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EXTERNAL SHOCKS AND DOMESTIC POVERTY ALLEVIATION: SIMULATIONS WITH A CGE MODEL OF MALAWI

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Abstract

Two sets of issues loom large on the economic horizon of Malawi: poverty alleviation and the country's vulnerability to shocks emanating from the outside world. In this paper, simulations with a Computable General Equilibrium (CGE) model of Malawi are used to analyze aspects of these issues. The primary database that is used is a 1998 Social Accounting Matrix (SAM) for Malawi which in part is based on the recently published Malawian Integrated Household Survey (IHS) 1997-98.

The simulations explore the effects of external shocks and domestic policy changes aimed at poverty alleviation. The external shocks reflect episodes to which Malawi's economy has been exposed in recent times: changes in the international prices of tobacco and petroleum products and fluctuations in the real exchange rate. Two types of poverty-alleviating domestic policy shifts are simulated: a public works program and a land reform program. The public works program may function as an absorber of negative shocks elsewhere in the economy. The land reform program may introduce a structural change in the distribution of factor incomes in favor of the poor.

The results for the simulated external shocks confirm that Malawi's economy is highly sensitive to external shocks of the magnitudes that the country has experienced in recent years. The consequences are particularly negative for the non-agricultural population. Real depreciation has a pro-rural bias and is a powerful tool for eliminating balance-of-payment difficulties. Real appreciation protects the urban population (which may be more powerful politically) and total household consumption. A more diversified production and export structure would make Malawi less vulnerable to external price shocks and reduce the pressures that lead to sharp exchange rate fluctuations. Agricultural households are less exposed to changes in Malawi's external environment since their incomes tend to be more diversified with a substantial non-agricultural component.

Assuming that it is self-targeted, the expanded public works program generates significant gains for the rural poor but has a negative impact on non-agricultural households, especially in urban areas. High administrative costs and mobilization of workers that otherwise would have been employed elsewhere make the program less attractive from an over-all welfare perspective. It becomes more attractive if resulting improvements in infrastructure reduce distribution costs.

The results for the land reform simulations show that a tax-based land reform program has the potential of generating substantial gains for the household groups that receive the redistributed resources. The aggregate gains and the distributional effects are reinforced if the new owners are able to maintain the production pattern of the estate sector. Matching financing from the rest of the world can play a similar role by benefiting the target groups.

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Appendix

1.0 Introduction[1]

Two sets of issues loom large on the economic horizon of Malawi: poverty alleviation and the country's vulnerability to shocks emanating from the outside world. In this paper, simulations with a Computable General Equilibrium (CGE) model of Malawi are used to analyze aspects of these issues. The simulations explore the effects of external shocks and domestic policy changes aimed at poverty alleviation. The external shocks reflect episodes to which Malawi's economy has been exposed in recent times: changes in the international prices of tobacco and petroleum products and fluctuations in the real exchange rate. Two types of poverty-alleviating domestic policy shifts are simulated: a public works program and a land reform program. The public works program may function as an absorber of negative shocks elsewhere in the economy whereas the land reform program may introduce a structural change in the distribution of factor incomes in favor of the poor. Selected simulations are carried out under alternative assumptions to clarify the role of different elements in determining the effects.

A major advantage of our modeling approach is that it provides an integrated and detailed framework for analyzing changes at the micro and macro levels, including a wide range of government policies. The current model is characterized by a relatively fine disaggregation of the household sector, permitting assessment of distributional effects of simulated changes in the economy. The primary database that is used is a 1998 Social Accounting Matrix (SAM) for Malawi (Chulu and Wobst 2000) which in part is based on the recently published Malawian Integrated Household Survey (IHS) 1997-98 (NSO 2000).

We will proceed as follows: Section 2 provides a background on the issues that are addressed in the simulations. Section 3 briefly presents the CGE model and its data base.[2] Section 4 is devoted to simulations, while Section 5 presents conclusions.

2.0 Background

2.1 Economic Structure

This section provides a snapshot of the structure and state of Malawi's economy in 1998 and recent growth performance, covering both macro and micro aspects. The main purpose is to help us better understand the impacts of the different policies and exogenous shocks that are simulated later in this paper.

Tables 1-4 summarize Malawi's growth performance in the 1990s and its macroeconomic balances in 1998. The 1998 data were extracted from the project SAM (Chulu and Wobst 2000). With the exception of growth data in Table 1, all data are expressed as shares of GDP at market prices.

[1] Various colleagues have commented, assisted with the analysis or provided information used in the paper; we would like to thank Todd Benson, Jennifer Chung-I Li, Moataz El-Said, Ahmed Kamaly, and Sanjukta Mukherjee.
[2] The model is presented in detail in Löfgren (2000).

Table 1 shows that domestic absorption (the sum of private consumption, government consumption and investment) exceeds GDP by around 10%, by definition reflected in a trade deficit of identical magnitude. The investment share (13%) is lower than in other low-income countries.[3] Compared to these, Malawi's economy is relatively open, with the sum of exports and imports representing 75% of GDP. In US dollars, GDP per capita in 1998 was US$160. Since 1990, aggregate annual growth has been close to 4%, in excess of population growth. Among the absorption components, private consumption has increased while investment and government consumption have declined. On the supply side, agriculture has outperformed the other sectors.

The current account of the balance of payments (Table 2) shows that agriculture has a strong trade surplus whereas industry and, to a lesser extent, services record significant deficits. The current account deficit (foreign savings) is smaller than the trade deficit due to a net transfer surplus. On the income side of the current government accounts (Table 3), taxes contribute around 75% with the rest covered by transfers (grants) from the rest of the world. On the spending side, the main item is government consumption. The surplus (government savings) is close to the value of foreign transfers received, *i.e.*, current government revenues are just about sufficient to finance current operations. The bulk of investment is carried out by the government (Table 4). Given that government investment exceeds government savings, there is an over-all deficit in the government budget. All but a small part of investment is financed by the outside world, either explicitly (as foreign savings) or implicitly (as grant aid to the government).[4]

Table 5, which is also derived from the project SAM, provides a more disaggregated perspective on the structure of production and trade, complementing the information in Tables 1 and 3. Agriculture is dominant in terms of employment and exports. The sector represents 87% of total employment but a smaller share, 36%, of GDP (*i.e.*, its labor-intensity is above the economy-wide average). In addition to the disaggregation along product lines in Table 5, the agricultural crop sector may be disaggregated into small-scale (68% of agricultural value-added) and large-scale (32%) sub-sectors. Close to 70% of total exports are agricultural, with the lion's share for tobacco (representing close to 50% of total exports, including services, and close to 60% of merchandize exports). Virtually all tobacco production is exported. On the other hand, exports are much smaller or negligible for maize, non-crop agriculture, and industry. Agricultural imports represent a small share of total imports (8%) and of total domestic agricultural demand (11%). For non-agricultural commodities as a whole, imports constitute a much more significant share of domestic demand (30%), in particular for non-food manufacturing and other services.

Table 6 shows selected data for Malawi's households, disaggregated on the basis of socio-economic characteristics. Some 87% of Malawi's population lives in rural areas. In 1998, the poverty rate was 61% in rural areas and 51% in urban areas. In the rural areas, the majority of the population belongs to the category of agricultural households with land holdings of less than two

[3] NEC (2000a, pp. 6-7) makes the same observation. In 1999, more government investment raised the investment share to 20%. However, even this higher share may note be sufficient to generate GDP growth at levels sufficient to significantly reduce poverty.

[4] There are obvious links between Tables 1-4. Table A.1 restates this information in a condensed, aggregated SAM. This format has the advantage of making the links between the different accounts explicit and impose consistency between information from different sources.

hectares. The data indicate that there are substantial welfare gaps, both in terms of urban to rural average per-capita income and within each area.

These income differences are largely driven by an unequal distribution of factor assets and associated incomes.[5] The importance of different factor incomes in the income of each household is indicated in Table 7, while Table 8 shows how incomes from different factors are distributed across households. In general, the agricultural – non-agricultural household distinction is reflected in the different sources of factor incomes for the different households. The low-income households primarily rely on their labor whereas those who are better off rely more on land and capital. A substantial share of total agricultural resource incomes accrues to urban households whereas rural households earn a large part of the non-agricultural labor income. The rural households do not control any urban capital.

In sum, this snapshot of Malawi's economy paints the picture of an economy that is closely linked to the outside world and vulnerable to external shocks (with a single commodity dominating merchandize exports and investment being largely financed by the outside world). The potential repercussions of negative shocks (from external or internal sources) are severe as a large part of the population lives below the poverty line.

2.2 External Shocks

As mentioned in the Introduction, our simulations will address three types of external shocks: changes in the international prices of tobacco and petroleum products and variations in the real exchange rate. Figure 1 shows the evolution for these variables since 1990 (with both commodity prices measured in constant US dollars and all variables indexed to 1990=100).[6] For all three, the variations have been substantial. The tobacco price declined by 50% between 1991 and 1994, increased by 66% between 1994 and 1998, and declined by 25% between 1998 and 2000. The long-term prospects for tobacco prices may be negative (World Bank 1998, p. 35). The international price of petroleum products, which in 1998 accounted for 7% of total imports, has also fluctuated substantially: between 1996 and 1998, the average price fell by more than 40% whereas, between 1998 and 2000, it more than doubled.

In the mid-1990s, Malawi attained current account convertibility. Since that time, the value of the Kwacha has been determined by market forces subject to Reserve Bank interventions aimed at smoothing out seasonal fluctuations. Relative to other African countries, Malawi's real exchange rate fluctuations are among the highest: the year-to-year changes in the index for the real effective exchange rate were above 25% in 1994, 1996, and 1998, without any perceptible trend since 1994.[7] The reasons for these sharp variations include budgetary crises, pegging of the nominal exchange rate at unsustainable levels, the seasonality of Malawi's export earnings, and unpredictable foreign aid flows (IMF 1997, p. 14; World Bank 2000a, p. 220).

[5] Factor incomes accounts for more than 90% of total incomes for every household category in the SAM except for the urban, non-agricultural households with low education (representing less than 1% of the total population); for this group, factor incomes account for 66%, with the balance represented by transfers from the government.
[6] The data underlying Figure 1 are presented in Table A4.
[7] The real effective exchange rate is from the IMF: it is a weighted average of nominal exchange rates for selected countries adjusted for differences in inflation.

The simulation analysis in this paper will assess the impact of these external shocks on selected indicators, including the distribution of gains and losses across different household groups and producing sectors.

2.3 Domestic Poverty Alleviation

Public Works Programs

To alleviate domestic poverty, Malawi's government is pursuing a variety of policies. The Public Works Program (PWP), which is carried out by the Malawi Social Action Fund, is becoming more important. According to plans, the Expanded PWP will employ the equivalent of 250,000 full-time workers (5% of the total labor force but a larger share of the targeted labor segment) at a daily wage of US$0.35 (KW11 at 1998 prices) (NEC 2000a and 2000b).

In the short run, it may dampen the negative impact of shocks on the poor. A major attraction of PWPs is that, by offering wages that are below the lowest market rates, they can be self-targeting, attracting only the poorest at times of slack in the regular labor market. This obviates the task of administratively identifying the poor to which the benefit is targeted and may assure that labor is not diverted from other productive activities. However, to some extent it may be difficult to avoid the latter outcome given that rural, basic wages are very low. In 1999, reports convey monthly wage figures that are KW200 or less than US$5 (NEC 2000a, p. 67; World Bank 2000b), *i.e.*, below the rate of the PWP. Another potential drawback of PWPs is large administrative costs relative to the benefits that are distributed.

In our simulations of the Expanded PWP, we address the following questions: What welfare improvements will the program generate? How does its impact differ depending on whether the program absorbs surplus labor or ends up diverting workers from employment in other activities? How sensitive are its effects to the level of administrative costs?

Land Reform

In Malawi, cultivable land is scarce and inequitably distributed, a situation that has generated intense land competition and conflict.[8] The sector is dualistic, consisting of a large number of smallholders and an estate sector that, as a result of government policies, tends to occupy the best land (Lele 1989). In 1998, the estates accounted for 32% of value-added in crop agriculture (with tobacco as their dominant crop) in spite of the fact that they represented only 9% of the cultivated area.

The general rationale for land reform rests on that it can reduce poverty, increase efficiency, and add to economy-wide growth. Efficiency gains (measured by total factor productivity) are likely

[8] Summary data of the inequality of land distribution in Malawi are not available. As an indicator of the prevailing inequality, according to the 1998 SAM and population data, the average annual per-capita income from agricultural land and capital varies from US$1.6 for rural agricultural households who are landless or own less than 0.5 ha (representing 20% of Malawi's population) to US$2,360 for households with 10 ha and above.

given that evidence from many developing countries suggest that small farms are more efficient.[9] Through greater linkages to the rest of the economy, higher incomes for smallholders tend to support more rapid economy-wide growth (van Zyl *et al*. 1996, pp. 4-5; Binswanger 1996, pp. 20-21).

Different approaches to land reform are possible. Compared to reforms that are imposed on the landowners, market-assisted land reforms have the advantage of being based on voluntary agreements between buyers and sellers. The government may provide grants that finance the bulk of the cost of land and additional production-related investments for selected beneficiaries. Supplementary financing is provided by other sources, including an agricultural credit system. Such market-assisted land reforms may be carried out at costs comparable to those of other government interventions and may impose less of a burden on government capacity than reforms that are imposed from above. (For a discussion of this type of land reforms, see Deininger 1998).

The land reform simulations of this paper implement a simplified version of a market-assisted land reform. The government makes payments to eligible beneficiaries to finance their land purchases. These payments are financed by a tax that is a fixed share of estate incomes (defined as the return to estate land and capital, *i.e.*, the sales revenue net of the costs of intermediate inputs and labor), possibly supplemented by grant aid from the outside world. Such a reform approach spreads the burden that is imposed on estates evenly across the sector; no additional burden is imposed on the estate owners that give up their land since this is the outcome of a voluntary transaction.

To simulate this type of land reform, it is necessary to determine an approximate level for the average land price at which buyers and sellers will arrive through their negotiations. A piece of land (and the capital that comes with it) may be viewed as an asset that is expected to yield a perpetual income stream (the return to land and capital net of any taxes). According to economic theory, the price (in present value terms) of such an asset is the annual net income (after deducting any taxes and an allowance for capital consumption) divided by the interest or discount rate (Chiang 1984, p. 464). This formulation captures an effect that is often observed in the real world: the imposition of a tax on an asset (or its income) reduces the market price of that asset.[10]

Our analysis is based on the assumption that the land sellers receive a fixed annual payment (indexed to the domestic inflation) during a period of 10 years; the present value of the payment stream is scaled to assure that it is identical to the present value of the asset (calculated in the manner described above). In practice, the land transactions would be facilitated if a third party, for example a foreign government, guaranteed the payments. The simulations test the sensitivity of the required annual payment per land unit during the 10-year period to alternative discount rates. The amount of land that is transferred is defined as the resources available (from the land tax and foreign grants, net of administrative costs) divided by the annual payment required

[9] The fact that, in Malawi, yields (output per land unit) are higher on estate lands does not negate this since the estates are relatively intensive users of capital and intermediate inputs and have benefited from long periods of government interventions in its favor.

[10] In Malawi, substantial estate lands are unutilized. When a land tax is imposed, it is possible that some estate owners prefer to turn over the land to the state, thus freeing up more land for redistribution (Chulu 2000).

during the ten-year period. In the simulations, the land is transferred, on an equal per-capita basis, to the lowest-income, rural, agricultural, household groups (the three rural agricultural groups with less than two hectares, representing 57% of the Malawi's total population).

Major questions revolve around the technology and the cropping pattern that will prevail on the redistributed lands. In the simulations, two extreme alternatives are tested: the redistributed land either retains the characteristics of the estate lands or takes on the characteristics of smallholder lands.

The purpose of the simulations is to draw a general picture of the likely impact of a tax-based land reform and its sensitivity to various assumptions. The analysis will address the following types of questions: How large a land area can be redistributed? What is the impact of any given reform scheme on aggregated and disaggregated household welfare? How is this impact influenced by the productivity and production pattern of the land-reform beneficiaries? Complementary analyses of various micro-level aspects could cast light on important aspects such as the selection of beneficiaries, production issues, and mechanisms for arranging land transactions (including financing of part of the land cost through the banking system).

Before turning to the simulations, we will first give a brief overview of the model structure and the database.

3.0 Model Structure and Database

The simulation analysis of this paper is based on a CGE model of Malawi. To the best of our knowledge, this is a first for Malawi. Since the model is presented in detail in Löfgren (2000), we will here only provide a brief verbal overview.

CGE models may be defined as economy-wide models the solutions to which depict a simultaneous general equilibrium in all markets of the economy. CGE models are widely applied to policy analysis in developing countries and have a comparative advantage when there is a need to consider links between different producing sectors, links between the macro and micro levels, and the disaggregated impact of changes in policies and exogenous shocks on production, and household welfare. The current model is structured in the tradition of trade-focused CGE models of developing countries described in Dervis, de Melo, and Robinson (1982). Its distinguishing features include a detailed treatment of households and the division of the agricultural crop sector into small-scale production and estates.

Figure 2 provides a bird's-eye perspective on the model, highlighting the links between its major building blocks: producers, factor markets, commodity markets, households, the government, and the rest of the world. The arrows in the figure represent payment flows. For payments other than taxes, transfers, and savings, real flows (a factor service or a commodity) go in the opposite direction. In the model, all blocks except the government and the rest of the world are further disaggregated; Table 9 shows the full model disaggregation. In Figure 2, the block labeled "Households" represents all domestic non-government institutions that are listed in Table 9 (*i.e.*, all households and all enterprises).

We will explain the structure of the model while moving through Figure 2. Starting from the left, the producers (also referred to as the production activities) earn their income from sales in domestic and foreign markets. The income is allocated to purchases of intermediate inputs and payments to production factors (different types of labor, land, and capital). When making their decisions, the producers maximize profits subject to production functions with neoclassical substitutability for factors and fixed coefficients for intermediate inputs. They are assumed to act in a perfectly competitive setting, taking the prices of outputs, intermediate inputs, and factors as given. It is assumed that, for each producer, there are quality differences between what is produced for the domestic market and exports. The allocation of outputs between these two destinations is determined by the relative prices received in domestic and foreign markets. For the export markets, the model makes the so-called small-country assumption: Malawi can sell any quantity it desires at fixed world prices.

For the domestic product markets, the demand side consists of investment demand, private consumption, government consumption, and intermediate input demands. The supplies come from domestic producers and the rest of the world (imports). In each market, the ratio between demands for products from these two sources depends on relative prices, assuming that there are quality differences between imports and domestic output. Malawi is assumed to be a price-taker also on the import side: it can buy any quantity it desires at fixed world prices. Flexible prices clear the market segments for products of domestic origin.

In the factor markets, the demands of the producers are met with fixed supply quantities. In each market segment, a flexible (rental) price (or wage) assures that quantities demanded and supplied are equal. A key question is: to what extent are the different factor markets segmented? Given the short-run focus of the simulations of this paper, it is appropriate to impose a high degree of market segmentation. Unless otherwise noted, the land and capital markets are segmented by activity, *i.e.*, land and capital cannot move from one activity to another. In each market segment, a flexible rent assures that demand and supply are equal. On the other hand, each labor factor is able to move freely across all relevant (agricultural or non-agricultural) activities.

Except for a portion paid to the rest of the world (reflecting foreign ownership), the incomes of the factors are distributed to the different households in fixed shares that reflect the shares that they control for each factor. The households may also receive transfer payments from the government (which are indexed to the consumer price index). The households allocate this income to pay taxes, save (both of which are fixed shares of incomes), as well as to consume (according to demand functions derived from utility maximization).[11]

The government collects taxes and transfers from the rest of the world (fixed in foreign currency).[12] These are used for consumption (of fixed commodity quantities), transfers to

[11] The model distinguishes between households and enterprises. Enterprises earn land and capital incomes; they allocated these incomes to direct taxes, savings, and transfers to households and the rest of the world. The households earn labor incomes and transfers from the enterprises and the government. They use these incomes for direct taxes, savings, and consumption.

[12] In addition to direct taxes on households and enterprises, the model includes additional tax tools: direct taxes on labor incomes, and different indirect taxes: import tariffs, taxes on commodity sales, and an export tax.

households (indexed to the domestic price level), and savings. Alternative treatments are possible with regard to the determination of government savings. They may, for example, be a flexible residual, defined as the difference between government revenues and expenditures. Another alternative is to fix government savings while permitting a tax instrument to vary to assure that this fixed savings level is realized.

In the savings-investment block, the total purchase of investment goods (disaggregated into government capital formation, private capital formation, and stock changes) is financed by savings from the domestic institutions and the rest of the world. The rest of the world (the current account of the balance of payments) supplies Malawi with foreign currency when it purchases Malawi's exports from and makes transfer payments to its government. Malawi spends its foreign currency on imports. To the extent that Malawi's spending exceeds its earnings, foreign savings (the current account deficit) is positive.

The last three blocks, which include the government, savings-investment, and the rest of the world, are associated with the macro constraints of the model. A major question is how the model assures that, in each block, spending (for the government and the rest of the world also including savings) equals revenue. In the simulations of this paper, investment quantities are treated as fixed, assuming that government policy and private decisions are unaffected by the changes associated with the model simulations. In the rest of the world block, foreign savings are fixed; the real exchange rate is the flexible variable that balances the foreign currency receipts (including foreign savings) and foreign currency spending of the model country. Given this, the domestic savings side has to adjust to ensure that the investment cost is fully financed. As noted above, household savings are a fixed share of household incomes. Thus, the role of assuring that investment is fully financed falls on government savings. This is a reasonable assumption in the Malawian context given that government savings account for more than 90% of domestic savings while government capital formation represents more than 80% of domestic capital formation. In most simulations, variations in the (effective) direct tax rates imposed on households is the mechanism which assures that the required value of government savings is generated. The direct tax rates are only varied for the households that, according to the SAM, initially pay such taxes. These household groups represent the 12% of the population (predominantly urban) with the highest per-capita incomes.

One important feature of the model that is not reflected in Figure 2 is that of distribution costs (which also may be labeled marketing costs or transactions costs). Such costs arise whenever a commodity is distributed domestically as part of international trade (to or from the border) or as part of domestic trade (from domestic supplier to domestic demander). This feature is important in many African settings where an underdeveloped transport network leads to high transportation costs (cf. Ahmed and Rustagi 1993) and particularly important in Malawi as it is a land-locked country.

The model is built around a 1998 SAM for Malawi (Chulu and Wobst 2000). Most of the model parameters are set endogenously in a manner that assures that the base solution to the model exactly reproduces the values in the SAM – the model is "calibrated" to the SAM. The remaining parameters, a set of elasticities, are set exogenously. Household consumption elasticities were estimated using data from the Malawian IHS (Bouis and Quabili 2000). Trade and production

elasticities were selected on the basis of available estimates for countries that are similar to Malawi. (For the central-case values, see Table A.5.) The trade elasticities (which measure the extent of quality differences between output sold domestically, imports, and exports) are higher for agricultural products compared to the products of other sectors. As a result, changes in agricultural export and import prices (due to changes in world markets or exchange rate changes) are transmitted in a relatively full fashion to the prices faced by domestic producers when producing for the domestic market. To check the performance of the model, simulated general equilibrium price elasticities of supply for agricultural goods were compared to and found to be within the range of econometric estimates (partial and general equilibrium) for the same elasticities.

The model is solved in a comparative static mode. It provides a simulation laboratory for doing controlled experiments, changing policies and other exogenous conditions, and measuring the impact of these changes. Each solution provides a full set of economic indicators, including household incomes; prices, supplies, and demands for factors and commodities (including foreign trade for the latter); and macroeconomic data.

4.0 Simulations

The simulations are divided into two groups. The first is concerned with external shocks: it analyzes the impact of changes in the real exchange rate, and in the international prices of tobacco and petroleum. The second group addresses two kinds of policies aimed at domestic poverty alleviation: public works and a land reform. Background on the issues related to the simulations was presented in Section 2.

4.1 External Shocks

Real Exchange Rate Depreciation

Malawi's record points to the importance of assessing the incidence of variations in the real exchange rate on the domestic economy. We will first analyze the impact of a 10% depreciation, here viewed as the result of a desire or need to reduce the current account deficit and the surplus on the capital account (for example because of a decline in foreign investment or foreign aid in loan form, or reduced willingness to draw on foreign reserves). Alternatively, it may be seen as the outcome of a conscious use of the real exchange rate as a tool to promote tradables and a more diversified production and export structure.

Tables 10 and 11 present assumptions and results for this simulation (DEP10) and the following simulations.[13] The initial micro effect of real depreciation is an increase in producer prices for exports, with a larger impact in relatively export-oriented sectors, and demand-side prices for imports, which boost prices of domestically produced import substitutes. The impacts of these price changes on domestic production of export commodities and import substitutes are stronger

[13] For all simulations in this paper, Appendix Tables A.6-A.10 present additional results (for GDP at factor cost, factor incomes, production, and household consumption).

if the quality differences between traded and non-traded items are small and if factors easily can move to the sectors that enjoy stronger incentives.

On the macro level, more exports and fewer imports reduce the trade deficit and foreign savings (the current account deficit). This may be desirable from a balance-of-payments perspective. However, in order to maintain unchanged levels of investment (and government consumption), it becomes necessary to raise domestic savings. In the current model, this is done via an increase in government savings through higher direct taxes, which have a negative impact on household consumption.[14]

As shown in Table 11, the final outcome includes changes in exports and import volume by close to 5%, reducing foreign savings by 3% of GDP (and generating a similar decrease in the trade deficit). Given that total domestic production is relatively fixed (due to fixed total employment for all factors), the fall in the trade deficit imposes cuts in absorption and household consumption (by around 4-5%). Increases in government savings and direct tax revenues by around 3% of GDP are required to support an unchanged investment level.

On the production side, agricultural terms of trade improve significantly. The shares of economy-wide value-added and factor incomes increase for agriculture and its factors, relatively the most strongly for the estate sector. Agricultural output is reoriented toward tradable crop production, especially by the estate sector. Outside of agriculture, there is a marginal shift toward service sectors and, within industry, toward textiles and other manufacturing.

The distributional impact is strongly pro-agricultural, with the largest consumption gains to the households that control agricultural land and capital. Substantial losses, in the range 4-13%, are registered for all non-agricultural households, with losses at the lower end of this range for rural households who depend in part on agricultural work for their incomes.

The purpose of the second simulation (DEP10-ST) is to assess the importance of using different approaches to government financing in conditioning distributional effects. The simulation is identical to DEP10 except for the mechanism used by the government to generate enough government and domestic savings to finance the investment program. Instead of adjusting direct tax rates, the government varies the rates of commodity sales taxes.

As shown in Table 11, the impact of this scenario on the macro indicators, including total household consumption, are very similar. However, the distributional effects are strikingly different. Compared to DEP10, farmers with more than 5 hectares gain substantially whereas all other rural households lose. In urban areas, the agricultural household group (which does not pay direct taxes) loses whereas all other households gain.

[14] Given that total GDP at factor cost is relatively fixed (due to fixed factor employment, a reasonable short-run assumption), a decrease in the trade deficit requires a decline in one or more of the components of domestic absorption: household consumption, investment, and government consumption. In the current model formulation, household consumption adjusts. However, alternative formulations would have permitted a different burden-sharing between these three components

Tobacco Export Prices

As noted in Section 2, Malawi's export prices for tobacco have been highly volatile, changing by up to 40% from one year to the other. In this simulation (TOB-25), we explore the short-run impact of a 25% decrease in the tobacco export price (in foreign currency). According to preliminary data, this is the approximate decline (in constant dollars) that Malawi suffered between 1998 and 2000.

At the micro level, this shock initially reduces export and producer prices for tobacco, giving rise to disequilibrium on the production side. In response, the variable factors (different labor types) move from the tobacco sector to other sectors. At the macro level, a deficit appears in the current account of the balance of payments, signaling that the economy, in order to maintain external balance, has to increase exports and/or reduce imports. This imbalance gives rise to exchange rate depreciation, *i.e.*, raising the prices and encouraging production of traded output relative to non-traded commodities.

Table 11 summarizes the final outcome. The real exchange rate depreciates by around 9%. The loss in the terms of trade leads to a decrease in absorption that is reflected in a 5% decrease in aggregate household consumption. Government revenues increase as a result of an increase in the domestic value of transfers from abroad (which are fixed in foreign currency) and higher tariff revenues (the response of import demand to higher domestic-currency import prices is inelastic). The domestic value of foreign savings also increases. The government is able to reduce direct tax rates while still generating the value of government savings that is needed to fully finance domestic investment (in spite of that the cost of investment rose due to higher import prices).

The distribution of this aggregate loss across the different household groups primarily depends on the changes in their respective factor incomes and the prices of the commodities in their baskets of consumption commodities.

Within agriculture, production and value-added shifts from tobacco to other crops, especially crops that are relatively tradable (since they are affected positively by the exchange rate depreciation). The over-all agricultural terms of trade improves, an indication that the gain in farm-level export and import prices of non-tobacco outputs dominates the decline in tobacco prices. The loss is smaller for the smallholder sector (since tobacco is less important in their production pattern) and the fixed factors (land and capital) within this sector. Outside of agriculture, the losses (in production and incomes) are particularly large for non-traded service sectors, including personal services and distribution services (which lose from lower tobacco exports).

The net result is that the households that most strongly rely on incomes from the fixed factors of the smallholder sector are able to increase their consumption (by 3-5%). All other households lose. The consumption losses are particularly large (7-10%) for households that depend on agriculture only to a minor extent.

Petroleum Import Prices

The next simulation (PET+100) imposes a 100% increase in the import price of petroleum products, *i.e.*, a change that mimics recent world market developments. Since this also constitutes a negative shock in the external terms of trade, the direction of many changes are the same of those recorded for the preceding tobacco simulation.

The initial micro-level repercussion is that the domestic price for petroleum products increases, with a resulting decline in demand. The impact is even more negative (in terms of real consumption and production) for households and activities that have high spending shares for petroleum. At the macro level, real exchange rate depreciation is brought about by the emergence of an unsustainable current account deficit.

As shown in Table 11, the size of the depreciation needed to restore equilibrium in the current account of the balance of payments is larger than for the tobacco price shock, around 11%. This is the case in spite of the fact that the loss in the external terms of trade (the ratio between indices of foreign-currency export and import prices) is much smaller for the petroleum price shock (6%) than for the tobacco price shock (15%). This less flexible response is due to the absence of domestic substitutes for petroleum products and the assumption of fixed input coefficients for intermediate inputs (including petroleum products). Within the agricultural sector, it is easier to reallocate production between different activities.

At the macro level, absorption and household consumption decline by 3-4%. The depreciation makes investment goods more expensive. Although it also raises the domestic value of foreign savings, an increase in government savings, in part supported by higher direct taxes, becomes necessary.

At the micro level, this strong depreciation provides a significant boost to the agricultural sector, improving its domestic terms-of-trade indices (especially for the estate crop sector), and raising sectoral shares in value-added and the shares of agricultural factors in total factor incomes (especially fixed factors in the estate sector). Production shifts toward more tradable outputs throughout the economy. In the context of an aggregate loss, the ultimate impact on the consumption of different household groups primarily depends on how they make their living. Consumption gains (in the range of 2-6%) are registered for the agricultural households that control most of the agricultural resources whereas the majority of resource-poor agricultural households face a small loss. Across the board, the non-agricultural households suffer a significant loss in consumption (by 4-9%).

Combined changes in tobacco and petroleum prices

The next simulation (TOB-PET) combines the changes in tobacco and petroleum prices that were introduced individually in the two preceding simulations (TOB-25 and PET+100). The goal is to assess the broad impact on Malawi's economy of the two major adverse price shocks that it has experienced since 1998.

The results confirm that these price shocks impose a major burden on Malawi's economy, in particular given that living standards are at a low level. In the absence of additional resource inflows to the government, it is difficult to see how the aggregate welfare loss could be avoided, in particular in the short run.[15] However, the results also show that the impact on those who rely on agriculture is relatively positive – the consumption changes for these household groups range from losses by 3% (for the resource-poor) to gains by 9% (for the resource-rich). By contrast, the consumption losses of the non-agricultural households are by 12-19%. Hence, the most pressing political issue is that of protecting the bulk of the urban population.

Simulated General-Equilibrium Elasticities

Table 13 shows the results when the preceding shocks are repeated with 1% increases in the experiment parameters (the real exchange rate, the tobacco export price, and the petroleum import price). When this is applied, the non-base values for all indicators that are expressed as %-age changes from the base (*i.e.*, all indicators except those expressed as GDP shares) show the general equilibrium elasticities with respect to the exogenous change. This provides an additional comparative perspective on the impact of these shocks.

The directions and magnitudes of the different changes are as expected, given the results reported above. These results for the new simulation set highlight important differences in terms of how sensitive the economy is to these exogenous changes. Changes in the real exchange rate (DEP1) have the strongest repercussions, understandable as it directly affects all export and import prices and changes the current account deficit. The real depreciation elasticities are around 0.5 for exports and –0.5 for absorption and imports. The absolute values of the corresponding elasticities with respect to the tobacco export price (TOB+1) and the petroleum import price (PET+1) are around 0.4 and 0.04, respectively. In relative terms, these numbers are roughly proportional to the weight of these two commodities in Malawi's foreign trade.

4.2 Public Works Program and Distribution Costs

Section 2 provided data on Malawi's planned expanded public works program. As noted, such a program aims at raising the incomes of vulnerable groups, either as a countercyclical measure against negative external shocks or as a more permanent source of employment and income. Another goal of the program is to improve the domestic infrastructure and reduce domestic distribution costs.

The next set of simulations will assess the impact of this program and test how the outcome can differ depending on the administrative costs, the ability of the program to mobilize workers without diverting them from other activities, and its impact on distribution costs. Across all public works simulations, the program hires the equivalent of 250,000 full-time workers at an exogenous daily wage of KW11 (at 1998 prices).

[15] Additional simulations, not reported in this paper, indicate that a large increase in foreign aid (around 10% of GDP) would be needed to keep the real exchange rate from depreciating and that, if such aid were forthcoming, the deterioration in agricultural terms of trade would not be kept in check. As a result, the looses of the resource-poor agricultural households would be even larger.

The first simulation (PWP) implements the government program in accordance with the plan. Tables 14 and 15 show assumptions and key results. It is here assumed that the workers are not diverted from other activities, *i.e.*, that during the time spent in the program, they would otherwise have been without work.

The additional worker income (in effect a transfer payment from the government) is distributed to the households in the same manner as income for uneducated agricultural laborers (cf. Table A3).[16] The workers covered by the program represent around 9% of the total agricultural labor force with no education. The administrative cost mark-up on the wage bill is 14% (in accordance with the government plan). The government is assumed to raise direct taxes on the households that initially pay such taxes to make up for its spending increase and assure the financing of the initial level of real investment. In effect, this means that the households that do not participate in the program provide the financing.

As shown in Table 15, the consumption gains for the major, low-income, rural agricultural household groups are by 3-4%, with the higher figure for those with lower incomes. Most other households lose. The impact on specific groups depends on the combined impact of the direct tax increase and the extent to which their labor endowment belongs to the targeted group. Overall household consumption declines slightly as part of the domestic absorption switch to government consumption (which increases by 1.3%), reflecting the costs of administering the program. The required increase in direct taxes is close to the total cost of the program (1.3% of GDP). The change in total absorption is negligible.[17] As a result of the redistribution that takes place (from consumption by households that are relatively well-off to consumption by low-income rural households and the government), domestic demand switches to non-traded output, a development that brings about a slight real depreciation.

The following simulation (PWP-L) is identical except for the assumption that the workers employed in the program are no longer available for work in agriculture. As a result, losses are registered in agricultural (and total) GDP, absorption, and total household consumption (for the latter by 1%). Compared to the preceding simulation, a slight depreciation is needed to maintain an unchanged trade balance in the face of lower agricultural production.

Within the available consumption envelope, the redistributional effects are more pronounced. The fundamental reasons are (1) the wage increase that results from the tightening of the market for uneducated agricultural labor; and (2) an improvement in agricultural terms of trade (caused by depreciation and the agricultural supply cut). Compared to the base, substantial consumption gains (by 4-6%) accrue to the agricultural households with the lowest per-capita incomes (resource-poor agricultural households and non-agricultural households with little or no education). The largest losses (by around 5%) are registered for the households that rely on agriculture the least for their incomes and face an increased tax burden (most urban households and the most educated, non-agricultural households in rural areas).

[16] Among workers with no education, the agricultural segment accounts for around 90% of the total in Malawi.
[17] The production of the public works program is not counted as part of GDP. In an accounting sense, it could be considered part of government consumption. However, although this would raise total absorption, household consumption would not be affected.

The next simulation (PWP-A) is identical to the first in this set except for an increase in the mark-up for administration from 14% to 50%. The main difference in the results is that, in order to finance and administer the program, larger increases are needed in direct taxes (by 1.7% of GDP) and government consumption (by 4.5%). This reduces both aggregate household consumption (by 0.8%) and disaggregated consumption for the households who face the bulk of the tax increases. Compared to the first simulation, only minimal changes are recorded for the macro aggregates and the consumption levels by the households targeted by the program.

One of the arguments in favor of public works programs is that they can improve infrastructure (perhaps most importantly the road network), thereby reducing the costs of distributing commodities domestically (as part of domestic or international trade). It is difficult to put a precise figure on the cost reductions that are likely. Nevertheless, to gauge the importance of this consideration, we will conduct two simulations with reduced distribution costs, first in isolation from other changes and after that in conjunction with the basic version of the public works program.

In the simulation DIST, the distribution costs per unit traded are reduced by 1% (at base-year prices).[18] This constitutes an economywide efficiency gain and has a positive impact on most economic indicators. Absorption and aggregate household consumption both increase by 0.2%. The reduced cost of trade encourages exports and imports. Agricultural terms of trade improves. The consumption gains are particularly strong for resource-rich agricultural households. Employment declines in the distribution sector (which employs 23% of the non-agricultural labor force), with a negative impact on the wages of non-agricultural workers. As a result, some of the non-agricultural households register losses.

When introduced in conjunction with the public works program (PWP-DIST), a 1% reduction in distribution costs has a very similar incremental effect. By further improving agricultural terms of trade, it reinforces the gains or reduces the losses of agricultural households while adding to the losses of some of the urban households. On average, both urban and rural households gain from the change. The results indicate that a 2% reduction in distribution costs would be sufficient for the public works program to generate an aggregate gain in household consumption.

4.3 Land Reform

In Section 2, we described the general approach followed in the land reform simulations. For all simulations, it is assumed that a tax of 15% is imposed on all land and capital incomes in the estate sector. For most simulations, the government payment is matched by an equal payment from the rest of the world. The asset price is computed on the assumption that the government (and, if applicable, the rest of the world) makes a fixed annual payment during a 10-year period. In each time period, a fixed share of the payment to the landowners is allocated to administrative

[18] The cost per unit of a commodity that is traded depends on the quantity of trade inputs (a fixed input coefficient) and the price of these inputs. In this simulation, the input coefficient is reduced by 1%. In the simulations, the transaction cost per traded commodity unit may fall by more or less depending on the change in the price of trade inputs.

costs (which, apart from core administration, also may cover programs that support the producers that operate the redistributed assets). The resources are redistributed on an equal per-capita basis to the rural, agricultural households that control less than two hectares of land (including some who control no land at all).

Tables 16 and 17 show the distinguishing assumptions and a result summary for the different simulations. The simulations differ in the assumed technology for the redistributed land, the administrative cost share, the discount rate (which is used when computing the asset price), and the presence/absence of matching co-financing from the rest of the world.

In the first simulation (LR-S), the government is the sole source of financing, the administrative cost markup is 10%, and the discount rate is 15%. It is assumed that the farmers operating the redistributed land are restricted to the technology and production options of Malawi's current smallholders. Close to 11% of the estate lands are redistributed at a price of US$2,500 per hectare. (The price is the present value of the installments received by the seller during a ten-year period. It is determined by the discount rate, the simulated resource income per ha on estate lands, and the tax rate.)

The overall consumption loss is around 0.5%. As expected, the households receiving the redistributed land gain, albeit to a moderate extent (by 1.8%). The other households lose (by 1-2%). These results are driven by reduced production in the agricultural sector and a production pattern that is less oriented toward tradables. This supply shift raises domestic agricultural prices and necessitate a slight depreciation, in the process improving agricultural terms of trade. In addition, aggregate household consumption and its distribution are influenced by an increased tax burden on estate landowners and the diversion of resources from households to government consumption (to administer the program). The total budget of the program (covering both land transactions and administrative costs) is 0.8% of GDP. The direct tax increase is of a similar magnitude.

The next simulation (LR-E) differs from the first in that the beneficiaries of the land reform are assumed to operate their new lands like the estates. As a result, the agricultural productivity loss that influenced the results of the preceding simulation is no longer present.

Compared to the first simulation, the aggregate consumption impact of the reform is more positive in terms of aggregate household consumption (which declines only marginally). Among the household groups, the consumption gains of the land-reform beneficiaries are stronger (increase by 2.7%) since they are more productive under this scenario. A less positive change in agricultural terms of trade (primarily due to a larger agricultural supply) explains the larger losses for other agricultural households and the gains for all non-agricultural households.

The third land-reform simulation (LR-E-R) differs from the second in that the rest of the world matches the tax-based funding that the government provides. This has a significant impact. A larger land area (more than 19% of the estate lands) gets redistributed. The inflow of foreign resources leads to real appreciation (by 1%), less exports, more imports, a deterioration in agricultural terms of trade, as well as higher absorption and aggregate household consumption. At the micro level, the combined effect of changes in the redistributed land area and agricultural

terms of trade further reinforce the consumption gains of the land-reform beneficiaries (by 4.6%) whereas, compared to the second simulation (LR-E), the estate owners and other agricultural households lose and non-agricultural households gain.

The last two simulations test the sensitivity of these results to the assumed land price and the administrative cost mark-up. For the simulation LR-E-R-I, a reduction in the discount rate to 10% raises the land price and reduces the redistributed area. The increase in the land price is mitigated by a decline in agricultural terms of trade and estate factor incomes as the domestic demand pattern becomes less oriented toward agricultural output. Since less land is redistributed, the gains for the resource-poor agricultural households are smaller. Across the board, the loss in agricultural terms of trade redistributes consumption from agricultural to non-agricultural households.

In the final simulation (LR-E-R-A), the administrative cost mark-up rises from 10% to 50% in a simulation that otherwise is identical to simulation three (LR-E-R). This change benefits all household groups except large holders (since they suffer from the loss in agricultural terms of trade). Domestic demand shifts to government consumption at the expense of a slight decline in household consumption, something which induces the decline in the agricultural terms of trade. Since fewer resources remain for land redistribution, the redistributed area and the consumption gains for the resource-poor households drop (from 4.6% to 2.7%). For other households groups, the terms-of-trade shift generates a slight tendency toward non-agricultural gains and agricultural losses.

5.0 Conclusions

In this paper, a CGE model of Malawi has been used as a tool to enhance our understanding of the short-run incidence of exogenous shocks and domestic policies aimed at poverty alleviation.

The results for the simulated exogenous shocks confirm that Malawi's economy is highly sensitive to external shocks of the magnitudes that the country has experienced in recent years. The combined shock of lower tobacco prices and higher petroleum prices imposes a severe burden, in particular on the non-agricultural population. This set of simulations point to the crucial importance of exchange rate management (in particular due to its link to domestic agricultural terms of trade). Real depreciation has a pro-rural bias and is a powerful tool for eliminating balance-of-payment difficulties. Conversely, real appreciation protects the urban population (which may be more powerful politically) and total household consumption. This suggest that it may be attractive to avoid depreciation as a short-run means of protecting urban living standards but that such an approach quickly can become unsustainable. A more diversified production and export structure would make Malawi less vulnerable to external price shocks and reduce the pressures that lead to sharp exchange rate fluctuations.

A more specific insight from a comparison between simulations of changes in tobacco and petroleum prices is that aggregate information about external terms-of-trade changes is not sufficient to permit an assessment of domestic welfare effects. The flexibility of the economy's response matters greatly and depends on the specific nature of the shock. Apart from this, the

distributional effects of negative terms of trade shocks stemming from changes in tobacco and petroleum prices are relatively similar, dominated by the fact that both bring about real depreciation.

The results also indicate that the agricultural households are less exposed to changes in Malawi's external environment. The reason is that the incomes of agricultural households tend to be more diversified with a substantial non-agricultural component. Given that external shocks that benefit (harm) the agricultural economy tend to have the opposite impact on the non-agricultural economy, the incomes of agricultural households are more stable.

A final lesson is that, if the government wants to improve its budgetary balance while attaching priority to poverty alleviation, then it should strive to rely more heavily on direct taxes (which in practice are collected from the better-offs) rather than indirect taxes (which impose a more widely shared burden).

Assuming that it is self-targeted, the expanded public works program generates significant gains for the rural poor but has a negative impact on non-agricultural households, especially in urban areas. Higher administrative costs reduce the effectiveness of the program, but, within the maximum limits considered (a 50% administrative mark-up rate), significant gains continue to accrue to the targeted groups. A failure to mobilize unemployed workers would reinforce these distributional consequences at the expense of a significant economy-wide welfare loss. Infrastructural improvements that reduce distribution costs would also reinforce these distributional effects but they would have a beneficial impact on over-all welfare.

The results for the land-reform simulations show that a tax-based land reform program has the potential of generating substantial gains for the household groups that receive the redistributed resources. The aggregate gains and the distributional effects are reinforced if the new owners are able to maintain the production pattern of the estate sector. Matching financing from the rest of the world can play a similar role by benefiting the target groups. The results are less sensitive to alternative assumptions about the discount rate (which has a strong impact on domestic asset prices). The current analysis of the land-reform needs to be complemented by research on micro-level aspects of land reform, including the scope for using the land tax to encourage the surrendering of unutilized estate lands.

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Table 1. Disaggregation of factors, institutions, and activities

Set (no. of elements)	Elements
Labor (8)	• Agricultural (four categories according to educational level: no, low, medium, and high) • Non-agricultural (four categories according to educational level: no, low, medium, and high)
Other factors (5)	• Land (small farmers and large farmers) • Agricultural capital (small farmers and large farmers) • Non-agricultural capital
Households (14)	• Rural agricultural (five land holding sizes: < 0.5 ha, 0.5-1 ha, 1-2 ha, 2-5 ha, and > 5 ha) • Rural non-agricultural (four categories according to educational level of household head: no, low, medium, and high) • Urban agricultural • Urban non-agricultural (four categories according to educational level of household head: no, low, medium, and high)
Other institutions (5)	• Enterprises (agricultural small-farmer, agricultural large-farmer, non-agricultural) • Government • Rest of the world
Agricultural activities (11)	• Small-farmer crops (Maize, Tea, Tobacco, Other) • Large-farmer crops (Tea, Sugar, Tobacco, Other) • Non-crop (Fishing, Livestock, Forestry)
Non-agricultural activities (22)	• Industry (Mining and quarrying, Meat, Dairy, Grain milling, Bakery and confectioneries, Processed sugar, Beverages, Textile and leather, Wood, Paper printing and packaging, Chemicals (incl. fertilizers), Soap, Other manufacturing) • Services (Electricity and water, Construction, Distribution, Hotels, Telecommunications, Financial institutions and insurance, Business services, Public services (incl. government), Personal services)

Table 2. Selected national accounts and macro data

	GDP Share (%)	Trend growth 1990-1998 (% p. yr)
Private consumption	84.1	7.1
Investment	13.2	-12.7
Government consumption	13.1	-4.7
Exports	32.7	4.9
Imports	43.1	2.9
GDP at market prices	100.0	3.7
Net indirect tax	9.2	
GDP at factor cost	90.8	3.7
Agriculture	32.6	8.5
Industry	18.1	1.3
Services	40.0	0.5
Population		2.7
Consumer price index		30.1

Source: World Bank 2000b.

Table 3. Current account of the Balance of Payments (% of GDP at market prices)

	Revenue	Spending
Agricultural trade	22.3	3.4
Industrial trade	4.3	28.3
Service trade	6.0	11.4
Net private transfer payments		2.5
Net government transfer receipts	5.6	
Foreign savings	7.2	
Total	45.6	45.6

Source: Chulu and Wobst 2000.

Table 4. Current government income and spending (% of GDP at market prices)

	Income	Spending
Export tax	0.1	
Tariffs	2.5	
Sales tax	6.6	
Income tax	6.4	
Government consumption		13.1
Net domestic transfer payments		2.9
Net transfer receipts from RoW	5.6	
Government savings		5.4
Total	21.3	21.3

Source: Chulu and Wobst 2000.

Table 5. Savings-investment balance (% of GDP at market prices)

	Investment	Savings
Foreign savings		7.2
Government savings		5.4
Private savings		0.6
Private investment	2.3	
Government investment	8.5	
Change in Inventory	2.3	
Total	13.2	13.2

Source: Chulu and Wobst 2000.

Table 6. Structure of production, employment, and trade 1998 (%)

	Share in total value-added	Share in total employment	Share in total exports	Export share in sector output	Share in total imports	Import share in domestic use
Agriculture	35.5	87.0	68.0	35.0	7.8	10.8
Maize	9.1	23.0	0.7	2.4	7.5	26.6
Tobacco	5.9	8.6	47.6	98.2		
Other crops	17.8	46.0	19.6	29.9	0.3	1.2
Other agriculture	2.8	9.4	0.1	0.8		0.5
Non-agriculture	64.5	13.0	32.0	9.1	92.2	30.2
Food processing	6.6	1.5	3.5	3.8	8.2	13.0
Other manufacturing	8.7	2.1	9.9	13.1	50.6	54.1
Other industry	5.1	1.4			6.8	21.9
Distribution services	16.1	3.1				
Public services	10.1	2.0				
Other services	17.9	2.9	18.6	27.2	26.6	42.7
Total	100.0	100.0	100.0	16.4	100.0	26.8

Source: Chulu and Wobst 2000.

Table 7. Selected household data

	Income share (%)	Population share (%)	Income per capita (1998 KW)	Income per capita (1998 $)	Poverty head –count ratio (%)
Rural agricultural households					
< 2 ha land holding	24.9	57.2	1953.2	62.9	
2-5 ha land holding	6.6	4.6	6420.8	206.7	
> 5 ha land holding	3.8	0.2	70313.7	2263.1	
Rural non-agricultural households					
No and low education	6.4	11.3	2539.5	81.7	
Medium and high education	10.6	13.5	3536.6	113.8	
Total rural households	52.2	86.7	2703.7	87.0	60.6
Urban households					
Agricultural	6.3	2.8	10286.9	331.1	
No and low education	3.3	1.3	11141.2	358.6	
Medium and high education	38.2	9.2	18729.2	602.8	
Total urban households	47.8	13.3	16207.1	521.6	50.8
Total	100.0	100.0	4493.6	144.6	59.6

Source: Chulu and Wobst 2000; World Bank 2000b; and NSO 2000.

Table 8. Structure of household factor incomes in 1998 SAM (%)

	Agricultural labor	Land	Non-agricultural labor	Agricultural capital	Total
Rural agricultural households					
< 2 ha land holding	56.6	6.9	36.5		100.0
2-5 ha land holding	29.3	58.6	12.1		100.0
> 5 ha land holding	3.0	95.6	1.4		100.0
Rural non-agricultural households					
No and low education	34.5		65.5		100.0
Medium and high education	21.9		78.1		100.0
Total rural households	39.1	18.0	42.9		100.0
Urban households					
Agricultural	3.2	67.3	29.5		100.0
No and low education	1.0		57.2	41.8	100.0
Medium and high education	0.6	11.2	31.7	56.5	100.0
Total urban households	0.9	17.7	32.9	48.5	100.0
Total	20.6	17.8	38.2	23.4	100.0

Source: Chulu and Wobst 2000.

Table 9. Structure of factor income distribution in 1998 SAM (%)

	Agricultural labor	Land	Non-agricultural labor	Agricultural capital
Rural agricultural households				
< 2 ha land holding	65.8	9.4	23.0	
2-5 ha land holding	9.4	21.7	2.1	
> 5 ha land holding	0.6	21.1	0.1	
Rural non-agricultural households				
No and low education	10.6		10.8	
Medium and high education	11.5		22.2	
Total rural households	97.8	52.1	58.3	
Urban households				
Agricultural	1.0	23.2	4.8	
No and low education	0.1		4.2	5.0
Medium and high education	1.1	24.8	32.8	95.0
Total urban households	2.2	47.9	41.7	100.0
Total	100.0	100.0	100.0	100.0

Source: Chulu and Wobst 2000.

Table 10. External shock simulations: assumptions

	DEP10 10% real depreciation	DEP10-ST 10% real depreciation with flexible sales tax	TOB-25 25% decrease tobacco export price	PET+100 100% increase petro import price	TOB-PET TOB-25 + PET+100
Change in real exchange rate (KW/FCU - %)	10	10			
Change in world export tobacco price (%)			-25		-25
Change in world import petroleum price (%)				100	100

Table 11. External shock simulations: summary of results

	BASE	DEP10 10% real depreciation	DEP10-ST 10% real depreciation with flexible sales tax	TOB-25 25% decrease tobacco export price	PET+100 100% increase petro import price	TOB-PET TOB-25 + PET+100
Macro data (at constant 1998 KWbn)						
Absorption	54.8	-4.1	-3.8	-4.6	-3.1	-8.0
Household consumption	46.3	-4.8	-4.5	-5.4	-3.7	-9.5
Government consumption	7.2	0.0	0.0	0.0	0.0	0.0
Exports	13.8	4.8	5.1	5.4	3.7	9.7
Tobacco	4.9	2.4	2.3	-6.0	1.7	-3.4
Imports	26.1	-4.9	-4.4	-6.1	-3.9	-9.6
Petroleum	1.9	-4.4	-3.4	-4.5	-6.9	-9.1
Macro indices (base = 100)						
Real exchange rate	100.0	10.0	10.0	9.2	11.3	21.0
Agriculture terms-of-trade	100.0	23.2	20.4	14.1	15.3	29.7
Per capita household consumption (at constant 1998 KW)						
Rural agricultural households						
< 2 ha land holding	2.0	1.3	-1.9	-2.3	-0.2	-2.7
2-5 ha land holding	6.4	7.3	3.2	2.8	3.6	5.8
> 5 ha land holding	67.1	5.0	9.0	4.9	6.0	9.2
Rural non-agricultural households						
No and low education	2.5	-4.2	-6.9	-7.2	-4.3	-11.7
Medium and high education	3.4	-7.7	-8.5	-8.7	-6.1	-15.0
Total rural households	2.7	-0.2	-2.4	-3.0	-1.0	-4.4
Urban households						
Agricultural	10.3	7.7	3.0	-2.6	2.0	-1.8
No and low education	10.7	-12.5	-10.8	-9.6	-9.0	-18.6
Medium and high education	17.3	-13.2	-8.3	-9.0	-8.2	-17.5
Total urban households	15.2	-10.2	-6.9	-8.1	-6.8	-15.4
Share of GDP (%)						
Investment	13.2	0.3	0.3	1.1	1.1	2.4
Foreign savings	7.2	-3.2	-3.1	1.4	0.6	2.1
Government savings	5.4	3.5	3.5	-0.3	0.6	0.4
Direct taxes	6.4	2.8	-0.6	-1.3	0.2	-0.9

Source: Model simulations.

Units: In BASE column, units have been indicated.
In non-BASE columns, % change from BASE for items not computed as GDP shares;
deviation from BASE for items computed as GDP shares.

Table 12. Elasticity simulations: assumptions

	DEP1 1% real depreciation	TOB+1 1% increase tobacco export price	PET+1 1% increase petro import price
Change in real exchange rate (KW/FCU - %)	1		
Change in world export tobacco price (%)		1	
Change in world import petroleum price (%)			1

Table 13. Elasticity simulations: summary of results

	BASE	DEP1 1% real depreciation	TOB+1 1% increase tobacco export price	PET+1 1% increase petro import price
Macro data (at constant 1998 KWbn)				
Absorption	54.8	-0.41	0.18	-0.03
Household consumption	46.3	-0.49	0.21	-0.04
Government consumption	7.2			
Exports	13.8	0.5	-0.23	0.04
Tobacco	4.9	0.3	0.14	0.02
Imports	26.1	-0.52	0.25	-0.04
Petroleum	1.9	-0.48	0.19	-0.13
Macro indices (base = 100)				
Real exchange rate	100	1	-0.34	0.11
Agriculture terms-of-trade	100	2.2	-0.52	0.14
Per capita household consumption (at constant 1998 KW)				
Rural agricultural households				
< 2 ha land holding	2	0.13	0.07	
2-5 ha land holding	6.4	0.71	-0.1	0.03
> 5 ha land holding	67.1	0.61	-0.15	0.05
Rural non-agricultural households				
No and low education	2.5	-0.43	0.26	-0.04
Medium and high education	3.4	-0.79	0.32	-0.06
Total rural households	2.7	-0.01	0.11	-0.01
Urban households				
Agricultural	10.3	0.73	0.1	0.02
No and low education	10.7	-1.28	0.37	-0.09
Medium and high education	17.3	-1.34	0.36	-0.08
Total urban households	15.2	-1.04	0.32	-0.07
Share of GDP (%)				
Investment	13.2	0.03	-0.04	0.01
Foreign savings	7.2	-0.31	-0.05	0.01
Government savings	5.4	0.35	0.01	0.01
Direct taxes	6.4	0.27	0.04	

Source: Model simulations.

Units: In BASE column, units have been indicated.
In non-BASE columns, % change from BASE for items not computed as GDP shares; deviation from BASE for items computed as GDP shares.

Table 14. Simulation of public works program and distribution cost: assumptions

	PWP base case	PWP-L PWP with labor diversion	PWP-A PWP with 50% admin cost	DIST 1% cut in distribution costs	PWP-DIST PWP + DIST
Spending on public works program*	1	1	1		1
Program workers diverted from other sectors*		1			
Cut in distribution costs at base prices (%)				1	1
Mark-up on program cost for administration (%)	14.3	14.3	50.0		14.3

Note: * 1 = YES

Table 15. Simulation of public works program and distribution cost: summary of results

	BASE	PWP base case	PWP-L PWP with labor diversion	PWP-A PWP with 50% admin cost	DIST 1% cut in distribution costs	PWP-DIST PWP + DIST
Macro data (at constant 1998 KWbn)						
Absorption	54.8	-0.1	-0.6	-0.1	0.2	0.1
Household consumption	46.3	-0.3	-1.0	-0.8	0.2	-0.1
Government consumption	7.2	1.3	1.3	4.5		1.3
Exports	13.8	-0.4	-1.0	-0.3	0.2	-0.2
Imports	26.1	-0.3	-0.8	-0.2	0.2	-0.1
Macro indices (base = 100)						
Real exchange rate	100.0	-0.3		-0.3	0.1	-0.2
Agriculture terms-of-trade	100.0	2.1	11.1	1.9	1.5	3.6
Per capita household consumption (at constant 1998 KW)						
Rural agricultural households						
< 2 ha land holding	2.0	3.6	5.7	3.6	0.2	3.8
2-5 ha land holding	6.4	1.8	1.3	1.9	0.6	2.4
> 5 ha land holding	67.1	-1.9	-2.1	-3.3	1.4	-0.6
Rural non-agricultural households						
No and low education	2.5	2.7	3.7	2.7	-0.1	2.6
Medium and high education	3.4	-1.6	-5.1	-1.8	-0.3	-1.9
Total rural households	2.7	1.9	2.2	1.7	0.2	2.1
Urban households						
Agricultural	10.3	0.7	-0.4	0.8	0.7	1.4
No and low education	10.7	-2.3	-4.8	-2.9	-0.3	-2.6
Medium and high education	17.3	-3.4	-5.3	-4.6	0.1	-3.3
Total urban households	15.2	-2.7	-4.6	-3.7	0.1	-2.6
Share of GDP (%)						
Investment	13.2	-0.2	-0.2	-0.2	-0.1	-0.3
Foreign savings	7.2	-0.1		-0.1		-0.1
Government savings	5.4	-0.1	-0.2	-0.1		-0.1
Direct taxes	6.4	1.2	1.0	1.7	-0.1	1.1
Public works spending		1.3	1.3	1.8		1.3

Note: Source: Model simulations.
Units: In BASE column, units have been indicated.
In non-BASE columns, % change from BASE for items not computed as GDP shares;
Deviation from BASE for items computed as GDP shares.

Table 16. Land reform simulations: assumptions

	LR-S Base case with small-farm tech'y	LR-E Base case with estate tech'y	LR-E-R LR-E + RoW finance	LR-E-R -I LR-E-R with 10% int rate	LR-E-R -A LR-E-R with 50% adm cost
Redistributed land has estate technology*		1	1	1	1
Mark-up on program cost for administration (%)	10	10	10	10	50
Co-financing from the rest of the world*			1	1	1
Discount rate for computation of asset price	15	15	15	10	15

Note: * 1 = YES

Table 17. Land reform simulations: summary of results

	BASE	LR-S Base case with small-farm tech'y	LR-E Base case with estate tech'y	LR-E-R LR-E + RoW finance	LR-E-R -I LR-E-R with 10% int rate	LR-E-R -A LR-E-R with 50% adm cost
Macro data (at constant 1998 KWbn)						
Absorption	54.8	-0.3		0.7	0.7	0.8
Household consumption	46.3	-0.5	-0.1	0.6	0.7	
Government consumption	7.2	0.6	0.6	1.1	1.1	5.7
Exports	13.8	-1.3	-0.3	-1.6	-1.6	-1.5
Imports	26.1	-0.6	-0.2	0.3	0.4	0.5
Macro indices (base = 100)						
Real exchange rate	100.0	0.2	-0.1	-1.0	-1.0	-1.0
Agriculture terms-of-trade	100.0	3.7	1.3	-0.5	-1.0	-2.0
Per capita household consumption (at constant 1998 KW)						
Rural agricultural households						
< 2 ha land holding	2.0	1.8	2.7	4.6	3.9	2.7
2-5 ha land holding	6.4	0.7	0.2	-0.7	-0.8	-1.0
> 5 ha land holding	67.1	-1.0	-2.3	-3.1	-2.6	-4.8
Rural non-agricultural households						
No and low education	2.5	-0.8	-0.5	-0.4	-0.2	0.1
Medium and high education	3.4	-1.0	-0.5	-0.1		0.3
Total rural households	2.7	0.6	1.0	1.8	1.6	0.9
Urban households						
Agricultural	10.3	-1.4	-2.1	-2.4	-1.8	-3.1
No and low education	10.7	-1.1	-0.4	0.3	0.4	0.6
Medium and high education	17.3	-1.8	-1.4	-0.6	-0.2	-0.8
Total urban households	15.2	-1.7	-1.4	-0.8	-0.4	-1.1
Share of GDP (%)						
Investment	13.2			-0.1	-0.1	-0.1
Foreign savings	7.2			-0.1	-0.1	-0.1
Government savings	5.4					
Direct taxes	6.4	0.7	0.7	0.7	0.8	1.0
Total spending on land reform		0.8	0.8	1.4	1.4	1.5
Redistributed share of estate land (%)		10.7	10.7	19.3	16.3	11.7
Price of estate land ($ per ha)		2546.8	2458.1	2406.4	3599.9	2401.6

Source: Model simulations.

Units: In BASE column, units have been indicated.
In non-BASE columns, % change from BASE for items not computed as GDP shares;
Deviation from BASE for items computed as GDP shares

Table A1. Condensed Macro SAM for Malawi 1998 (% of GDP at market prices)

	Products	Factors	Households	Government	RoW	S-I	Taxes	Total
Products			84.1	13.1	32.7	13.2		143.1
Factors	90.8							90.8
Households		90.8		2.9				93.6
Government					5.6		15.7	21.3
RoW	43.1		2.5					45.6
S-I			0.6	5.4	7.2			13.2
Taxes	9.2		6.4					15.7
Total	143.1	90.8	93.6	21.3	45.6	13.2	15.7	

Source: Chulu and Wobst (2000); authors' computations;

Notation: Products = production and commodities; Factors = factors of production; Households = aggregate domestic non-government institution; RoW = rest of world; S-I = savings-investment; Taxes = direct and indirect taxes.

Table A2. Disaggregated structure of household factor incomes in 1998 SAM (%)

	Agr Labor No educ	Agr Labor Low educ	Agr Labor Med educ	Agr Labor High educ	Non-Agr Labor No educ	Non-Agr Labor Low educ
Rural agricultural households						
< 0.5 ha land holding	17.9	11.5	16.4	1.1	9.0	10.0
0.5-1 ha land holding	19.8	18.3	19.3	1.2	8.0	8.6
1-2 ha land holding	15.5	17.6	28.1	0.9	3.9	8.3
2-5 ha land holding	6.0	6.6	15.4	1.2	2.1	1.9
> 5 ha land holding	0.1	0.4	2.6			0.9
Rural non-agricultural households						
No education	35.2				64.8	
Low education		34.0				66.0
Medium education			24.8			
High education				10.2		
Urban households						
Agricultural	0.2	0.3	2.0	0.7	2.0	1.4
No education	1.4				98.6	
Low education		0.8				34.1
Medium education			0.6			
High education				0.5		

Source: Chulu and Wobst (2000); authors' computations.

Table A2. Continued.

	Non-Agr Labor Med educ	Non-Agr Labor High educ	Non-Agr Cap	Sm-farm land+ cap	Estate land+cap	Total
Rural agricultural households						
< 0.5 ha land holding	23.7	7.1		3.3		100.0
0.5-1 ha land holding	14.0	3.7		7.2		100.0
1-2 ha land holding	14.2	2.2		9.4		100.0
2-5 ha land holding	7.5	0.6		58.6		100.0
> 5 ha land holding	0.5			70.0	25.5	100.0
Rural non-agricultural households						
No education						100.0
Low education						100.0
Medium education	75.2					100.0
High education		89.8				100.0
Urban households						
Agricultural	18.7	7.4		45.4	21.9	100.0
No education						100.0
Low education			65.1			100.0
Medium education	35.6		53.4		10.4	100.0
High education		29.0	58.7		11.8	100.0

Source: Chulu and Wobst (2000); authors' computations.

Table A3. Disaggregated structure of factor income distribution in 1998 SAM (%)

	Agr Labor No educ	Agr Labor Low educ	Agr Labor Med educ	Agr Labor High educ	Non-Agr Labor No educ	Non-Agr Labor Low educ
Rural agriculture households						
< 0.5 ha land	21.7	14.3	12.8	10.9	13.2	13.0
0.5-1 ha land	27.1	25.5	17.0	12.6	13.2	12.6
1-2 ha land	26.0	30.0	30.2	11.6	7.8	14.7
2-5 ha land	7.1	7.9	11.6	11.4	3.0	2.4
> 5 ha land	0.1	0.3	1.1			0.7
Rural non-agriculture households						
No education	17.6				39.2	
Low education		21.4				43.5
Medium education			24.6			
High education				30.3		
Urban households						
Agricultural	0.2	0.4	1.4	6.1	2.6	1.6
No education	0.2				21.0	
Low education		0.3				11.5
Medium education			1.1			
High education				17.1		
Total	100.0	100.0	100.0	100.0	100.0	100.0

Source: Chulu and Wobst (2000); authors' computations.

Table A3. Continued

	Non-Agr Labor Med educ	Non-Agr Labor High educ	Non-Agr Cap	Sm-farm land+cap	Estate land+cap
Rural agriculture households					
< 0.5 ha land	9.0	4.8		2.0	
0.5-1 ha land	6.0	2.8		5.0	
1-2 ha land	7.4	2.0		8.0	
2-5 ha land	2.7	0.4		34.9	
> 5 ha land	0.1			24.9	14.8
Rural non-agriculture households					
No education					
Low education					
Medium education	36.2				
High education		19.0			
Urban households					
Agricultural	6.4	4.5		25.2	19.9
No education					
Low education			5.0		
Medium education	32.2		37.3		25.0
High education		66.4	57.7		40.2
Total	100.0	100.0	100.0	100.0	100.0

Source: Chulu and Wobst (2000); authors' computations.

Table A4. Real external price indices 1990-2000 (1990=100).

	Tobacco exports	Petroleum	Real effective exchange rate
1990	100	100	100
1991	115	83	97
1992	90	78	105
1993	66	69	103
1994	58	63	145
1995	80	63	166
1996	78	78	120
1997	92	77	108
1998	96	55	149
1999	100	76	148
2000	72	97	128

Sources and units:
Tobacco (FAO; constant 1990 dollars)
Petroleum (World Bank and IMF; constant 1990 dollars)
Real effective exchange rate (IMF; 2000 figure is for May; inverted to Kwachas per foreign currency unit). The deflator is the World Bank G-5 MUV Index (the unit price index for manufactures exported from the G-5 countries).

Table A5. Disaggregated elasticities for production and trade

	Production	Armington	CET
Agriculture			
Crops			
Maize	0.3	1.1	0.5
Tea	0.5	1.1	1.5
Sugar	0.3		
Tobacco	0.5		10.0
Other	0.5	1.1	1.5
Non-crop			
Fishing	0.3	1.1	1.5
Livestock	0.3	1.1	1.5
Forestry	0.3		
Industry			
Mining	0.5		
Meat	0.5	1.1	
Dairy	0.5	1.1	
Milling	0.5	1.1	1.5
Bakery	0.5	1.1	
Sugar—processed	0.5	1.1	1.5
Beverages	0.5	1.1	1.5
Textile	0.5	1.1	1.5
Wood	0.5	0.4	0.5
Paper	0.5	0.4	0.5
Chemicals	0.5	0.4	0.5
Soap	0.5	1.1	1.5
Other	0.5	0.4	0.5
Electricity	0.5		
Construction	0.5		
Services			
Distribution	0.5		
Hotels	0.5	0.3	0.4
Telecommunications	0.5	0.3	0.4
Banking and Insurance	0.5	0.3	0.4
Business	0.5	0.3	0.4
Public	0.5		
Personal	0.5		

Production	Elasticity of substitution between factors in value added production function
Armington	Elasticity of substitution between imports and domestic goods in CES aggregation function;
CET	Elasticity of transformation between exports and domestic sales in CET function

Table A6. Real GDP at factor cost (by aggregated activity)

	BASE	DEP10 10% real depreciation	DEP10-ST 10% real depreciation with flexible sales tax	TOB-25 25% decrease tobacco export price	PET+100 100% increase petro import price
Agriculture	18.0	0.0	0.0	-0.2	0.0
Small farmer crops	11.2	0.1	0.2	0.3	0.1
Estate crops	5.3	0.3	0.3	-0.5	0.2
Non-crop	1.4	-2.3	-3.0	-2.7	-2.0
Industry	10.0	0.3	-0.2	0.7	0.0
Services	22.1	-0.3	0.0	-0.8	-0.1
Total	50.0	-0.1	0.0	-0.3	0.0

	TOB-PET TOB-25 + PET+100	DEP1 1% real depreciation	TOB+1 1% increase tobacco export price	PET+1 1% increase petro import price	PWP base case
Agriculture	-0.1	0.0	0.0	0.0	0.0
Small farmer crops	0.5	0.0	0.0	0.0	0.0
Estate crops	-0.2	0.0	0.0	0.0	0.0
Non-crop	-5.0	-0.2	0.1	0.0	0.2
Industry	0.5	0.0	0.0	0.0	0.2
Services	-1.0	0.0	0.0	0.0	-0.2
Total	-0.4	0.0	0.0	0.0	0.0

	PWP-L PWP with labor diversion	PWP-A PWP with 50% admin cost	DIST 1% cut in distribution costs	PWP-DIST PWP + DIST	LR-S Base case with small-farm tech'y
Agriculture	-1.5	0.0	0.0	0.0	-0.8
Small farmer crops	-1.7	0.0	0.0	-0.1	4.3
Estate crops	-1.0	0.0	0.0	0.0	-11.4
Non-crop	-0.8	0.0	0.1	0.3	-1.4
Industry	0.3	0.2	0.1	0.3	-0.1
Services	-0.3	-0.2	-0.1	-0.3	0.1
Total	-0.6	0.0	0.0	-0.1	-0.3

Table A6. Continued.

	LR-E Base case with estate tech'y	LR-E-R LR-E + RoW finance	LR-E-R -I LR-E-R with 10% int rate	LR-E-R -A LR-E-R with 50% adm cost
Agriculture	0.0	0.0	0.0	0.0
Small farmer crops	0.0	-0.2	-0.2	-0.2
Estate crops	0.0	0.4	0.4	0.4
Non-crop	0.0	0.1	0.1	-0.3
Industry	0.1	0.2	0.2	0.1
Services	-0.1	-0.2	-0.2	-0.1
Total	0.0	0.0	0.0	0.0

Source: Model simulations.
Units: In BASE column, KWbn (at 1998 prices)
In non-BASE columns, % change from BASE (at constant prices)

Table A7. Disaggregated factor income distribution

	BASE	DEP10 10% real depreciation	DEP10-ST 10% real depreciation with flexible sales tax	TOB-25 25% decrease tobacco export price	PET+100 100% increase petro import price
Agricultural labor					
No education	5.2	0.5	0.5	-0.2	0.4
Low education	5.1	0.5	0.5	-0.2	0.4
Medium education	8.1	0.8	0.7	-0.3	0.6
High education	0.7	0.1	0.1	0.0	0.0
Non-agricultural labor					
No education	4.3	-0.4	-0.3	0.1	-0.2
Low education	4.9	-0.4	-0.3	0.1	-0.3
Medium education	17.4	-1.4	-1.2	0.4	-0.9
High education	9.7	-0.9	-0.7	0.2	-0.6
Land					
Small farmers	7.6	1.0	0.9	-0.4	0.7
Estates	3.2	0.7	0.6		0.4
Capital					
Small farmers	2.7	0.4	0.3	0.0	0.2
Estates	3.2	1.0	0.9	0.0	0.6
Non-agricultural	27.7	-1.8	-1.8	0.5	-1.3
Total	100.0				

	TOB-PET TOB-25 + PET+100	DEP1 1% real depreciation	TOB+1 1% increase tobacco export price	PET+1 1% increase petro import price	PWP base case
Agricultural labor					
No education	0.1	0.0	0.0	1.3	2.9
Low education	0.1	0.0	0.0	0.0	0.0
Medium education	0.1	0.0	0.0	0.0	0.0
High education	0.0	0.0	0.0	0.0	0.0
Non-agricultural labor					
No education	0.0	0.0	0.0	-0.1	-0.2
Low education	0.0	0.0	0.0	-0.1	-0.2
Medium education	-0.1	0.0	0.0	-0.5	-1.0
High education	-0.1	0.0	0.0	-0.3	-0.5
Land					
Small farmers	0.1	0.0	0.0	0.0	-0.1
Estates	0.1	0.0	0.0	0.0	
Capital					
Small farmers	0.0	0.0	0.0	0.0	0.0
Estates	0.1	0.0	0.0	0.0	0.1
Non-agricultural	-0.2	0.0	0.0	-0.4	-1.0
Total					

Table A7. Continued

	PWP-L PWP with labor diversion	PWP-A PWP with 50% admin cost	DIST 1% cut in distribution costs	PWP-DIST PWP + DIST	LR-S Base case with small-farm tech'y
Agricultural labor					
No education	2.9	1.3	0.0	1.3	0.1
Low education	0.0	0.0	0.0	0.0	0.1
Medium education	0.0	0.0	0.1	0.1	0.2
High education	0.0	0.0	0.0	0.0	0.0
Non-agricultural labor					
No education	-0.2	-0.1	0.0	-0.1	-0.1
Low education	-0.2	-0.1	0.0	-0.1	-0.1
Medium education	-1.0	-0.5	-0.1	-0.6	-0.2
High education	-0.5	-0.3	0.0	-0.3	-0.1
Land					
Small farmers	-0.1	0.0	0.0	0.0	0.9
Estates	0.0	0.0	0.1	0.1	-0.2
Capital					
Small farmers	0.0	0.0	0.0	0.1	-0.3
Estates	0.1	0.0	0.1	0.1	-0.2
Non-agricultural	-1.0	-0.3	-0.1	-0.5	-0.2
Total					

	LR-E Base case with estate tech'y	LR-E-R LR-E + RoW finance	LR-E-R -I LR-E-R with 10% int rate	LR-E-R -A LR-E-R with 50% adm cost
Agricultural labor				
No education	0.0	0.0	0.0	0.0
Low education	0.0	0.0	0.0	0.0
Medium education	0.1	0.0	0.0	-0.1
High education	0.0	0.0	0.0	0.0
Non-agricultural labor				
No education	0.0	0.0	0.0	0.0
Low education	0.0	0.0	0.0	0.0
Medium education	-0.1	-0.1	0.0	0.0
High education	-0.1	0.0	0.0	0.1
Land				
Small farmers	0.4	0.6	0.5	0.3
Estates	-0.3	-0.6	-0.5	-0.4
Capital				
Small farmers	0.4	0.6	0.5	0.3
Estates	-0.3	-0.7	-0.6	-0.5
Non-agricultural	0.0	0.2	0.2	0.3
Total				

Source: Model simulations. Units: In BASE column, %; in non-BASE columns, deviation from BASE.

Table A8. Disaggregated distribution of VA by activity

	BASE	DEP10 10% real depreciation	DEP10-ST 10% real depreciation with flexible sales tax	TOB-25 25% decrease tobacco export price	PET+100 100% increase petro import price
Agriculture	35.9	4.9	4.4	3.1	3.3
Small farmers	22.5	2.7	2.4	2.7	1.9
Maize	9.2	1.0	1.0	1.7	0.7
Tea	0.1			0.1	
Tobacco	2.0	0.8	0.7	-0.6	0.5
Other	11.2	0.8	0.7	1.6	0.6
Estates	10.6	2.1	1.9	0.3	1.4
Tea	0.7	0.2	0.1	0.4	
Tobacco	4.1	1.4	1.3	-1.0	1.0
Sugar	0.2	0.1	0.1	0.1	0.1
Other	5.6	0.4	0.4	0.8	0.3
Non-crop	2.8	0.1		0.1	0.1
Fishing	0.5				
Livestock	1.1	0.1			
Forestry	1.2				
Industry	20.0	-1.2	-1.6	-0.4	-1.1
Mining	1.3			0.1	
Meat	0.6	-0.1	-0.1	-0.1	-0.1
Dairy	0.6	-0.1	-0.1	-0.1	-0.1
Milling	1.9	-0.1	-0.1	-0.1	-0.1
Bakery	0.3	-0.1	-0.1	-0.1	-0.1
Sugar—processed	1.0	0.2	0.2	0.4	0.1
Beverages	1.8	-0.2	-0.5	-0.5	-0.3
Textile	0.9			0.1	
Wood	1.0	-0.2	-0.2	-0.1	-0.1
Paper	1.6	0.1	0.1	0.1	0.1
Chemicals	0.7	-0.1	-0.1	-0.1	-0.1
Soap	1.6	-0.2	-0.2	-0.1	-0.1
Other	2.8			0.3	
Electricity	1.5	-0.3	-0.2	-0.2	-0.2
Construction	2.3	-0.2	-0.2	-0.1	-0.1
Services	44.1	-3.7	-2.8	-2.7	-2.3
Distribution	16.3	-1.3	-1.1	-2.1	-0.9
Hotels	3.9	-0.5	-0.3	-0.1	-0.3
Telecommunications	4.6	-0.3	-0.1	0.1	-0.1
Banking and Insurance	3.9	0.2	0.3	0.6	0.2
Business	1.8			0.2	
Public	10.0	-1.1	-1.0	-0.9	-0.7
Personal	3.6	-0.8	-0.5	-0.5	-0.5
Total	100.0				

Table A8. Continued

	TOB-PET TOB-25 + PET+100	DEP1 1% real depreciation	TOB+1 1% increase tobacco export price	PET+1 1% increase petro import price	PWP base case
Agriculture	6.3	0.5	-0.1	0.0	0.5
Small farmers	4.6	0.3	-0.1	0.0	0.3
Maize	2.5	0.1	-0.1	0.0	0.1
Tea	0.1		0.0	0.0	
Tobacco	-0.2	0.1	0.0	0.0	
Other	2.3	0.1	-0.1	0.0	0.2
Estates	1.5	0.2	0.0	0.0	0.1
Tea	0.5		0.0	0.0	
Tobacco	-0.2	0.1	0.0	0.0	
Sugar	0.2	0.0	0.0	0.0	
Other	1.1	0.0	0.0	0.0	0.1
Non-crop	0.1	0.0	0.0	0.0	0.1
Fishing	0.1	0.0	0.0	0.0	
Livestock		0.0	0.0	0.0	0.1
Forestry	0.1	0.0	0.0	0.0	
Industry	-1.4	-0.1	0.0	0.0	0.2
Mining		0.0	0.0	0.0	
Meat	-0.2	0.0	0.0	0.0	0.0
Dairy	-0.2	0.0	0.0	0.0	0.0
Milling	-0.1	0.0	0.0	0.0	0.0
Bakery	-0.1	0.0	0.0	0.0	0.0
Sugar—processed	0.6	0.0	0.0	0.0	0.0
Beverages	-0.7	0.0	0.0	0.0	0.4
Textile	0.1	0.0	0.0	0.0	0.0
Wood	-0.3	0.0	0.0	0.0	0.0
Paper	0.2	0.0	0.0	0.0	0.0
Chemicals	-0.2	0.0	0.0	0.0	0.0
Soap	-0.3	0.0	0.0	0.0	0.0
Other	0.3	0.0	0.0	0.0	0.0
Electricity	-0.3	0.0	0.0	0.0	0.0
Construction	-0.3	0.0	0.0	0.0	
Services	-4.8	-0.4	0.1	0.0	-0.7
Distribution	-2.9	-0.1	0.1	0.0	-0.2
Hotels	-0.3	-0.1	0.0	0.0	-0.1
Telecommunications			0.0	0.0	-0.1
Banking and Insurance	0.9		0.0	0.0	-0.1
Business	0.2		0.0	0.0	
Public	-1.7	-0.1	0.0	0.0	-0.1
Personal	-1.1	-0.1	0.0	0.0	-0.2
Total					

Table A8. Continued

	PWP-L PWP with labor diversion	PWP-A PWP with 50% admin cost	DIST 1% cut in distribution costs	PWP-DIST PWP + DIST	LR-S Base case with small-farm tech'y
Agriculture	2.1	0.4	0.3	0.8	0.7
Small farmers	1.2	0.3	0.2	0.4	1.5
Maize	0.5	0.1		0.1	0.3
Tea					
Tobacco	0.1		0.1	0.1	0.4
Other	0.5	0.2		0.2	0.8
Estates	0.6	0.1	0.2	0.3	-0.8
Tea					-0.1
Tobacco	0.3		0.1	0.2	-0.2
Sugar					
Other	0.3	0.1		0.1	-0.5
Non-crop	0.3	0.1		0.1	
Fishing	0.1				
Livestock	0.2	0.1		0.1	
Forestry	0.1				
Industry	-0.1	0.3		0.3	-0.2
Mining					
Meat					
Dairy	-0.1				
Milling	-0.1				
Bakery					
Sugar—processed					
Beverages	0.6	0.4		0.5	0.1
Textile	-0.1				
Wood	-0.1				
Paper		0.1			
Chemicals	-0.1				-0.1
Soap					
Other					
Electricity	-0.1				-0.1
Construction	-0.1				
Services	-2.1	-0.7	-0.4	-1.1	-0.5
Distribution	-0.8	-0.2	-0.4	-0.6	
Hotels	-0.3	-0.2		-0.1	-0.1
Telecommunications	-0.2	-0.1		-0.1	-0.1
Banking and Insurance	-0.1	-0.1		-0.1	
Business		0.1			
Public	-0.4	-0.1		-0.1	-0.1
Personal	-0.3	-0.2		-0.2	-0.1
Total					

Table A8. Continued

	LR-E	LR-E-R	LR-E-R -I	LR-E-R -A
	Base case with estate tech'y	LR-E + RoW finance	LR-E-R with 10% int rate	LR-E-R with 50% adm cost
Agriculture	0.3	-0.1	-0.2	-0.5
Small farmers	0.2	-0.1	-0.2	-0.3
Maize	0.1			-0.1
Tea				
Tobacco		-0.1	-0.1	-0.1
Other	0.1			-0.1
Estates	0.1		-0.1	-0.1
Tea		-0.1	-0.1	-0.1
Tobacco		-0.1	-0.1	-0.1
Sugar				
Other	0.1	0.1	0.1	
Non-crop				
Fishing				
Livestock		0.1		
Forestry				
Industry	0.1	0.5	0.4	0.4
Mining				
Meat		0.1	0.1	
Dairy				
Milling				
Bakery				
Sugar—processed				
Beverages	0.2	0.4	0.4	0.2
Textile				
Wood				
Paper				0.1
Chemicals				
Soap				
Other				
Electricity				
Construction				
Services	-0.4	-0.3	-0.2	
Distribution	-0.1	-0.3	-0.2	-0.2
Hotels	-0.1			
Telecommunications	-0.1	-0.1		
Banking and Insurance		-0.1		
Business				0.2
Public	-0.1	0.1	0.1	0.1
Personal	-0.1			
Total				

Source: Model simulations. Units: In BASE column, %; in non-BASE columns, deviation from BASE.

Table A9. Disaggregated commodity production levels

	BASE	DEP10 10% real depreciation	DEP10-ST 10% real depreciation with flexible sales tax	TOB-25 25% decrease tobacco export price	PET+100 100% increase petro import price
Agriculture	23.4	0.2	0.1	-0.5	0.1
Crops	21.0	0.5	0.5	-0.3	0.3
Maize	5.0	0.2	0.3	1.8	0.2
Tea	2.2	1.5	0.9	3.0	-0.1
Sugar	0.3	1.5	1.3	2.1	1.0
Tobacco	4.9	2.4	2.3	-6.0	1.7
Other	8.6	-0.7	-0.7	1.0	-0.4
Non-crop	2.5	-1.9	-3.1	-2.6	-1.8
Fishing	0.3	-1.0	-1.9	-1.2	-1.1
Livestock	1.5	-1.3	-3.4	-2.3	-1.6
Forestry	0.7	-3.8	-3.2	-3.7	-2.8
Industry	32.8		-0.4	0.4	-0.2
Mining	0.7	4.1	3.5	5.9	2.9
Meat	1.6	-1.4	-4.0	-2.8	-1.8
Dairy	0.5	-4.0	-3.0	-2.7	-2.8
Milling	7.8	0.5	0.1	0.6	0.3
Bakery	0.4	-3.0	-3.7	-3.3	-2.6
Sugar—processed	1.4	5.1	4.4	7.3	3.5
Beverages	2.3		-2.9	-2.6	-1.0
Textile	2.3	1.3	0.8	3.8	1.0
Wood	1.9	-6.3	-5.2	-5.4	-4.3
Paper	1.6	0.9	0.9	1.0	0.6
Chemicals	1.9	-1.0	-1.0	-1.0	-1.7
Soap	1.6	-0.5	-0.8	-0.4	-0.5
Other	3.6	2.5	1.9	3.9	1.7
Electricity	2.6	-2.9	-2.0	-1.5	-1.8
Construction	2.7			-0.1	
Services	25.9	-0.3	0.2	-0.5	
Distribution	8.9	0.3	0.1	-3.3	
Hotels	2.6	-2.0	-0.3	1.5	-0.7
Telecommunications	2.9	0.7	1.6	2.7	0.8
Banking and Insurance	2.5	5.6	5.8	8.6	4.5
Business	1.4	3.4	3.3	5.1	2.6
Public	5.5	-1.9	-2.0	-2.7	-1.4
Personal	2.1	-6.4	-4.0	-4.8	-3.8
Total	0.1		-0.1	-0.2	-0.1

Table A9. Continued

	TOB-PET TOB-25 + PET+100	DEP1 1% real depreciation	TOB+1 1% increase tobacco export price	PET+1 1% increase petro import price	PWP base case
Agriculture	-0.3				
Crops	0.2	0.1			
Maize	1.9		-0.1		-0.1
Tea	2.7	0.2	-0.2		-0.1
Sugar	3.0	0.2	-0.1		0.1
Tobacco	-3.4	0.3	0.1		-0.1
Other	0.6	-0.1			0.1
Non-crop	-4.8	-0.2	0.1		0.6
Fishing	-2.3	-0.1	0.1		0.6
Livestock	-4.5	-0.1	0.1		1.2
Forestry	-6.7	-0.4	0.1		-0.8
Industry					0.1
Mining	8.5	0.4	-0.2		0.3
Meat	-5.4	-0.1	0.1		1.4
Dairy	-7.1	-0.3	0.1		-0.8
Milling	0.8	0.1			0.2
Bakery	-7.1	-0.3	0.1		0.1
Sugar—processed	10.4	0.5	-0.3		0.4
Beverages	-4.4		0.1		2.0
Textile	4.9	0.1	-0.1		-0.6
Wood	-10.0	-0.7	0.2		-1.1
Paper	1.6	0.1			0.2
Chemicals	-2.9	-0.1			-0.2
Soap	-1.1				0.1
Other	5.6	0.2	-0.1		
Electricity	-3.5	-0.3	0.1		-0.5
Construction					
Services	-0.6				-0.2
Distribution	-3.1	0.1	0.1		0.1
Hotels	1.4	-0.2			-1.2
Telecommunications	3.9		-0.1		-0.6
Banking and Insurance	14.2	0.5	-0.3		-0.1
Business	8.3	0.3	-0.2		0.8
Public	-5.1	-0.2	0.1		0.2
Personal	-10.4	-0.6	0.2		-1.3
Total	-0.3				

Table A9. Continued

	PWP-L	PWP-A	DIST	PWP-DIST	LR-S
	PWP with labor diversion	PWP with 50% admin cost	1% cut in distribution costs	PWP + DIST	Base case with small-farm tech'y
Agriculture	-1.3			0.1	-1.6
Crops	-1.4				-1.6
Maize	-1.6		-0.1	-0.2	-1.0
Tea	-0.9	-0.1			-15.2
Sugar	0.5	0.1	0.1	0.2	0.2
Tobacco	-0.7	-0.1	0.3	0.2	1.7
Other	-1.8		-0.1		-0.6
Non-crop	-0.4	0.4	0.1	0.6	-0.9
Fishing	-0.7	0.6		0.5	-0.2
Livestock	0.4	1.0	0.1	1.2	
Forestry	-2.0	-1.1	0.1	-0.7	-3.2
Industry	0.1	0.1	0.1	0.2	-0.2
Mining	1.3	0.3	0.2	0.5	0.4
Meat	0.6	1.3	0.1	1.5	
Dairy	-1.5	-1.2	0.1	-0.7	-0.5
Milling	0.2	0.3		0.2	
Bakery	-0.4	-0.3	0.1	0.2	-0.5
Sugar—processed	1.6	0.4	0.3	0.7	0.6
Beverages	3.0	1.9	0.3	2.3	0.8
Textile	-1.2	-0.9	0.1	-0.5	-0.3
Wood	-2.6	-1.7	0.1	-1.0	-0.9
Paper	0.3	0.6	0.1	0.3	0.2
Chemicals	-0.5		0.1	-0.1	-1.1
Soap	0.1	-0.1	0.1	0.2	
Other	0.6		0.2	0.2	0.1
Electricity	-1.1	-0.1	0.1	-0.4	-1.3
Construction					
Services	-0.3	-0.1	-0.1	-0.3	
Distribution	-0.3	0.1	-0.8	-0.7	0.4
Hotels	-1.4	-1.4	0.2	-0.9	-0.5
Telecommunications	-0.4	-0.6	0.3	-0.3	-0.3
Banking and Insurance	1.1	-0.2	0.2	0.1	0.4
Business	1.6	2.7	0.1	1.0	0.7
Public		0.1	0.3	0.5	-0.1
Personal	-2.2	-1.4	0.2	-1.1	-0.7
Total	-0.4				-0.5

Table A9. Continued

	LR-E	LR-E-R	LR-E-R -I	LR-E-R -A
	Base case with estate tech'y	LR-E + RoW finance	LR-E-R with 10% int rate	LR-E-R with 50% adm cost
Agriculture	-0.1	-0.5	-0.5	-0.6
Crops	-0.1	-0.7	-0.7	-0.7
Maize	-0.1	-0.1	-0.1	0.3
Tea	-1.3	-5.9	-5.7	-6.2
Sugar	0.1			-0.1
Tobacco	-0.1	-1.9	-2	-1.9
Other	0.2	1.0	1.0	0.8
Non-crop	0.2	0.6	0.6	0.1
Fishing	0.2	0.7	0.6	0.5
Livestock	0.6	1.4	1.3	0.8
Forestry	-0.6	-1.2	-1.1	-1.5
Industry	0.1	0.2	0.2	0.1
Mining	0.2	-0.1	-0.2	-0.3
Meat	0.7	1.7	1.5	0.9
Dairy	-0.3	0.1	0.2	-0.2
Milling	0.1	0.1	0.1	0.1
Bakery	-0.1	0.4	0.4	-0.1
Sugar—processed	0.3	-0.1	-0.2	-0.4
Beverages	1.2	2.1	1.8	1.2
Textile	-0.3	-0.3	-0.2	-0.5
Wood	-0.5	0.1	0.3	-0.3
Paper	0.1			0.6
Chemicals	-0.2	-0.5	-0.4	-0.1
Soap		0.2	0.2	
Other		-0.2	-0.2	-0.3
Electricity	-0.3	-0.3	-0.2	0.6
Construction				
Services	-0.1	-0.2	-0.2	-0.1
Distribution		-0.6	-0.6	-0.6
Hotels	-0.5	-0.3	-0.2	-0.1
Telecommunications	-0.4	-0.5	-0.3	-0.2
Banking and Insurance		-0.6	-0.6	-0.8
Business	0.4	0.4	0.4	3.0
Public	0.1	0.6	0.6	0.3
Personal	-0.7	-0.2		0.3
Total		-0.1	-0.1	-0.1

Source: Model simulations.

Units: In BASE column, KWbn (at 1998 prices)

In non-BASE columns, % change from BASE (at constant prices)

Table A10. Disaggregated household consumption levels

	BASE	DEP10 10% real depreciation	DEP10-ST 10% real depreciation with flexible sales tax	TOB-25 25% decrease tobacco export price	PET+100 100% increase petro import price
Rural agricultural households					
< 0.5 ha land	3.4	-1.2	-4.1	-4.5	-2.1
0.5-1 ha land	3.9	1.5	-1.6	-2.0	
1-2 ha land	4.6	2.9	-0.5	-1.0	1.0
2-5 ha land	3.2	7.3	3.2	2.8	3.6
> 5 ha land	1.7	5.0	9.0	4.9	6.0
Rural non-agricultural households					
No education	1.4	-4.3	-7.1	-7.7	-4.3
Low education	1.7	-4.2	-6.7	-6.8	-4.3
Medium education	4.1	-5.7	-8.0	-8.9	-5.5
High education	0.8	-17.9	-10.5	-7.8	-9.0
Urban households					
Agricultural	3.0	7.7	3.0	-2.6	2.0
No education	0.7	-7.1	-9.4	-9.5	-7.3
Low education	0.8	-17.1	-12.0	-9.6	-10.5
Medium education	7.1	-14.1	-9.2	-9.9	-8.6
High education	9.8	-12.5	-7.7	-8.3	-7.9
Total	46.3	-4.8	-4.5	-5.4	-3.7

	TOB-PET TOB-25 + PET+100	DEP1 1% real depreciation	TOB+1 1% increase tobacco export price	PET+1 1% increase petro import price	PWP base case
Rural agricultural households					
< 0.5 ha land	-6.8	-0.1	0.2		3.4
0.5-1 ha land	-2.2	0.2	0.1		4.0
1-2 ha land	-0.2	0.3			3.4
2-5 ha land	5.8	0.7	-0.1		1.8
> 5 ha land	9.2	0.6	-0.1	0.1	-1.9
Rural non-agricultural households					
No education	-12.1	-0.4	0.3		7.5
Low education	-11.4	-0.4	0.2		-1.1
Medium education	-14.5	-0.6	0.3	-0.1	-0.9
High education	-17.6	-1.8	0.3	-0.1	-5.0
Urban households					
Agricultural	-1.8	0.7	0.1		0.7
No education	-16.8	-0.7	0.4	-0.1	-0.5
Low education	-20.1	-1.8	0.4	-0.1	-3.9
Medium education	-18.7	-1.4	0.4	-0.1	-3.6
High education	-16.6	-1.3	0.3	-0.1	-3.2
Total	-9.5	-0.5	0.2		-0.3

Table A10. Continued

	PWP-L PWP with labor diversion	PWP-A PWP with 50% admin cost	DIST 1% cut in distribution costs	PWP-DIST PWP + DIST	LR-S Base case with small-farm tech'y
Rural agricultural households					
< 0.5 ha land	5.3	3.4	0.1	3.5	1.8
0.5-1 ha land	6.7	4.1	0.2	4.3	1.8
1-2 ha land	5.2	3.4	0.3	3.8	1.8
2-5 ha land	1.3	1.9	0.6	2.4	0.7
> 5 ha land	-2.1	-3.3	1.4	-0.6	-1.0
Rural non-agricultural households					
No education	14.2	7.5	-0.2	7.3	-0.7
Low education	-4.7	-1.1	-0.1	-1.2	-0.9
Medium education	-4.5	-0.9	-0.3	-1.2	-0.9
High education	-8.1	-6.4	0.2	-4.9	-1.5
Urban households					
Agricultural	-0.4	0.8	0.7	1.4	-1.4
No education	-2.6	-0.4	-0.4	-0.9	-0.9
Low education	-6.7	-5.0	-0.3	-4.1	-1.2
Medium education	-6.1	-4.8	-0.1	-3.7	-1.9
High education	-4.8	-4.4	0.2	-3.0	-1.7
Total	-1.0	-0.8	0.2	-0.1	-0.5

	LR-E Base case with estate tech'y	LR-E-R LR-E + RoW finance	LR-E-R -I LR-E-R with 10% int rate	LR-E-R -A LR-E-R with 50% adm cost
Rural agricultural households				
< 0.5 ha land	3.3	6.0	5.1	3.8
0.5-1 ha land	2.6	4.5	3.8	2.7
1-2 ha land	2.3	3.7	3.1	2
2-5 ha land	0.2	-0.7	-0.8	-1
> 5 ha land	-2.3	-3.1	-2.6	-4.8
Rural non-agricultural households				
No education	-0.5	-0.3	-0.1	0.1
Low education	-0.6	-0.4	-0.2	0.1
Medium education	-0.5	-0.2		0.3
High education	-0.7	0.1	0.3	0.4
Urban households				
Agricultural	-2.1	-2.4	-1.8	-3.1
No education	-0.4		0.2	0.5
Low education	-0.3	0.5	0.6	0.7
Medium education	-1.4	-0.6	-0.2	-0.8
High education	-1.4	-0.5	-0.1	-0.9
Total	-0.1	0.6	0.7	

Source: Model simulations. Units: In BASE column, KWbn (at 1998 prices); in non-BASE columns, % change from BASE (at constant prices)

Figure 1. Prices of tobacco and petroleum (in constant US$) and real effective exchange rate, (KW per foreign currency unit) 1990-2000

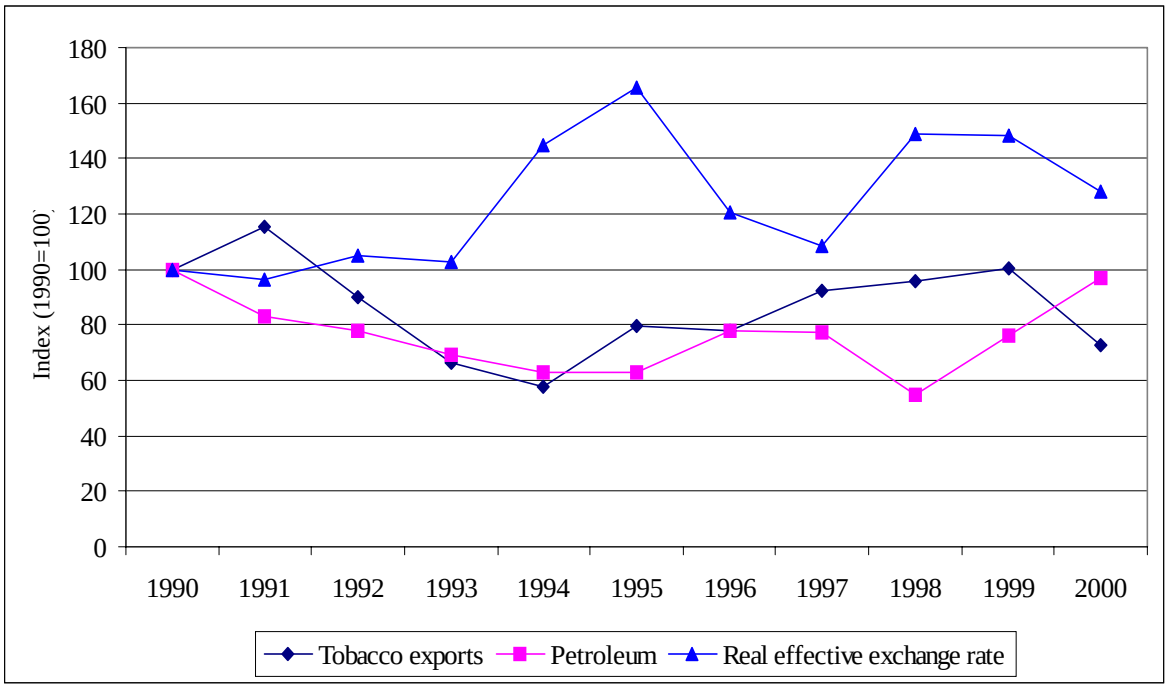
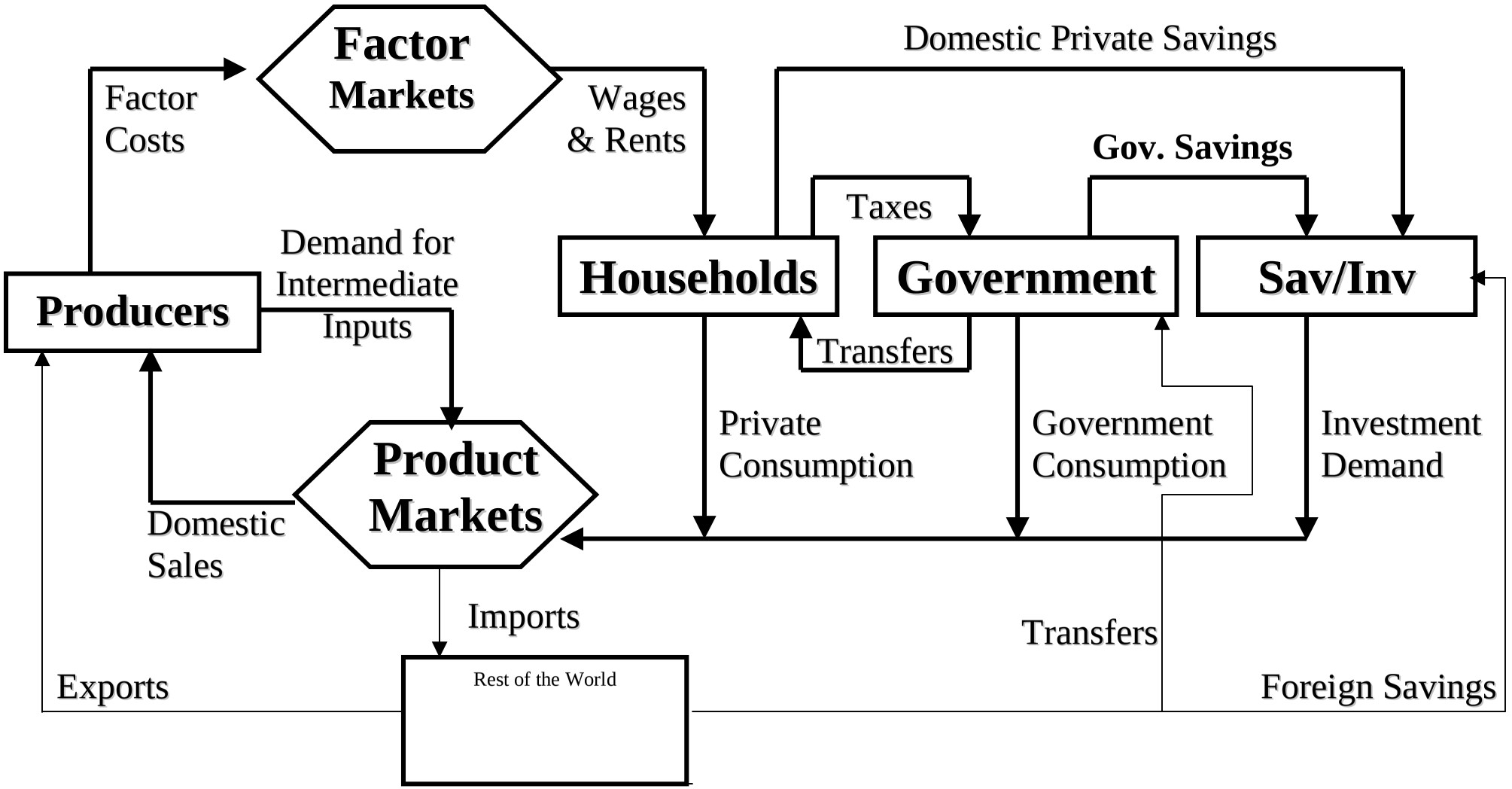


Figure 2. Major payment flows in the CGE model



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