empirical reality in Zimbabwe.

In the model, markets for goods, factors, and foreign exchange are assumed to respond to changing demand and supply conditions, which in turn are affected by government policies,

the external environment, and other exogenous influences. The model is Walrasian in that it determines only relative prices and other endogenous variables in the real sphere of the economy. Sectoral product prices, factor prices, and the foreign exchange rate are defined relative to the consumer price index, which serves as the *numeraire*. Notably, the exchange rate represents the relative price of tradable goods vis-a-vis nontradables (in units of domestic currency per unit of foreign currency).

The closure rules are defined by a set of constraints that need to be satisfied by the economic system but are not considered in the decisions of micro agents (Robinson 1989, 907-908). Aside from the supply-demand balances in the product and factor markets, three macroeconomic balances are specified in the Zimbabwe CGE model: (i) the fiscal balance, showing that government savings is the difference between government revenue and spending;[5] (ii) the external balance, equating the supply and demand for foreign exchange; and (iii) the specification that total investment is determined by total saving, which corresponds to the neoclassical macroeconomic closure.

THE POLICY EXPERIMENTS

It bears emphasizing that counterfactual model simulations serve to disentangle the policy effects from other possible influences on economic performance (such as external market developments and weather disturbances) which historical analysis can not be expected to do. The various policy experiments (trade liberalization, changes in government expenditure and tax policies, maize marketing reform, and land redistribution) are first described, then followed by a presentation and interpretation of the results of model simulations.

Trade liberalization was the most significant policy reform implemented under the Economic Structural Adjustment Program (ESAP). The foreign trade regime in 1991 was characterized by direct controls on imports and foreign exchange, as well as by import tariffs at varying rates across commodities and a 20 percent import surtax, which are embodied in the base model. The gradual elimination of import licenses and freeing of foreign exchange controls took place as part of the ESAP, which also simplified the tariff structure and significantly reduced the average tariff rate to 17 percent by 1994. The government's intention was to phase out the import surtax and "to move toward greater uniformity in the tariff structure" (GATT 1995, 28), a declared objective in ESAP that was also expressed in ZIMPREST. In later years, however, tariffs were adjusted in variance with the latter objective. For instance, responding to requests by some producer groups for protection, the government in 1996 modified the tariff structure as follows: 5 percent for raw materials, 15 percent for partly processed goods and consumables, 30 percent for intermediate goods, and 50 percent for finished goods (EIU 1996).

In terms of the overall income effect, standard trade theory shows that there are both static and dynamic gains from trade liberalization associated with the increased efficiency of resource allocation and use, among other sources. The chief beneficiaries are export-producing sectors, where relative incentives are made more favorable by the lower cost of imported material inputs and higher output prices in domestic currency. In Zimbabwe the major export producers are in large-scale commercial agriculture, mining, and some industrial sectors – ownership of which belongs to the more affluent segment of the population.

Employment in these sectors consists of both unskilled and skilled workers, which come from households of differing income levels. The direct employment impact of trade liberalization is likely to be positive, at least in the medium term, given the relative abundance of (unskilled) labor in Zimbabwe. Inter-industry relations and the operation of labor markets mediate the indirect employment effect, which also has implications for income redistribution. On the consumption side, there are likely to be differing changes in product demand – and in the derived demand for factor services – since various income groups are affected differently by the policy shift. The net effect of trade liberalization on income distribution is therefore not clear-cut.

It is possible that simultaneous changes in other aspects of the policy environment can enhance the effectiveness of trade liberalization in promoting equitable growth in Zimbabwe. As a general definition, a group of policies can be considered complementary when the effect of each policy on a given objective increases as any one of the other policies is jointly implemented. For this paper we specifically address the complementarities among trade, fiscal, and land policies toward the improvement of income growth and distribution in Zimbabwe. Additionally, the economy-wide income and equity effects of price liberalization in the maize and grain milling sectors, also a major component of ESAP, are examined. The sole buyer of maize in 1991 was GMB, the procurement price being announced before the harvest season; aiming to keep the consumer price of maize meal low, GMB sold maize to the millers at a subsidized price. These pre-reform conditions are reflected in the base model.

It seems clear that (1) redistributing some land from large-scale commercial agriculture to smallholder households and (2) restructuring government expenditure toward smallholder agriculture are pro-equity policy measures that will affect positively the distribution of income gains from trade liberalization. But will it not reduce overall income growth? A relevant consideration is that the demand stimulus arising from the increased incomes of low-income households will favor labor-intensive, domestically produced goods and services over capital-intensive and imported products, as earlier studies have shown for a number of developing countries. The domestic linkage effects of those two complementary policies may serve to increase the effectiveness of trade liberalization in promoting economic growth with equity. Moreover, the removal of government interventions in the maize and grain milling markets can be expected to further enhance overall income and equity in Zimbabwe.

Trade liberalization is represented in the policy experiments as follows: (1) removal of non-tariff barriers, including import rationing; (2) elimination of the import surcharge and adjustment of tariffs to a low (10 percent) uniform rate; (3) dismantling of foreign exchange controls and market determination of the exchange rate. Distinction is made between the two "liberalized" trade regimes – with and without maize price control; in the latter case, the maize sector is modeled like any other production activity (with market-determined prices) and the price subsidy to grain millers is eliminated. Also, the additional scenario of trade liberalization without maize price control is considered in combination with income tax adjustment to compensate for the decline in government revenue from trade taxes. More specifically:

- **Simulation I** (Trade liberalization alone): Set the quantity rationing rates equal to one, and the import tax rates equal to 0.10; the current account balance is fixed exogenously and the foreign exchange rate is the equilibrating variable.

- **Simulation II** (Trade liberalization with maize price decontrol): Add to Simulation I removal of the maize price penalty to maize producers and price subsidy to grain millers.

- **Simulation III** (Trade liberalization with maize price decontrol and income tax adjustment): Add to Simulation I uniform increases in the income tax rate for enterprises and the two affluent household groups, namely, the LSC farm owner/manager and high-income urban households,[6] that leave government net revenue unchanged.

Next, the complementarity of trade liberalization with land reform is addressed. The base model reflects the existing land ownership structure, absence of land taxation, no voluntary land subdivision, and associated underutilization of LSC farms. The government's plan is to buy 50 percent of whole LSC farms for resettlement of smallholders. This is expected to result in lower LSC production, including export crop production, and other adverse effects with macroeconomic significance. However, there would be offsetting favorable effects related to the increased production of maize and other crops heavily grown in smallholder farms. It has been argued that a more efficient means of promoting smallholder agriculture is to tax agricultural land, liberalize the land market by permitting voluntary subdivision of LSC farms, and assist newly resettled smallholders (World Bank 1995b). This would likely result in a net addition of smallholder farms to the extent of the underutilized LSC land (assumed to be cultivable using smallholder farm technology) without loss of LSC farm output.

Simultaneous changes in trade, fiscal, and land policies are considered in the following policy experiments, which involve two alternative, highly stylized land redistribution schemes of contemporary relevance in Zimbabwe. The first, to be referred to as "Land reform A," follows existing policy in prohibiting the subdivision of agricultural land. Fifty percent of whole LSC farms are purchased by the government and redistributed in small portions to smallholder households (a 26 percent increase in land used by smallholder farms). The LSC sector loses one half of its cropland area, which is added to the smallholder sector together with one half of the LSC underutilized arable land (as calculated in Roth 1990). The other redistribution scheme, "Land reform B," allows for subdivision of LSC farmland. “Underutilized” (uncultivated) arable land in LSC farms is fully transferred to smallholders (a 35 percent increase for SH farms) but LSC cropland area is unchanged. As part of the land reform package in either scheme, land taxes are levied that finance increases in government expenditure directed to the resettlement of smallholder households and productivity improvement in the two most promising crops for increased smallholder production, namely, cotton and horticulture. Finally, LSC farm owners receive payments from the government and foreign sector as compensation for the transferred land. This is in line with the government's willingness to consider paying LSC farm owners the value of capital improvement on their land as compensation (Shaw 1998). There has also been some discussion of the British government contributing to the payment for confiscated LSC farmland.
The specific features of the two land reform scenarios are:

- **Simulation IV** (Land reform package A): Consisting of (1) Land reform A; (2) land taxation at Z$30 per hectare on LSC farms and $Z1 per hectare on smallholder farms; (3) a 20 percent increase in total factor productivity for smallholder cotton and

horticulture, assumed to result from the increased government expenditure financed by the land tax; (4) payment for cultivated and underutilized land transferred to smallholder are made to LSC farm owners, shared equally by the government and foreign sector.[7]

- **Simulation V** (Land reform package B): Same as Simulation IV except that Land reform B is implemented instead of Land reform A.

Two additional policy experiments involving land reform, **Simulations VI and VII,** essentially repeat Simulations IV and V, respectively, but including trade liberalization with income tax adjustment and maize price decontrol.

Finally, two policy experiments relate to the macroeconomic problem of persisting fiscal deficits in Zimbabwe:

- **Simulation VIII** : Government consumption expenditure is reduced so that the *current* fiscal deficit is eliminated. The Zimbabwe CGE model abstracts from the capital account of the government budget, which in 1991 contributed about 70 percent to the overall budget deficit. Thus, having the current fiscal deficit reduced from about Z$473 million to zero in Simulation VIII addresses only a part of the larger macroeconomic problem.

- **Simulation IX** imposes current fiscal balance in combination with trade liberalization, maize price decontrol, and income tax adjustment.

RESULTS OF MODEL SIMULATIONS

Tables 1 presents the results of the first three policy experiments. Trade liberalization by itself leads to an appreciable increase in total GDP (4.4 percent) and an even more significant rise in agricultural GDP (9.5 percent), implying an anti-agriculture bias of the existing trade restrictions.[8] [9]The exchange rate (in real terms) depreciates (by 7.4 percent) and both exports and imports expand substantially (by 25.8 and 23.4 percent, respectively). LSC farm production increases by much more than smallholder production, owing to the greater export orientation of LSC agriculture. Larger income gains understandably accrue to LSC farm households than smallholder households. High-income urban households benefiting more than their low-income counterparts adds to the negative equity effect of trade liberalization in Zimbabwe. However, the impact on aggregate real disposable income, representing the sum of gross incomes of all households net of direct taxes deflated by the general CPI, is positive.

Price decontrol in the maize market, which effectively makes the trade regime completely liberalized, is seen (from the second column of Table 1) to further increase GDP and aggregate household income. At the same time incomes of smallholder, LSC farm-worker, and low-income urban households rise while that of the more affluent LSC farm-owner/manager and high-income urban households are not affected significantly (relative to the corresponding results of trade liberalization alone); thus, the equity effect of maize price decontrol is positive. Notably, quantitative differences between the outcomes of Simulations I and II are in general relatively small, since the maize sector represents under 2 percent of GDP at factor cost, and the price penalty to maize producers (10 percent) and subsidy to grain

millers (15 percent) are not large in the base model. Even so, maize price decontrol needs to be viewed as a win-win policy reform measure that improves both overall income and equity in Zimbabwe.

The effect of trade liberalization on government revenue (not shown) is negative, implying that the positive impact of the larger income tax base does not fully offset the reduction in import tax (tariff and surcharge) revenue. Indeed, government "dissaving" (current expenditure minus current revenue) increases significantly from the base value of Z$473 million to Z$1,303 million, which would have worsened an already fragile fiscal situation in 1991 (see GATT 1995). Combining trade liberalization with higher income tax rates for enterprises and the two affluent household groups that leave the fiscal balance unchanged at the base level (Simulation III) does not alter much the GDP effects since incomes are mainly redistributed. However, aggregate household income gains declines significantly, which is chiefly due to the expected negative effect on the two household groups whose income tax rates are raised. Income changes for the poorer household groups are not much affected.

The results of four policy experiments involving land reform are summarized in Table 2. Simulation IV, including Land reform A (no voluntary farm subdivision), a new land tax, and expanded government expenditure to promote smallholder agriculture, leads to unfavorable outcomes in overall GDP, agricultural GDP, and aggregate household income. Not surprisingly, LSC production shows a drastic fall, accompanied by similar decline in exports, while smallholder-farm GDP increases appreciably. LSC farm-worker households suffer from the reduction in labor demand, wage rate, and hence real income. There is however an observed rise in LSC farm-owner income, attributable mainly to the land-transfer payments from the government and foreign sector (Z$284 million each). On the other hand the disposable income of smallholder households improves only slightly, despite the significant increase in farm production, owing in large part to their payment of the new land tax (amounting to nearly Z$4 million).

Adoption of the Land reform package B in Simulation V is seen to result in modest increases in GDP, exports, and agricultural GDP – improving therefore on the negative outcomes of Land reform package A. There is very little effect on LSC farm production, and indeed also on the incomes of the two LSC household groups, which is understandable in-as-much-as LSC cropland area does not change. Notably, the income gain for smallholder households is slightly larger than in Simulations IV (in spite of larger land tax), while that of low-income urban households improves appreciably. Thus, neither of the two land reform packages can be considered to simultaneously promote overall income growth and equity, although land reform B is slightly more effective.

The last two columns of Table 2 give the corresponding results of policy experiments combining each of the two land reform packages with trade liberalization, maize market decontrol, and income tax adjustment. They indicate drastically improved outcomes in GDP, foreign trade, agricultural production (in both LSC and smallholder farms), and aggregate income – relative to the two preceding experiments. Moreover, there is a clear improvement on the equity front: while the income gains for all household groups increase, the poorer households (LSC farm-worker, smallholder, and low-income urban) increase by far more than those for two affluent household groups. Significant synergy effects are revealed, as income gains exceed the sum of corresponding gains from the separate experiments – indicating

policy complementarity between the land reform and trade liberalization packages.

The comparative results of Simulations VI and VII on GDP, exports, agricultural production, and each of the real disposable household income indicators point to the general superiority of Land reform B over Land reform A when implemented jointly with the other policies. Indeed, the policy reform package represented in Simulation VII provides a win-win strategy in promoting overall income growth and equity in Zimbabwe.[10]

The sustainability of trade liberalization depends, according to some analysts (see, for example, Gunning 1996), on whether the perennially large fiscal deficits can be reduced significantly. The Zimbabwe CGE model can only address the current fiscal account, which in 1991 contributed about 30 percent of the overall fiscal deficit. The results of two model simulations assuming zero current fiscal deficit are summarized in Table 3. By itself, cutting government consumption expenditure to eliminate the current fiscal deficit (Simulation VIII) leads to slight declines in GDP and exports (by less one percent). However, agricultural production increases slightly, suggesting an anti-agricultural bias of fiscal policy in 1991. Not surprisingly, income gains accrue mostly to rural households. Simultaneously implementing trade liberalization, maize price decontrol, and income tax adjustment (Simulation IX) results in much more favorable outcomes in GDP, foreign trade, and household income distribution relative to the scenario of zero fiscal deficit only. Thus, the "real" effects of a contractionary fiscal policy are effectively swamped by the economy-wide impact of the trade liberalization package. Comparison with the results of Simulation III (Table 1) involving only the trade liberalization package shows identical GDP effects, but a more favorable equity impact and a negative outcome for aggregate household income in Simulation VII.

CONCLUSION

These comparative results from counterfactual simulations based on the Zimbabwe CGE model illuminate the greater effectiveness of trade policy reform in promoting overall growth of the Zimbabwean economy, and of fiscal policy and sectoral reforms in improving income equity among the five household groups. That significant improvements in aggregate household income and its distribution are accompanied by large increases in agricultural GDP is indicative of the central role of agriculture in achieving equitable growth in Zimbabwe. Finally, the above findings suggest that the land reform schemes specified in the model simulations represent a less potent instrument compared to trade policy reform combined with other complementary policy measures.

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Figure 1-- Nested production functions in the Zimbabwe CGE model

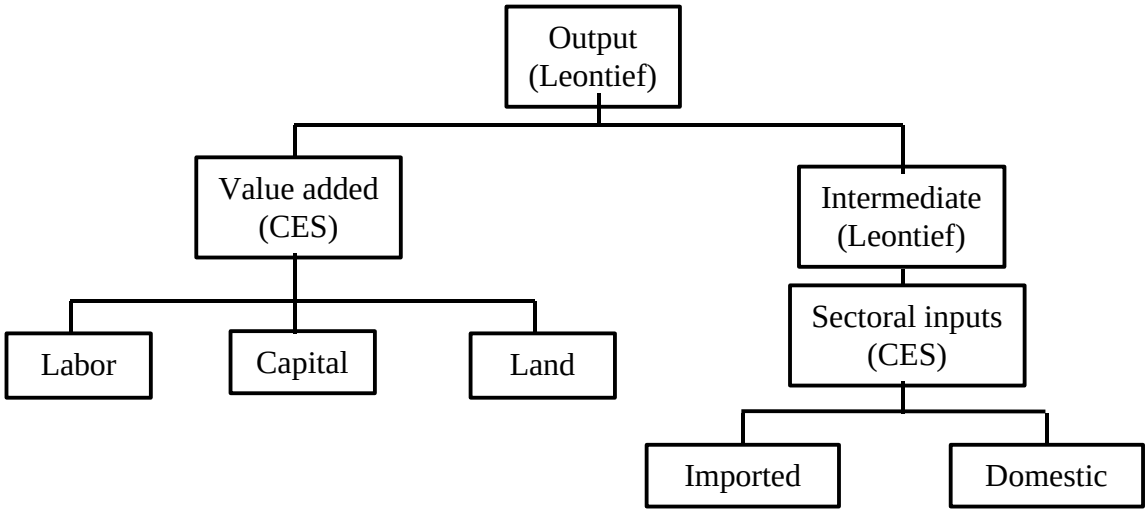

Table 1 – Zimbabwe CGE model simulation results: Trade liberalization, maize price decontrol, and income tax adjustment (percentage changes from base values)

	Simulation I	Simulation II	Simulation III
GDP at factor cost	4.41	4.53	4.52
Exports	25.83	25.80	25.79
Imports	23.43	23.39	23.38
Exchange rate	7.42	7.33	7.34
Agriculture GDP	9.45	10.72	10.76
LSC farms	10.81	11.36	11.39
Smallholder farms	5.64	8.92	8.99
Real disposable household incomes			
Aggregate	3.66	3.79	0.93
LSC farm-owner/manager	4.19	4.20	0.44
LSC farm-worker	9.24	10.39	10.43
Smallholder	2.40	3.60	3.76
High-income urban	3.81	3.72	0.40
Low-income urban	1.96	2.65	2.62

Notes: Simulation I – Trade liberalization with maize price control
Simulation II – Trade liberalization with maize price decontrol
Simulation III – Income tax adjustment added to Simulation II

Table 2 – Zimbabwe CGE model simulation results: Alternative land reform scenarios (percentage changes from base values)

	Simulation IV	Simulation V	Simulation VI	Simulation VII
GDP at factor cost	-3.28	0.26	3.12	5.08
Exports	-13.49	1.59	21.10	25.91
Imports	-0.03	-0.06	23.14	23.69
Agriculture GDP	-10.29	0.52	4.01	11.60
LSC farms	-16.05	-0.27	-0.61	10.18
Smallholder farms	5.83	2.72	16.93	15.56
Real disposable household incomes				
Aggregate	-0.65	0.23	0.69	1.47
LSC farm-owner/manager	2.38	0.10	2.42	0.48
LSC farm-worker	-22.07	-0.54	-5.14	9.57
Smallholder	0.36	0.56	5.65	6.01
High-income urban	-2.50	0.12	-1.77	0.71
Low-income urban	-2.54	0.93	2.50	4.73

Notes: Simulation IV – Land reform package A
Simulation V – Land reform package B
Simulation VI – Land reform package A plus trade liberalization with income tax adjustment and maize price decontrol
Simulation VII – Land reform package B plus trade liberalization with income tax adjustment and maize price decontrol

Table 3 – Zimbabwe CGE model simulation results: Removal of current fiscal deficit (percentage changes from base values)

	Simulation VIII	Simulation IX
GDP at factor cost	-0.32	4.52
Exports	-0.94	25.78
Imports	0.81	23.37
Agriculture GDP	0.83	10.78
LSC farms	1.06	11.40
Smallholder farms	0.19	9.03
Real disposable household incomes		
Aggregate	0.16	-0.65
LSC farm-owner/manager	1.19	-1.62
LSC farm-worker	1.63	10.46
Smallholder	0.13	3.85
High-income urban	-0.51	-1.44
Low-income urban	-0.42	2.61

Notes: Simulation VIII – Government consumption expenditure reduced to eliminate current fiscal deficit.
Simulation IX – Simulation VIII plus trade liberalization with income tax adjustment and maize price decontrol

NOTES

1.Senior Research Fellow and Research Analyst, respectively at the International Food Policy Research Institute (IFPRI). This paper is based on the recently completed country study on Zimbabwe under the IFPRI project "Macroeconomic Reforms and Regional Integration in Southern Africa" (MERRISA), funded by DANIDA (Denmark) and GTZ (Germany). The complete study is forthcoming as an IFPRI Research Report. Sherman Robinson provided many helpful insights, comments, and suggestions concerning various aspects of the study.

2. Previously, a highly aggregative CGE model for Zimbabwe, based on a 1985 SAM, has been developed and used to analyze the variability of national income in the 1980s (Davies *et al.* 1994) and the short-run effects of trade policy reform in the early 1990s (Davies *et al.* 1998), among other applications. It has no household disaggregation and distinguishes only five production sectors, where "small scale agriculture" is one sector and "commercial farming" is a part of the "exportables" sector.

3. According to Masters (1994, 9-10), "LSC-farm workers enjoy almost no mobility . . . and their wages bear little relation to wages elsewhere;" this isolation "is due in part to their history of state-sponsored recruitment from very low-income areas in neighboring Malawi and Mozambique" and in part to "their relative lack of education."

4. The rural population accounts for about 88 percent of the poor in Zimbabwe, 81 percent coming from the smallholder-farm sector (World Bank 199, 27). The remaining rural poor (about 7 percent) are in LSC farm-worker households. The poverty share of the urban population is 12 percent, much lower than its population share of 28 percent.

5. Government capital expenditure is assumed part of government savings, which leads to an overstatement of the "fiscal balance" (or understatement of the fiscal *deficit*) relative to the case where capital expenditure is included as part of government spending.

6. "Adjustment of direct taxes" is no doubt better achieved through a more effective tax collection than by increasing legal tax rates.

7. Payment for transferred land is estimated from published data (CSO 1996b, 4) on "own capital formation" (in 1991 Zimbabwe dollars) by LSC farms over a period of nine years (1983 to 1991). For cultivated land, it consists of the total value of own capital formation, while for underutilized land, it is estimated as 10 percent of own capital formation in irrigation work, fencing, and land conservation. The total value of capital improvement is calculated at Z$1,096 million for cultivated land and Z$10 million for underutilized land.

8. Not surprisingly, export-oriented sectors such as tobacco, coffee, tea, and mining show relatively larger increases in value added (12 to 18 percent).

9. It should be noted that the static effects of trade liberalization as calculated from the CGE model simulations understate the actual income benefits that would accrue to the liberalizing country. In a dynamic context, additional income gains (in the aggregate) would be generated

by inter-sectoral capital flows arising from the changing relative profitabilities due to the shift in trade policy. Also, there would be improvements in overall productivity at the sectoral level, since greater openness, as indicated above, is conducive to increased competition, better economies of scale, and more rapid adoption of labor skills and new technologies. Moreover, there are positive intertemporal income benefits implied by the larger domestic savings made possible by the observed rise in national income that will finance additional investments.

10. The positive impact of land reform, with or without accompanying changes in other policies, on smallholder household income may seem insubstantial – about 5 percent of base-year income at best. It bears emphasizing, however, that the latter result is accompanied by a favorable outcome in overall income (GDP). Larger increases in smallholder income would of course be possible, based on other land redistribution schemes, but which could result in a negative effect on overall income.