AgEcon SEARCH
RESEARCH IN AGRICULTURAL & APPLIED ECONOMICS

The World's Largest Open Access Agricultural & Applied Economics Digital Library

This document is discoverable and free to researchers across the globe due to the work of AgEcon Search.

Help ensure our sustainability.

Give to AgEcon Search

AgEcon Search
http://ageconsearch.umn.edu
aesearch@umn.edu

*Papers downloaded from **AgEcon Search** may be used for non-commercial purposes and personal study only. No other use, including posting to another Internet site, is permitted without permission from the copyright owner (not AgEcon Search), or as allowed under the provisions of Fair Use, U.S. Copyright Act, Title 17 U.S.C.*

Commodity prices, structural constraints and food price shocks in Tanzania

Piero Conforti
Economist, Trade and Markets Division, Food and Agriculture Organization of the United Nations (FAO)

Alexander Sarris
Director, Trade and Markets Division, Food and Agriculture Organization of the United Nations (FAO)

Contributed Paper prepared for presentation at the International Association of Agricultural Economists Conference, Beijing, China, August 16-22, 2009

Copyright 2009 by Piero Conforti and Alexander Sarris. All rights reserved. Readers may make verbatim copies of this document for non-commercial purposes by any means, provided that this copyright notice appears on all such copies.

COMMODITY PRICES, STRUCTURAL CONSTRAINTS AND FOOD PRICE SHOCKS IN TANZANIA

by

Piero Conforti and Alexander Sarris[1]

Abstract. This paper explores the impact of the recent soar in world commodity prices on economic activity and household welfare in Tanzania, and the possible policy responses to that shock. The analysis is based on a single country computable general equilibrium model that includes considerable factor market and household details, as well as marketing margins between producers, consumers and foreign markets. Results indicate that the Tanzanian economy may fail to benefit from the opportunities arising from the increase in world agricultural prices, as this would imply a considerable reduction in most production activities, but the few that are directly export oriented. Policies can counteract only to a limited extent these negative impacts. Tariff and domestic tax reductions show some desirable results, albeit small in size, while export taxes further depress the domestic economy. Injections of foreign resources fail to stimulate domestic production. Structural bottlenecks deeply affect the results: a reduction of the high marketing margins would improve the ability of the economy to adapt to any change in world prices.

[1] Piero Conforti is an Economist and Alexander Sarris is Director at the Trade and Markets Division of the Food and Agriculture Organization (FAO) of the United Nations. No senior authorship is assigned.

1. Introduction

The recent upsurge in world prices for basic food commodities and petroleum prices has raised for some months the spectrum of a potential "double squeeze" in many low-income food deficit countries (LIFDCs). Import costs have risen significantly in countries which are large food importers, while the extent to which increased commodity prices have benefited the activities that produce exportable goods appeared uncertain at best, due to the presence of structural constraints and other factors preventing price transmission and hindering the possibility of competing in foreign markets. Despite prices reverted quickly after the summer of 2008, the issue remains of understanding how can policies assist in reacting to terms of trade shocks, and, more in general, of how to reduce the vulnerability of poor economies to exogenous changes in the international economic environment.

In poor developing countries, backward technologies and poor infrastructural endowments, resulting in large market weaknesses such as large marketing margins, render many domestic products non-tradable in fact. This is especially the case of agricultural production, where subsistence farming is widespread, and the more traditional parts of the food production chain: a significant portion of households' consumption still flows directly from production into self-consumption, bypassing the specialized processing and distribution systems. Food processing and marketing usually show high transaction costs arising from poor infrastructures, such as inadequate transport facilities, and from institutional and physical gaps in the organization of activities. Under such condition, the effects on the supply side are likely to materialize much slower than those on the demand side; hence an increase in world prices of basic food is likely to result in an immediate increase in the food import bill and imported inflation, while increased opportunities for producers and exporters materialize only after some months, if at all.

Most Government in developing countries and Low-Income-Food Deficit Countries (LIDCs), which found themselves under severe difficulties in 2007 and early 2008, put in place policies aimed at counteracting the effects of the soaring world food prices. Many such policy responses were aimed at counteracting inflationary pressure by offering subsidies to consumers, injecting food reserves in the domestic markets, lifting tariffs on imported food, and even at limiting exports, in an attempt to protect domestic consumers. Some of these, however understandable, appear to be very questionable choices; it is the case, for instance, of export bans, that probably ended up contributing to the soar of world prices by reducing the size of world markets. The effect of other measures is more difficult to assess; and, in

general, any policy change aimed at responding to a large external shock is likely to bring about considerable economy-wide effects which are complex in nature, and spread across sectors and institutions. This is especially the case if a policy is implemented in an economy characterized by the above-mentioned structural constraints. The literature has documented that inadequate infrastructures that generate wide and inefficient transport and transaction costs, can directly contribute to rural poverty, particularly in Africa (Stifel *et al.*, 2003; Minot, 2005; Delgado *et al.* 2003; Kilima, 2006). However, few policy analysis exercises have included this aspect in assessing the impacts of trade liberalization and other policies (Arndt et. al., 2000; Wobst, 2003).

This paper builds on the literature by discussing possible policy changes in response to the recent commodity price soar by taking a specific Eastern African country, Tanzania, which can be considered a rather typical LIFDC. With a per capita income of about US$ 280, Tanzania is among the world's poorest countries. Agriculture plays a dominant role in the economy, accounting for nearly 45 percent of GDP, for about three quarters of merchandise exports, employing around 70 percent of the labour force, and constituting a source of livelihood for about 80 percent of the population, particularly for the poorer and more vulnerable groups in rural areas. The average farm size varies between less than 1 and 3 hectares, and the vast majority of the crop area is cultivated by hand. Activities are still to a large extent dependent upon unpaid family labour, particularly of women and children, who account for at least 70 percent of total agricultural labour. Agricultural productivity is generally low due to limited input use, unfavourable weather conditions, frequent pests and diseases, poor knowledge of agronomic practices and other technologies, low capital investment, especially for small scale farmers. All this results in relatively high poverty levels: in 2000-01 the incidence of poverty was 36 percent on average, while it reached 41 percent in those households depending on food crops, 39 percent in those depending on cash crops, and 33 percent in those depending on livestock[2]. A study by Levin and Mbamba (2004) showed that an expansion of agricultural production may have considerable potential effects in terms of employment and income generation, which would however benefit mostly the non-poor households, both in rural and urban areas.

Within this context, this paper aims at testing the response of the economy to different policies, focusing on few key structural features of the Tanzanian economy, namely the size

[2] In Tanzania the terms "cash crops" normally refers to exportable crops grown by farmers for cash, such as coffee, cotton, cashew nuts, tobacco, tea, etc.

of the marketing margins, and the degree of substitutability between domestically-produced and foreign goods, both on the import side and the export side. The attempt is to take into account and analyze structural constraints, and the extent and modes in which they contribute to shape the result of policy analysis (Ackerman, 2005; Taylor and von Arnim, 2006).

Therefore, the paper presents a set of policy experiments run on a Social Accounting Matrix (SAM) built from the data provided by IFPRI (Thurlow and Wobst, 2003), which includes considerable factor, household, and sectoral detail. Simulations are run with a single-country computable general equilibrium (CGE) model (Lofgren et al., 2002).

Next two sections illustrate the main features of the database and the model, while section 4 describes the scenarios simulated and their logic. Results are in Section 5, which reports also on the sensitivity of the results to key parameters, and how they shape the degree of tradability of production. Finally, section 6 concludes.

2. The dataset: a modified Social Accounting Matrix for Tanzania

The SAM computed by Thurlow and Wobst (2003) was aggregated to include 24 different activities and commodities[3], six types of labour, four of which can be classified as unskilled[4], plus agricultural and non-agricultural capital, and land, which is only employed in agriculture. The dataset includes an aggregate enterprise entity, six types of households, three urban and three rural[5], plus a government sector. Indirect taxes are reported separately from taxes on value added, factor use, as well as imports tariffs and export subsidies.

A comparison of the SAM provided by Thurlow and Wobst (2003) with microeconomic evidence from independent surveys conducted in Tanzania (Sarris *et al*., 2006) revealed that the former includes a low level of marketing margins for the domestic market, as well as for exports and imports, particularly for agricultural and food products. This arises from the type of margins computed by Thurlow and Wobst (2003), which are those between the wholesale and the retail level, while those between the farm gate and the wholesale level are not

[3] The complete list of activities/commodities includes: maize, other cereals, beans, other cash crops, cassava and roots, coffee, cashew, other fruits and vegetables, other crops, livestock, fishing and hunting, mining, meats, processed grains, other processed foods, beverages, other secondary activities, construction activities, utilities, trade, hotels, transportation, other services, and public administration.

[4] The complete list of labour types includes: subsistence labour, child labour, non-educated male labour, non-educated female labour – which altogether form the unskilled group – plus educated male labour and educated female labour.

[5] The complete list of households includes, for both the rural and the urban sectors, poor, non-poor-non-educated, and non-poor-educated, distinguished on the basis of the status of the reference person in the household.

considered[6]. For this reason, the SAM from Thurlow and Wobst (2003) was modified. Given the absence of systematic information on marketing margins, these were re-computed as percentages of the values of the marketed as well as of the exported and imported commodities. The difference in the resulting income in the SAM was subtracted from the income of the respective producers, with the result that the whole SAM had to be rebalanced. For exported commodities, it was assumed that the margin associated with marketing transaction costs would amount to 50 percent of the marketed values. For imports the same margin was set at 20 percent of import values, and for domestic sales to households at 30 percent of purchased values.

To minimize information losses, the rebalancing was run by maintaining at their original level the data which was considered to be more reliable, particularly those on foreign trade and the public sector. The rebalancing was implemented with different methods, and the results were ranked in terms of percentage deviation from the original figures. The smaller and more widespread changes were achieved by minimizing the sum of the squared residuals of the changes in the SAM elements.

Table 1 reports the SAM employed in the simulation in a compact form, while Table 2 reports the major structural characteristics of the Tanzanian economy, as inferred from the same SAM. Maize and other cereals appear as dominant activities in terms of GDP but less so in terms of exports, which are dominated by coffee and cashew; large shares of most agricultural products are not marketed. The most important sector on the export side is transport, and on the import side the other secondary products. Despite their small importance in total trade, maize and cereals imports constitute a significant share of consumption.

3. The model

Simulations were run with a single country computable general equilibrium model, built as a modified version of the one presented in Lofgren *et al.* (2002), which is comparative static. Production is modelled as a Constant Elasticity of Substitution (CES) function, with value added for each activity defined as a CES function of factor inputs. Activities produce outputs of individual commodities, which are allocated to domestic and export uses via a constant

[6] For instance, if the average price of coffee received by farmers as inferred from micro surveys is compared to the average (wholesale export) market price obtained in the Moshi auction the margin is larger than 50 percent in Kilimanjaro, a region close to Moshi, and even higher for Ruvuma a region much further away from Moshi than Kilimanjaro.

elasticity of transformation (CET) function. Imports are assumed to be imperfect substitutes for domestic output, following the approach proposed by Armington (1969). Therefore, commodities available in the domestic market are modelled as composite goods, resulting from domestic and imported differentiated products. Non-land capital is assumed to be fixed in each sector at the base year level. Total arable land is also assumed to be fixed, but substitution is allowed among agricultural activities, based on relative price changes.

Demand is modelled separately for household self consumption – flowing directly from activities to the households without including marketing margins – and marketed consumption, in which household purchase composite commodities which do include margins and indirect taxes. Two separate demand systems account for home and marketed goods, both modelled as Linear Expenditure Systems. Investment demand is defined as an adjustment coefficient multiplying an amount fixed in the base period, akin to capital coefficients times the volume of total real investment.

The model includes explicitly a trade activity which collects the marketing margins associated with all activities, and distinguishes three margins, namely those involved in exporting goods, in importing goods, and those required for selling into the domestic market. Margins enter the price formation equations as exogenous transaction cost coefficients.

Welfare is measured as "Money Metric Utility"(MMU) (Deaton, 1980), that is by comparing the expenditure of a household under a simulated scenario, where the household has expenditure Y, and pays prices p_0, with the expenditure that the same household would have incurred to obtain the same level of welfare as in the base period, but at current prices p.

Being comparative static, the model does not take into account the adjustment path implied in each scenario, nor the associated costs. As a proxy for such costs, we computed a Structural Change Index (Clark et al, 1996), which provides a comparative measure, under each scenario, of the amount of resources that migrate from one activity to another

The closure rule adopted is based on a combination of available evidence and knowledge of the Tanzanian context. Commodity markets are assumed to clear with flexible prices, as there are no major output price controls in the economy. In factor markets, however, the likely presence of excess unskilled labour and shortage of skilled labour led us to assume that the wages of all unskilled labour classes are fixed in real terms, while those of the skilled labour classes are flexible, and respond to supply and demand. On total investment, we side with the classical view that it is determined by available savings, given that the availability of private

savings constitutes in fact a significant constraint in Tanzania, and given what is suggested by microeconomic evidence. In the same vein, on the current account we assume a flexible exchange rate with a fixed availability of foreign savings. Finally, we assume that the government budget is endogenously determined, so that the tax rates and other fiscal instruments are fixed.

Finally, the parameters employed in the simulations are calibrated using as a starting point those reported by Thurlow and Wobst (2003), and the CES and CET elasticities reported by that same source for product groups similar to those employed here. On the demand side, the calibration is based on a procedure that enforces symmetry, homogeneity and negativity properties on the linear expenditure systems.

4. Changes in prices and policy scenarios

Our first goal in the simulations is to assess the medium-term adjustment of the economy to the shock on foreign prices. For this purpose, an *ad hoc* baseline scenario was built, named BASEPR, in which we consider the cumulative prices changes for the period 2001 to 2007 in both import and export prices (Table 3). Price changes are computed from different sources. Import and export unit values faced by Tanzania in current US dollars were retrieved from the COMTRADE database at three-digit level[7]. The resulting changes were deflated with the US GDP deflator. For some product groups, however, the COMTRADE could not provide meaningful results, due to changes in the composition of the aggregates between the two periods and/or other inconsistencies[8]. In such cases, world price changes were retrieved from the database of the CO.SI.MO.-AGLINK model employed by OECD and FAO in the preparation of the world agricultural commodity outlook. Changes in world coffee prices were derived from the database of the International Coffee Organization. World oil price changes were also derived from the COSIMO-AGLINK database. Non-agricultural commodity world price changes were retrieved from the International Financial Statistics of the International Monetary Fund. All such nominal changes in US dollars were deflated with the same US GDP deflator. The sector named "other secondary goods" in the SAM includes

[7] Data were retrieved from the COMTRADE under the SITC revision 2 classification, at three digit level. This classification system was chosen because its product groups are the closest available to the product groups reported in the SAM. The three digit was chosen because it is the more aggregated level at which information is available in terms of physical quantities; and these are required in the computation of trade unit values.
[8] In fact, whenever data permits, the base period was computed as an average centred on 2001; while the end period was the 2006-07 average.

petroleum as well as other manufactured goods. The world price change for this item was computed as a weighted average on the basis of the relative share of petroleum and other goods.

The description of the scenarios simulated is reported in Table 4. As mentioned, one of the objectives of this paper is analyzing the effect of structural conditions in determining the response to price shocks, as well as to the related policy responses. To emphasise this aspect, and given the mentioned importance of trade margins in the Tanzanian context, before implementing the price shocks we run a counterfactual scenario in which trade margins are reduced by 20 percent (BASETD). This allows a comparison between the effect of the price shocks reported in Table 3 under the actual conditions (BASEPR), and under a condition in which trade margins are smaller (BASEPRTD). In other words, the scenarios are designed to show the differential effect that the presence of large marketing margins makes in the response of the economy to the price shocks. In the same vein, policy shocks are run assuming as a starting point both the price shock on the actual economy as described by the SAM (BASEPR), and on the economy as it would look like with lower marketing margins (BASEPRTD).

Concerning policies, the first four pairs of scenarios describe changes in trade measures (Table 4). The Government is assumed to reduce 20 percent all existing tariffs (scenarios ATARCUT and BTARCUT), in order to ease prices for consumers. Otherwise, under scenarios (ATARSELECT and BTARSELECT) the Government is assumed to reduce tariffs only on key food staples, to counteract inflation while maintaining protection in strategic sectors[9]. As a third trade policy option, it is considered the introduction of export taxes, that the Government may set in order to re-distribute part of the additional income accruing to exporters from the increase in world prices; this is analyzed in scenarios AEXPT and BEXPT, in which all exports are taxed. Also in this case, however, the Government may be willing to take a selective approach, and introduce export taxes only on a few agricultural export goods[10]; this option is analyzed in scenarios AEXPTSELECT and BEXPTSELECT.

Two more scenarios are aimed at analyzing the possibility that the Government decides to reduce domestic indirect taxation in order to ease the position of the consumers who are net purchases of such goods. Scenarios ADOMTAX and BDOMTAX simulate a 20 percent

[9] Scenarios ATARSELECT and BTARSELECT reduce tariffs only for maize, other cereals, beans, cassava and other roots, live animals, processed grains, meats and other foods.
[10] Scenarios AEXPTSELECT and BEXPTSELECT introduce export taxes on coffee, cashew and other cash crops.

decrease in indirect taxes on the major food staples, specifically on maize, other cereals, beans, cassava and other roots, live animals, processed grains, meats and other foods. In scenario ADOMTAX such tax reductions are implemented starting from the world price increases described in Table 3 with existing marketing margins, whereas scenario BDOMTAX implies the same changes starting from the reduced marketing margins baseline.

The last two pairs of scenario investigate the reaction of the economy to an inflow of foreign resources proportional to size of the increase in the import bill generated by the price changes reported in Table 3. This could be, for instance, an inflow of untied aid aimed at supporting the balance of payments. Specifically, these scenario assume an increase in the available foreign savings corresponding to half of the additional initial import bill generated by the increased world prices, computed on the SAM (AFSAVBL and BFSAVBL); or to 25 percent of it (AFSAVHBL and BFSAVHBL) (Table 4).

5. The effect of an increase in world commodity prices and the related policy responses:

5.1 Price changes

Altogether, changes in world prices imply for Tanzania a shock amounting to 5.9 percent of GDP(Table 5). The price shock arising in the agriculture fisheries and forestry sectors is positive, as prices or exportables increase more than prices of importable products. The shock is negative but small for other food products, and very negative for other sectors largely due to the increase in imported oil prices. The terms of trade shock, therefore, is negative largely due to the increase in non agricultural goods and to the oil price shock.

As shown by Table 6, the price shock produces a significant income effect in the economy: production and consumption are reduced, together with savings, and this drives down both GDP and investment. Imports contract, as a consequence of the same income effect, while exports increase, driven by agricultural exports, which are highly concentrated, as seen, in coffee, cashew and few other items. The reduction that takes place in most productive activities results altogether in a reduction of unskilled labour employment. The appreciation of the exchange rate results from the changes in real domestic prices, which are mostly negative. The “real” exchange rate, however - which is computed as the ratio of the price of tradable to non tradable goods – shows the expected depreciation following the price shock.

The comparison of the base run (BASEPR) with the counterfactual scenario in which marketing margins are lower (BASEPRTD) indicates the importance of this structural

element: even without the price shock, the second column of Table 6 shows that the economy would fare a lot better should marketing margins be just 20 percent lower than what they are. And, by comparison, the fifth column of the same Table shows that the same price shock would produce less dramatic changes in the economy, if the marketing margins were 20 perecent smaller: GDP and unskilled labour would be reduced far less than with the actual marketing margins.

Changes in production and trade for the three main parts in the economy (Table 7) show how output would be reduced; and, despite the good export performance of agriculture, production would be marginally reduced under all the price shock scenarios. Lower marketing margins would imply a higher incentive to produce, as output would be higher in all sector, and that this would dampen the effect of the negative price shock.

More details on the effect of the price shock on production are in Table 8. Here it becomes evident how the economy would become more focused on the very few exportable products, and particularly on coffee; cashew and the other secondary sectors that would also see some expansion. But the level of activity would shrink in most of the rest of the economy. The size of this effect depends upon the marketing margins: when these are reduced, the degree of specialization of the economy is smaller. For instance, the increase in coffee production is half the one computed with the actual margins.

As expected, the behaviour of production is consistent with what happens to relative prices (Table 9): the price shocks result in a reduction of most real prices the economy, due to two reasons: firstly, the negative terms of trade shock - that increases the ratio of tradables to non-tradable prices, as shown also by the "real" exchange rate reported in Table 6 – and, secondly, by the presence of the high marketing margins, that hinder price transmission and makes all goods less tradable. In fact, such reduction in real prices appears to depend significantly upon the marketing margins: the base run in which they are 20 percent lower shows considerable increase in real prices, and, consistently, the world price shock results in smaller reduction of the domestic real price when implemented on a base with reduced marketing margins (Table 9, last column).

Welfare results for the price change scenarios are negative for all households (Figure 1), and particularly for the better off urban ones, which are less dependent on self consumption, and more exposed to world price changes. On the contrary where subsistence farming is common, as it is among the rural poorer households, the effects are minimal, due to high incidence of

non tradables in the consumption basket. It is worth noticing how, also in terms of welfare, the world price shock would generate less reduction under the assumption of reduced marketing margins, particularly for the rural households, as a consequence of improved output prices received.

The Structural Change Index for the price shock experiments (Figure 2) shows how the price shock would generate an amount of adjustment similar to the one generated by a decrease in marketing margins, and an even wider re-allocation of unskilled labour in the economy. In general, skilled labour is the resource that migrates to a higher extent from one sector to the other, given its (assumed) fixed availability.

5.2 Policy responses

Turning to policy reactions, cutting import tariffs across the board - scenarios ATARCUT and BTARCUT - produces some positive effect, although quite small in size (Table 10). Reduced tariffs allows more imports to enter the country, and especially agricultural imports, that increase about 3 percent over the world prices increase scenario BASEPR. Under the assumption of reduced marketing margins (scenario BTARCUT), the impact of a generalized tariff cut is similar (Table 10), apart from exports, that still increase marginally with an import tariff cut, due to the higher price incentive that the world price increases generate for the producers of exportables, which reduces the negative effect on real domestic prices.

Cutting tariffs selectively, hence maintaining protection unchanged and reducing it only on the major food staples, does not appear to be a successful choice. In general, results of scenario ATARSELECT are small in size (Table 10), and this means that the corresponding policy would not be effective in counteracting the negative impact of the world price changes.

Policies on the export side appear to produce even more questionable effects: taxes imply a further polarization of the economy on the few activities that can be exported and in the non tradables, whose real domestic prices are still not (or less) penalized compared to the others. Particularly, an across the board export tax, that the government may set in order to capture and re-distribute some of the benefits of the price increase (scenarios AEXPT and BEXPT), produces the apparently puzzling effect of further increasing agricultural exports (Table 10). Changes in real prices by activity can assist understanding this result: a generalized export

tax lower domestic real prices significantly in virtually all activities[11], but those few in which agricultural export are concentrated, such as coffee, cashew, the other cash crops as well as in mining and the other secondary sector goods. The reason is that the size of the world price shock allows these activities to benefit regardless of the high marketing margins and the newly set tax. With lower marketing margins - scenario BEXPT in Table 10 - the results are similar, but with a stronger effect on total exports, given the improved transmission of price signals in the economy due to the lower margins. Government savings would increase considerably under all scenarios implying export taxes, due to the increase in the proceedings of both domestic and export taxes.

Setting export taxes selectively on main agricultural export goods penalizes these activities more directly, while total export increase following the more favourable prices in non agricultural activities, that attract resources. Apart from this, the other results do not differ qualitatively from those yielded by the generalized export tax: only the size of all changes is reduced.

An reduction in indirect taxes on domestic consumption of major food items (scenarios ADOMTAX and BDOMTAX) has a moderate expansionary effect: production is stimulated, especially in the activities that are more oriented towards the domestic market, while exportables, especially in agriculture, shrinks marginally (see Table A1); in turn, his has a positive effect on unskilled labour and overall GDP. These changes are amplified when the simulation is run starting from a lower level of marketing margins, that is, under scenario BDOMTAX.

Finally, an injection of foreign savings that compensates for half or 25 percent of the increased import bill seem to produce mainly an appreciation of the exchange rate that the injection would bring about. As a consequence, export would be penalized while imports would increase. With lower margins (scenarios BFSAVBL and BFSAVHBL) the overall effect on GDP is slightly negative, while a marginal expansion takes place with the actual (high) level of the margins. The reason of this difference arises from the size of the increase in export: with higher margins, exports are reduced by a higher extent, and therefore activities selling in the domestic market attract relatively more resources; for this reason, unskilled labour is reduced less, and GDP still expands marginally.

[11] Price and output changes are not shown due to space reasons; however, they are available from the authors upon request.

Welfare changes, that summarize the impact of these policy scenarios, are reported in Table 11. Intuitively, cutting tariffs (scenarios ATARCUT, BTARCUT, ATARSELECT and BTARSELECT) appears to be a welfare-enhancing measure for most types of households, and especially for urban households who are net food buyers to a greater extent. Such positive effect, however, is small in size even when all tariffs are cut, and it becomes negligible when only the tariffs on food and agricultural staples are reduced.

Instead, export taxes - scenarios AEXPT, BEXPT, AEXPTSELECT and BEXPTSELECT - reduce welfare, especially when they are applied across the board, and especially for poorer households, both urban and rural. This is the outcome of the observed changes in unskilled labour, and therefore it depends to some extent by the assumption of fixed wages[12].

Among the other policies, the reduction in domestic indirect taxes (scenarios ADOMTAX and BDOMTAX) has a moderate but positive effect, slightly more pronounced for the better off households. Finally, the injections of foreign savings (scenarios AFSAVBL, AFSAVHBL, BFSAVBL and BFSAVHBL) penalise directly the rural poor households, due to the reduction in export and unskilled labour that they imply, while improving the position of the better off urban households.

5.3 Sensitivity to key parameters and the degree of tradability

In order to check on the robustness of these results to changes in key parameters, and to verify the effect of different degrees of tradability of the economy, the simulations described above have been repeated with different values of three key model parameters, namely:

1. the Constant Elasticity of Transformation (CET), that allocates production between the domestic market and exports;

2. the Constant Elasticity of Substitution (CES), that regulates consumers' choice between imported and domestically produced goods;

3. the constant elasticity of substitution at the bottom of the technology nest (σ), where activities respond to the changes in the relative price of intermediates and factors of production[13].

[12] It should be observed, however, that the welfare reduction for poor rural household is amplified when the full employment assumption is adopted (see Table A5 in the Appendix) as a result of the higher reduction in the production of exportables (see Table 7).

[13] The model was run the value of the three parameters increased by 100 percent for agricultural products only, firstly, and subsequently for all products.

The results obtained do not depend substantially from the parameters: despite the size of some changes become markedly different, there are virtually no variations in the signs, at least for key variables (Tables 12 and 13).

In terms of the degree of substitutability and flexibility in the economy, as expected, higher trade elasticities tend to emphasise trade, both on the import and the export side, when assessed on the basis of the actual marketing margins (Table 12). When substitutability is increased on the export side, the side of the appreciation of the nominal exchange rate is smaller, as the trade balance worsens to a greater extent. The contrary happens with a higher CES elasticity on the import side, as the trade balance improves slightly compared to what happens under the standard parameter set.

The contrary happens, however, when the substitution supply parameter σ is shocked: exchange rates and trade react to a lower extent, trade still increases, and GDP growth is amplified (Table 12). This is due to the fact that, following the price shock, production increases faster than under the standard parameter set, and this generates more tax revenues, investment and less depreciation.

Results are different when the same price shocks are implemented under the assumption that marketing margins are lower (Table 13). In this case a change in the trade elasticity makes a smaller difference in the results; agricultural imports are reduced less then under the standard parameter set. In turn, this affects the change in the nominal exchange rate, that appreciates slightly more.

6. Concluding remarks

The world price soar observed over the last years appear unlikely to benefit the Tanzanian economy. On the one hand, this is due to the production and trade structure of the country: increased prices bring about a negative terms-of-trade shock, of about 6 percent of GDP between 2001 and 2007, assuming no adjustment in the economy. On the other hand, when the reaction of the economy is analyzed with a behavioural model, the ability of the country to adjust to a change of world prices appears limited at best; and a significant chare of this limitation depends on the presence of structural constraints.

The world price change generates a significant negative income effect in the economy: production and consumption are reduced, together with savings, and this drives down both

GDP and investment. The economy becomes more polarized on few exportable products - particularly coffee; cashew and the other secondary sectors - that see some increase; but output shrinks in most other activities. Welfare is reduced, especially for the urban poor, where the incidence of net food buyers is higher, and less so for the rural poor households, where self-consumption is widespread.

In terms of policies that may counteract such shocks, the simulations showed that cutting tariffs produces positive but very limited effects: it can counteract the reduction in domestic production, and this yields a positive outcome on unskilled labour, which drives GDP slightly up. On the contrary, export taxes appear to produce questionable effects: output decreases further in all activities but the few exportables and some non tradables. Rather, reducing indirect taxation yields a moderate expansionary effect, as it stimulates production in the activities which are oriented towards the domestic market, especially in agriculture. And the injection of foreign resources appears to affect primarily the nominal exchange rate, whose appreciation penalizes production and exports, while easing imports.

The same price and policy shocks would produce far less dramatic changes if the marketing margins would be 20 smaller than what they are in the actual SAM: trade would react more, but GDP and unskilled labour would be reduced less. This indicates that tackling some of the structural bottlenecks would increase the adaptability of the economy under all price scenarios, and make it more resilient and adaptable to changes in the terms of trade.

Apart from the robustness of results to parameters, sensitivity indicates that productivity and the degree of tradability of goods in the economy are key elements of the picture: they can improve the capacity of the economy to adjust to foreign price shocks. This is consistent with the idea that policies designed to improve the tradability of domestic products would be beneficial, as argued also by Levin and Mbamba (2004).

To conclude, given the importance of the structural constraints in the economy – such as those that produce the high marketing margins and the reduced substitutability between the domestic and foreign goods – it is useful to observe that more efforts should be undertaken to identify the ones that are more prominent in the country, and the means required to tackle them. Some of them are likely to take the form of lack of physical infrastructures, such as roads, ports or other transport facilities; some may take the form of lack of information, or institutional capacities.

In terms of foreign resources that may be employed to address the structural problems that prevent a correct functioning of the markets, the Aid for Trade framework should be regarded as a useful source. Moreover, the highly concentrated nature of the Tanzanian economy, especially on the export side, indicates that room for manoeuvre should be left available to policy makers to promote nascent sectors, by, for instance, allowing them to protect potential infant industries. In this respect, it would probably be desirable for Aid for Trade resources not to be made contingent upon commitments in terms of drastic tariff reductions.

Finally, it is worth considering the extent to which the results presented here can be useful and valid beyond the Tanzanian context, or whether they are strictly dependent upon that context. While the peculiarities of other economies prevent direct generalizations, it should be observed that some of the results obtained may apply, with different nuances, to other countries that, like Tanzania, are highly dependent on an agricultural sector characterized by low productivity; rely on imports of staple food to a significant extent; do not produce oil; and tend to suffer from structural constraints. The booming of world commodity prices may produce in such contexts that same excessive polarization of the economy on few viable exportables – while leaving behind most of the other activities - and generate the undesirable welfare outcomes that were observed in the simulations. As seen, while policies can dampen these negative outcomes, tackling structural constraints seems to yield a higher impact, especially in terms of improved adaptability of the economy.

References

Ackerman, Frank (2005). The Shrinking Gains from Trade: A Critical Assessment of Doha Round Projections, GDAE Working Paper No. 05-01

Armington, P.A. (1969), "A Theory of Demand for Products Distinguished by Place of Production" *International Monetary Fund Staff Papers* 16

Arndt, C. H. Tarp Jensen, S. Robinson, and F. Tarp (2000) "Marketing margins and agricultural technology in Mozambique", The Journal of Development Studies, vol. 37(1), pp. 121-137

Clark, C., Geer T. and B. Underhill "The Changing Structure of Australian Manufacturing", *Staff Information Paper*, Productivity Commission, Government of Asutralia, 1996

Deaton, A., 1980. The Measurement of Welfare. Theory and Practical Applications. Living Standards Measurement Study, Working Paper No. 7, World Bank, Washington DC.

Delgado, C., N. Minot, and M. Tiongco (2003) "Evidence and implications of non-tradability of food staples in Tanzania 1983-1998" International Food Policy Research Institute, Markets Trade and Institutions Division, MTID Discussion Paper No. 72

Food and Agriculture Organization of the United Nations (FAO) and Organization for Economic Co-operation and Development (OECD) (2007) *OECD-FAO Agricultural Outlook 2007-2016*

Government of the United Republic of Tanzania, the World Bank, and International Food Policy Institute, (2000). Agriculture in Tanzania since 1986: Follower or Leader of Growth?. A World Bank country study

Kilima, F.T.M. (2006) "Are price changes in the world market transmitted to markets in less developed countries? A case study of sugar, cotton, wheat, and rice in Tanzania", Department of Agricultural Economics and Agribusiness, Sokoine University of Agriculture, IIIS Discussion paper No 160, Morogoro, Tanzania,

Levin, J., and R. Mbamba (2004), "Economic growth, sectoral linkages and poverty reduction in Tanzania", World Bank, background paper for the Tanzania CEM.

Lofgren, H. R. Lee Harris, R. and S. Robinson. (2002) "A Standard Computable General Equilibrium (CGE) Model in GAMS" International Food Policy Research Institute, Microcomputers in Policy Research No 5

Minot, N. (2005) "Are poor, remote areas left behind in agricultural development: The case of Tanzania", International Food Policy Research Institute, Markets Trade and Institutions Division, MTID Discussion Paper No. 90

National Bureau of Statistics, 2002. Household Budget Survey 2000/01, Dar es Salaam.

Rattso, J. (1982) "Different macroclosures of the original Johansen model and their impact on policy evaluation", Journal of Policy Modeling vol. 4(1) pp. 85-97

Robinson, S. (1981) "Macroeconomics, financial variables, and computable general equilibrium models", World Development vol. 19, pp. 1509-1525

Sarris, A., S. Savastano, and L. Christiaensen (2006) "Agriculture and poverty in commodity dependent African countries: A rural household perspective from the United Republic of Tanzania" FAO Commodities and Trade Technical Paper No. 9.

Stifel, D., B. Minten, and P. Dorosh (2003) "Transactions costs and agricultural productivity: Implications of isolation for rural poverty in Madagascar" International Food Policy Research Institute, Markets and Structural Studies Division, MSSD Discussion Paper No. 56.

Taylor, L. (1990) "Structuralist CGE models" in L. Taylor, (editor) Socially Relevant Policy Analysis. Cambridge, Mass., USA, MIT Press.

Taylor L. and R. von Arnim (2006). Modeling the Impact of trade liberalization. A critique of Computable General Equilibrium Models Oxfam International Research Reports, May 2006

Thurlow, J. and P. Wobst (2003) "Poverty-focused Social Accounting Matrices for Tanzania", International Food Policy Research Institute, Trade and Macroeconomics Division, TMD Discussion Paper No. 112.

Wobst, P. (2003) "The impact of domestic and global trade liberalization on five southern African countries", The Journal of Development Studies, vol. 40(2), pp. 70-92

Table 1. The SAM for Tanzania (2001, million TzS)

	activities (24)	commodities (24)	margins (3)	labour (6)	capital (2)	land (1)	enterprises (1)	households(6)	Government	taxes (6)	ROW	S-I	TOTAL expend
activities (24)		12226						1939					14165
commodities (24)	6337		1283					5282	516		1306	1231	15955
margins (3)		1283											1283
labour (6)	4285												4285
capital (2)	3218												3218
land (1)	301												301
enterprises (1)					2495								2495
households(6)				4267	697	301	2398		61		404		8129
Government							1			668			670
taxes (6)	24	436		18			95	94					668
ROW		2009			26								2035
S-I								814	92		324		1231
TOTAL income	14165	15955	1283	4285	3218	301	2495	8129	670	668	2035	1231	54436

Source: calculation based on Thulow and Wobst (2003)

Table 2. Production and trade structure of the Tanzanian economy in 2001

	Share in total value added (percentage)	Share in total exports (percentage)	Share in total imports (percentage)	Shar of exports in production (percantage)	Share of marketed production in total production (percentage)	Share of imports in total domestic consumption (percentage)	Ratio of domestic margin to marketed production (percentage)
maize	9.9	0.1	0.8	0.2	48.2	3.6	12.0
other cereals	5.6	0.2	2	0.5	76.7	7.7	5.4
beans	2.3	0.1	0	0.6	73.6	0	20.5
other cash crops	4.6	10.2	2.5	22.1	93.3	8.8	17.6
cassava and roots	3.6	0	0	0	40.2	0	22.8
coffee	0.8	7.3	0	92.7	96	0	46.3
cashew	1	7.2	0	98.6	100	0	49.3
other fruits and vegetables	6.6	2.1	0.4	6.9	65.9	2	26.3
other crops	0.8	0.3	0	9.5	58.6	0.3	21.8
livestock	3.3	0.5	0.1	2.4	83.7	1.1	12.8
fishing and hunting	7.7	5.4	0	13.3	77.5	0.1	26.2
mining	1.5	1.5	0.7	12.7	100	9	4.5
meats	2.3	0	0.2	0.2	75.1	1.5	25.6
processed grains	0.7	0.5	0.8	1	100	2.3	24.9
other processed foods	2	0.5	3.7	1.3	97.3	14.8	26.8
beverages	0.9	0.1	0.8	0.5	95.9	8.2	24.1
other secondary	6.2	3.3	62.7	1.6	100	52.9	2.6
utilities	1.7	0	0	0	100	0	0.0
construction	4.5	0	0.1	0	100	0.3	0.0
trade	10.5	0	0	0	100	0	0.0
hotels	2.6	0	0	0	100	0	0.0
transportation	5.8	44.3	19.5	53.7	100	36.4	0.0
other services	9	10.9	4.7	7.4	74.9	4.9	0.0
administration	6.2	5.5	0.9	4.4	100	1.1	0.0

Source: author's calculations

Table 3. World price changes

	percentage real price increase 2001-07	
	exports	imports
maize	*47.8*	*22.9*
other cereals	*49.6*	*49.6*
beans	*13.9*	*-13.9*
other cash crops	*26.3*	*6.5*
cassava and roots	*13.9*	*-13.9*
coffee	*63.6*	*1.4*
cashew	*33.8*	*1.4*
other fruits and vegetables	*58.0*	*13.0*
other crops	*27.3*	*27.3*
livestock	*17.9*	*32.7*
fishing and hunting	*43.3*	*63.8*
mining	*70.6*	*33.1*
meats	*-6.1*	*5.5*
processed grains	*11.7*	*20.3*
other processed foods	*27.3*	*27.3*
beverages	-	*13.4*
other secondary	*48.2*	*48.2*
construction	-	*48.2*
transportation	*1.2*	*9.7*
other services	*32.6*	*37.2*

Source: adapted from COMTRADE and Fao and OECD (2007)

Table 4. The scenarios simulated

basic scenarios

BASE	calibration
BASETD	updated base with 20 percent decrease in marketing margins
BASEPR	updated base run with increased world prices
BASEPRTD	updated base with 20 percent decrease in marketing margins and increased world prices

policy scenarios

ATARCUT	20 percent cut in import tariffs, on BASEPR	BTARCUT	20 percent cut in import tariffs, on BASEPRTD
ATARSELECT	20 percent decrease in import tariffs of basic foods, on BASEPR	BTARSELECT	20 percent decrease in import tariffs of basic foods, on BASEPRTD
AEXPT	20 percent export tax on all exports, on BASEPR	BEXPT	20 percent export tax on all exports, on BASEPRTD
AEXPTSELECT	20 percent export tax of major agricultural export items, on BASEPR	BEXPTSELECT	20 percent export tax of major agricultural export items, on BASEPRTD
ADOMTAX	20 percent decrease in sales taxes on basic foods, on BASEPR	BDOMTAX	20 percent decrease in sales taxes on basic foods, on BASEPRTD
AFSAVBL	foreign savings increased to compensate 50 percent of the increase in the total net import bill, on BASEPR	BFSAVBL	foreign savings increased to compensate 50 percent of the increase in the total net import bill, on BASEPRTD
AFSAVHBL	foreign savings increased to compensate 25 percent of the increase in the total net import bill, on BASEPR	BFSAVHBL	foreign savings increased to compensate 25 percent of the increase in the total net import bill, on BASEPRTD

Table 5. Origin of the external price shock
(percent of 2001 GDP)

	exports	imports
Agriculture, Fishery & Forestry	2.28	0.38
Food	0.03	0.33
Others	1.42	8.87
Total (sum of the above)	3.73	9.58

Source: author's calculations

Table 6. Aggregated results under the basic scenarios
(million Tz shillings in BASE and percentage changes from BASE in other scenarios)

	BASE	BASETD	BASEPR	BASEPRTD	BASEPRTD on BASETD
GPD	7804.2	*3.9*	*-1.3*	*2.9*	*-1.0*
agricultural import	24.8	*16.1*	*-3.4*	*11.5*	*-4.0*
total imports	209.3	*11.4*	*-7.0*	*3.9*	*-6.7*
agricultural export	22.6	*54.9*	*35.7*	*88.2*	*21.5*
total exports	107.8	*9.1*	*6.0*	*14.3*	*4.7*
investment	1.000	*0.7*	*-11.2*	*-11.8*	*-11.3*
government savings	92.5	*-24.0*	*30.0*	*1.8*	*33.9*
unskilled labour	2.5	*14.4*	*-3.0*	*12.6*	*-1.8*
nominal exchange rate	1.000	*4.7*	*-21.1*	*-17.4*	*-21.0*
real exchange rate (trd/nontrd)	1.000	*-8.1*	*2.1*	*-7.4*	*0.7*

Source: author's calculations

Table 7. Changes in production and trade under the basic scenarios
(million Tz Shillings in the BASE and percentage changes under scenarios)

	BASE	BASETD	BASEPR	BASEPRTD	BASEPRTD on BASETD
			Production		
Agriculture, Fishery & Forestry	3.897	*8.5*	*-0.6*	*-8.4*	*-0.1*
Food	1.423	*7.5*	*-4.7*	*-11.5*	*-4.6*
Others	8.845	*1.3*	*-1.6*	*-2.9*	*-1.3*
			Export		
Agriculture, Fishery & Forestry	217.9	*53.1*	*37.9*	*88.8*	*23.3*
Food	7.8	*104.9*	*-26.2*	*71.4*	*-16.4*
Others	852.3	*-3.0*	*-1.9*	*-5.3*	*-2.4*
			Import		
Agriculture, Fishery & Forestry	147	*27.2*	*-1.8*	*24.0*	*-2.5*
Food	101	*0.1*	*-5.8*	*-6.6*	*-6.6*
Others	1846	*10.7*	*-7.5*	*2.9*	*-7.1*

Source: author's calculations

Table 8. Domestic output changes in basic scenarios
(percentage change from BASE)

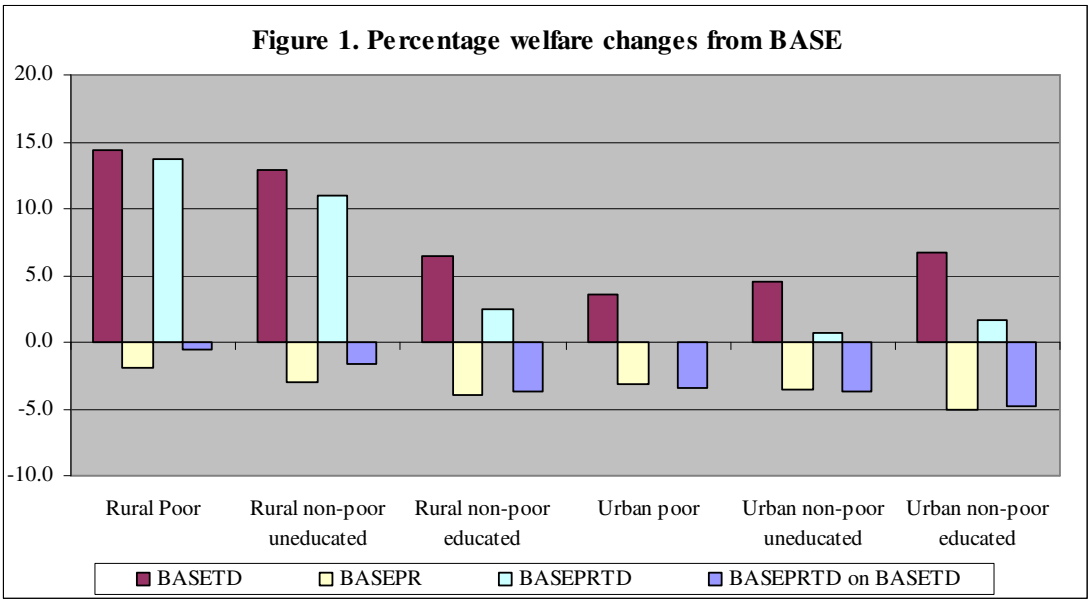
	BASETD	BASEPR	BASEPRTD	BASEPRTD on BASETD
maize	*3.8*	*-1.9*	*-5.5*	*-1.8*
other cereals	*5.4*	*0.1*	*-5.3*	*1.2*
beans	*5.2*	*-2.7*	*-7.5*	*-2.1*
other cash crops	*13.3*	*-7.2*	*-18.1*	*-6.2*
cassava and roots	*4.4*	*-2.2*	*-6.3*	*-1.8*
coffee	*60.2*	*110.6*	*31.8*	*56.6*
cashew	*37.1*	*15.7*	*-15.4*	*10.6*
other fruits and vegetables	*7.4*	*-1.7*	*-8.4*	*-0.4*
other crops	*12.5*	*-5.2*	*-15.7*	*-3.0*
livestock	*9.6*	*-2.6*	*-11.2*	*-1.9*
fishing and hunting	*10.5*	*-1.6*	*-10.8*	*0.0*
mining	*0.0*	*0.2*	*0.3*	*0.2*
meats	*4.8*	*-3.6*	*-8.1*	*-3.9*
processed grains	*8.0*	*-4.4*	*-11.5*	*-4.3*
other processed foods	*8.6*	*-4.7*	*-12.7*	*-4.4*
beverages	*8.2*	*-8.3*	*-15.2*	*-7.6*
other secondary	*0.8*	*5.9*	*5.1*	*5.4*
utilities	*5.8*	*-0.2*	*-5.6*	*0.3*
construction	*1.7*	*-8.0*	*-9.6*	*-7.9*
trade	*-5.6*	*1.0*	*7.0*	*0.3*
hotels	*18.3*	*-15.9*	*-28.7*	*-6.7*
transportation	*-2.7*	*-6.1*	*-3.4*	*-6.4*
other services	*4.1*	*-1.8*	*-5.7*	*-1.3*
administration	*0.5*	*-0.2*	*-0.8*	*-0.2*

Source: author's calculations

Table 9. Average domestic real price changes in basic scenarios
(percentage change from BASE)

	BASETD	BASEPR	BASEPRTD	BASEPRTD on BASETD
maize	*3.6*	*-4.2*	*3.9*	*-0.5*
other cereals	*10.7*	*-9.9*	*12.0*	*0.8*
beans	*11.1*	*-11.8*	*12.1*	*-1.1*
other cash crops	*14.8*	*-16.5*	*16.5*	*-3.4*
cassava and roots	*4.0*	*-4.5*	*4.3*	*-0.4*
coffee	*46.2*	*7.3*	*36.6*	*42.7*
cashew	*46.5*	*-24.9*	*49.9*	*9.1*
other fruits and vegetables	*10.9*	*-11.3*	*12.2*	*-0.5*
other crops	*10.5*	*-11.0*	*11.8*	*-0.6*
livestock	*15.2*	*-15.3*	*16.5*	*-1.4*
fishing and hunting	*12.8*	*-12.8*	*14.1*	*-0.4*
mining	*13.3*	*5.0*	*7.7*	*17.0*
meats	*3.1*	*-3.5*	*3.2*	*-0.4*
processed grains	*5.5*	*-5.2*	*6.3*	*0.7*
other processed foods	*7.6*	*-12.1*	*7.6*	*-5.6*
beverages	*7.0*	*-12.3*	*6.7*	*-6.2*
other secondary	*12.5*	*-4.2*	*12.3*	*8.1*
utilities	*23.8*	*-21.6*	*24.4*	*-1.4*
construction	*11.4*	*-9.5*	*10.2*	*1.2*
trade	*-21.5*	*29.3*	*-24.3*	*-1.8*
hotels	*28.7*	*-34.3*	*37.3*	*-8.4*
transportation	*6.2*	*-24.8*	*8.0*	*-19.8*
other services	*7.0*	*-7.5*	*7.0*	*-0.5*
administration	*16.8*	*-18.1*	*17.5*	*-2.9*

Source: author's calculations



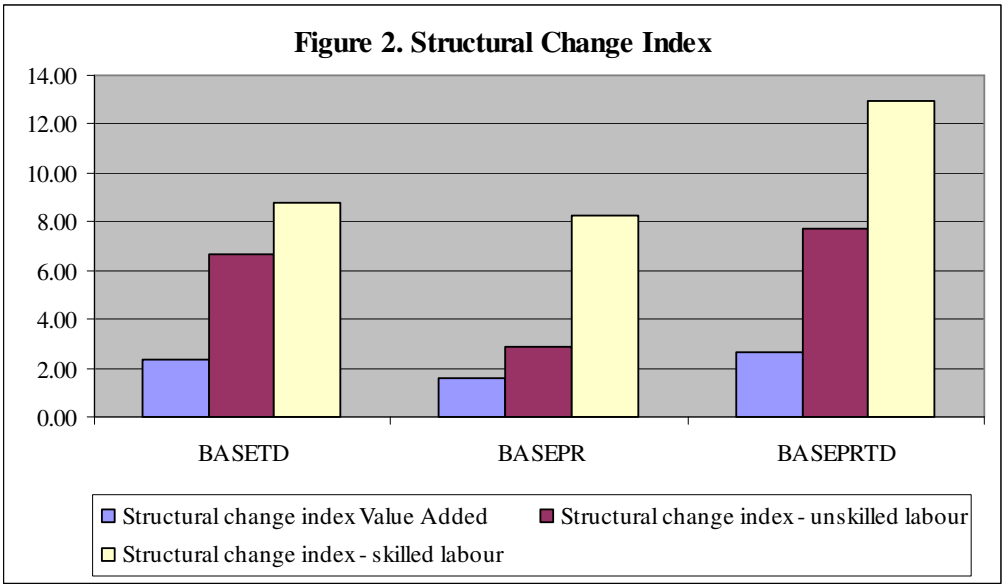


Table 10. Aggregated results under the policy scenarios, with standard marketing margins

	ATARCUT	ATARSELECT	AEXPT	AEXPTSELECT	ADOMTAX	AFSAVBL	AFSAVHBL
			(percentage changes from BASEPR)				
GPD	*0.07*	*-0.01*	*-2.11*	*-0.23*	*0.14*	*0.03*	*0.01*
agricultural import	*3.1*	*1.0*	*-29.6*	*-13.9*	*0.2*	*4.9*	*2.4*
total imports	*0.2*	*0.1*	*-0.5*	*0.1*	*0.0*	*4.9*	*2.5*
agricultural export	*-0.1*	*0.3*	*6.4*	*-2.2*	*-0.2*	*-7.9*	*-3.9*
total exports	*0.2*	*0.1*	*-1.5*	*1.7*	*0.0*	*-4.0*	*-2.0*
investment	*-1.18*	*-0.23*	*18.00*	*4.48*	*-1.55*	*14.29*	*7.26*
government savings	*-17.5*	*-1.8*	*285.6*	*86.2*	*-16.5*	*0.1*	*0.2*
unskilled labour	*0.18*	*-0.02*	*-4.74*	*-0.90*	*0.40*	*-0.10*	*-0.07*
nominal exchange rate	*0.4*	*0.2*	*18.1*	*9.3*	*0.3*	*-2.9*	*-1.5*
real exchange rate (trd/nontrd)	*0.1*	*0.0*	*-3.1*	*-2.2*	*-0.1*	*-1.6*	*-0.8*

	BTARCUT	BTARSELECT	BEXPT	BEXPTSELECT	BDOMTAX	BFSAVBL	BFSAVHBL
			(percentage changes from BASEPRTD)				
GPD	*0.08*	*-0.01*	*-2.16*	*-0.41*	*0.12*	*-0.06*	*-0.03*
agricultural import	*3.4*	*1.1*	*-31.2*	*-14.0*	*0.3*	*4.6*	*2.2*
total imports	*0.3*	*0.1*	*-2.0*	*-0.7*	*0.0*	*4.6*	*2.3*
agricultural export	*0.2*	*0.2*	*1.3*	*-2.9*	*-0.1*	*-5.6*	*-2.8*
total exports	*0.3*	*0.1*	*-2.7*	*0.8*	*0.0*	*-3.5*	*-1.7*
investment	*-1.3*	*-0.2*	*20.0*	*6.4*	*-1.4*	*14.0*	*7.1*
government savings	*-26.1*	*-2.6*	*421.3*	*146.6*	*-20.4*	*0.7*	*0.5*
unskilled labour	*0.2*	*0.0*	*-5.7*	*-1.6*	*0.4*	*-0.4*	*-0.2*
nominal exchange rate	*0.5*	*0.2*	*16.6*	*8.2*	*0.3*	*-2.8*	*0.0*
real exchange rate (trd/nontrd)	*0.1*	*0.0*	*-3.9*	*-2.1*	*0.0*	*-1.4*	*-0.7*

Source: author's calculations

Table 11. Welfare results under different policy scenarios

	Rural Poor	Rural non-poor uneducated	Rural non-poor educated	Urban poor	Urban non-poor uneducated	Urban non-poor educated
			percentage changes from BASEPR			
ATARCUT	*0.2*	*0.2*	*0.3*	*0.4*	*0.3*	*0.3*
ATARSELECT	*0.0*	*0.0*	*0.1*	*0.1*	*0.1*	*0.1*
AEXPT	*-5.2*	*-4.9*	*-4.9*	*-6.0*	*-4.0*	*-4.0*
AEXPTSELECT	*-2.2*	*-2.0*	*-1.0*	*-1.2*	*-0.6*	*-0.4*
ADOMTAX	*0.3*	*0.3*	*0.4*	*0.5*	*0.5*	*0.4*
AFSAVBL	*-0.5*	*-0.5*	*0.6*	*0.9*	*0.4*	*1.0*
AFSAVHBL	*-0.3*	*-0.3*	*0.3*	*0.5*	*0.2*	*0.5*
			percentage changes from BASEPRTD			
BTARCUT	*0.2*	*0.2*	*0.3*	*0.4*	*0.3*	*0.3*
BTARSELECT	*0.0*	*0.0*	*0.1*	*0.1*	*0.1*	*0.1*
BEXPT	*-6.0*	*-5.8*	*-5.4*	*-6.5*	*-4.6*	*-4.6*
BEXPTSELECT	*-3.0*	*-2.8*	*-1.4*	*-1.3*	*-0.9*	*-0.7*
BDOMTAX	*0.3*	*0.3*	*0.4*	*0.5*	*0.4*	*0.4*
BFSAVBL	*-0.8*	*-0.8*	*0.6*	*1.1*	*0.5*	*1.0*
BFSAVHBL	*-0.4*	*-0.4*	*0.3*	*0.6*	*0.2*	*0.5*

Source: author's calculations

Table 12. Aggregated results for BASEPR under different parameters

(000 Tz shillings in BASE and percentage changes from BASE in other scenarios

	BASE	BASEPR						
		standard parameters	higher CET elasticity, all products	higher CET elasticity, agricultural and food products only	higher CES elasticity, all products	higher CES elasticity, agricultural and food products only	higher supply elasticity in all activities	higher supply elasticity in agriculture and food production only
GPD	7804.2	*-1.3*	*-1.2*	*-1.3*	*-1.3*	*-1.3*	*-1.4*	*-1.8*
agricultural import	24.8	*-3.4*	*-1.4*	*-1.8*	*0.5*	*-2.0*	*16.0*	*18.7*
total imports	209.3	*-7.0*	*-6.7*	*-6.9*	*-7.4*	*-6.8*	*-5.0*	*-5.6*
agricultural export	22.6	*35.7*	*35.8*	*36.3*	*33.9*	*35.6*	*45.7*	*39.2*
total exports	107.8	*6.0*	*6.3*	*5.8*	*5.0*	*5.9*	*2.1*	*3.6*
investment	1.0	*-11.2*	*-11.1*	*-11.0*	*-11.7*	*-11.3*	*-10.5*	*-10.0*
government savings	92.5	*30.0*	*28.6*	*28.8*	*26.8*	*29.6*	*-0.9*	*10.6*
unskilled labour	2.5	*-3.0*	*-2.8*	*-2.8*	*-2.9*	*-3.0*	*-2.7*	*-3.8*
nominal exchange rate	1.000	*-21.1*	*-22.1*	*-21.9*	*-21.6*	*-21.0*	*-28.7*	*-28.4*
real exchange rate (trd/nontrd)	1.000	*2.1*	*2.2*	*2.4*	*1.4*	*2.0*	*0.7*	*3.3*
SCI value added	0.00	*10.7*	*1.7*	*1.7*	*1.8*	*1.7*	*2.5*	*2.3*
SCI unskillled labour	0.00	*-9.9*	*3.1*	*3.2*	*3.2*	*3.3*	*5.3*	*5.2*
SCI skillled labour	0.00	*12.0*	*8.3*	*8.4*	*8.7*	*8.5*	*12.1*	*10.7*

Source: author's calculations

Table 13. Aggregated results for BASEPRTD under different parameters

(000 Tz shillings in BASE and percentage changes from BASE in other scenarios

	BASETD	BASEPRTD						
		standard parameters	higher CET elasticity, all products	higher CET elasticity, agricultural and food products only	higher CES elasticity, all products	higher CES elasticity, agricultural and food products only	higher supply elasticity in all activities	higher supply elasticity in agriculture and food production only
GPD	8109.0	*-1.0*	*-0.8*	*-0.8*	*-1.0*	*-0.9*	*-1.3*	*-1.5*
agricultural import	28.8	*-4.0*	*-1.0*	*-1.3*	*-2.0*	*-4.3*	*27.3*	*25.4*
total imports	233.2	*-6.7*	*-6.2*	*-6.4*	*-7.2*	*-6.7*	*-2.2*	*-2.8*
agricultural export	35.0	*21.5*	*21.7*	*21.9*	*19.7*	*20.9*	*28.9*	*25.0*
total exports	117.6	*4.7*	*5.0*	*4.6*	*3.7*	*4.5*	*2.1*	*2.5*
investment	1.0	*-11.3*	*-11.0*	*-10.9*	*-11.8*	*-11.3*	*-9.2*	*-9.0*
government savings	70.3	*33.9*	*30.6*	*30.9*	*25.1*	*28.6*	*-4.4*	*2.0*
unskilled labour	2.8	*-1.8*	*-1.6*	*-1.6*	*-1.7*	*-1.6*	*-1.6*	*-2.5*
nominal exchange rate	1.000	*-21.0*	*-22.3*	*-22.2*	*-21.7*	*-21.1*	*-31.0*	*-30.8*
real exchange rate (trd/nontrd)	1.000	*0.7*	*1.0*	*1.1*	*0.1*	*0.5*	*0.4*	*2.1*
SCI value added	0.00	*11.1*	*2.7*	*2.7*	*2.7*	*2.6*	*3.4*	*3.4*
SCI unskillled labour	0.00	*-11.8*	*7.9*	*7.9*	*7.6*	*7.7*	*10.6*	*11.1*
SCI skillled labour	0.00	*12.1*	*12.3*	*12.2*	*13.0*	*13.0*	*14.8*	*14.5*

Source: author's calculations