CHAPTER 7

POLICY SIMULATIONS/EXPERIMENTS USING SAM ACCOUNTING MULTIPLIERS

7.1 Introduction

In Chapter 5, it was indicated that both accounting income and price multipliers would be used in this study, in order to analyze the effects of international trade liberalization on household food security and agricultural competitiveness in Botswana using SAM-based models. In this chapter accounting-income multiplier analysis are used to examine the effects of global trade liberalization on food security in Botswana. Under SAM-accounting multiplier analysis income is allowed to vary while commodity prices are held constant.

Specifically, Round (2003: 7-8) observes that SAM fixed-price multipliers rely on some strong assumptions such as “that there is excess capacity in all sectors and unemployed (or under-employed) factors of production… as prices are fixed, there is no allowance for substitution effects anywhere, at any stage”. Furthermore, some accounts are classified as endogenous while others are exogenous (see section 7.2 below). These assumptions imply that an increase in export demand or government expenditure/investment in the economy will not influence the domestic prices, supply constraints or the underemployment of factors of production.

While they might be true for certain economies or sectors of the economy, these assumptions might overstate or underestimate the SAM multiplier effects. In Chapter 8 we will relax one of these assumptions by allowing prices to vary following an external policy shock. In the global economy it might be true that for small countries like Botswana, factor or commodity prices may

not change, as such countries are price-takers. Suffice, to note that the fixed price multiplier analysis have limitations.

Whereas in terms of conventional Leontief input-output models, agriculture has low production multipliers, through the application of SAM multiplier analysis, the sector exhibits larger multipliers and very strong income and consumption linkages (Sadoulet and de Janvry, 1995). In conventional Leontief analysis, intermediate demand serves as a multiplier, of which agriculture shows low multipliers when this demand is considered. However, in the SAM income multiplier analysis, value-added or factor income is regarded as a leakage (in institutions such as households). As a result, value-added or factor income generates demand in the SAM, hence the higher income and consumption linkages by agricultural sector (Sadoulet & de Janvry: 1995, p. 291).

This chapter applies the SAM accounting fixed-price multipliers in order to analyze the effects of changes in income on household food security, through policy experiments that cover beef and textiles exports. These goods, in addition to diamonds, currently provide Botswana with foreign earnings to import food, other goods, services, etc. Diamonds constitute at least 70 percent of the country's total export earnings and about 50 percent of the government revenue (NDP 9, 2003).

Whilst the diamond sector has been the mainstay of the economy for almost three decades, Botswana still has a significant number of impoverished households. Diamond corporate tax revenue has been used by government to finance and promote sustainable economic diversification since the early 1980's by means of public assistance schemes. The textiles industry constitutes one of the key potential areas for diversification, as well as assisting the country to increase foreign earnings and employment opportunities (NDP 9, 2003). The beef sector, like diamond mining, still remains one of the traditional sectors for generating scarce foreign export earnings for the purposes of ensuring household and national food security.

Improved export earnings for developing countries, following enhanced market access in developed countries, constitute the main component of the Doha Development Agenda (DDA). In fact the DDA as contained in the Ministerial Declaration observes that:

> International trade can play a major role in the promotion of economic development and the alleviation of poverty. We recognize the need for all our peoples to benefit from the increased opportunities and welfare gains that the multilateral trading system generates. The majority of WTO members are developing countries. We seek to place their needs and interests at the heart of the Work Programme adopted in this Declaration. Recalling the Preamble to the Marrakesh Agreement, we shall continue to make positive efforts designed to ensure that developing countries, and especially the least developed among them, secure a share in the growth of world trade commensurate with the needs of their economic development. In this context, enhanced market access, balanced rules, and well targeted, sustainably financed technical assistance and capacity-building programmes have important roles to play (WTO, 2001).

In this regard, it is expected that countries like Botswana will advocate for improved market access to the developed countries by removing several trade barriers such as quotas, subsidies, tariffs, discriminatory sanitary and phyto-sanitary (SPS) and food safety measures. At least the results of the partial equilibrium analysis, the ATPSM, in Chapter 4 indicate that if developed countries, and major, players like the EU, USA and Japan reduce trade-distorting measures such as subsidies, quotas and tariffs, countries such as Botswana could possibly improve their export earnings from competitive enterprises such as beef. ATPSM results in Chapter 4 show that global trade liberalization in agriculture can improve beef exports for

Botswana but that there are other potential welfare losses (a decline in government revenue, consumer welfare, etc).

The loss in welfare is due to loss of preferences especially in the EU as producer price subsidies under the amber box provisions of the WTO-Agreement on Agriculture are considered as trade distorting (Agreement on Agriculture, WTO, 1995). As indicated in Chapter 4, the proposed tariff reduction formulas to liberalize global agricultural trade all include the reduction of the amber box provisions (direct farmer producer price and input subsidies) especially among major industrialized countries to improve competitiveness and export market access to developing countries. According to ATPSM, Botswana's beef exports are globally competitive. In all the four scenarios captured in ATPSM, it is evident that Botswana's beef industry is globally competitive primarily because of its relative higher comparative cost advantage in relation to other beef exporters/producers. While higher producer prices based on preferential market access to the EU play an important role in the industry, by and large, Botswana's relative success in the beef export industry is also largely depended on relative free land resources, suitable climatic conditions and public subsidies compatible with the green box provisions of the WTO-Agreement on Agriculture.

In addition, the World Bank (2002) has also confirmed in its study that the reduction or removal of agricultural subsidies by major trading players could increase export earnings for developing countries. The WTO is currently working on improving, in particular, market access for exports from developing countries, including agricultural and industrial goods. However, progress here has still remained elusive for most developing countries, as evidenced by several unsuccessful WTO Ministerial Conferences (Seattle, 1999; Doha, 2001 and Cancun, 2003). Below we briefly describe the steps that are followed to generate SAM income multipliers before we carry out the policy experiments.

7.2 Exogenous and Endogenous Accounts under SAM-Accounting Income Multiplier Analysis

Of the 59 accounts described in detail in Chapter 6, some are classified as endogenous while others are exogenous. In general, government (regarded as an institution not an activity), capital and the rest of the world are, normally, in terms of macro-economic theory, classified as exogenous factors while the rest are endogenous (see Chapter 5). An exogenous factor/account represents an account whose importance or influence in the economy is exogenously determined and through this account an external policy shock is introduced into an endogenous account(s). As in an econometric analysis, the exogenous account is an independent variable while an endogenous account is a dependent variable.

It is customary that government, capital and the rest of the world are classified as exogenous accounts (Pyatt and Round, 1985; Thorbecke, 1989 and 1994; Powell and Round, 1997; Arndt, Jensen and Tarp, 2000; Round, 2003). Specifically, Round observes, “government outlays are essentially policy determined, the external sector is outside domestic control and as the model has no dynamic features so investment is exogenously-determined” (Round, 2003, p.6).

Furthermore, in an open and small economy such as Botswana, the preceding assumptions about exogenous accounts are to some extent valid. For instance, government cannot realistically control capital or investment since investors are influenced by returns to their scarce resources. Following globalisation and recent easy movement of capital, several governments have placed limitations on the influence of capital flows and movement. Similarly, while government can to some extent influence trade transactions by means of export and import duties and the like, entrepreneurs are strongly influenced by other factors such as risks and profitability, as well as returns to their scarce resources including those of capital, labour and management. In carrying out policy experiments based on the SAM-multiplier analysis,

exogenous accounts are aggregated into a single account, which records an aggregate set of injections into the system and the leakages from it (Round, 2003, p.6).

In this present study, endogenous accounts range from "Professional and technical employees - citizen/P_1" under the category of factors through households, institutions until they end up at activity, "services/P_{40-43}" (see Table 6.2). There are 50 endogenous accounts in this study but one single exogenous account at time, to undertake policy experiments will be used.

To generate fixed-price income multipliers only endogenous accounts (factors, households/institutions and production activities) were used. The steps described in Chapter 5 of this study were followed.

Finally, before we analyze the results, one should explain how the results are interpreted after a shock has been introduced. For each policy shock, a table showing all the endogenous accounts, the entry of the shock into the endogenous account(s), the vector or multiplier matrix, $\mathbf{M_a^x}$**,** and the Stone's decomposed multiplier matrices, i.e. I, T, O and C are provided (see Table 7.1 below).

After $\mathbf{M_a}$ **'Dx**, columns showing the decomposed Stone's multiplier matrices follow (I, T, O and C). In order to check whether the aggregate $\mathbf{M_a}$ **'Dx** is indeed equal to Stone's additive multipliers, another column indicated as "check" is provided in the table. The difference between M_a 'Dx and the sum of Stone's additive multiplier matrices is zero and hence the "check" column should also show a zero value opposite each endogenous account.

7.3 Policy shock based upon an increase in beef export Income/Earnings

Beef export earnings, in general, are able to pay for Botswana's food import bill regarding basic cereals such as maize and sorghum, excluding dairy and

vegetable products (External Trade Statistics, CSO, 2003 & 2004). As a result, improved market access for Botswana's beef exports in industrialized countries, in particular, is expected to enhance food security by increasing domestic supply through imports. Additional supply from imports enables, *ceteris paribus*, households to purchase more food and other tradables. The domestic supply of beef in several industrialized countries is curtailed by high import duties, stringent sanitary and phyto-sanitary measures, rules of origin, technical barriers, etc (Ingco and Nash, 2004).

In this policy experiment, we introduce the external shock of an increase of beef export earnings in the reduced 1993/94 SAM with 50 endogenous accounts and analyze the effects of the shock on food security and activity accounts, in particular. Specifically, the shock is applied to the "meat processing/P_{12}" activity as the appropriate endogenous account for the policy experiment. The demand for imported food and other consumables at household and national levels depends, in part, on access to foreign exchange, which the beef industry also generates.

In addition, the beef industry exhibits very strong income and demand linkages in Botswana's economy (see Townsend & Sigwele, 1998). Below we analyze the effects of an increase of beef export earnings based on fixed-price income multipliers. Both the multiplicative aggregate multiplier developed by Pyatt and Round (1979) and the additive and decomposed multiplier approach used by Stone (1985) will be employed to analyze the results of the policy shock.

7.3.1 The Effects of an Increase in Beef Export Earnings/Income on Food Security based on the Multiplicative Multiplier Matrix ($\mathbf{M_a}^{\mathbf{x}}$)

Based upon the multiplier matrix, $\mathbf{M_a^x}$, when beef export earnings increase by ten percent, we observe the following effects at factor, household and activity levels. The ten percent shock is primarily based on ATPSM results which indicate that after global trade liberalization in agriculture, beef export

earnings in Botswana would increase by about 13 percent (see Chapter 4). A ten percent increase in beef export earnings or about P 17.386 million (column 3 under "shock" opposite the "Meat Processing/P_{12}" activity in table 7.1), generated an additional P 17.911 million in P_{12} (column 4 under Multiplier, $\mathbf{M_a * D_x}$) which in turn, by means of the movement of the income injection amongst endogenous accounts, also created demand for factors to meet the additional external demand. Table 7.1 records the effects of a ten percent increase in beef export earnings on factors, households and activities.

Table 7.1 An Increase in Beef Export Earnings

Income Multiplier Experiment

			Multiplier		**Stone**				
		Shock (Dx)	Ma * Dx		I	T	O	C	Check
Prof. & Tech Employees - Cit.	F1	0	0.859	0.15%	0.000	0.000	0.521	0.338	0.000
Prof. & Tech. Employees - Non-Cit.	F2	0	0.345	0.12%	0.000	0.000	0.139	0.206	0.000
Admin & Manag. Employees – Cit.	F3	0	0.604	0.30%	0.000	0.000	0.404	0.200	0.000
Admin & Manag. Employees - Non-Cit.	F4	0	0.505	0.26%	0.000	0.000	0.298	0.207	0.000
Clerical Employees - Citizens	F5	0	0.729	0.14%	0.000	0.000	0.390	0.339	0.000
Clerical Employees - Non-Citizens	F6	0	0.015	0.28%	0.000	0.000	0.010	0.005	0.000
Skilled Manual - Citizens	F7	0	1.851	0.24%	0.000	0.000	1.319	0.533	0.000
Skilled Manual - Non-Citizens	F8	0	0.089	0.10%	0.000	0.000	0.038	0.051	0.000
Unskilled Employees	F9	0	1.268	0.25%	0.000	0.000	0.917	0.351	0.000
Mixed Income	F10	0	7.118	1.87%	0.000	0.000	6.070	1.048	0.000
Gross Operating Surplus	GOS	0	6.893	0.11%	0.000	0.000	3.569	3.324	0.000
Urban Households - Wage Income	I1	0	3.205	0.22%	0.000	0.000	2.260	0.945	0.000
Urban Households - Self-employed	I2	0	2.665	0.74%	0.000	0.000	2.186	0.479	0.000
Urban Households -Transfers	I3	0	0.134	0.31%	0.000	0.000	0.108	0.025	0.000
Rural Households - Wage Income	I4	0	2.560	0.24%	0.000	0.000	1.827	0.733	0.000
Rural Households - Self-employed	I5	0	3.253	0.68%	0.000	0.000	2.667	0.586	0.000
Rural Households - Transfers	I6	0	0.638	0.24%	0.000	0.000	0.515	0.123	0.000
Non-Citizen Households	I7	0	1.181	0.18%	0.000	0.000	0.672	0.510	0.000
Non-Financial Enterp	Non-Fin	0	6.087	0.09%	0.000	0.000	3.152	2.935	0.000
Financial	Fin	0	-0.064	0.00%	0.000	0.000	-0.033	-0.031	0.000
Private Non-Profit Institutions	NPI	0	0.074	0.03%	0.000	0.000	0.038	0.036	0.000
Trad. Agric - Cattle	P1	0	7.073	2.55%	0.000	6.236	0.000	0.837	0.000
- Other	P2	0	0.661	0.50%	0.000	0.352	0.000	0.309	0.000
Freehold Farms	P3	0	3.255	2.72%	0.000	2.999	0.000	0.256	0.000
Hunting, Fishing & Gathering	P4	0	0.647	0.60%	0.000	0.276	0.000	0.371	0.000
Mining	P5-11	0	0.199	0.00%	0.000	0.113	0.000	0.086	0.000
Meat Processing	P12	17.386	17.911	5.68%	17.386	0.018	0.000	0.507	0.000
Dairy & Other Agric. Processing	P13	0	1.833	0.62%	0.000	1.091	0.000	0.742	0.000
Beverages	P14	0	0.678	0.23%	0.000	0.017	0.000	0.661	0.000
Textiles	P15	0	0.176	0.13%	0.000	0.014	0.000	0.162	0.000
Chemicals	P16	0	0.190	0.17%	0.000	0.092	0.000	0.098	0.000
Transport & Equipment	P17	0	0.045	0.11%	0.000	0.009	0.000	0.035	0.000
Metal Products	P18	0	0.454	0.21%	0.000	0.069	0.000	0.385	0.000
Bakery & Products	P19	0	0.420	0.40%	0.000	0.116	0.000	0.304	0.000
Tanning & Leather Products	P20	0	0.005	0.02%	0.000	0.002	0.000	0.002	0.000

Wood & Products	P21	0	0.060	0.21%	0.000	0.026	0.000	0.034	0.000
Paper & Products	P22	0	0.114	0.11%	0.000	0.041	0.000	0.074	0.000
Village Industries	P23	0	0.124	0.26%	0.000	0.048	0.000	0.076	0.000
Other Manufacturing	P24	0	0.345	0.17%	0.000	0.102	0.000	0.242	0.000
Water	P25	0	0.539	0.39%	0.000	0.296	0.000	0.243	0.000
Electricity	P26	0	0.552	0.28%	0.000	0.304	0.000	0.248	0.000
Construction	P27	0	1.792	0.08%	0.000	1.127	0.000	0.665	0.000
Trade	P28	0	1.709	0.18%	0.000	0.226	0.000	1.483	0.000
Hotels & Restaurants	P29	0	0.187	0.08%	0.000	0.044	0.000	0.143	0.000
Transport	P30-33	0	0.970	0.16%	0.000	0.382	0.000	0.588	0.000
Communications	P34	0	0.330	0.18%	0.000	0.108	0.000	0.222	0.000
Business Services	P35-37	0	2.382	0.18%	0.000	0.323	0.000	2.059	0.000
Central Government	P38	0	0.579	0.02%	0.000	0.016	0.000	0.563	0.000
Local Government	P39	0	0.049	0.02%	0.000	0.004	0.000	0.045	0.000
Services	P40-43	0	0.850	0.12%	0.000	0.131	0.000	0.719	0.000

Source: Own Calculations, 2006.

Factor level

At factor level, the increase in beef exports generated an additional income or improved welfare of about P 20.3 million in all. The major factor beneficiaries are "Mixed Income// F_{10}" and Gross Operating Surplus/GOS, which received P 7.1 million and P 6.7 million respectively (column 4 under "Multiplier") of the total factor impact after a ten percent increase in beef exports. The distribution of the gains among factors or the total factor multiplier impact is displayed in Figure 7.1 below.

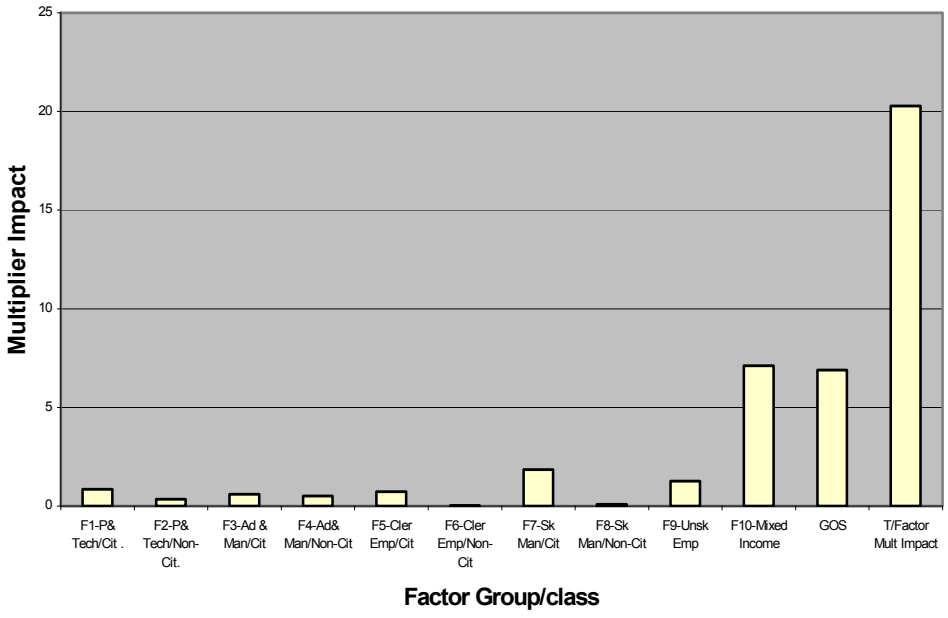

Figure 7.1: Distribution of Additional Factor Income in Botswana after an Increase in Beef Export Earnings (in million Pula)

As indicated in Chapter 6, “Mixed income” is a factor income associated with traditional cattle farming as well as the informal sector, while GOS is a return to owners of capital in the beef industry, including the meat-processing firms: especially the Botswana Meat Commission (BMC), a state-owned organization enjoying an export monopoly on beef. Both mixed income and GOS account for more than 50 percent of the additional total factor income/welfare after an increase in beef exports. Mixed income constitutes one of the main sources of income among self-employed rural households (see Chapter 6). Traditional cattle farming/P_1 is a primary activity that provides intermediate inputs, i.e. cattle for meat processing.

Among workers only citizen skilled manual personnel/P_7 and unskilled workers/F_9 benefited most from the increase in exports originating in the meat-processing activity. This should not necessarily be surprising, as the industry largely requires skilled labour. The increase in export demand for beef benefited skilled manual workers most while unskilled personnel who provide labour for primary cattle farming, the source of intermediate input, gained less. Currently, Botswana is faced with increasing unemployment especially among the young and unskilled people.

Household Level

At the household level, a ten percent increase in beef export earnings led to an additional income of about P 13.6 million in total for all households, excluding other institutions. The main beneficiaries of additional income following an increase in export demand for beef are wage and self-employed households in both urban and rural areas. Altogether, these households accounted for about 87 percent of the total impact on households of the increase in beef export earnings. Additional household income following an initial injection of beef export income into the meat-processing activity ranges from just P 130 000 for rural households dependent on income transfers to about P 3.2 million each for wage-based urban and self-employed rural households. The additional household gains between urban and rural

households dependent on wage income and self-employment, are almost equal.

Households receive their additional income from factors that benefit from an increase in export demand for beef. Increase in export demand in turn leads to more output in the activity account. Mixed income, a factor of unincorporated enterprises, is one of the major sources of income for self-employed households, while wage-reliant households depend on income from workers (see Chapter 6). Primary or traditional cattle farming, which provides intermediate inputs to the meat-processing activity, accounts for about 80 percent of mixed income (1993/94 SAM, CSO, 1999). It is therefore not surprising that an increase in beef export earnings benefits self-employed households the most because they own cattle.

Figure 7.2 illustrates the distribution of additional household income following an injection of beef export earnings initially into the endogenous “meat processing” activity.

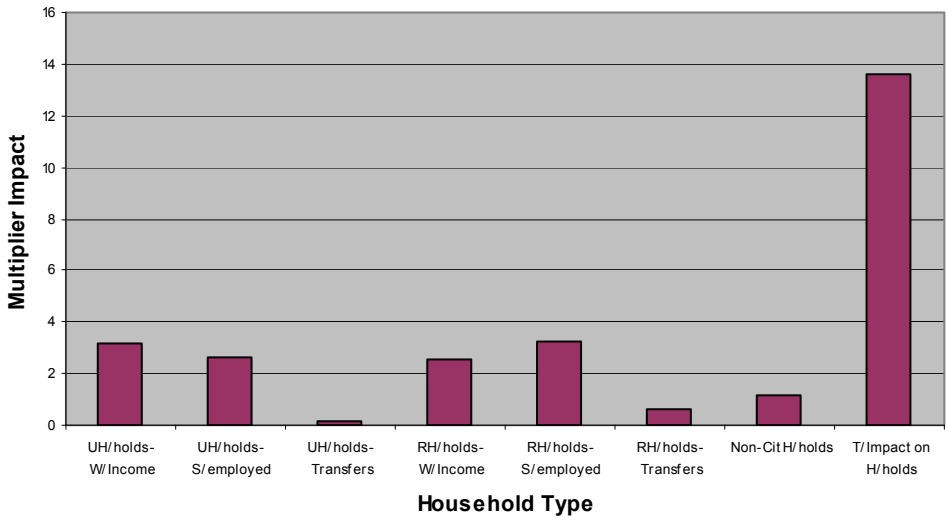

Figure 7.2: Distribution of Additional Household Income after Improved Beef Export Earnings (in million Pula)

Households in both rural and urban areas whose income is reliant on transfers benefit marginally from an increase in beef exports. As a group, these households account for less than one percent of the additional total income that accrues to all households after injecting beef export earnings into the "meat processing" activity. Households which are dependent only on income transfers receive less than 30 percent of the additional income gained by the two top most beneficiaries of household income generated by an increase in export demand for beef (i.e. wage-based urban and self-employed rural households). In fact non-citizen households, as represented in Figure 7.2 gain more than households whose income is derived from transfers. This is primarily because the former depend on wage income while the latter have only a few members of their families in formal employment. Non-citizen households, in general, enjoy an additional advantage over citizen households because they have skilled professional, technical or managerial members in the formal sector (see Chapter 6). Lack of skills and limited formal education in those households dependent on income transfers reduce their opportunities to benefit from wage income. Government is currently increasing access to education and vocational institutions in order to benefit, among others, such households (NDP 9, 2003).

As indicated in Chapter 6, households dependent on income transfers constitute the poorest sections of the country's population and spend at least 36 percent of their disposable income on food (HIES 1993/94, CSO, 1995; HIES 2002/03, CSO, 2004). As the distribution of cattle is highly skewed in Botswana, it should not be surprising that households whose income is derived from transfers do not benefit much from an increase in export demand for beef. Currently, about 45 percent of rural households in the country do not own cattle (CSO, 2002). Ownership of or access to a factor or endowment/asset such as cattle is, clearly, important if households are to benefit from an increased demand for beef exports. In fact improved market access for beef exports in Botswana vindicates Stopler-Samuelson theorem (see Chapter 3). According to this theorem owners of factors of production (including assets) used intensively in the export industry under free or

liberalized trade gain more compared to those who own less. In this case households who own cattle benefit more from improved export market access.

Case studies in Indonesia, Gambia and Mexico employing SAM income multiplier analysis indicate the importance of skilled human resources for the poor to be able to benefit from increased export demand for agricultural products (Thorbecke, 1994). Skilled labour gains relatively more from an increase in external demand because of their scarcity unlike unskilled workers. As access to grazing land in Botswana is increasingly becoming a binding constraint, investment in human capital is now one of the most important determinants for income distribution, because ownership of cattle by the poor faces major technical and economic constraints. Since wage-based households obtain their income mainly from their skilled employed members, households whose income is reliant on transfers could also benefit from an increase in export demand if their human capital base is developed.

In terms of the results of the policy experiment regarding beef exports, it appears that improved export market access for beef under the Doha Development Agenda (DDA) may not necessarily improve the welfare/food security of poor households or those whose income is derived from transfers. Lack of relevant resource endowments, in other words cattle, and wage income do not contribute much to their welfare compared to that of wage-based households, because poor households have very few skilled members employed in the formal sector (see Chapter 6). Income transfers account for about 50 percent of their income. It should, however, be pointed out that SAM multiplier analysis handles income effects between socio-economic groups but fails to capture/measure intra-group income differentials because it assumes zero variance within groups (Thorbecke *et al.* 1999, p.26 and Round, 2003, p.10).

Improved market access for beef exports mainly enhances the incomes of wage-based and self-employed households in both urban and rural areas, together with non-citizen households in Botswana. This means that these

households can, *ceteris paribus*, enhance their income food security by means of increased foreign exchange earnings. Additional foreign earnings from expanded beef exports could be used to purchase and import more food and other household items. The Doha Development Agenda advocates (among other objectives) for improved export market access to products of special interest to developing countries. It further suggests the reduction of tariff and other barriers, especially those erected by industrialized countries that are protecting their farm sectors with tariffs and high domestic subsidies.

From a food security perspective, household income which is augmented as a result of foreign earnings from beef exports increases disposable income. This additional income can be used to increase domestic production by the purchase of farm inputs, or the hiring of animal/mechanical draught power to increase sustainable production. As Botswana is semi-arid and less suited to arable farming, additional household income from beef exports could be used to import food and other household effects. Importing food will augment household supplies and complement domestic production or stocks. In this way, improved access to beef export markets enhances the physical availability of household and national food supplies through imports.

Similarly, additional household income, especially for self-employed and wage-based families in both rural and urban areas, increases, *ceteris paribus*, effective demand for food and other essentials (the economic access component of the food security equation). Regarding nutrition, obviously an important food security component, it is assumed that households will purchase or prepare nutritionally balanced and safe food, whether by means of imports or their own production. The three aspects of physical availability, economic access and nutrition form the basic elements of household food security (World Bank, 1986; World Food Summit, 1996).

However, for households dependent on income transfers, an enlarged beef export market does not contribute much to their food security. The main reasons for this are that these households, unlike self-employed households,

do not own cattle or do they possess the necessary skills for employment in the formal sector. For these households, alternative domestic income and employment opportunities coupled with skills development and safety-nets are critical. Safety-nets include welfare grants, old age pensions and food aid. Concerning employment, efforts are being made to establish sustainable enterprises by providing subsidized capital and training to potential local and foreign investors. Limited success has been achieved in this regard, as in general, the new firms tend to be skill and capital-intensive.

It should also be indicated that the implementation of the Doha Development Agenda will erode trade preferences enjoyed by countries such as Botswana under the current Cotonou Agreement (see results in Chapter 4 on global, agricultural trade liberalization). At present other WTO members feel the current ACP-EU trade agreement is discriminatory and is therefore in conflict with the WTO Agreement on liberalized trade. Recognizing the concerns by other WTO members on ACP-EU trade cooperation, the current Cotonou Agreement which was initially signed in 2000 in Benin and revised in 2005, shows that future trade relations/agreements between the EU and ACP countries will be reciprocal and regional (Cotonou Agreements, 2000 and 2005). The economic partnership agreements or EPAs will promote EU-ACP trade cooperation on reciprocal and regional basis while at the same time complying with the WTO rules. EPAs are expected to be WTO-compliant to avoid trade disputes in which are non ACP countries feel discriminated by the current EU-ACP trade arrangement. Already banana exporters outside the EU-ACP framework have partly won their case (through the WTO) to access the EU market based on the most favoured nation (MFN) treatment. MFN treatment demands equal treatment for all members. Before the WTO ruling, non-ACP countries faced higher import duties before they could access the EU market.

Further, EPAs including the envisioned SADC-EU Economic Partnership Agreement will cover development /economic assistance, regional integration, trade, investment, etc in the respective regional free trade areas. The planned

development assistance is meant to allow ACP countries to adjust and integrate fully into the global economy. It is also expected that development assistance in the agricultural sector by the EU to EPAs will concentrate on the minimally-trade distorting "green box measures". The green box measures of the WTO Agreement on Agriculture cover public goods such as infrastructure (roads, telecommunications), research, extension, pest and disease control, human resource development, environment, conservation, etc (Agreement on Agriculture, WTO, 1995). Assistance to Botswana to implement minimally trade-distorting measures as the green box provisions will enable her, *inter alia*, to address the perennial supply-side constraints in the beef industry to benefit from improved export market access. Supply-side constraints are mainly due to underdeveloped physical and marketing infrastructure, lack of appropriate technology, effective pest and disease control mechanisms, skills, etc. In general, almost all WTO members support the continued implementation of the green box measures to develop agriculture provided there is discipline to prevent the use of farm subsidies that distort trade such as input and price support especially by industrialized countries (WTO Ministerial Declaration, Hong Kong, 2005).

Activity level

Of the total P 44.2 million gained by 29 endogenous activities, after an injection of P 17.4 million worth of beef export income into the "meat processing/P_{12}", the main beneficiaries are the seven activity sub-accounts: meat processing itself (P 17.9 million), traditional cattle (P 7.1 million), freehold farming (P 3.2 million), business services (P 2.4 million), dairy processing (P 1.8 million), construction (P 1.8 million) and trade (P 1.7 million).[7] These activity sub-accounts gain each at least P1 million worth of additional output (see figures in bracket for each activity) after a ten percent increase in beef exports. The meat-processing activity alone accounts for about 41 percent of the additional total activity output gained, while traditional

[7] The total of P 44.2 million is obtained by adding the figures opposite each activity under the Multiplier Column in Table 7.1.

cattle farming, the supplier of intermediate input, contributed about 16 percent of the total activity output gained. The seven activity sub-accounts demonstrate very strong inter-industry linkages through input-output interactions following an external income shock.

The remaining 22 activities almost all gained from an injection of beef export income, although they each registered an additional output of less than P 1 million. By means of conventional Leontief input-output or inter-industry interactions, these activities recorded incremental outputs ranging from just P 10 000 for transport and equipment, tanning and leather products and local government to about P 970 000 for transport/$P_{30\text{-}33}$. Whilst the inter-industry or input-output linkages between the 22 activities are relatively weaker than for the first seven sub-accounts indicated earlier, it is evident that an increase in beef export demand has evidently significant sectoral linkages in Botswana's economy. Specifically, activities like traditional cattle production/P_1 and freehold beef farming/P_3, which provide primary inputs into meat processing/P_{12}, demonstrate relatively strong input-output linkages with the latter following an increase in beef export demand.

The existence of strong sectoral linkages augurs well for efforts to improve market access in industrialized countries, in particular, in order for a relatively competitive beef export industry in Botswana to contribute to rural development and household welfare. Non-agricultural activities such as transport, business services, construction, trade, services, water and electricity also demonstrate the importance of forward and backward linkages between the meat-processing activity and other productive enterprises, something that partial equilibrium or sectoral policy analysis normally ignores or underestimates.

One other important policy implication of the effects of improved market access for Botswana beef exports, is that the country should address supply-side constraints to meet export demand. Whilst beef farming is largely extensive, grazing land and access to portable water are increasingly

becoming binding factors in cattle farming. As a result, strategies that improve productivity on current range lands supported by appropriate technology, efficient marketing infrastructure, disease control measures, etc are critical for the economic and environmental sustainability of the industry.

7.3.2 The Effects on Food Security of an Increase in Beef Export Earnings, based on Stone's Additive Multiplier

In the preceding analysis, we examined the effects of a ten percent increase in beef export earnings based on the multiplicative multiplier, $\mathbf{M_a^x}$, used by Pyatt and Round. In this section we now employ the additive multiplier approach to analyze the effects of improving beef export earnings on household food security. As indicated in Chapter 5, Stone's additive multiplier matrix is given as I+T+O+C= $\mathbf{M_a^x}$, where I represents an identity, T stands for transfer effects, O covers inter-group effects while C represents the circular flow. M_a^x still represents the multiplicative multiplier as in the previous analysis.

$\mathbf{M_a^x}$ as a multiplicative multiplier is not disaggregated, unlike Stone's additive multiplier. By means of the decomposed Stone's additive multiplier it is possible to identify which effects (transfer, inter-group or circular) dominate the influence of the external shock on the endogenous account. Below we will now examine the effects of the disaggregated additive multiplier on household food security following a ten percent increase in beef export earnings at factor, household and activity levels.

Factor level

In almost all the factor accounts, the inter-group or open-loop effects (O) dominate, while the circular or closed-loop (C) effects only prevail over more than one or two factors. Table 7.2 shows Stone's disaggregation of the multiplier effects on the factor account after an injection of beef export income. This information is extracted from Table 7.1. There are no transfer

effects among factor sub-accounts. Except for non-citizen professional and technical workers/F_2 where the C multiplier effects are largest, for several factors the open-loop or inter-group (O) effects are at least twice greater than the C effects (mixed income/F_{10}, unskilled employees/F_9, skilled manual/F_7, etc.). The inter-group or open-loop (O) effects measure the results arising from a policy shock/injection that completes its tour outside its original group without returning to it (the group) while the C effects capture the circular flow of the external shock through all groups. The O effects, also known as cross/spill-over effects, capture the impact on meat processing, initially, and on factors and households and other activities following an increase in beef export demand (Round, 2003, p.11).

As additional beef export income is injected into various activities, additional demand on factors is created. Increased demand for beef exports leads to employment and compensation of the factors of production by means of inter-group/spill-over income and expenditure interactions. Table 7.2 shows that factors like “mixed income, gross operating surplus and skilled manual/F_7 and unskilled workers/F_{10}” (in the second fifth column under Stone’s decomposed open-loop “O” effects) benefited the most from open-loop (O) or inter-group interactions. For instance, mixed income gained P 6.07 million additional factor income, while gross operating surplus/GOS came second and recorded an additional return to owners of capital worth P 3.57 million. Other workers who also gained significantly from open-loop effects comprise (citizen) professional and technical workers/F_1, administrative and managerial staff/F_3 as well as clerical officers/F_5. If mixed income and capital are excluded, skilled workers as opposed to unskilled personnel gained more from an injection of additional beef export income into endogenous accounts through open-loop effects.

The closed-loop (C) effects in Table 7.2 capture the complete circular flow of income among all endogenous accounts, indicating interdependency or integration in the economy following a shock from beef exports (Powell & Round, 1997). Compared to open-loop effects, the factor account shows that

the closed-loop (C) effects are smaller in almost all factor sub-accounts except for (non-citizen) professional and technical personnel/F_2. This implies a limited circular flow of beef export income among endogenous accounts.

Table 7.2: Stone's Disaggregated Multipliers on the Factor Income

Factor Group	Multiplier	I	T	O	C
F1-P& Tech/Cit.	0.859	0	0	0.521	0.338
F2-P& Tech/Non-Cit.	0.345	0	0	0.139	0.206
F3-Ad & Man/Cit.	0.604	0	0	0.404	0.200
F4-Ad& Man/Non-Cit.	0.505	0	0	0.298	0.207
F5-Cler Emp/Cit.	0.729	0	0	0.390	0.339
F6-Cler Emp/Non-Cit.	0.015	0	0	0.010	0.005
F7-Sk Man/Cit.	1.851	0	0	1.319	0.533
F8-Sk Man/Non-Cit.	0.089	0	0	0.038	0.051
F9-Unsk Emp.	1.268	0	0	0.917	0.351
F10-Mixed Income	7.118	0	0	6.070	1.048
GOS	6.893	0	0	3.569	3.324
T/Factor Multi Impact	20.276	0	0	13.673	6.603

Source: Own calculations, 2006

Briefly, the economic policy implications, arising from Stone's disaggregated multipliers, to the factor account after an increase in demand for beef exports reveal interesting structural features of Botswana's economy. Firstly, an increase in beef export demand leads to additional employment of factors by endogenous activities including meat processing, the initial entry of the policy shock. Mixed income, gross operating surplus, skilled and unskilled manual workers (citizens) benefit most from increased production by activities to meet export demand for beef. Other workers like professional, administrative and clerical staff (all citizens) also benefit significantly from income generated by activities to meet additional export demand.

Secondly, the inter-group or open-loop (O) effects have a greater impact on factor employment and income compared to closed-loop (C) or circular effects. This implies stronger income leakages through inter-group interactions, compared to the complete circular flow of income among

endogenous activities. As a result, additional beef export income does not lead to stronger closed-loop effects or interdependence among endogenous accounts (factors, households and activities) for the complete circulation of income. Weak closed-loop effects suggest limited economic integration (Thorbecke, 1994; Powell and Round, 1997; Round, 2003). Similar results concerning the dominance of open-loop or inter-group effects over closed-loop effects under the factor account have been observed in a case study of Ghana, using a SAM fixed price multiplier approach (Powell and Round, 1997; Round, 2003).

Whilst unskilled manual workers benefit significantly from an external beef export income injection, by and large skilled workers benefit still more, and this finding implies a bias towards intensity in skills. Whereas mixed income also covers returns to labour in unincorporated informal enterprises which employ unskilled labour, the results of the disaggregated multiplier effects on factor income indicate a bias towards employment of relatively skilled personnel, a development which may not contribute much to addressing the issue of rising unemployment among young and unskilled school leavers in Botswana. Evidently, it is critical that Botswana provide technical knowledge to upgrade workers with skills for them to be able to benefit from increases in export demand for commodities like beef. Already government is investing in technical skills through the establishment of vocational training centres as well as the creation of a second university to specialize in science and technology.

Household level

As in the factor account, the inter-group or open-loop (O) effects dominate all household accounts. Table 7.3 displays Stone's disaggregated multiplier effects on the Household Account after an injection of beef export income, initially, into "meat processing".

Table 7.3: Disaggregated Fixed-Price Multiplier Effects by Household after an Increase in Beef Exports

	Ma * Dx	I	T	O	C
UH/holds - W/Income	3.205	0.000	0.000	2.260	0.945
UH/holds - S/employed	2.665	0.000	0.000	2.186	0.479
UH/holds – Transfers	0.134	0.000	0.000	0.108	0.025
RH/holds - W/Income	2.560	0.000	0.000	1.827	0.733
RH/holds - S/employed	3.253	0.000	0.000	2.667	0.586
RH/holds – Transfers	0.638	0.000	0.000	0.515	0.123
Non-Citizen H/holds	1.181	0.000	0.000	0.672	0.510
Total Impact	13.636	0.000	0.000	10.235	3.401

Source: Own calculations, 2006

In Table 7.3, as under factors described earlier, the O or open-loop effects dominate circular or C effects by a factor of at least two in most cases. For instance, the analysis of additional income for urban households based on wage income (UH/holds-W/income) shows that these households gained P2.26 million under open-loop effects while through closed-loop effects the same households only registered a net benefit of P 0.945 million, which is less than half. This feature is true for almost all citizen households.

Open-loop effects again contributed over fifty percent of additional total household income following the injection of beef export income into all endogenous accounts. Additional household income gained through “O” multiplier effects, as earlier indicated, benefited mainly wage-based and self-employed (citizen) households in both rural and urban areas. Whilst (citizen) households based on income transfers gained more through “O” multiplier effects, their additional income was still far less than that which wage-based and self-employed households received under the same effects. Closed-loop effects only contributed less than fifty percent of additional total household income after an increase in beef exports.

As households, like other institutions, receive their income from factors, the results of Stone’s additive and decomposed multipliers reveal some interesting features about the country’s economy. Whilst additional beef export income creates more demand for factors by activities in order to meet

external demand, additional factor income translates into further household income. The additional household income is mainly generated through open-loop or cross/spill-over effects while the closed-loop effects contribute the remainder. The dominance of open-loop or "O" effects over closed-loop effects, demonstrates weak interdependence or integration among endogenous activities (factors, households and activities).

The closed-loop effects, also known as interdependency effects, "reflect the extent of integration within an economy, on both the consumption and production sides. The more consumers spend on domestic goods and services, the more diversified their consumption patterns, the larger the interdependency effects" (Thorbecke, 1994, p.26). In the event of weak closed-loop effects, this strongly implies limited domestic economic diversification, a major policy challenge facing Botswana, since the capital-intensive diamond sector still dominates. The sector accounts for at least 30 percent of the country's GDP and this has been the trend for more than 20 years (NDP 9 and MFDP, 2003). Scarcities of skills and management have been identified as some of the key constraints of economic diversification in several national development plans. Current government policies and programmes, offering education and an emphasis on technical, business and management training, are intended to meet private sector demand, in particular, for skilled manpower. Scholarships and grants for undergoing technical, business and management training have been provided to citizens.

Further, we can also note that part of the reason for the limited economic integration could also be found in the basic assumptions of the SAM fixed price multiplier analysis itself. In terms of this approach, prices are held constant and no dynamic effects are introduced, while excess capacity and underemployment of factors are also assumed. Substitution effects are not allowed owing to fixed prices, while excess capacity could be confined to certain sectors of the economy, not necessarily all industries.

No transfer (T) effects were observed in the household account following the injection of beef export income into endogenous activities. Similar findings were also recorded for the household account in the Ghana case study (Powell and Round, 1994; Round, 2003).

Activity Level

Disaggregated multiplier results of introducing additional beef export income into activities are recorded in Table 7.4 below. We can observe from this table that the three primary agricultural activities (traditional cattle/P_1, free-hold farms/P_3), together with dairy processing/P_{13} and construction/P_{27} and the transfer (T) effects (column five) dominate the circular (C) effects by at least a factor of five, excepting other agriculture/P_2, after an increase in beef export earnings. For instance, traditional cattle farming registers a gain in output worth P 6.24 million under T effects while through closed-loop (O) effects, the same activity only gains about P 0.84 million (see column 5 in Table 7.4).

Also known as “intra-group” effects, transfer effects capture the typical Leontief input-output interactions or inter-industry interrelationships. This means that in order to meet demand for beef exports, the injection of income into meat processing triggers an increase of output in other activities. Traditional cattle and freehold farming, in particular, provide intermediate inputs (cattle) into meat processing. The relatively high multiplier for “meat processing” under the fourth column, “I”, captures the initial impact of the shock or injection.

Table 7.4: Disaggregated Fixed Price Multiplier Effects on the Activity Account

Income Multiplier Experiment

			Multiplier	Stone			
		Shock (Dx)	Ma * Dx	I	T	O	C
Trad. Agric - Cattle	P1	0	7.073	0.000	6.236	0.000	0.837
- Other	P2	0	0.661	0.000	0.352	0.000	0.309
Freehold Farms	P3	0	3.255	0.000	2.999	0.000	0.256
Hunting, Fishing & Gathering	P4	0	0.647	0.000	0.276	0.000	0.371
Mining	P5-11	0	0.199	0.000	0.113	0.000	0.086
Meat Processing	P12	17.386	17.911	17.386	0.018	0.000	0.507
Dairy & Other Agric. Processing	P13	0	1.833	0.000	1.091	0.000	0.742
Beverages	P14	0	0.678	0.000	0.017	0.000	0.661
Textiles	P15	0	0.176	0.000	0.014	0.000	0.162
Chemicals	P16	0	0.190	0.000	0.092	0.000	0.098
Transport & Equipment	P17	0	0.045	0.000	0.009	0.000	0.035
Metal Products	P18	0	0.454	0.000	0.069	0.000	0.385
Bakery & Products	P19	0	0.420	0.000	0.116	0.000	0.304
Tanning & Leather Products	P20	0	0.005	0.000	0.002	0.000	0.002
Wood & Products	P21	0	0.060	0.000	0.026	0.000	0.034
Paper & Products	P22	0	0.114	0.000	0.041	0.000	0.074
Village Industries	P23	0	0.124	0.000	0.048	0.000	0.076
Other Manufacturing	P24	0	0.345	0.000	0.102	0.000	0.242
Water	P25	0	0.539	0.000	0.296	0.000	0.243
Electricity	P26	0	0.552	0.000	0.304	0.000	0.248
Construction	P27	0	1.792	0.000	1.127	0.000	0.665
Trade	P28	0	1.709	0.000	0.226	0.000	1.483
Hotels & Restaurants	P29	0	0.187	0.000	0.044	0.000	0.143
Transport	P30-33	0	0.970	0.000	0.382	0.000	0.588
Communications	P34	0	0.330	0.000	0.108	0.000	0.222
Business Services	P35-37	0	2.382	0.000	0.323	0.000	2.059
Central Government	P38	0	0.579	0.000	0.016	0.000	0.563
Local Government	P39	0	0.049	0.000	0.004	0.000	0.045
Services	P40-43	0	0.850	0.000	0.131	0.000	0.719
Total Activity Impact			44.127	17.386	14.584	0.000	12.157

Source: Own calculations, 2006

After the dominance of transfer effects which result from input-output industry interactions, Table 7.4 indicates the strength of closed-loop effects in all the remaining 25 endogenous activities. Closed-loop effects capture interdependence or integration within an economy following the introduction of a shock. Unlike the factor and household accounts, the activity account

exhibits very strong closed-loop effects, which in turn capture the full, circular, flow of income/expenditure among endogenous activities after a shock. This development further indicates a degree of economic diversification that was very weak in the factor and household disaggregated multipliers. The circular flow of income or shock in an economy is one of the main features demonstrated by a country's SAM (see Chapter 6).

It is also worth observing that when the disaggregated effects in Table 7.4 are expressed as a proportion of total activity impact, that is P44.127 million, transfer (T) effects are greater than closed-loop effects. Transfer effects account for 33 percent (14.584/44.127*100) of total activity impact after an injection of additional beef export income while closed-loop effects contribute about 28 percent (12.157/44.584*100). Overall, the activity impact is dominated by the contribution of transfer effects or Leontief input-output inter-industry income interactions. This further suggests limited economic integration or diversification in the economy, although at activity level, interdependence among endogenous accounts is stronger than at factor and household levels (see Tables 7.2 and 7.3).

The analysis of Stone's additive and decomposed multipliers in the activity account in Table 7.4 suggests important economic implications for Botswana. The overall dominance of transfer effects or Leontief input-output interactions indicates strong input-output industry interactions or transfer effects following the introduction of a shock. Specifically, an increase in beef export demand triggered, overall, stronger transfer (T) effects or Leontief input-output inter-industry interactions than closed-loop effects. This implies that an income shock to the meat processing activity after an increase in beef export demand created strong inter-industry interactions, in order to raise output so as to meet external demand. It should also be borne in mind that the overall dominance of transfer effects also suggests limited interdependency effects or economic integration which is achieved through closed-loop effects owing to the complete circular flow of income among endogenous accounts.

Furthermore, compared to the initial income injection of P17.386 million in meat processing (see column 5 under "I"), additional total activity output owing to transfer effects is smaller (P14.584 million), which suggests weak input-output inter-industry interactions in the economy. Presumably the introduction of additional technical and managerial skills coupled with infrastructural support could improve activity output, owing to inter-industry interactions.

Whilst overall the transfer effects are greater than closed-loop effects, it is also worth noting that for most activities, closed-loop effects dominate. For these 25 activities, the dominance of closed-loop effects suggests relatively strong economic integration among endogenous accounts, which in turn enhances the diversification of the country's economy. However, compared to the initial income injection of P17.386 million in meat processing (see column 5 under "I"), overall increase in activity output owing to closed-loop effects, as was the case with transfer effects, is smaller (P12.127 million). This implies a weak full circular flow of income among endogenous accounts or low interdependency effects which contribute towards economic diversification.

Improvements in economic diversification constitute some of Botswana's current policy challenges (NDP 9, 2003). Enhanced economic integration exhibits a full and complete circulation of income among endogenous accounts after a policy shock. Government and the private sector continue to address the technical, institutional and infrastructural constraints that, if dealt with, could enhance inter-economic integration and diversification, in order to generate scarce employment opportunities among other results. No open or inter-group effects were observed among activities in Table 7.4.

7.4 Policy Simulation based upon an increase in textiles export earnings

The textiles industry has been identified as a potential sector for sustainable economic diversification and employment creation, as well as for generating foreign earnings to be used in importing food, inputs, machinery, technology, and the like (NDP 9, 2003). Currently, Botswana exports textiles and clothing

to the United States under a preferential trade agreement. This agreement, commonly referred to as the Africa Growth Opportunity Act (AGOA), allows developing countries in Africa to access the US textiles and clothing market duty-free. Through AGOA Botswana has obtained additional scarce export earnings while employment opportunities for less-skilled women, in particular, have been created to enhance household income and food security.

Whilst most of the poor or food-insecure households are situated in the rural areas, growing numbers of impoverished households are found in urban areas (HIES 2002/03, 2004). Some of these households depend on income transfers (see Chapter 6). In fact poverty or food insecurity is no longer merely a rural phenomenon but constitutes a nationwide concern. As textile activities are based mostly in urban areas, it is assumed that diversification into this sector could also enhance income and food security of households, including those dependent on income transfers. Botswana's textiles industry is export-led. Over the last few years, textiles export earnings have surpassed beef foreign earnings indicating the potential of the industry (External Trade Statistics 2000-05, CSO, 2006). The relatively low wage rate enjoyed by Botswana coupled with improved infrastructure, technology and a pool of skilled youth could promote loose industries like textiles if niche markets are identified (Barnes, 2005; Department of Labour, 2006).

7.4.1 The Effects of an Increase in Textiles Export Earnings/Income on Food Security based upon the Multiplicative Multiplier, M_a^x

As the textiles has been identified as a potential sector for economic diversification and employment creation, we examine the effects of a ten percent or P 10.329 million increase in textiles export earnings on household food security at factor, household and activity levels. The ten percent increase is also based on the similar growth rate earlier adopted for beef. If Botswana exploits some of her comparative advantages including a stable macro-economic environment, it is possible for the country to increase her textiles exports like high-wage countries in south-east Asia.

Table 7.5 records the multiplier results of the policy shock in all 50 endogenous accounts. The policy shock is introduced into the "textiles" activity/$P_{15.}$ The analysis of the results in the subsequent paragraphs will be undertaken, as before, at factor, household and activity levels.

Table 7.5: Fixed Price Multiplier Effects after an Increase in Textiles Exports

Income Multiplier Experiment								
			Multiplier		**Stone**			
		Shock (Dx)	Ma * Dx	**I**	**T**	**O**	**C**	Check
Prof. & Tech Employees - Cit.	F1	0	0.374	0.000	0.000	0.230	0.144	0.000
Prof. & Tech. Employees - Non-Cit.	F2	0	0.303	0.000	0.000	0.215	0.087	0.000
Admin & Manag. Employees - Cit.	F3	0	0.250	0.000	0.000	0.170	0.079	0.000
Admin & Manag. Employees - Non-Cit.	F4	0	0.550	0.000	0.000	0.470	0.080	0.000
Clerical Employees - Citizens	F5	0	0.442	0.000	0.000	0.305	0.137	0.000
Clerical Employees - Non-Citizens	F6	0	0.005	0.000	0.000	0.003	0.002	0.000
Skilled Manual - Citizens	F7	0	2.017	0.000	0.000	1.803	0.215	0.000
Skilled Manual - Non-Citizens	F8	0	0.335	0.000	0.000	0.315	0.020	0.000
Unskilled Employees	F9	0	0.637	0.000	0.000	0.494	0.143	0.000
Mixed Income	F10	0	0.412	0.000	0.000	0.061	0.351	0.000
Gross Operating Surplus	GOS	0	3.635	0.000	0.000	2.337	1.298	0.000
Urban Households - Wage Income	I1	0	1.802	0.000	0.000	1.425	0.378	0.000
Urban Households - Self-employed	I2	0	0.391	0.000	0.000	0.221	0.170	0.000
Urban Households - Transfers	I3	0	0.024	0.000	0.000	0.015	0.009	0.000
Rural Households - Wage Income	I4	0	1.279	0.000	0.000	0.988	0.291	0.000
Rural Households - Self-employed	I5	0	0.602	0.000	0.000	0.393	0.209	0.000
Rural Households - Transfers	I6	0	0.145	0.000	0.000	0.100	0.045	0.000
Non-Citizen Households	I7	0	1.215	0.000	0.000	1.011	0.204	0.000
Non-Financial Enterprises	Non-Fin	0	3.210	0.000	0.000	2.064	1.146	0.000
Financial	Fin	0	-0.034	0.000	0.000	-0.022	-0.012	0.000
Private Non-Profit Institutions	NPI	0	0.039	0.000	0.000	0.025	0.014	0.000
Trad. Agric - Cattle	P1	0	0.291	0.000	0.014	0.000	0.277	0.000
- Other	P2	0	0.106	0.000	0.005	0.000	0.101	0.000
Freehold Farms	P3	0	0.091	0.000	0.007	0.000	0.084	0.000
Hunting, Fishing & Gathering	P4	0	0.146	0.000	0.031	0.000	0.116	0.000
Mining	P5-11	0	0.101	0.000	0.066	0.000	0.034	0.000
Meat Processing	P12	0	0.183	0.000	0.008	0.000	0.176	0.000
Dairy & Other Agric. Processing	P13	0	0.323	0.000	0.079	0.000	0.244	0.000
Beverages	P14	0	0.277	0.000	0.006	0.000	0.272	0.000
Textiles	P15	10.33	12.188	10.329	1.795	0.000	0.065	0.000
Chemicals	P16	0	0.092	0.000	0.055	0.000	0.037	0.000
Transport & Equipment	P17	0	0.026	0.000	0.007	0.000	0.019	0.000
Metal Products	P18	0	0.180	0.000	0.029	0.000	0.150	0.000
Bakery & Products	P19	0	0.103	0.000	0.008	0.000	0.095	0.000

Tanning & Leather Products	P20	0	0.001	0.000	0.001	0.000	0.001	0.000
Wood & Products	P21	0	0.031	0.000	0.021	0.000	0.011	0.000
Paper & Products	P22	0	0.114	0.000	0.082	0.000	0.032	0.000
Village Industries	P23	0	0.069	0.000	0.040	0.000	0.029	0.000
Other Manufacturing	P24	0	0.228	0.000	0.144	0.000	0.084	0.000
Water	P25	0	0.342	0.000	0.215	0.000	0.127	0.000
Electricity	P26	0	0.497	0.000	0.378	0.000	0.119	0.000
Construction	P27	0	0.695	0.000	0.439	0.000	0.256	0.000
Trade	P28	0	1.147	0.000	0.541	0.000	0.606	0.000
Hotels & Restaurants	P29	0	0.182	0.000	0.123	0.000	0.059	0.000
Transport	P30-33	0	0.613	0.000	0.365	0.000	0.248	0.000
Communications	P34	0	0.359	0.000	0.256	0.000	0.103	0.000
Business Services	P35-37	0	1.981	0.000	1.211	0.000	0.770	0.000
Central Government	P38	0	0.262	0.000	0.014	0.000	0.247	0.000
Local Government	P39	0	0.036	0.000	0.017	0.000	0.019	0.000
Services	P40-43	0	0.991	0.000	0.652	0.000	0.339	0.000

Source: Own calculations, 2006

Factor level

Figure 7.3 indicates that of the total additional factor income of P 8.960 million generated by an increase in demand for textiles exports, about 41 percent was gained by owners of capital or gross operating capital/GOS while (citizen) skilled and unskilled manual workers gained 23 percent and 7 percent respectively. (Non-citizen) administrative managerial staff also gained about 6 percent of total factor income. Figure 7.3 also illustrates that other factor groups that gained from additional income originating from an increase in textiles exports include (citizen) clerical staff, mixed income, professional and technical personnel (both citizen and non-citizen) and (non-citizen) skilled manual workers.

Relative to other worker groups, it is evident from figure 7.3 that, overall, the textiles industry is skill-intensive and this is likely to hurt Botswana, especially when targeting high-income and quality-sensitive markets in the industrialized countries. Low-wage and leading textiles and clothing exporting countries such as China, India, Pakistan, Thailand, Bangladesh and Vietnam will also create employment problems for high-cost producing countries such as Botswana (UNCTAD, 2004; FIAS, 2004).

UNCTAD observes that high quality standards, low production costs including wages, compliance with importing customer and legal requirements, etc will determine the benefits to be gained from global textiles trade liberalization (UNCTAD, 2004). The multi-fibre agreement has further liberalized the textiles industries by removing quotas, hence the recent dominance of low-cost exporters such as China. Land-locked and high-cost countries like Botswana may not benefit from more liberalized textiles and clothing industries unless certain trade preferences are retained for some time so as to build technical and business capacities as well as to identify niche markets. As a result, further textiles and clothing global trade liberalization holds major policy implications for Botswana, in creating competitive and yet sustainable employment opportunities for the unskilled workforce as well as improving the incomes of the poor. All raw materials for the textiles and clothing industries are imported, while economies of scale in these activities may also work against Botswana.

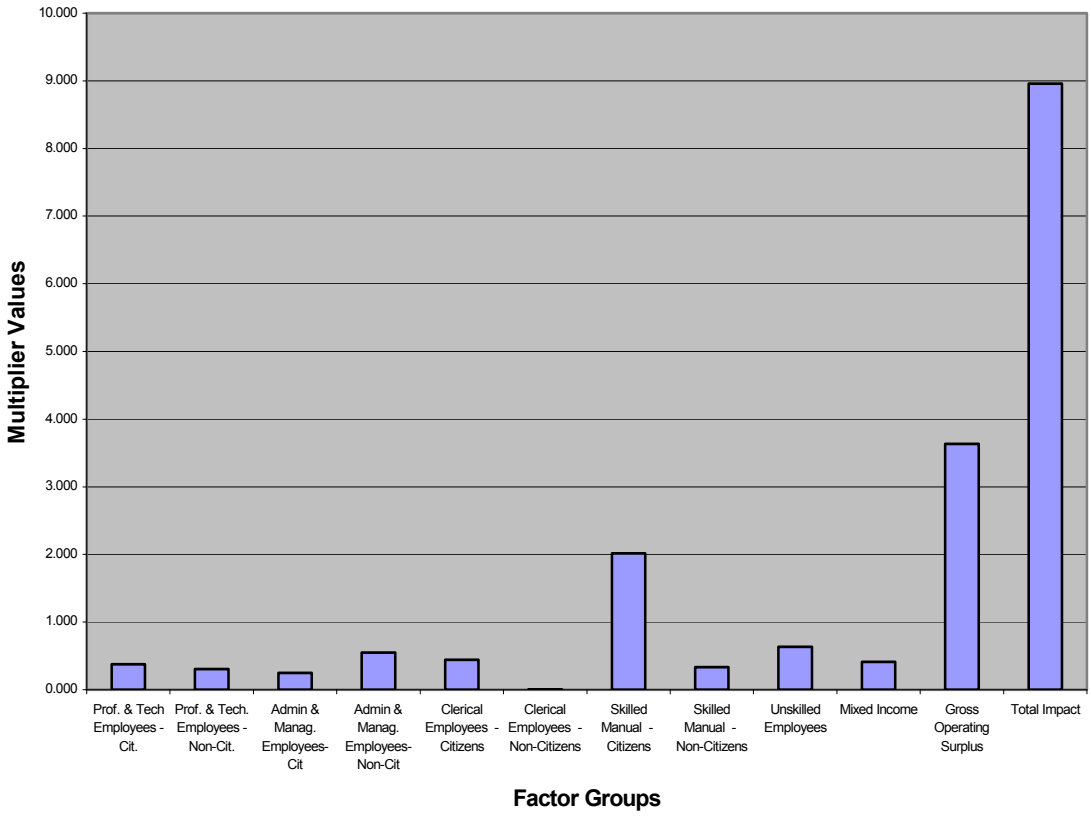

Figure 7.3: Distribution of Additional Factor Income after an increase in Textiles Exports

Household Level

Figure 7.4 illustrates the distribution of additional income at household level, after an initial injection of about P 10.329 million into the textiles activity in order to meet external demand. Of the total additional household income of P 5.458 million gained from an increased demand for textiles exports, wage-based households altogether received about 56 percent. Wage-based households in urban areas gained 33 percent of the total additional household income while their rural counterparts received about 23 percent. Non-citizen households gained about 22 percent of the total additional household income.

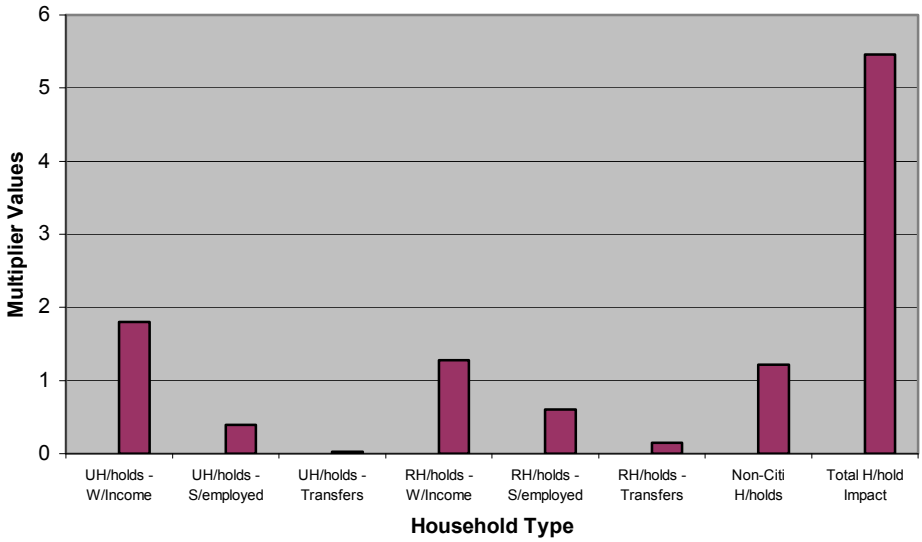

Figure 7.4 Distribution of Additional factor Income after Textile Earnings

Households obtain their income from factors they own, such as labour and capital. As a result, wage-based households received their additional income from their members who were employed in the textiles industry. The relative income share for non-citizen households results from the employment of skilled non-citizen workers in the textiles industry.

Self-employed households altogether shared about 18 percent of the total household income gained from increased demand for textiles. Figure 7.6 indicates that self-employed households based in the rural areas gained more than their urban counterparts. Households dependent on income transfers

altogether shared about three percent of the total household income gained through an increase in demand for textiles exports. As indicated earlier, such households constitute the poorest in the country. Possessing limited endowments in skilled human resources, these households, unlike wage-based ones, do not benefit much from a booming textiles industry.

Given the apparently unfavourable conditions for textiles development in Botswana, it is therefore unlikely that expanding textiles exports will generate sustainable employment opportunities and also contribute to poverty alleviation in this country. In particular, as countries with a comparative advantage (natural resources), lower production costs including low wage rates and skilled personnel intensify their competition in a more liberalized global textiles industry, price-takers and high-cost countries like Botswana will find it extremely difficult to maintain a foothold. The implications for Botswana are that niche markets should be identified while skills development and quality standards are enhanced in order to access the highly competitive global textiles and clothing markets. Government has therefore established vocational and industrial training centres to develop, among other capacities, technical and management skills in these industries.

Activity level

Of the P 21.657 million total activity output gained after an injection of textiles export income, about 56 percent was generated by the textiles industry itself while the next most important beneficiary activity was business services, which registered an additional nine percent increase in output. Trade and services each displayed a five percent increase in output following an injection of textiles export income. These activity output gains are primarily owing to inter-industry output interactions. An analysis of the disaggregated multiplier effects will shed more light on this aspect.

After textiles, business services, trade and services, the next activities to gain from an injection of textiles export income are construction, electricity, and

communications and water, while primary agricultural activities (cattle farming, other agriculture and freehold farming) altogether registered only a three percent increase in output. As indicated earlier, all raw materials in the textiles industry are imported, since Botswana is generally not suited to viable cotton production owing to unfavourable climatic factors.

The few activities benefiting from an increase in textiles exports suggest very limited inter-industry linkages. This further implies very weak prospects for economic diversification in the textiles industry unless niche markets are identified, and skills and high quality standards developed competitively. In general, countries with a comparative advantage in textiles and clothing industries and also endowed with skills, coupled with lower production and marketing costs, usually demonstrate strong inter-industry linkages (UNCTAD, 2004). As the UNCTAD observes, " factors such as…cost reduction, quality, investments in modern technologies, and product innovation are regarded as key ingredients for creating dynamic textiles and clothing industries… there will be a relocation to countries with lowest wages" (UNCTAD, 2004, p.8). For Botswana, this adds more pressure to be globally competitive in the textiles and clothing industries.

7.4.2 Effects of an Increase in Textiles Export Earnings based upon the Stone's Additive Multiplier

As in the previous sections, we now also examine the effects of an increase in textiles export earnings on household food security based on decomposed additive multipliers which captures the transfer (T), open-loop (O) and closed-loop (C) effects. Below we analyze these effects on the endogenous accounts after introducing a policy shock, namely an increase in export income from textiles. The analysis is once again undertaken at factor, household and activity levels.

Factor level

At factor level based on Stone's additive and decomposed multiplier analysis, it is evident from Table 7.6 that of the total factor income of P 8.960 million gained after an increase in textiles export demand, about 75 percent was generated through open-loop (O) effects while the remaining 25 percent stemmed from closed-loop (C) effects. As a result of open-loop effects, gross operating surplus/GOS and (citizen) skilled manual workers gained 37 percent and 28 percent respectively from the total factor income.

Table 7.6: Disaggregated Fixed Price Multiplier Effects on the Factor Level after Textiles Exports

Factor	Ma * Dx	I	T	O	C
Prof. & Tech Employees - Cit.	0.374	0.000	0.000	0.230	0.144
Prof. & Tech. Employees - Non-Cit.	0.303	0.000	0.000	0.215	0.087
Admin & Manag. Employees - Cit.	0.250	0.000	0.000	0.170	0.079
Admin & Manag. Employees - Non-Cit	0.550	0.000	0.000	0.470	0.080
Clerical Employees - Citizens	0.442	0.000	0.000	0.305	0.137
Clerical Employees - Non-Citizens	0.005	0.000	0.000	0.003	0.002
Skilled Manual - Citizens	2.017	0.000	0.000	1.803	0.215
Skilled Manual - Non-Citizens	0.335	0.000	0.000	0.315	0.020
Unskilled Employees	0.637	0.000	0.000	0.494	0.143
Mixed Income	0.412	0.000	0.000	0.061	0.351
Gross Operating Surplus	3.635	0.000	0.000	2.337	1.298
Total Impact	8.960	0.000	0.000	6.404	2.556

Source: Own calculations, 2006

In addition, Table 7.6 indicates that most factor groups gained more through open-loop effects except for the mixed income group, whose additional income came mainly from closed-loop effects. Open-loop effects capture the effects of increased textiles production (in order to meet export demand) on factor and household income while taking into account production linkages only (Powell and Round, 1997). This demonstrates very weak interdependency effects or integration among accounts.

Under closed-loop effects, Table 7.6 illustrates that the full and complete circulation of additional income at factor level is very weak, since open-loop effects dominate. The implication is that at factor level, the additional textiles export income does not enjoy full circulation owing to limited integration among endogenous accounts. Specifically, this implies limited income-expenditure interactions among the accounts that in turn adversely affect efforts by government to achieve economic diversification by means of textiles.

Household Level

Insofar as the household account is concerned Table 7.7 records disaggregated multiplier effects after an injection of textiles export income.

Table 7.7: Disaggregated Fixed Price Multiplier Effects on the Household Account after Textiles Exports

Household Type	Multiplier	I	T	O	C
UH/holds - W/Income	1.802	0.000	0.000	1.425	0.378
UH/holds - S/employed	0.391	0.000	0.000	0.221	0.170
UH/holds – Transfers	0.024	0.000	0.000	0.015	0.009
RH/holds - W/Income	1.279	0.000	0.000	0.988	0.291
RH/holds - S/employed	0.602	0.000	0.000	0.393	0.209
RH/holds – Transfers	0.145	0.000	0.000	0.100	0.045
Non-Cit. H/holds	1.215	0.000	0.000	1.011	0.204
Total H/hold Impact	5.458	0.000	0.000	4.152	1.306

Source: Own calculations, 2006

Of the total additional household income of P5.458 million gained from an increase in textile exports, about 76 percent (P 4.152 million) was created through open-loop (O) effects while the remainder, 24 percent (P 1.306 million), stemmed from closed-loop (C) effects. The main recipients of the total household income generated through open-loop effects include wage-based households in urban areas (34 percent), wage-based households in rural areas (24 percent) and non-citizen households (24 percent). Self-

employed households in both urban and rural areas were the next largest group to benefit from household income generated through open-loop effects.

Households whose income is derived from transfers only received three percent of the total additional household income generated through open-loop effects. In fact most of their income was generated through open-loop effects. As indicated in the earlier analysis, households whose income originates mainly from transfers constitute the poorest in the country, and the results of the textiles multiplier demonstrate that the industry exerts a very limited income/food security effect on them.

Closed-loop (C) effects only accounted for 24 percent of the total household income gained after an injection of additional textiles export income. These results imply very limited interdependency effects or integration among endogenous accounts, since full and complete circulation of the injected textiles export income is not realized. Possible reasons include limited skills, capital, technology and the like, as these factors are considered critical for a strong textiles industry (UNCTAD, 2004).

Activity Level

Table 7.8 records Stone's decomposed multiplier effects on the activity account after an injection (I) of P 10.329 million worth of textiles export income. Of the total activity output of P 21.657 million gained after an increase in textiles exports, about 56 percent is derived from the textiles industry itself. When Stone's additive and decomposed multipliers are used, 31 percent of the additional output has been generated through transfer (T) effects, while closed-loop (C) effects account for 22 percent of the total activity output realized.

Table 7.8: Disaggregated Fixed Price Multiplier Effects on the Activity Account after Textiles

Activity	Multiplier	I	T	O	C
Trad. Agric - Cattle	0.291	0	0.014	0	0.277
- Other	0.106	0	0.005	0	0.101
Freehold Farms	0.091	0	0.007	0	0.084
Hunt, Fish & Gathering	0.146	0	0.031	0	0.116
Mining	0.101	0	0.066	0	0.034
Meat Processing	0.183	0	0.008	0	0.176
Dairy & O/Process	0.323	0	0.079	0	0.244
Beverages	0.277	0	0.006	0	0.272
Textiles	12.188	10.329	1.795	0	0.065
Chemicals	0.092	0	0.055	0	0.037
Transport & Equip.	0.026	0	0.007	0	0.019
Metal Products	0.180	0	0.029	0	0.150
Bakery & Products	0.103	0	0.008	0	0.095
Tan & Leather Prod	0.001	0	0.001	0	0.001
Wood & Products	0.031	0	0.021	0	0.011
Paper & Products	0.114	0	0.082	0	0.032
Village Industries	0.069	0	0.040	0	0.029
Other Manufacturing	0.228	0	0.144	0	0.084
Water	0.342	0	0.215	0	0.127
Electricity	0.497	0	0.378	0	0.119
Construction	0.695	0	0.439	0	0.256
Trade	1.147	0	0.541	0	0.606
Hotels & Restaurants	0.182	0	0.123	0	0.059
Transport	0.613	0	0.365	0	0.248
Communications	0.359	0	0.256	0	0.103
Business Services	1.981	0	1.211	0	0.770
Central Government	0.262	0	0.014	0	0.247
Local Government	0.036	0	0.017	0	0.019
Services	0.991	0	0.652	0	0.339
Total Activity Impact	21.657	0	6.609	0	4.719

Source: Own calculations, 2006

The results in Table 7.8 indicate that transfer or intra-group (T) effects dominate the closed-loop effects. Transfer effects capture the inter-industry or conventional Leontief input-output interactions. Specifically, here we measure the effects of textiles production (increased to meet export demand) on the output of other activities. For most activities, transfer effects are greater than the circular or C effects. Activities in which the transfer (T) effects dominate

include mining, business services, transport, communications, water, electricity, construction, wooden products, hotels and restaurants, paper products, village industries and the textiles industry itself. In activities where the transfer effects are greater, the implication is that the inter-industry input-output interactions are stronger than closed-loop effects. This suggests very limited circulation of the additional output/income among activities, which in turn implies limited economic integration among endogenous accounts after injecting the textiles export income.

Interestingly, for the primary agricultural as well as food-processing activities, the closed-loop or C effects were dominant. This signifies that for the latter activities the policy shock of the textiles export income completed its circular tour of all endogenous accounts and returned to its origin, i.e. the “textiles” activity. The dominance of closed-loop effects among these activities implies strong economic integration or inter-dependency effects among endogenous accounts, a feature that is desirable for diversification since consumers enjoy a wider choice of goods and services in the domestic economy.

7.5 Summary

This chapter has demonstrated that improved export market access is important for Botswana as well as for food security and an increase in sectoral output including the agricultural industry. As she is structurally a food deficit country owing to unfavourable climatic and physical factors, any increase in the domestic supply of food and other household items depends on access to foreign exchange earnings or income in order to augment locally-produced goods. As the food balance sheets in Chapter 1 indicate, most of Botswana’s basic food goods are imported, hence the need to improve export market access so as to generate foreign exchange.

The results of the SAM-accounting multiplier analysis have indicated the importance of injecting additional export income into endogenous accounts (factors, households and activities). An increase in beef export earnings

benefited factors and households, while the meat-processing activity also gained. Among factors, gross operating surplus and mixed income gained most from an injection of additional export income into meat processing. Skilled manual workers (citizens) were the main beneficiaries of gains from meat processing induced by an increase in demand for beef, followed by unskilled manual workers (citizens). Self-employed households in both urban and rural areas benefited the most from an increase in external demand for beef. Some of these households own cattle, hence their gaining from improved export market access for beef. Wage-based households in both urban and rural areas were the next ones to benefit most, after self-employed households. Employed members of wage-based households contributed to the latter are gains from improved beef export earnings.

Not surprisingly, (citizen) households who depend on income transfers gained only marginally from an increase in external demand for beef, primarily because they lack the primary resource, cattle. At least 45 percent of rural households do not own cattle and as indicated earlier, access to an endowment asset is important for households to benefit from trade liberalization. Households reliant on income transfers constitute the poorest group in the country and therefore their food security is not likely to improve much from enhanced export market access unless they have access to assets or skills.

The other policy experiment, that is, an increase in textiles export income, displayed similar results, with gross operating surplus or return to owners of capital gaining the most after an injection of additional export income into textiles activities. As was expected, the textiles activity witnessed an increase in output, which induced an additional requirement for factors to meet the demand. Among workers, skilled manual workers (citizens) followed by unskilled manual employees (citizens), benefited most from an increase in external demand for textiles products. In general, the textiles industry, like meat processing, are also relatively skill-intensive and therefore they may not necessarily assist Botswana to reduce unemployment amongst her youth.

Wage-based households in both urban and rural areas gained more than self-employed households or those dependent on income transfers. Employed members of wage-based families are responsible for remitting money to owners of factors. Compared to other citizen households, those dependent on income transfers, once again, did not benefit much from an increase in external demand for textiles products, partly owing to lack of skills among their family members. Consequently, as in the case of improved beef exports, households reliant on income transfers are not likely to improve their food security or welfare as a result of enhanced export market access. Other supportive systems will need to be developed to improve the welfare of poor households or those dependent on income transfers as export market access does not necessarily enhance their income security.

From the food security perspective, this chapter has demonstrated that improved market export market access increases, *ceteris paribus*, additional household disposable income which could be used to purchase and import more food and other household effects (thereby enhancing economic access). However, households depended on income transfers or with limited factors (skilled workers or capital) or assets like cattle gained marginally from improved export market access. In fact the results of improved market access support the Stopler-Samuelson theorem which states that in free or liberalized trade those who own factors or assets which are intensively used in the export industry benefit more than those who are least endowed. Owners of cattle or factors like capital and skills benefit more from trade liberalization.

Notwithstanding the negative income distributional effects of trade liberalization, additional household income generated by exports from beef and textiles could pay for more imported food and other basic items (increasing physical availability). As indicated in Chapter 1, Botswana depends heavily on food imports to meet her national and household food requirements. Imports are financed by, among other sources, export earnings from beef and, textiles. In this way, this chapter has shown that trade

liberalization could contribute to improved food security by increasing consumption and supplies.

Of course, for Botswana to benefit from improved export market access of beef and textiles, the country will need to address supply-side constraints. Specifically, both sectoral output and productivity will need to improve through investment in infrastructure, production technology, skills, information and communication technology, quality standards of traded goods, etc. Investments in these areas do not constitute trade-distorting measures as defined under the WTO. During the current national development plan, like in the previous plans, government continues to increase public investment in infrastructure, human resource development, etc to improve productivity, competitiveness and efficiency (NDP 9, MFDP, 2003).

Finally, this chapter has also indicated that open-loop effects dominate the path/movement of shock among factor and household endogenous accounts once an injection has been introduced. At an activity level, in the two policy experiments (beef and textiles) transfer or inter-industry input-output interactions and closed-loop effects are very important in capturing the movement of the shock, once introduced among endogenous accounts. Whilst closed-loop effects capture the full and circular flow of the shock, other effects demonstrate very limited income and demand inter-account linkages or interdependency. Limited closed-loop effects strongly suggest an economy where integration is very weak, which in turn could adversely affect efforts to diversify Botswana's economy, given the dominance of diamond mining.

Lack of skills, limited competition, underdeveloped infrastructure, etc could be partly responsible for weak economic integration and diversification. Plans are underway during NDP 9 to attend to some of these challenges. As a free enterprise country, Botswana also strives to improve competition in the input and output markets for the benefit of the economy and households. A competition policy has already been approved by Parliament following which

the necessary institutional/legal structures will be created to enforce fair business practices in the country.