# System-wide Impacts of Agricultural Export Taxes: A Simulation Experiment with Ethiopian Data

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The Macaulay Land Use Research Institute

2004

ISSN 1743-9965

# System-wide Impacts of Agricultural Export Taxes: A Simulation Experiment with Ethiopian Data

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The Macaulay Institute, Aberdeen. http://www.macaulay.ac.uk/serp

Aberdeen Discussion Paper Series: People, Environment and Development.

Editor: Ayele Gelan

Series Coordinator: Clive Spash

2004

ISSN 1743-9965

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## ABSTRACT

*This paper examines rural-urban spillover effects of agricultural price policy in a developing economy. It employs a computable general equilibrium methodology based on a bi-regional social accounting matrix for Ethiopia. The simulation experiment quantifies system-wide impacts of exports tax on agricultural products. Protecting consumers (particularly urban households), transferring income from producers to consumers, and shifting resources from the agriculture to industry are among the most important motivations cited in the literature for exports tax on agricultural products in developing economies. However, taking inter-regional spill-over effects into account, this study shows that the removal of agricultural export tax does actually improve household welfare both in the rural and urban regions. Also, the elimination of export tax enhances structural transformation of the economy.*

*Key words: export tax; rural-urban migration; household welfare; Ethiopia.*

# INTRODUCTION

This paper is motivated by a recent report that has evaluated Ethiopia's export sector performance during the 1990s and proposed a strategy to enhance economic development and reduce poverty through export promotion (World Bank 2002). A key finding of the report was that, although Ethiopia has implemented an economic reform programme for over a decade, its participation in the global economy has barely changed from the level attained during early 1980s. Real export per capita was 14.4 and 14.6 dollars in 1981 and 1999 respectively. Although the trade to GDP ratio has increased from 22 percent in late 1980s to 47 percent in late 1990s, this was mainly driven by increases in imports (from 12.5 percent to 25.3 percent of GDP). Even then the trade GDP ratio remains significantly lower than the corresponding average for Sub-Saharan Africa, which stands at 61 percent during the period (ibid, p. 10).

The World Bank report suggests a number of strategies for rapid export growth. These are classified into three broad categories. First, there is a need to pay attention to supply side constraints that impede the further development of agricultural exports. Second, immediate measures are required to take advantage of the new market access opportunities, induce new export activities, and create new comparative advantages. Third, policy improvements are required to stimulate the business environment and accelerate Ethiopia's integration into the world economy. This study concentrates on the third point and provides an in-depth analytical investigation into quantifiable policy related issues that explain Ethiopia's export trade performance. It focuses on system-wide impacts of export taxes on agricultural products.

Ethiopia's economic reform programme was begun with a firm commitment by the government to give priority to the agricultural sector with "Agricultural Development Led Industrialisation" as an underpinning long-term economic development strategy (IMF, 2000). In spite of this pledge the government has insisted on levying taxes on agricultural exports. For instance, if all trade margins are taken into account (including export taxes), Ethiopian coffee farmers receive only 60 percent of the

f.o.b. price. This compares unfavourably with Kenya where the marketing system returns

more than 70 percent to farmers while the corresponding figure for Uganda is about 80 percent (World Bank 2002, p. 16).

Ethiopia's experience in implementing trade liberalisation with negligible achievements in export performance provides an interesting case for broader conceptualisation of economic reform programmes in developing economies. Whilst the positive association between openness and growth are widely acknowledged (Sachs and Warner 1995, Dollar 1992, Edwards 1998, World Bank 2001), it is vital to recognise that the potential benefit of openness can be realised only when complementary domestic policies and institutions are in place (Rodrick 1999). World Bank (2002, p. 5) explains that many African countries continue to experience economic stagnation despite trade liberalisation because of absence of good complementary domestic policies and institutions.

Export tax on agricultural products has been an important source of government revenue in Ethiopia, although its share in total tax revenue has declined over recent years. During 1996/97 fiscal year, five years after Ethiopia began implementing an economic reform programme, the total amount of agricultural export tax collected amounted to 138 million birr (IMF, 2002). As a proportion of total tax revenue or the country's GDP, this amount looks relatively small (constituting only about 2.8 percent and 0.3 percent respectively). The significance of the burden caused by the policy of taxing agricultural exports becomes apparent when we consider the disincentive it creates to the production of exportable agricultural products. For instance, the producer price of agricultural exports would have been higher by about 6 percent in 1996/97 if it were not for the export tax. The key point here is that, given the already unfavourable marketing system in the country noted earlier, agricultural export tax simply makes the situation worse by widening the gap between producer prices and world prices.

Thus, the main underlying reason for the continued export taxation is the government's attempt to maximise its revenue particularly when import tax is

substantially reduced because of the structural adjustment programme. Since exports tax on agricultural products provides government revenue on a stable basis, and then this is cited as one of the main arguments in favour of this form of taxation (Hoff 1993, Skinner 1993). In addition to the revenue maximisation objective, there are at least four arguments in favour of export taxes (Khan 2001, p. 319). First, export taxes can act as substitutes for income and land taxes since the latter are far more difficult, both politically and administratively, to assess and collect. Second, government may use export taxes to stabilise producer and consumer prices. Third, export taxes can be used to limit export to take advantage of imperfections in the world market. Fourth, it is possible to diversify agricultural production by varying the tax rates between different export products. However, export taxes have at least two disadvantages. First, they reduce output of exportable and income of exporters. Second, they are likely to distort resource allocation between sectors or within sectors between different activities (Goode 1984, Due 1988, Schiff and Valdes 1992, FAO 1993).

Khan (2001) observes that the tax burden can be shifted to producers or consumers depending on conditions in domestic and foreign market. In the case of Ethiopia, World Bank (2002, p. 48) states that businesses do not have equal opportunity with a few firms dominating the export market because of numerous barriers to entry for new participants. Given the market imperfection whereby Ethiopian exporters enjoy a monopoly position, it is expected that most of the tax burden is passed onto farmers who are adversely affected by a fall in their income because of lower farm gate prices and hence the disincentive created in production.

This study employs a computable general equilibrium modelling approach and uses a Social Accounting Matrix for Ethiopian (1996). A two-region (rural-urban) model is developed and implemented through numerical simulations. We concentrate on system-wide impacts of eliminating export taxes on agricultural products. We use a multi-period simulation approach in order to trace impacts of the policy shocks over the short-run and long-run time intervals. The uniqueness of this simulation experiment is that it addresses different concerns in a single modelling framework, paying particular attention to linkages between agricultural and non-agricultural sectors as well as Ethiopia's long-run economic development objective achieving

structural transformation. The simulation experiment focuses on two major areas of policy concerns. The first one is the short-run impact of removing export tax on household relative welfare in rural and urban regions. The second one is related to long-run development objective of whether export tax on agricultural products enhances or retards structural transformation of the Ethiopian economy.

The reminder of this paper is structured as follows. Section 2 provides a theoretical analysis of effects of export tax removal. Section 3 provides a salient view of the CGE model. Section 4 discusses a social accounting matrix for Ethiopia. Section 5 presents details of simulation results with discussion of policy implications. We end with a short summary and concluding remarks in section 6.

## THEORETICAL ANALYSIS

### Partial Equilibrium Analysis

From exporters' point of view, export tax plays a role similar to cost of transportation (Krugman and Obstfeld, p. 197). The immediate impact of eliminating an export tax is to reduce the cost of shipping a product to external markets. If the government removes a tax of one birr (Ethiopian currency) per bushel of coffee, then this creates an incentive for exporters to increase the amount of coffee exports. The volume of coffee exports would increase until the level of prices in the domestic and the world markets are equal.

Figure 1 illustrates the specific effects of abolishing a Tx birr tax per unit of coffee exports. With the coffee exports tax, the domestic price of coffee is equal to Pd, which is less than Pw by the amount of tax per unit, Tx. If the exports tax is abolished (Tx = 0), the wedge between domestic and world price disappears (Pd = Pw). This has an expansionary effect on domestic production with the quantity of coffee supply rising from $Q_s^*$ to $Q_s$. On the other hand, the increase in domestic price (from Pd to Pw) causes domestic consumption to fall from $Q_d^*$ to $Q_d$. Consequently, the quantity of export supplied rises from $Q_s^* - Q_d^*$ to $Q_s - Q_d$.

It is useful to examine the effect of these changes on the welfare of producers and consumers as well as changes in the government revenue. First, we consider the gain to producers who receive a higher price and hence higher producer surplus. Note that producer surplus is given by the area above the supply curve but below the price line. When the tax is in place, producer surplus was the area above S but below Pd. With the elimination of export tax, this area increases by the sum of the shaded areas: a, b, c, d, and e. This indicates that producers gain from the elimination of an exports tax. On the other hand, consumers face a higher price that makes them worse-off. Consumer surplus lies below the demand curve but above the price line. With a rise in the domestic price from Pd to Pw, the area of consumer surplus falls by the sum of shaded areas of a and b. The government revenue falls by the amount of the shaded area denoted by d. This is given by the tax rate times the quantity exported before tax reduction, i.e., Tx($Q_s^* - Q_d^*$).

Since the policy shock generates gains and losses to different groups, it is essential to examine whether the overall welfare effect to the nation is positive or negative. The net effect is given as gains to producers (a, b, c, d, and e) less losses to consumers and the government (a, b, and d). Areas a, b, and d represent redistribution effect of the policy change with producers gaining; consumers and the government losing. The overall net gain to the nation is given by the sum of triangles c and e. These represent efficiency gains from removing distortions caused by a tax on production and consumption. It is useful to provide further interpretations of these efficiency gains. Triangle e represents efficiency gain resulting from removing distortions to production that an exports tax causes by inducing producers to produce too little of an exportable good. Triangle c, on the other hand, shows efficiency gain resulting from removing distortions to consumption that an export tax causes by inducing consumers to consume too much of an exportable product.

**General Equilibrium Analysis**

Whilst the partial equilibrium analysis clearly shows overall effect of eliminating exports tax on a particular sector, it does not explain feedback effects of changes in one sector on other sectors of the economy. In a developing economy including

Ethiopia, most exports come from agriculture. This suggests that rural producers would unambiguously gain from exports tax reduction. On the other hand, the analytical framework developed in the previous section indicates that the welfare of urban consumers may be adversely affected. However, this may not be the case if we take into account general equilibrium relationships between urban and rural sectors in product markets (intermediate and final demand) and labour market (effects on migration and regional wage rates). Gelan (2002, pp. 713-717) develops an analytical framework and provides detailed theoretical discussion of the effects of trade liberalisation on urban-rural interactions in a developing economy. We heavily rely on this work but concentrate on explaining system-wide effects of only one policy instrument of trade liberalisation, namely exports tax reduction.

We consider a developing economy with two regions, rural and urban, with each region producing a composite good QU and QR respectively. Moreover, we assume that urban output is competitive to imports and the rural output is exportable. The rural wage rate is flexible and ensures equilibrium between labour demand and labour supply in the region. However, the urban region is characterised by real wage rigidity and this causes an interregional wage differential and urban unemployment. The regional labour markets are linked through rural-urban migration that takes place until the expected urban wage is equal to the actual rural wage rate (Harris and Todaro, 1970). This relationship is determined by the Harris-Todaro migration function:

$$W^R = W^* \frac{L^U}{L^U + U} \quad (1)$$

Where WR is the rural real wage; W* is the fixed urban real wage; LU is the number of employed labour force in the urban region; and U is the equilibrium level of urban unemployment.

Figure 2 displays the relationship between labour demand and wage rates in the two regions. The total labour force is measured on the horizontal axis with OR and OU denoting the origins of the rural labour force and urban labour force respectively. The corresponding labour demand curves in the two regions are $L_0^R$ and $L_0^U$. It is worth noting two important features of these curves. First, each labour demand

curve slopes downwards indicating the conventional inverse relationship between labour demand and real product wage rate. Second, we follow the stylised fact in the HT tradition (e.g Harris-Todaro, 1970, p.130) that the urban labour demand is more inelastic than the rural labour demand. Hence, LDU is steeper than LDR. If the labour markets in the two regions were competitive, the intersection of the two labour demand curves at A would determine equilibrium employment levels in both regions with no unemployed labour force.

However, the existence of fixed real wage in the urban region gives rise to divergence from the competitive regional employment levels. At the exogenously given urban real wage, W*, the level of urban employment is $L_0^U$. The remaining labour force of the nation, $O^R L_0^U$, is allocated to the rural region and urban unemployment by making use of the rectangular hyperbola, curve $q^*$. The latter represents the Harris-Todaro locus along which the migration conditions (given by equation 1) are satisfied. The intersection of $q$ with the rural labour demand curve at point B determines equilibrium levels of rural employment, $L_0^R$, rural wage rate, $W_0^R$, and equilibrium urban unemployment, U, which is given by the distance between $L_0^R L_0^U$.

The HT framework discussed above can be used to analyse adjustments in regional labour markets in response to export tax elimination. Equation (2) brings together the links between the level of prices in the domestic and the world markets:

$$P_d^r = P_w^r(1-t)ER \quad (2)$$

Where superscripts $P_d^r$ and $P_w^r$ denote domestic and world prices, respectively, of the agricultural output; ER and t are the nominal exchange rate and tax rates respectively.

Let's assume exports tax reform is not accompanied by nominal devaluation of the domestic currency, i.e., ER remains unchanged. With a given $P_w^r$, if export tax is eliminated ($t \Rightarrow 0$), then $P_d^r$ has to adjust upward to retain equilibrium between the

two sides of equation (2). In other words, the removal of export taxes increases the domestic sales price of rural goods. This creates incentives for producers and hence labour demand is expected to increase. Thus $LD_0^R$ shifts to $LD_1^R$ which intersect with the migration locus at C causing the number of urban unemployed to decline. This suggests that some proportion of the urban unemployed would be relocated to rural areas because of a rise in employment opportunities in the region. Since the reduction of agricultural exports tax does not directly affect urban output, the urban labour demand curve, $LD_0^U$, is not expected to shift. The net outcome is a fall in urban unemployment by $L_1^R - L_0^R$, which also represents the amount by which rural employment increases.

The immediate effect of the policy shock on the direction of migration provides an interesting theoretical insight. With a given rural labour supply, a rise in demand for labour causes rural wage to rise from $W_0^R$ to $W_1^R$. Whether there would be a sustainable reversal of the direction of migration would depend on the strengths of the interregional spill-over effects of the policy shock. The rise in export demand is expected to generate additional income in the rural region as well as additional intermediate demand by rural producers. Thus, a rise in the final and intermediate demand for urban goods in the rural region may positively influence urban production. However, in this study, we maintain the assumption of fixed urban real wage because we are interested in examining the effect of removing rural taxation even when the government does not allow this to affect the welfare urban households. In this context, urban production may be adversely affected because urban nominal wage has to increase by equal proportion with the change in the consumer price index in the region. Additionally, the rise in the price of agricultural goods is likely to cause an increase in cost of production in the urban region. The net effect of eliminating agricultural export tax on urban production depends on the balance between the positive and negative spill-over effects. If the positive effects dominate, then labour demand in the urban region may increase causing $L_0^U$ to shift upwards and then limiting the possibility of migration reversal.

The above discussion applies to the short-run with fixed real wages in the urban region. However, it proves useful to consider the long-run effects. The key to explaining differences between the short-run and long-run effects of exports tax elimination lies in the possibility of factor substitution with variations in the sizes of capital stock in the long-run (Edwards, 1988; Hazari and Sgro, 1991; Gelan, 2002). In the short-run, trade liberalisation causes capital rental rates differential to increase across sectors and regions. Through time, producers would adjust the amount of capital stocks to the desired level. As the actual capital in each sector approaches the desired levels, then the differential across sectors and regions tends to narrow. However, this depends on a number of conditions such as factor substitution possibilities, labour demand elasticities (the slopes of $L^R$ and $L^U$), and the sizes of migration elasticity parameters (i.e., the slope of the HT locus, q). The elasticity of labour mobility plays an important role in capturing the effects of different causes of labour immobility between regions. Parai and Beladi (1998, p.180) note that despite significant inter-sectoral wage differentials, enough labour do not move from the low wage to the high wage sector to equate the wage rates in the two sectors even in the long-run. "Locational preferences, attachment to existing arrangements, and also the high cost of relocation are usually cited as the possible reasons behind the sluggish movement of labour from one sector to the other."(Ibid). Further discussion of issues related to migration elasticity is made in the following section. Here it suffices to say that these rigidities are taken into account by using sufficiently smaller than unitary migration elasticity parameter. Each of these conditions will be discussed in detail together with the specification of the applied CGE model.

## DESCRIPTION OF THE MODEL

The CGE model for Ethiopia follows a small-open-economy assumption. Gelan (2002, pp. 717-722) provides detailed description of the model with analysis of numerical simulation results for a range of trade policy instruments. Here we provide a salient view of the model concentrating on its relatively novel features.

**Overview**

The model is capable of calculating interactions between the two domestic regions, urban and rural, as well as those between the national economy and the rest of the world. It is calibrated on a bi-regional Social Accounting Matrix (SAM) for Ethiopia, 1996. The model is developed with a view that the economic structures of rural and urban regions are significantly different from each other but the two regions are linked in many ways. In development economics, the relationship between the two regions is described as a dualistic pattern of development. We incorporate economically meaningful dualistic features into the conventional economic analysis through appropriate specification of the structural equations denoting regional markets.

The model comprises two industries producing two types of goods in each region. The urban region produces two goods: an urban traded good (a composite of manufactured goods) and an urban non-traded good (a composite of urban services). Similarly, the rural region produces two goods: a rural traded good (a composite of agricultural products) and a rural non-traded good (a composite of rural services). The non-tradable in each region are mainly services that cater for local demand. The non-traded good in the rural region is a composite of all non-agricultural outputs produced and consumed mainly in the rural region. Similarly, the non-traded good in the urban region includes all non-manufacturing products produced and consumed mainly in the urban region except for the Ethiopian Airlines that contributes significantly to Ethiopia's foreign exchange earnings. Being location specific by their nature, non-traded activities play a crucial role in the development of the urban and rural regions, in terms of attracting both people and investment.

We recognise regional differences by incorporating region-specific parameters in the production function. This is based on the widely held view in development economics that production technology in the urban region tends to be both capital-intensive and less flexible than in the rural region (Eckuas, 1956; Neary, 1981). Applied CGE models capture the notion of technological dualism by restricting the sizes of capital-labour substitution elasticity parameters to less than unity in urban sectors and to greater than unity in rural sectors (Kelley et al, 1972, 1984). We

adopt these assumptions and implement the model with 0.3 and 2.5 capital-labour substitution parameters in the urban and rural region respectively.

The Armington (1969) specification is employed in modelling demand for goods and services. This indicates that commodities of the same type, but with different geographical origins, are not perfect substitutes. The reasons for the use of the Armington assumption are many-fold. Firstly, any given change in trade policy does not produce a large direct effect on the structure of the economy if imports are assumed to be perfectly complementary to national output because intermediate and final users become price insensitive. On the contrary, a small change in trade policy may generate a large effect with the perfect substitution assumption. The Armington assumption restricts these extreme demand responses to changes in trade policy. Secondly, in model calibration procedures, the demand function for imported goods can be identified separately from the demand for domestically produced commodities through the nesting of production functions.

The model is closed through conditions that guarantee different market equilibria. We assume that all goods markets are competitive with flexibility of prices ensuring that demand for each commodity is equal to its supply at the marginal cost of production. Labour market equilibrium is governed by the wage setting equations and the migration function, the flexibility of urban unemployment and the rural wage rate playing an important role in this process. The wage setting assumption has an important influence on the level of income, demand for commodities and hence on the composition of economic activity.

**The Migration Function**

The model is implemented with different wage-setting assumptions for each region. In the urban region, the real wage is fixed and this serves as a numeraire. The rural wage rate is determined by the market through interactions between demand and supply. The rural wage is less than the urban wage rate and this gives rise to urban-rural wage differential. The equilibrium rural wage is a by-product of the Harris-Todaro hypothesis that labour movement from the rural to urban region is related directly to the rural-urban wage differential and indirectly to the urban unemployment rate. This is given by the generalised Harris-Todaro migration function that provides

a mechanism through which the level of rural wages adjusts to changes in urban labour market.

Inter-regional migration is the only source of growth for the regional labour force in our model. This means that we do not allow for natural population growth. This is due mainly to our interest to capture the effect the policy shock on the performance of labour markets in the domestic economy. If natural growth were allowed in the model, then this would provide an additional source of labour supply to the regions and isolating the effect of this would add further complication to the modelling structure. Due to labour market imperfections that give rise to unemployment in the region, the urban labour force is greater than the sum of sectoral employment in the region. On the other hand, flexibility of the rural wage guarantees full-employment of the labour force in the region. This implies that at any given time the sum of sectoral employment gives total labour force in the rural region.

The size of the labour force in each region varies from period to period due to rural-urban migration, which is given by the generalised HT migration function:

$$MG_t = \mu_0 + \mu_w \left[ \log\left( \frac{W^U}{CPI^U} \right) - \log\left( \frac{W^R}{CPI^R} \right) \right] + \mu_e \left( \log\ U_{t-1} - \log L^U_{t-1} \right) \quad (3)$$

Where $\mu_O$ is the intercept term; $\mu_w$ is migration elasticity with respect to urban-rural wage differential; $\mu_e$ is migration elasticity with respect to the probability of getting employment in the urban region; and CPI is the consumer price index. Gelan (2000, pp. 78-81) provides detailed analytical discussion of algebraic derivation of equation 3 from the conventional HT model given by equation 1.

While the intercept term is obtained at the stage of calibrating the model, it is necessary to use extraneous elasticity parameters from the literature for the other parameters. It is useful to note that the relative sizes of $\mu_e$ and $\mu_w$ indicate whether migrants are risk takers or risk averse. If households are risk averse, then they are likely to give a larger weight to employment opportunity in the urban region than the higher urban wage. Conversely, if migrants are risk takers, then they are likely to attach greater weight to the urban wage than the urban employment rate. As far as

we are aware, empirical estimates of these parameters are not available for any developing country including Ethiopia. Thus, we are guided by available estimates from developed countries. Treyz et al (1993) estimated that elasticities for US internal migration with respect to wage differential and probability of employment were 0.119 and 0.181 respectively. For the UK, Layard et al (1991) estimated a relatively lower migration elasticity with respect to both determinants of migration (with $\mu_w = 0.058$ and $\mu_e = 0.081$). In contrast to these findings, other studies indicate that migrants are risk takers, migration elasticity with respect to wage differential being larger than migration elasticity with respect to the probability of finding jobs in the urban region (Casas, 1984). Thus, we elected for implementing the model with equal values of 0.05 for both parameters. This implies that rural-urban migrants are equally sensitive to changes in regional wage differentials and urban unemployment rates.

**Capital Stock Adjustment**

In the short-run, the amount of capital in each of the region is fixed. In the medium to the long-run, however, the size of capital stock in each sector varies due to the discrepancy between the actual and the desired capital stock. The adjustment of these variables is given by the following relationship:

$$K_{i,t}^{X} = (1-\delta_i^{X})K_{i,t-1}^{X} + V_{i,t-1}^{X} \quad (4)$$

where K, δ, and V are capital stock, depreciation rate, and investment respectively; superscript X is region; and subscripts i and t denote producing sectors and time.

If there is a difference between the actual and the desired capital stocks, then this gives rise to a discrepancy between capital rental rates and the user cost of capital. If the desired capital stock is greater than the actual capital stock, then capital rental rates exceed the user cost of capital and hence there is a need for more investment. The user cost of capital rises and becomes equal to the capital rental rate in the long-run. At that point, there will be no need for further investment. The rates of change in sectoral user cost of capital depend on changes in the price of investment goods, the market interest rate, and the rate of depreciation. If we assume that the rate of depreciation and the market rate of interest are uniform across regions and

sectors, then the user cost of capital in a particular sector is determined by the price of investment goods. In addition to changes in prices, the size of the speed of adjustment parameter plays a crucial role in determining the rate of changes in sectoral capital stocks. The investment function can be obtained by re-arranging the relationships in equation (4) and expressing V as a function of the difference between the desired and the actual capital stock and then introducing the speed of adjustment parameter ($\gamma$):

$$V_{i,t}^{X} = \gamma_{i}^{X}(K_{i,t}^{\bullet X} - K_{i,t-1}^{X}) + \delta_{i}^{X} K_{i,t-1}^{X} \quad (5)$$

Following the tradition of core-periphery models, we assume that investment activities tend to be concentrated in urban regions. In our modelling framework, this feature of urban-rural differential is taken into account by introducing a relatively larger speed of adjustment parameter for producing sectors in the urban region than in the rural sectors. Accordingly, the model is implemented with a speed of adjustment parameter of 0.1 for producing sectors in the rural region and 0.5 for producing sectors in the urban region.

## A SOCIAL ACCOUNTING MATRIX FOR ETHIOPIA

Table 1 shows a SAM that provides further insight into the structure of the model. The figures in it give a sense of magnitudes involved in implementing the Ethiopian CGE model (Grais, de Melo, and Urata, 1986, pp. 61-88). Gelan (2000, pp. 138-172) provides detailed discussion of the conceptual framework employed and disparate data sources used to construct the SAM. Here it suffices to highlight the most important features of the Ethiopian SAM for 1996.

In line with the theoretical specification of our rural-urban CGE model, it is appropriate to categorise economic agents as producing industries or consuming households into a bi-regional framework. To that effect, we built regional dimensions to the structure of the SAM. As in all SAMs, it has equal number of columns and rows. Receipts or in-comings to an account are recorded row-wise while payments or out-goings are represented by entries in the respective column. The Ethiopian SAM built in this manner is presented in table 1 and it has 14 accounts that are categorised into eight broad categories:

- Four production accounts (1, 2, 3, 4)
- Two factors of production accounts (5, 6)
- Two households income and expenditure accounts (7, 8)
- Two business accounts (9, 10)
- A government revenue and expenditure account (11)
- A saving-investment balance account (12)
- An account for the rest of the world or an external sector account (13)
- An account for indirect taxes (14)

It is important to note that respective row totals (in-comings) and column totals (out-goings) are equal. This is one of the most important characteristic features of the conventional SAM construction. An important advantage of the SAM is its consistency with a series of statistical adjustments to fulfil sectoral balance requirements. Firstly, supply of and demand for goods and services are balanced. Secondly, total receipts by the production sectors from sales of goods and services equals to the total cost of production. Thirdly, each institutional account satisfies its budget constraint.

## NUMERICAL SIMULATIONS

It is useful to bear in mind that the macroeconomic closures in the model are largely based on the conditions that govern the amount of capital stock in the producing sectors. For this study, the model is implemented with an endogenous investment closure, where capital stock adjusts optimally from period to period depending on changes in commodity and factor prices. It is important to note that the regional labour market conditions are characterised by a fixed real wage rate, a flexible rural wage rate, and a fixed national labour supply. However, the regional labour supplies are allowed to optimally adjust via migration.

We concentrate on system-wide impacts of eliminating export taxes on agricultural products. With this policy shock, the model is set to run over a number of periods. It was necessary to run the model over a sufficiently long time interval within which most variables in the model reach their steady state values. In analysing the

outcomes from the multi-period simulation experiments, we focus on two time intervals. The first period results denote impact interval effects, which mean the immediate system-wide impact of the policy shock. Over the medium- to the long-run, most variables approach their steady state values. This provides the long-run impact of the policy change on all variables that make up the system.

In the remaining parts of this section, we discuss numerical simulation results by classifying them into two categories. First, we concentrate on short-run and long-run effects of the policy shock on a wide range of variables. Second, we analyse impact of the policy shock on the structure of the economy with a focus on relative changes in rural and urban GDP as well as patterns of changes in rural-urban migration.

Export tax reduction is essentially a price shock in that it improves export supply by increasing consumer and producer prices in the domestic market. Given that the amount of input (labour and capital) are fixed, sectoral expansions in output are expected to bid up the level of input prices (wage rates and user cost of capital). However, this depends on the extent to which output prices rise. The effects of tax reform on the regional real wage rates depend on the relative impacts it will have on the regional nominal wage rates and the general price levels.

Table 2 presents summary of simulation results for key variables. The endogeneity of investment essentially means allowing sectoral activity expansions through further investment. This has both demand-side and supply-side effects. In the short-run, we expect a substantial demand side effect. The initial sectoral expansion provides additional demand for investment goods. Also, the sectoral expansions lead to higher employment (most particularly in investment related activities such as construction) and hence higher income is generated. In the long-run, however, the supply side effects come through, with the rise in the amount of sectoral capital stock providing additional productive capacity. With these preliminary remarks, we proceed to highlighting simulation results.

**Overall Effects**

The change in aggregate GDP provides a good indicator about the overall impact of the exogenous policy change. We note that it rises by 1.81% in the long-run. Both regions experience GDP growth, with 1.77% and 1.84% increases for the rural and

the urban regions respectively. This indicates that the rate of expansion in the urban region is slightly higher in the corresponding change in the rural region. These results suggest that the overall effect of abolishing Ethiopia's agricultural export tax is expansionary with increases in the rural and the urban household incomes.

It is important to explain the key relationships that explain the overall expansionary effect of the policy shock. The natural starting point is to note that the initial stimulus comes from a rise in producer price and hence an increase in quantity of exports to the external market. Accordingly, total export increases by 1.65%. Additionally, the sectoral composition of export shifts towards agriculture that experiences a 6.68% increase while the manufacturing and urban service sectors encounter slight declines (by 1.25% and 1.93% respectively). In addition to creating a supply side stimulus in domestic market, the removal of exports tax causes domestic prices to adjust upwards to the level of prices in the world market. Accordingly, most producing sectors experience increase in commodity prices with the largest increase happening in the agricultural sector (by 4.45%). This creates an incentive for producers to undertake activity expansions.

The extents of activity expansions are indicated by changes in sectoral capital stocks and employment. The investment expansions cause significant increases in the amount of capital stock in all sectors. Producing sectors in the rural region experience larger proportionate increases in capital stocks than the amount of increases experienced by the urban producing sectors. Similarly, the commodity producing sectors (agriculture and manufacturing) experience relatively larger investment expansions than the service sectors. Sectoral activity expansions are indicated not only by increase in capital stock but also by changes in employment levels. In contrast to the pattern of changes in capital stocks, the urban region experiences relatively larger employment increase than the rural region. Accordingly, the level of employment in the urban region rises by 1.68% and the number of unemployed falls marginally. On the other hand, the level of employment in the rural region slightly declines.

The overall employment effect of the policy changes is positive although the magnitude of change is relatively small (a rises by 0.02%). Given that the urban

unemployment level declines only slightly (and also noting the marginal decline in rural employment), the urban employment could increase because of rural-urban migration (see section 5.4 below). The contrasting patterns of factor employment in the urban and rural regions are explained by two conditions. The first one is the parameter values used to implement the model. Following some stylised facts in economic development theory, a relatively high factor substitution possibility is assumed for the rural region (the default elasticity value is equal to 2.5 in the rural region and 0.3 in the urban region). Thus, any rise in the cost of labour induces greater capital expansion in the rural region than in the urban region while urban sectors employ both factors in certain proportions in order to undertake activity expansions. Secondly, it is useful to note that the size of capital stock in the rural producing sectors is relatively low and hence any small absolute change yields a significantly large change in percentage terms.

**Household Welfare Effects**

Having examined the overall expansionary effect of the removal of the Ethiopia's export tax, it is appropriate to analyse the welfare implication of this policy shock. The simulation experiments suggest that the overall welfare impacts are positive with improvements in household welfare for both rural and urban regions. It is useful to begin with changes in regional consumer price indices. Since commodity prices increase for all sectors, this inevitably causes a rise in the general price level in each region. Thus, the consumer price index increases by 3.36% and 1.14% in the rural and urban regions respectively.

It is important to recall that we have specified the model in such a way that real wage in the urban region is not allowed to change. This means that, as a matter of policy, urban nominal wage is adjusted by equal proportion with changes in the region's consumer price index while the change in the rural nominal wage is determined by interactions between demand and supply. Accordingly, while the rural nominal wage rates rises by 5.42%, the corresponding change in the urban nominal wage rate is equal to the proportionate increase in urban CPI, i.e., a rise by 1.14% from the base period. The change in regional real wage depends on the relative magnitudes of changes the region's CPI and nominal wage rate. Since rural nominal wage rate has

increased by larger proportions than the rural CPI, real wage increases by 1.99%. As noted above, the real wage is not allowed to vary in the urban region with equal changes in urban CPI and nominal wage.

While a change in regional labour income is a good indicator of the impact of the policy shock on household welfare, it does not show the overall impact. The reason is that the sectoral activity expansions stimulated by the policy change generate additional demand for all factors of production and hence affecting factor incomes other than labour income. As noted above, producing sectors both in the rural and urban regions experience a relatively large expansion in the amount of capital stock. This generates non-labour income to increase, causing household real disposable income to rise by larger proportions than the corresponding changes in labour income in each region. Accordingly, the urban and rural household real disposable income grows by 2.89% and 1.43% respectively.

**Government Budget and Balance of Payment Effects**

Although the removal of Ethiopia's export tax is expected to have expansionary effects in general, it is unlikely to have entirely positive impacts. Since export tax elimination directly reduces government revenue, this inevitably causes budget deficit to rise (by 13.5%). Similarly, the simulation experiments show that the BOP deficit rises by about 9% in spite of expansions in exports. There are two explanations for this. First, the rise in domestic income cause imports to increase by about 5%, which is about the same level of increase in exports. Secondly, a rise in government budget deficit means a rise in external financing and hence a rise in BOP deficit.

**Multi-Period Simulation Results**

In this section, we discuss simulation results across different time intervals. The motivation for this analysis comes from the need to examine the effect of removing agricultural export tax on the structure of the economy. More specifically, it is important to see what happens to the process of structural transformation of the economy. Since governments in developing countries have justified taxation of agriculture in terms of transferring resources from the rural to urban sectors and thereby accelerating the process of structural transformation, it is necessary to

examine to what extent export tax removal would adversely affect the desirable objective of structural transformation. We use two interrelated indicators to measure this effect. The first one is change in the composition of aggregate GDP, i.e., relative changes in rural and urban GDP across time. The second indicator is the effect of the policy shock on the direction of migration, i.e., whether rural-urban migration continues to take place or there would be a reversal in the direction of migration and hence a halt in the process of structural transformation.

Figure 3 shows the effect of the policy shock on relative changes in the composition of aggregate GDP. It is worth noting two patterns of changes in the urban and the rural GDP figures. First, as noted earlier, the aggregate GDP as well as regional GDP figures show modest increases. Second, the multi-period simulation results indicate that the urban region experiences a consistently larger GDP growth than the rural region throughout the simulation periods. This result reveals an interesting point that taxation of the agricultural sector is likely to hinder rather than accelerate structural transformation of the Ethiopian economy. The key point is that the traditional view of relying on transferring resources from the rural sectors emphasises the strength of backward linkages of the industrial sector implying that urbanisation and industrialisation would ultimately contribute to rural development with spread effects. However, the general equilibrium results here take into account the possibility of rural stagnation to hinder industrialisation and urban development.

Figure 4 displays the effect of the policy shock on the patterns of labour force migration. The shaded area indicates the amount of labour force migration that is induced by the policy change. The areas denotes by a shows the immediate effect with some proportion of the urban labour force is being relocated to the rural area where employment prospects have improved because of the stimulus generated by an increase in exports. This shows that migration reversal is likely to happen in the short-run when there is a policy change in terms of removing export taxes. The area denoted by b indicates that the pattern of rural-urban migration will be re-established in the medium-run and the long run. It is useful to note the consistent results from the patterns of regional GDP changes and those of the migration effects. In spite of the short-run migration reversal, the overall effect of the policy shock is to induce structural change of the national economy in a desirable direction.

## CONCLUSION

This study has concerned itself with quantifying system-wide impacts of agricultural export taxation in the Ethiopian economy. We have formulated an analytical framework and implemented it using a computable general equilibrium methodology with a social accounting matrix for Ethiopia constructed for 1996 as a base year. Multi-period numerical simulations were undertaken with a focus on three important policy concerns. These are effects on: (i) aggregate GDP and exports; (ii) household welfare; and long-run development objective of accelerating structural transformation of the Ethiopian economy.

The simulation experiments show that the removal of agricultural export tax has an overall expansionary effect with a modest rise in aggregate GDP by about 1.81 percent. Similarly, the policy shock yields a relatively large increase in agricultural export (by 6.68 percent). This supports the findings by the recent report by the World Bank (2002) which has inspired this study. While this report has provided a broader framework for understanding Ethiopia's sluggish export growth during 1990s, this study has focused on an element in the policy environment, namely agricultural export tax, and thoroughly investigated and quantified its impacts on the country's export performances.

The removal of agricultural export tax does not have any adverse effect on household welfare in both the rural and urban regions. In order to address welfare concerns, particularly during recent years over impacts of economic reforms on household wellbeing, we have not allowed household nominal earnings to fall behind changes in the general price levels in each region. This is useful not only in term of the recent concerns over household poverty in Ethiopia but also from the traditional view of protecting particularly urban consumers who spend a good deal of their income on agricultural products. Our findings show that the removal of the distortion in the system would in fact improve household welfare in both regions with increases in household real disposable income by 2.89 percent and 1.43 percent in the urban and the rural regions. This means that agricultural export tax cannot be justified on the grounds of protecting household welfare.

Similarly, the simulation results indicate that the removal of agricultural export tax does not conflict with the long-run development objective of achieving structural transformation of the Ethiopian economy. In fact, both urban rural GDP expand with urban GDP growth faster than rural GDP throughout the simulation periods. Also, despite some migration reversal in the short-run, the direction of migration continues to be from rural to urban thereby confirming lack of any conflict between structural transformation and elimination of agricultural export taxes.

It is important that the simulation results depend on some of the key assumption with regard to institutional settings that are expected to influence policy outcomes. For instance, the expansion of production in the rural region and agricultural export growth largely depended on investment conditions in the rural region. More specifically, the expansion of capital stock in rural areas critically depends on the availability of credit facilities from the banking system. We simply assume that farmers are allowed to borrow from banks whenever they find it convenient to expand farming activities. It was beyond the scope of this study to examine the extent to which this is possible in the current circumstance of the Ethiopian economy. In any event, such institutional constraint was a separate issue and our main concern here was to explain system-wide impacts of removing agricultural export tax.

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**Figure 1: Effects of Removing Agricultural Export Tax**

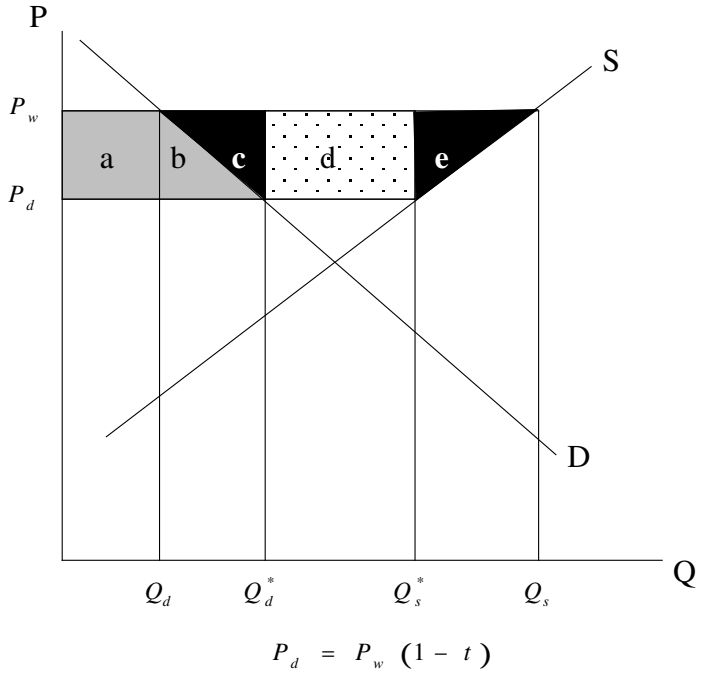

**Figure 2: Labour Market Effects of Export Tax**

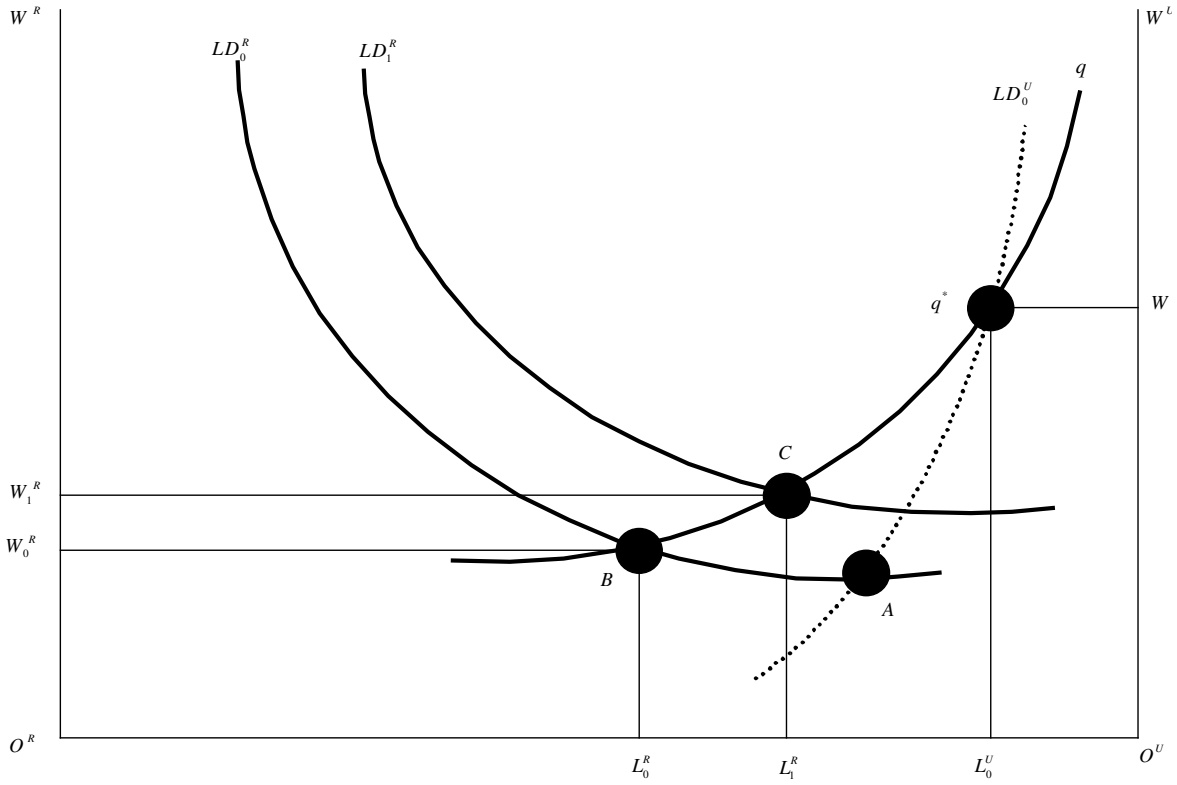

**Table 1 Social Accounting Matrix for Ethiopia, 1996 (Millions of Ethiopian Birr, Balanced)**

| No. | Sectors | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 | 9 | 10 | 11 | 12 | 13 | 14 | 15 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| 1 | Agriculture | 564 | 7 | 1,866 | 139 | | | 14,052 | 2,232 | | | 40 | 38 | 2,007 | | **20,944** |
| 2 | Rural Services | 72 | 65 | 133 | 78 | | | 395 | 2 | | | 1 | 211 | 0 | | **958** |
| 3 | Manufacturing | 130 | 38 | 887 | 1,346 | | | 3,261 | 2,297 | | | 36 | 637 | 551 | | **9,183** |
| 4 | Urban Services | 58 | 39 | 1,330 | 781 | | | 394 | 10,262 | | | 1,136 | 2,782 | 2,372 | | **19,155** |
| 5a | Rural Labour | 16,369 | 373 | | | | | | | | | | | | | **16,742** |
| 5b | Urban Labour | | | 1,253 | 6,830 | | | | | | | | | | | **8,083** |
| 6a | Rural Surplus | 2,680 | 345 | | | | | | | | | | | | | **3,024** |
| 6b | Urban Capital | | | 1,423 | 7,670 | | | | | | | | | | | **9,093** |
| 7 | Rural Hhold | | | | | 16,742 | | | | 2,640 | | 318 | | | | **19,701** |
| 8 | Urban Hhold | | | | | 8,083 | | | | | 8,085 | 186 | | -354 | | **16,000** |
| 9 | Rural Farms | | | | | | 3,024 | | | | | 1,250 | | | | **4,274** |
| 10 | Urban Firms | | | | | | 9,093 | | | | | 5,387 | | | | **14,480** |
| 11 | Government | | | | | | | 186 | 203 | 870 | 2,591 | | | | 2,862 | **6,711** |
| 12 | Capital | | | | | | | 159 | 328 | 764 | 3,805 | -773 | | 2,964 | | **7,246** |
| 13 | Imports | 851 | 65 | 1,790 | 1,707 | | | 638 | 316 | | | -903 | 3,195 | | | **7,657** |
| 14a | Net taxes | 119 | 19 | 287 | 400 | | | 106 | 106 | | | 27 | | 117 | | **1,181** |
| 14b | Import duties | 102 | 8 | 215 | 205 | | | 510 | 253 | | | 5 | 383 | | | **1,681** |
| **15** | **Total** | **20,944** | **958** | **9,183** | **19,155** | **24,825** | **12,117** | **19,701** | **16,000** | **4,274** | **14,480** | **6,711** | **7,246** | **7,657** | **2,862** | |

**Table 2: System-Wide Impacts of Abolishing Ethiopia's Agricultural Export Taxes**

| Variable description | % change from base period |
|---|---|
| Aggregate GDP | 1.81 |
| Rural GDP | 1.77 |
| Urban GDP | 1.84 |
| Exports: | 1.65 |
| Agriculture | 6.68 |
| Manufacturing | -1.25 |
| Urban services | -1.93 |
| Price of commodity output: | |
| Agriculture | 4.45 |
| Rural services | 2.65 |
| Manufacturing | 0.42 |
| Urban services | 0.65 |
| Capital stocks: | |
| Agriculture | 12.98 |
| Rural services | 8.74 |
| Manufacturing | 3.06 |
| Urban services | 1.74 |
| Total employment | 0.02 |
| Rural employment | -0.15 |
| Urban employment | 1.68 |
| Urban unemployment | -0.86 |
| Commodity output: | |
| Agriculture | 1.83 |
| Rural services | 2.24 |
| Manufacturing | 3.05 |
| Urban services | 1.66 |
| Consumer price indices (CPI): | |
| Rural | 3.36 |
| Urban | 1.14 |
| Nominal labour income: | |
| Rural | 5.42 |
| Urban | 1.14 |
| Real consumption wage: | |
| Rural | 1.99 |
| Urban | 0.00 |
| Real disposable income (CPI Deflator) | |
| Rural Hholds | 2.89 |
| Urban Hholds | 1.43 |
| Government | 13.50 |
| Balance of Payments | 8.99 |
| Imports from ROW | 4.92 |

**Figure 3: Changes in Aggregate GDP and its Composition**

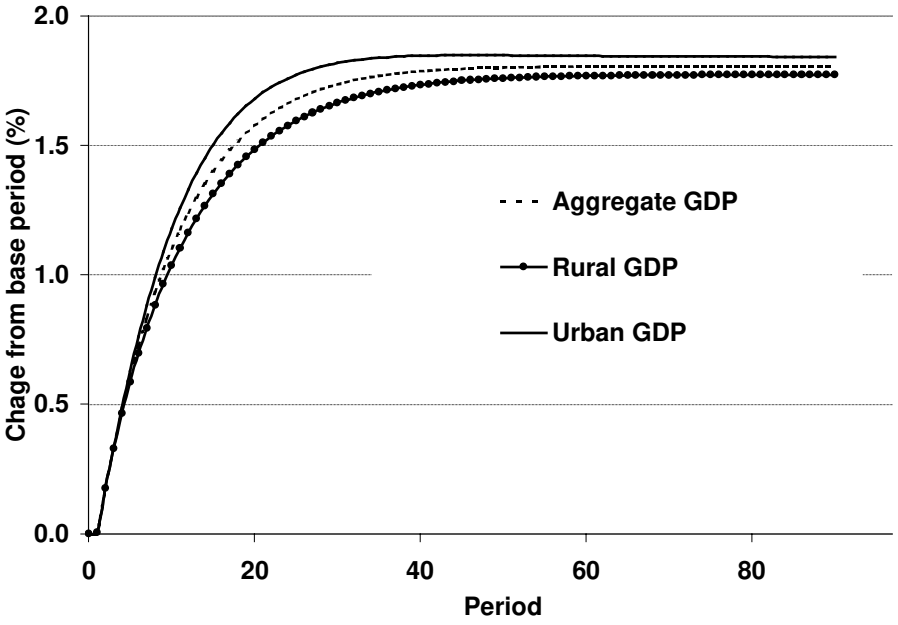


**Figure 4: Effects on Magnitude and Direction of Migration**