CHAPTER FIVE: Results of the Empirical Analysis

This chapter reports the estimated results of the model obtained from the 2SLS estimation procedures of the system as a whole. Two main blocks were estimated using OLS, a production or supply block and a consumption or demand block. The supply and demand blocks are estimated for seven main maize producing or consuming countries, with the rest of SADC treated as one group. For each of these six countries and the rest of SADC single equations for demand, supply and stock change was estimated using single equations. Net trade was used to close the model, and was determined by equating excess demand and excess supply across the whole region. All the regional prices are furthermore explicitly linked to a world reference price. All equations were estimated for the period 1977 to 1997.

Maize can be divided into both white and yellow maize, however due to the lack of data in this respect maize was modeled as a homogeneous product. The supply equations are conventional Nerlove partial adjustment models with all prices and incomes deflated into real terms using a GDP deflator and consumer price index. A further assumption made was that both demand and supply responses were homogeneous of degree zero with respect to price and expenditures. Both the demand and supply equations fit the data well and all the signs are correct. Although a yield equation was not estimated due to its relationship with area harvested and production, a trend equation was estimated for forecasting purposes.

The following sections contain the empirical results of the model. The t-statistics are presented in parentheses while short run elasticities and long elasicities are presented in the brackets and square brackets respectively. The mnemonic of the variables is given in appendix C.

5.1 Malawi Sub-model

The production block of Malawi is presented in equations 5.1 to 5.3. Maize area harvested in Malawi ($MAMAH_t$) was estimated as a linear function of lagged area harvested, a time trend to represent technological change, lagged maize producer price divided by the U.S. potash price, and a dummy variable for the year 1994. Although the variables were not all found to be statistically significant at the 5 % level, they are maintained in the model for its overall significance. The estimated short run own price elasticity is 0.092 whereas the long run is 0.1331. The own price elasticity indicates that a 1% increase in the producer price of maize divided by the U.S. potash price in Malawi Quachas will cause a 0.0924 % increase in area planted, indicating that area planted is relatively inelastic to own price. Various alternative specifications were estimated however based on economic and statistical theory and equation 5.1 was kept. Malawi maize production ($MAMPR_t$) is an identity and equal to area planted times yield.

Malawi's maize domestic consumption consists mainly of food use. Maize per capita consumption is a function of own price, price of substitutes and disposable income. Maize per capita consumption (MAMFOPC) was estimated as a function of real maize price, per capita real income as a proxy for disposable income, and a time trend to indicate changes in preferences. A shift is also included due to a change in the price trend in that year whereas DUM82 for the shock due to SAPS. Total domestic consumption is per capita consumption times total population.

Malawi's change in maize stock ($MAMSC_t$) was modeled as a function of lagged maize production and real maize domestic price. A dummy variable for 1993 was also included to capture the effects of the severe drought of 1992. Although the price variable has a low t-value, it was maintained in the model due to its economic significance. Drawing on economic theory, the estimated coefficients appearing in the equations have the correct sign and are statistically significant. The own price elasticity of demand is -0.061 and income elasticity of demand is 0.076.

Malawi's net trade position is an identity composed of total production (MAMPR), change in stock (MAMSC), maize used for human consumption (MAMFO), and other uses (MAMOU) such as industrial and animal consumption.

Malawi's real maize producer price was estimated as a function of the regional maize net trade position (RENTMA), a time trend, and a dummy for the years 1982 and 1995. All the variables are significant at the 5 % level except the dummy variable for 1995.

Equation 5.1: Malawi Maize Area harvested

$$MAMAH_t = + 560154.78 + 0.305*MAMAH_{t-1} + 146086.58*RMAMPP_{t-1} - 186999.01*DUM94 + 14009.11*TT$$

(1.57) (1.85) <0.092> [0.1331] (-2.79) (2.99)

$R^2 = 0.722$ D.W. = 2.033 D.F.= 5

Equation 5.2: Malawi Maize Production

$$MAMPR_t = MAMAH_t * MAYLD_t$$

Equation 5.3: Malawi Yield

$$MAYLD_t = MAMPR_t / MAMAH_t$$

Equation 5.4: Malawi Maize Per Capita Domestic Consumption

$$MAMFOPC_t = + 171.95 - 0.0138*RMAMCPD_t + 0.0075*RMAGNID_t - 13.83*SHIFT82 - 0.061*TT2 + 10.89*DUM82$$

(-0.60) (0.48) <-0.061> <0.076> (-0.98) (-1.88) (0.59)

$R^2 = 0.92$ D.W. = 1.322 D.F= 5

Equation 5.5: Malawi Maize Total Domestic Consumption

$$MATOFOU_t = MAMFOPC_t * MAPOP_t$$

Equation 5.6: Malawi Change in Maize Stock

$$MAMSC_t = -456633 + 0.368*MAMPR_{t-1} - 348.95*RMAMPPD_t - 534962*DUM93$$
(2.36) (-0.27) (-2.83)

$R^2 = 0.67$ D.W. = 1.92 D.F.= 4

Equation 5.7: Malawi Maize Net Trade

$$MAMNT = MAMPR + MAMSC - MAMFO - MAMOU$$

Equation 5.8: Malawi Maize Price

$$RMAMPPDt = 111.57 - 0.000032*RENTMA_t - 0.09322*TT2 + 57.97*DUM82 + 4.068*DUM95$$
(-7.67) (-14.81) (14.82) (0.99)

$R^2 = 0.95$ D.W. = 0.72 D.F.= 5

5.2 Mozambique Sub-model

Equations 5.9 to 5.11 are the Mozambique production block. Maize area harvested in Mozambique ($MOMAH_t$) was estimated as a linear function of lagged area harvested, a time trend to represent technological change, and Mozambique's maize producer price divided by the U.S. potash price in Mozambique's local currency, and a dummy variable for 1992-94. Not all the variables are statistically significant at the 5 % level, they are however maintained in the model for it's over all significance. The estimated short run own price elasticity is 0.0439 whereas the long run is 0.0667. The linear time trend is a surrogate for technological change and other forces that are shifting the supply curve outwards over time. The estimated coefficient of the lagged dependent variable suggests that adjustment does not occur fully in one period. Various other specifications for area harvested were estimated but equation 5.9 is retained based on economic and statistical theory. Mozambique maize

production ($MOMPR_t$) is an identity and equal to area harvested times yield.

Equation 5.9: Mozambique Maize Area harvested

$MOMAH_t$ = + 303799
+ 0.340*$MOMAH_t$ + 34398.11*$MOMPP_{t-1}$
(1.96) (1.79)
< 0.044>
[0.0667]
-134316.64*DUM9294 +20342.59*TT
(-2.94) (3.56)

$R^2 = 0.75$ D.W. = 1.73 D.F.= 6

Equation 5.10: Mozambique Maize Production

$MOMPR_t$ = $MOMAH_t$ * MOYLDt

Equation 5.11: Mozambique Maize Yield

$MOYLD_t$ = $MOMPR_t$ / $MOMAH_t$

Equation 5.12: Mozambique Maize Per Capita Domestic Consumption

$MOMFOPC_t$ = + 18.21
– 0.0012*$RMOMCPD_t$ + 0.0017*$RMOGDPD_t$
(-4.79) (6.05)
<-0.1663> <0.331>
+ 11.144*DUM78 + 0.089*DUM81 + 20.93*LTT
(3.20) (8.61) (5.48)
$R^2 = 0.93$ D.W. = 2.00 D.F.= 6

Equation 5.13: Mozambique Maize Total Domestic Consumption

$MOTOFOU_t$ = $MOMFOPC_t$ * $MOPOP_t$

Equation 5.14:Mozambique Change in Maize Stock

$MOMSC_t$ = -20710
+ 0.075*$MOMPR_{t-1}$ + 136146*DUM94 – 1291.4*TT
(2.40) (7.95) (-2.04)
$R^2 = 0.82$ D.W. = 2.58 D.F.= 4

Equation 5.15:Mozambique Maize Net Trade

MOMNT = MOMPR + MOMSC – MOMFO - MOMOU

Equation 5.16:Mozambique Maize Price

$RMOMPP_t$ = +127943
+ 0.0077*$RMOGDP_t$ – 0.00111*RENTMO
(2.96) (-2.88)
<0.00008> <-0.0033>
– 117804*SHIFT85 – 98917*DUM8687
(-42.31) (-24.33)
$R^2 = 0.99$ D.W. = 2.04 D.F.= 5

Mozambique's per capita food consumption (MOMFOPC) is model as a function of real own price, per capita gross national income as a proxy for disposable income, and a time trend to indicate changes in preferences. Two dummy variables were included in the model for the years 1985 and 1988; these dummies are included due to a spike in the maize price and a 55 % devaluation of the currency in 1985 and 1988 respectively. All the variables have the correct signs and are significant at the 5 % level. For the consumption block, the time trend is a surrogate for taste and habit formation that may shift the demand curve outward. Total maize consumption is maize per capita consumption time population.

Mozambique's change in maize stock ($MOMSC_t$) was modeled as a function of lagged maize production a time trend and a dummy for 1994 to capture a spike in that year. All the variables are significant at the 5 % level.

Mozambique's real maize producer price was modeled as a function of real GDP, regional net trade (RENTMO), a shift for 1995 and a dummy for the years 1986-1987. All the variables have the correct sign and are significant at the 5 % level.

5.3 South Africa Sub-model

The South Africa production block consists of equation 5.17 to 5.19. Maize area harvested (SAMAH) was estimated as a linear function of lagged area planted, real maize producer price, October rainfall in the main maize producing regions, and a dummy variable for 1996. The dummy variable was included to capture the increased uncertainty faced by farmers due to the dismantling of the maize marketing

board in the following marketing season. All the variables except October rainfall are significant at the 5 % level. This variable is however maintained in the model for it's over all significance and for the calculation of long run elasticities. Various alternative specifications were estimated which included wheat, sorghum, and oilseeds as competing crops, but the associated coefficients were low and insignificant, thus based on statistical and economic theory the above equation is kept. The estimated short run and long supply elasticity 0.0631 and 0.1339 respectively. South Africa maize production (SAMPR) is an identity and equal to area planted times yield.

Equation 5.17: South Africa Maize Area Harvested

$$SAMAH_t = +1422823 + 0.528*SAMAH_{t-1} + 618.601*SAMPPD_{t-1} + 2128.23*SAOCTR_t - 836126*DUM96$$

(2.46) (2.46) (1.37) (-4.04)

<0.0631>

[0.1339]

$R^2 = 0.82$ D.W. = 1.67 D.F.= 6

Equation 5.18:South Africa Maize Production

$$SAMPR_t = SAMAH_t * SAYLDt$$

Equation 5.19: South Africa Yield

$$SAYLD_t = SAMPR_t / SAMAH_t$$

Maize in South Africa is mainly consumed in two sectors; animal feed (SAMFEED) and human consumption (SAMFOPC). South African maize consumption is therefore modeled in two components. Per Capita human consumption is modeled as a function of real maize meal price, real bread price, real per capita GDP as a proxy for disposable income, and a dummy variable for the years 1987-1989. South African animal feed use is modeled as a function of real maize price, real weighted average meat prices, real sunflower producer price, and a time trend to capture technological advances in feed formulations and animal genetic improvements. Sunflower is a compliment to maize in feed formulations, as it constitutes a protein

source while maize is an energy source. Although sunflower prices together with the time trend are not significant at the 5 % level, they are kept in the model for its overall significance and economic importance.

South Africa's change in maize stock (SAMSC) was modeled as a function of lagged maize production and real maize price in U.S. dollars, and a dummy variable for 1994 was also included to capture a large spike in the stock change caused by a severer drought in that year.

The South African maize sector was historically regulated through the maize board. From approximately 1939 maize producer prices were set by the maize board and approved by the minister of agriculture. The formulas for calculating the maize price over the years did vary, however a common thread in these formulas was the base price, which was the previous years maize producer price. The base price was adjusted in accordance with inflationary pressures of the main inputs. In 1991 however the Maize Board started taking the international maize price into account when setting the local price. The effect of the international maize price on the local price culminated in 1997 with the disbandment of the maize board. It is for this reason that the South Africa's real maize producer price was determined as a function of lagged price, South Africa's maize net trade position, the U.S. Gulf port maize price deflated with the South African producer price index, and a shift variable for 1994. All the variables are significant at the 5 % level and the signs meet the *a priori* expectations.

Equation 5.20: South Africa Maize Per Capita Domestic Human Consumption

$$SAMFOPC_t = + 0.083 - 0.00011*(47.05*RSAMPPD_t) + 0.000077*RSAGDPD_t + 0.00011*RSABCPD_t - 0.0111*DUM8789$$

(-1.05) (0.48) (2.45) (-3.38)

<-0.1871> <0.0834> <0.205>

$R^2 = 0.69$ D.W. = 2.33 D.F.= 6

Equation 5.21: South Africa Total Domestic Human Consumption

$SAMTFOU_t = SAMFOPC_t * SAPOP_t$

Equation 5.22: South Africa Maize Domestic Animal Consumption

$SAMFEED_t = +1931196 - 6236.11*RSAMPPD_t + 3285.8*RSAMEATPPD_t + 1452.1*RSASFPPD_t + 498931.2*LTT$

(-2.99) (2.15) (1.65) (1.30)

<-0.773> <0.510> <0.317>

$R^2 = 0.68$ D.W. = 1.32 D.F.= 3

Equation 5.23: South Africa Change in Maize Stock

$SAMSC_t = -1864300 + 0.284*SAMPR_{t-1} - 1271.14*RSAMPPD_t - 2376568*DUM94$

(3.15) (-1.19) (-1.99)

$R^2 = 0.43$ D.W. = 2.17 D.F.= 5

Equation 5.24:South Africa Maize Net Trade

SAMNT = SAMPR + SAMSC – SAMFO – SAMFEED - SAMOU

Equation 5.25: South Africa Maize Price

$RSAMPP_t = +147.03 + 0.699*RSAMPP_{t-1} - 0.000011*SAMNT + 0.141*USMPPSA + 77.81*SHIFT94$

(7.62) (-3.33) (3.93) (2.90)

$R^2 = 0.99$ D.W. = 2.66 D.F.= 3

5.4 Tanzania Sub-model

Equations 5.26 to 5.29 are the Tanzania production block. Maize area harvested was estimated as a linear function of lagged area planted, lagged real maize producer price in U.S. dollars, real rice producer price, a shift variable for the period 1985-1990, and a dummy variable for 1991/1992. The dummy variable for 1985/1990 was included due to a change in maize price trend and the dummy variable for 1991/92 to capture a change in production trend. Alternative specifications were estimated, however equation 5.23 was chosen based on the sign of the estimated coefficients, R^2

and F-statistics. The maize area harvested was estimated as a function of the maize price in US dollars instead of the local currency because this rendered the model insignificant with parameter coefficients of the incorrect sign. The short run and long run supply elasticity are 0.0938 and 0.152 respectively.

The supply elasticity indicates that a 1 % increase in the real producer price of maize in U.S. dollars will cause a 0.094 % increase in area harvested, indicating that area planted is relatively inelastic to own price. Tanzanian maize production ($TAMPR_t$) is an identity and equal to area harvested times yield.

Equation 5.26:Tanzania Maize Area Harvested

$TAMAH_t$ = +937297.95
+ 0.3826*$TAMAH_{t-1}$ + 724.36*$RTAMPPD_{t-1}$
(1.46) (1.224)
<0.094>
[0.152]
-639.36*RTARPP+197094*DUM8590+ 314807*DUM9192
(-1.72) (1.97) (2.93)
<-0.127>
[-0.196]

$R^2 = 0.77$ D.W. = 2.58 D.F.= 6

Equation 5.27: Tanzania Maize Production

$TAMPR_t$ = $TAMAH_t$ * TAYLDt

Equation 5.28: Tanzania Yield

$TAMYLD_t$ = $TAMPR_t$ / $TAMAH_t$

Equation 5.29:Tanzania Maize Per Capita Domestic Consumption

$TAMFOPC_t$ = + 111.21
– 0.0030*$RTAMCPD_t$ + 0.00072*$RTAGDPD_t$–8.01*DUM78
(-2.44) (0.11) (-1.85)
<-0.1252> <0.0054>
+13.78*DUM81 – 10.51*LTT
(3.23) (-1.77)

$R^2 = 0.93$ D.W. = 1.83 D.F.= 5

Equation 5.30: Tanzania Maize Total Domestic Consumption

$TAMTFOU_t = TAMFOPC_t * TAPOP_t$

Equation 5.31:Tanzania Change in Maize Stock

$$TAMSC_t = -272126.42 + 0.186*TAMPR_{t-1} - 434.06*RTAMPPD_t - 402577*DUM8990 - 177155*DUM85$$
(2.06) (-1.10) (-4.16) (-1.29)

$R^2 = 0.59$ D.W. = 1.88 D.F.= 4

Equation 5.32:Tanzania Maize Net Trade

$TAMNT = TAMPR + TAMSC - TAMFO - TAMOU$

Equation 5.33:Tanzania Maize Price

$$RTAMPPD_t = +344.41 - 0.00001*RENTTA_t - 209.23*DUM92 - 26.18*DUM80 - 9.309*TT$$
(-1.19) (-1.66) (0.27) (-2.47)

$R^2 = 0.79$ D.W. = 0.72 D.F.= 6

Tanzanian per capita maize consumption is modeled as a function of real maize price, per capita gross domestic product, a time trend to capture changes in tastes and preferences, and two dummy variables for the years 1978 and 1981. The 1978 dummy is included due to a spike in the exchange rate, while the 1981 dummy is included due to a spike in real maize consumer price. All variables show the correct sign, and although per capita gross domestic product has a very low significance in the model, it is kept for its economic and theoretical significance.

Tanzania's change in maize stock ($TAMSC_t$) was modeled as a function of lagged maize production and real maize price. A dummy variable for 1989-1990 was also included to capture a large spike in stock change.

Tanzania's maize producer price in U.S. dollars was estimated as a linear function of the regional net trade position, a time trend and two dummy variables for the years

1980 and 1992. All the variables show the correct sign, and although not all the variables are significant at the 5 % level, they are kept for the overall significance of the model.

5.5 Zambia Sub-model

Equation 5.34: Zambia Maize Area harvested

$$ZAMAH_t = +190110.85 + 0.582*ZAMAH_{t-1} + 290.37*ZAMPP_{t-1} + 265139.76*DUM8889 - 118115.8*DUM91$$

(4.35) (0.62) (3.63) (-0.72)

<0.0708>

[0.1694]

$R^2 = 0.84$ D.W. = 1.81 D.F.= 6

Equation 5.35: Zambia Maize Production

$$ZAMPR_t = ZAMAH_t * ZAYLDt$$

Equation 5.36: Zambia Yield

$$ZAYLDt = ZAMPR_t / ZAMAH_t$$

Equation 5.37: Zambia Maize Per Capita Domestic Consumption

$$ZAMFOPC_t = +135.5 - 0.00009*RZAMCPD_t + 0.00009*RZAGNID_t$$

(-0.78) (3.09)

<-0.0752> <0.0972>

$R^2 = 0.90$ D.W. = 1.57 D.F.= 5

Equation 5.38: Zambia Maize Total Consumption

$$ZAMTFOU_t = ZAMFOPC_t * ZAPOP_t$$

Equation 5.39: Zambia Change in Maize Stock

$$ZAMSC_t = -247173 + 0.246*ZAMPR_{t-1} - 826211*DUM8889 + 570135*DUM95 + 1194*TT$$

(2.05) (-5.40) (2.70) (0.147)

$R^2 = 0.75$ D.W. = 1.83 D.F.= 5

Equation 5.40:Zambia Maize Net Trade

$$ZAMNT = ZAMPR + ZAMSC - ZAMFO - ZAMOU$$

Equation 5.41: Zambia Maize Price

$$RZAMPP_t = +65.07 + 0.995*USMPPZA_{t-1} - 0.00015*RENTZA \quad (1.93) \quad (-2.51)$$
$$- 65.168*SHIFT89 + 238.17*DUM90 - 71.67*DUM96 \quad (-2.88) \quad (5.72) \quad (-1.65)$$
$$R^2 = 0.97 \quad D.W. = 1.16 \quad D.F. = 5$$

The maize production block for Zambia consists of equations 5.34 to 5.36. Maize area harvested ($ZAMAH_t$) was estimated as a linear function of lagged area harvested, lagged real maize producer price divided by the U.S. potash price in Zambian local currency, and three dummy variables for 1988-89, and 1991. The dummy variable for 1979 was included due to a change in maize price trend and the 1989 dummy to capture a spike in maize price. All the variables have the correct sign and are statistically significant at the 5 % level. The short run and long run elasticity of supply are 0.0708 and 0.1694 respectively. The own price elasticity indicates that a 1 % increase in the real producer price of maize divided by the U.S. potash will cause a 0.0708 % increase in area planted, indicating that area planted is relatively inelastic to own price

Maize per capita consumption in Zambia (ZAMFOPC) was estimated as a function of real maize price and per capita real gross national income as a proxy for disposable income. All the variables have the correct sign and although maize price is not significant at the 5 % level, it is maintained in the model because it has the correct sign and for the overall economic significance of the model. Both own price and income elasticities are low indicating that it is a staple food. Zambia's change in maize stock ($ZAMSC_t$) was modeled as a function of lagged maize production, a time trend and two dummies to capture major spikes in the stock change.

Zambia's maize producer price was estimated as a function of lagged real U.S. maize

price, regional maize net trade position, a shift variable for 1989 due to a marked exchange rate devaluation, and two dummy variables for 1990 and 1996. All the variables have the correct sign, and all except the dummy 1996 and the U.S. maize price are significant at the 5 % level.

5.6 Zimbabwe Sub-model

Equations 5.42 to 5.45 are the production block of Zimbabwe. Maize area harvested ($ZIMAH_t$) was estimated as a linear function of lagged area harvested, lagged real maize producer price in U.S. dollars, a time trend, and a dummy variable for 1992. The dummy variable for 1992 was used to capture the large decrease in area planted caused by low real maize prices in 1990 and 1991. Alternative specifications, which included wheat, tobacco and cotton as competing crops, yielded very low coefficients and were statistically insignificant. The short run and long run elasticity of supply are 0.3605 and 0.4484 respectively. These elasticities compared to the other countries in the model are very high, the reason for this is however unclear. All the coefficients have the expected sign. Zimbabwe maize production ($ZIMPR_t$) is an identity and is equal to area planted times yield.

Equation 5.42: Zimbabwe Maize Area harvested

$$
\begin{aligned}
ZIMAH_t \quad = \quad & +125350.7 \\
& +0.196*ZIMAH_{t-1} + 3509.6*RZIMPPD_{t-1} \\
& \quad (1.46) \qquad\qquad (4.78) \\
& \qquad\qquad\qquad\quad <0.3605> \\
& \qquad\qquad\qquad\quad [0.4484] \\
& -245989*DUM92 \; + 28711*TT \\
& (-2.58) \qquad\qquad (5.47) \\
R^2 = 0.70 \qquad & D.W. = 2.18 \qquad\quad D.F. = 5
\end{aligned}
$$

Equation 5.43: Zimbabwe Maize Production

$$ZIMPR_t \quad = \quad ZIMAH_t * ZIYLDt$$

Equation 5.44: Zimbabwe Yield

$$ZIMYLDt \quad = \quad ZIMPR_t / ZIMAH_t$$

Equation 5.45: Zimbabwe Maize Per Capita Domestic Consumption

$ZIMFOPC_t$ = + 119.84
$- 0.0121*RZIMCPD_t + 0.0025*RZIGNID_t + 11.17*DUM8082$
(-1.27) (1.70) (2.68)
<-0.0752> <0.0972>
$- 7.60*DUM91$
(-2.15)

R-Square =0.97 D.W = 2.52 D.F.= 5

Equation 5.46: Zimbabwe Maize Total Domestic Consumption

$ZIMTOFU_t = ZIMFOPC_t * ZIMPOP_t$

Equation 5.47: Zimbabwe Change in Maize Stock

$ZIMSC_t$ = 353443
$+ 0.411* ZIMPR_{t-1} - 8539*RZIMPPD_t$
(2.63) (-2.41)
$- 1419302*DUM8586 + 589092*SHIFT87$
(-3.88) (1.93)

$R^2 = 0.62$ D.W. = 1.76 D.F.= 4

Equation 5.48:Zimbabwe Maize Net Trade

ZIMNT = ZIMPR + ZIMSC – ZIMFO – ZIMOU

Equation 5.49: Zimbabwe Maize Price

$RZIMPPD_t$ = 55.69
$- 0.00001*ZIMNT_t + 0.57*USMPPZI_t$
(-1.06) (3.98)
+ 83.38*DUM8182
(5.02)

$R^2 = 0.93$ D.W. = 1.52 D.F.= 4

The per capita domestic consumption is modeled as a function of real maize price, real per capita gross national income, and two dummy variables for the years 1980-1982 and 1991 to capture spikes and changes in price trends. Own price elasticity of demand is -0.142 and income elasticity is 0.137. Again all the coefficients have the expected sign.

Zimbabwe's change in maize stock ($ZIMSC_t$) was modeled as a function of lagged

maize production, real producer's price, and a dummy variable in 1985/1986 to capture a spike in stock change. Zimbabwe's real maize producer price in U.S. dollars was estimated as a function of the U.S. maize Gulf port price, Zimbabwe's net trade position, and a dummy variable for the years 1981-1982.

5.7 Rest of SADC Sub-model

The rest of SADC, as previously stated, comprises Botswana, Lesotho, Mauritius, and Swaziland. The remaining four countries were not included due to data constraints. Although aggregating data for such diverse countries it was nevertheless done in order to include as many countries as possible in the study. Many different specifications were tested and the models below were the most statistically significant and economically correct.

Equations 5.50 to 5.52 are the production block of the rest of SADC. A single area harvested equation is estimated for the rest of SADC, which includes Botswana, Lesotho, Mauritius, and Swaziland. The rest of SADC maize area harvested is modeled as a function of lagged area harvested, lagged real U.S. maize Gulf port price, and three dummy variables. The dummy variables are included in the model to capture spikes in the U.S. Maize Gulf port price. Maize area has a positive relationship with lagged area harvested and lagged real US Maize Gulf Port price. The estimated short run and long run elasticity are 0.0841 and 0.1338. Equation 5.52 represent total production as area harvested times yield per hectare.

Equation 5.50: Rest of SADC Maize Area harvested

$$SDMAH_t = + 107258.4 + 0.371*SDMAH_{t-1} + 14326.03*USMPPSD_t + 83970*DUM88 - 102774.7*DUM94 + 131933*DUM96$$

(1.56) (0.52) (2.31)

<0.0841>

[0.1338]

(2.61) (3.20)

$R^2 = 0.44$ D.W = 1.40 D.F.= 6

Equation 5.51: Rest of SADC Maize Production

$SDMPR_t = SDMAH_t * SDYLDt$

Equation 5.52: Rest of SADC Yield

$SDYLDt = SDMPR_t / SDMAH_t$

Equation 5.53: Rest of SADC Maize Per Capita Domestic Consumption

$$SDMFOPC_t = +0.066 -0.00002*USMPPSD_t+0.0016*RSDGDPD_t+0.015*DUM8586$$

(-1.31) (1.57) (3.19)

<-0.0006> <0.0004>

$R^2 = 0.82$ D.W = 0.73 D.F.= 5

Equation 5.54: Rest of SADC Total Domestic Consumption

$SDMTFOU_t = SDMFOPC_t * SDPOP_t$

Equation 5.55: Rest of SADC Change in Maize Stock

$$SDMSC_t = -94063.8 +0.441*SDMSC_{t-1} - 38.40*USMPPSD_t + 112977*DUM9293$$

(1.63) (-0.64) (2.24)

$R^2 = 0.31$ D.W. = 0.86 D.F.= 5

Equation 5.56: Rest of SADC Maize Net Trade

SDMNT = SDMPR + SDMSC – SDMFO - SDMOU

Maize per capita consumption in the rest of SADC is mainly human, and is modeled as a function of the real US maize Gulf port price, real per capita gross domestic product and dummy 1985-1986. All the variables have the correct sign and although the per capita GDP is not significant it is kept in the model because it has the correct sign and its economic importance.

Equation 5.57: Malawi Regional Net Maize Trade

$RENTMA_t = MOMNT_t + SAMNT_t + TAMNT_t + ZAMNT_t + ZIMNT_t + SDMNT_t$

Equation 5.58: Mozambique Regional Net Maize Trade

$RENTMO_t = MAMNT_t + SAMNT_t + TAMNT_t + ZAMNT_t + ZIMNT_t + SDMNT_t$

Equation 5.59: South Africa Regional Net Maize Trade

$$RENTSA_t = MOMNT_t + MAMNT_t + TAMNT_t + ZAMNT_t + ZIMNT_t + SDMNT_t$$

Equation 5.60: Tanzania Regional Net Maize Trade

$$RENTTA_t = MOMNT_t + MAMNT_t + SAMNT_t + ZAMNT_t + ZIMNT_t + SDMNT_t$$

Equation 5.61: Zambia Regional Net Maize Trade

$$RENTZA_t = MOMNT_t + MAMNT_t + SAMNT_t + TAMNT_t + ZIMNT_t + SDMNT_t$$

Equation 5.62: Zimbabwe Regional Net Maize Trade

$$RENTZI_t = MOMNT_t + MAMNT_t + SAMNT_t + TAMNT_t + ZAMNT_t + SDMNT_t$$

Equation 5.63: Rest of SADC Regional Net Maize Trade

$$RENTSD_t = MOMNT_t + MAMNT_t + SAMNT_t + TAMNT_t + ZAMNT_t + ZIMNT_t$$

Equation 5.64: Market Clearing Identity

$$ROW_t = MAMNT_t + MOMNT_t + SAMNT_t + TAMNT_t + ZAMNT_t + ZIMNT_t + SDMNT_t$$

The above set of equations form the SADC maize model. The individual country's maize is in several cases linked with the US maize Gulf Port price and regional and local maize net trade position in a system to account for price transmission. The price transmission elasticities with respect to the US Gulf Port price range form 0.09 in Zambia to 0.59 in Zimbabwe. This indicates that not all changes in US maize price are transmitted to SADC producers.

5.8 Model Performance and Validation Results

After the estimation, the model was validated using static and dynamic simulations to assess the sample's tracking ability. Appendix B reports the actual and simulated values maize of production and use for SADC for the period 1986 to 1996. The differences between the actual and simulation values indicate that errors in percentage term are less than 5 % for most of the variables. The graphical

representations of the actual and simulated production and consumption equations are in Appendix A. Table 5.1 reports the mean and the root mean square percentage errors. The Theil's inequality coefficients for the historical data period are presented in table 5.2.

Most of the endogenous variables have a low Root Mean Square Percentage Errors (RMS percentage). Variables that have high RMS percentage are SDMPR, ZAMSC, and SAMSC. Since some of the variables such as SDMPR, ZIMSC and SAMSC are of small magnitude thus any small error of prediction creates a high proportion of error when error is compared to the small actual values.

Theil's forecast errors of most of the simulation are from disturbance terms rather than from intercept or regression terms. As stated previously a value of U^M close to zero is desirable, and if U^M is not close to zero this indicates the presence of systematic error. U^S indicates the model's capability to replicate the degree of variability in the variable. A large U^S implies that the actual series has fluctuated considerably whereas the simulated variable has not or vice versa. U^C measures the unsystematic error. A value of $U^M = U^S = 0$ and $U^C = 1$ is ideal. From the table 5.2 it can be concluded that model performed satisfactorily.

Table 5.1: Mean Root Square

VARIABLE		MEAN ABSOLUTE % ERROR	RMS % ERROR
Area Harvested			
Malawi	MAMAH	3.87	4.64
Mozambique	MOMAH	7.95	9.31
South Africa	SAMAH	3.67	5.33
Tanzania	TAMAH	6.11	7.55
Zambia	ZAMAH	6.84	9.36
Zimbabwe	ZIMAH	7.89	9.82
Rest of SADC	SDMAH	12.63	17.52
Total SADC	TMAH	1.72	2.28
Production			
Malawi	MAMPR	3.8	4.59
Mozambique	MOMPR	8.08	9.37
South Africa	SAMPR	3.67	5.28
Tanzania	TAMPR	6.1	7.52
Zambia	ZAMPR	6.85	9.33
Zimbabwe	ZIMPR	7.88	9.8
Rest of SADC	SDMPR	12.65	*
Consumption			
Malawi	MAMFO	2.69	17.5
Mozambique	MOMFO	9.86	3.58
Tanzania	TAMFO	3.85	14.3
Zimbabwe	ZIMFO	2.07	4.93
Rest of SADC	SDMFO	7	9.3
Zambia	ZAMFO	3.11	3.71
South Africa (Human)	SAMFO	3.48	4.39
South Africa (Animal)	SAMFEED	8.15	9.61
Stock Change			
Malawi	MAMSC	139	272.1
Mozambique	MOMSC	*	*
Tanzania	TAMSC	*	*
Zambia	ZAMSC	87.82	119.7
South Africa	SAMSC	346.2	92.1
Zimbabwe	ZIMSC	*	*
Rest of SADC	SDMSC	202.5	388.3
Price			
Malawi	MAMPP	4.48	5.35
Mozambique	MOMPP	19.33	28.88
South Africa	SAMPP	11.49	4.21
Tanzania	TAMPP	36.34	49.83
Zambia	ZAMPP	19.34	25.78
Zimbabwe	ZIMPP	11.47	15.62

Note * means too small to report

Table 5.2: Theil's Statistics

VARIABLE		U^M	U^S	U^C
Area Harvested				
Malawi	MAMAH	0.00	0.22	0.78
Mozambique	MOMAH	0.00	0.18	0.82
South Africa	SAMAH	0.00	0.04	0.96
Tanzania	TAMAH	0.01	0.19	0.81
Zambia	ZAMAH	0.00	0.24	0.76
Zimbabwe	ZIMAH	0.00	0.10	0.90
Rest of SADC	SDMAH	0.01	0.21	0.79
Total	TMAH	0.13	0.01	0.86
Production				
Malawi	MAMPR	0.00	0.01	0.99
Mozambique	MOMPR	0.01	0.03	0.96
South Africa	SAMPR	0.00	0.00	1.00
Tanzania	TAMPR	0.00	0.28	0.72
Zambia	ZAMPR	0.00	0.29	0.71
Zimbabwe	ZIMPR	0.02	0.14	0.84
Rest of SADC	SDMPR	0.00	0.27	0.73
Consumption				
Malawi	MAMFO	0.00	0.03	0.97
Mozambique	MOMFO	0.01	0.02	0.96
Tanzania	TAMFO	0.01	0.00	0.99
Zimbabwe	ZIMFO	0.00	0.02	0.98
Rest of SADC	SDMFO	0.00	0.21	0.78
Zambia	ZAMFO	0.00	0.01	0.99
South Africa (Human)	SAMFO	0.00	0.13	0.87
South Africa (Animal)	SAMFEED	0.00	0.06	0.94
Stock Change				
Malawi	MAMSC	0.00	0.08	0.92
Mozambique	MOMSC	0.00	0.01	0.99
Tanzania	TAMSC	0.00	0.14	0.86
Zambia	ZAMSC	0.00	0.05	0.95
South Africa	SAMSC	0.00	0.22	0.78
Zimbabwe	ZIMSC	0.00	0.18	0.82
Rest of SADC	SDMSC	0.00	0.26	0.74
Prices				
Malawi	MAMPP	0.02	0.11	0.88
Mozambique	MOMPP	0.00	0.00	1.00
South Africa	SAMPP	0.00	0.05	0.95
Tanzania	TAMPP	0.08	0.39	0.53
Zambia	ZAMPP	0.01	0.10	0.89
Zimbabwe	ZIMPP	0.04	0.23	0.73

5.8.1 Impact Multipliers

To assess the performance of the model, the model is subject to exogenous shocks. The impact multipliers are computed to evaluate ex-ante performance of the model in response to changes in policy variables or response to exogenous shocks. The impact multipliers are computed as follows; first the model was simulated for period of 20 years past 1998 with all exogenous variables kept at their 1998 level. This procedure generates the base simulation. The model converged to a long-run equilibrium in the period 2008. The shock was then given to the chosen exogenous variable in that period and the model was simulated once again. The difference between base simulation and the simulation with the change in the exogenous variable in percentage term is the short run and long run multiplier. Table 5.3 and 5.4 report the changes in the actual values and the percentage change due to a 15 % increase in maize yield. Similarly, tables 5.5 and 5.6 report the change in the actual values and percentage change due to a 35 % increase of the inflation rate in each country.

The results from both simulations met the a priori expectations with respect to sign and impact of the two shocks. From tables 5.5 and 5.6 it is evident that an increase in yield in period 1 will cause production, stock change, and consumption to increase, while price will decrease due to an excess supply. Area harvested will as a consequence be reduced in the following periods. The extent and time periods it takes for each single country to return to normal depends on the various individual short and long run elasticities. Tanzania's maize price continues to decrease because it is in US Dollars and it is assumed that the currency will continue to devalue. The decrease in maize price in Tanzania also causes the Area harvested to decrease for a longer period than all the remaining countries. As far as the region as a whole is concerned, the regional net maize trade position increases by 30.80 % and 9.91 % in period 1 and 2. The subsequent periods however show a negative percentage change in the regional net trade position caused by the reduced area harvested and consequently production.

Table 5.3: Actual Change due to a 15 Percent Increase in Maize Yield

PERIOD	1	2	3	4	5	6
Area Harvested (Hectare)						
Malawi	0	-11347	-6662	-1619	-238	-7
Mozambique	0	-98	-58	-16	-3	0
Tanzania	0	-2701	-4046	-3923	-3279	-2544
Zambia	0	-23587	-15235	-5099	-1524	-327
South Africa	0	-8940	-6964	-3469	-1787	-968
Zimbabwe	0	-16212	-8720	-637	170	40
Rest of SADC	0	0	0	0	0	0
Maize Production (Tons)						
Malawi	297906	-16340	-9593	-2331	-342	-10
Mozambique	160349	-92	-55	-15	-3	0
Tanzania	1874941	-9317	-13960	-13533	-11313	-8776
Zambia	413030	-38212	-24681	-8261	-2468	-529
South Africa	176423	-18684	-14554	-7251	-3735	-2024
Zimbabwe	395282	-27561	-14824	-1083	288	68
Rest of SADC	34465	0	0	0	0	0
Maize Consumption (Tons)						
Malawi	925	260	-34	-21	-5	-1
Mozambique	4	1	0	0	0	0
Tanzania	2465	649	-76	-45	-27	-19
Zambia	20	4	-1	-1	0	0
South Africa (Human)	4883	4734	3223	2178	1463	978
South Africa (Animal)	27224	26392	17968	12143	8158	5454
Zimbabwe	590	202	-39	-11	0	0
Rest of SADC	0	0	0	0	0	0
Change In Stock (Tons)						
Malawi	2870	110687	-6133	-3603	-876	-130
Mozambique	0	12150	-7	-4	-1	0
Tanzania	14135	80811	-7569	-4863	-1695	-567
Zambia	0	43545	-4612	-3592	-1790	-922
South Africa	5549	538693	1012	-1496	-2187	-2106
Zimbabwe	39447	176121	-13951	-6816	-461	137
Rest of SADC	0	15226	0	0	0	0
Price(Local Currency/Ton)						
Malawi	-139	-39	5	3	1	0
Mozambique	-3818	-976	154	80	41	25
Tanzania (US Dollars)	-22	-21	-14	-10	-7	-4
Zambia	-19743	-5199	611	358	214	149
South Africa	-39604	-7806	2580	1025	317	123
Zimbabwe	-50	-17	3	1	0	0
Row	3378285	834787	-129965	-67092	-34173	-21273

Table 5.4: Percentage Change Due to a 15 Percent Increase in Maize Yield

PERIOD	1	2	3	4	5	6
Area Harvested (Hectare)						
Malawi	0.000	-0.845	-0.494	-0.120	-0.018	-0.001
Mozambique	0.000	-0.009	-0.005	-0.001	0.000	0.000
Tanzania	0.000	-0.075	-0.112	-0.109	-0.091	-0.071
Zambia	0.000	-1.390	-0.893	-0.297	-0.089	-0.019
South Africa	0.000	-1.596	-1.239	-0.613	-0.315	-0.170
Zimbabwe	0.000	-1.078	-0.577	-0.042	0.011	0.003
Rest of SADC	0.000	0.000	0.000	0.000	0.000	0.000
Maize Production (Tons)						
Malawi	13.253	-0.845	-0.494	-0.120	-0.018	-0.001
Mozambique	12.963	-0.009	-0.005	-0.001	0.000	0.000
Tanzania	13.098	-0.075	-0.112	-0.109	-0.091	-0.071
Zambia	12.903	-1.390	-0.893	-0.297	-0.089	-0.019
South Africa	12.917	-1.596	-1.239	-0.613	-0.315	-0.170
Zimbabwe	13.265	-1.078	-0.577	-0.042	0.011	0.003
Rest of SADC	12.782	0.000	0.000	0.000	0.000	0.000
Maize Consumption (Tons)						
Malawi	0.064	0.018	-0.002	-0.001	0.000	0.000
Mozambique	0.000	0.000	0.000	0.000	0.000	0.000
Tanzania	0.108	0.029	-0.003	-0.002	-0.001	-0.001
Zambia	0.002	0.000	0.000	0.000	0.000	0.000
South Africa (Human)	0.139	0.135	0.092	0.062	0.042	0.028
South Africa (Animal)	0.743	0.720	0.492	0.333	0.224	0.150
Zimbabwe	0.041	0.014	-0.003	-0.001	0.000	0.000
Rest of SADC	0.000	0.000	0.000	0.000	0.000	0.000
Change In Stock (Tons)						
Malawi	1.160	31.171	-2.574	-1.496	-0.360	-0.053
Mozambique	0.000	27.238	-0.021	-0.013	-0.003	-0.001
Tanzania	9.421	37.291	-5.898	-3.711	-1.263	-0.419
Zambia	0.000	37.462	-6.773	-5.198	-2.524	-1.285
South Africa	0.365	26.218	0.067	-0.099	-0.144	-0.139
Zimbabwe	12.155	38.188	-5.146	-2.450	-0.162	0.048
Rest of SADC	0.000	-145.23	0.000	0.000	0.000	0.000
Price(Local Currency/Ton)						
Malawi	-18.763	-4.652	0.578	0.357	0.091	0.020
Mozambique	-2.737	-0.686	0.107	0.055	0.028	0.018
Tanzania	-3.637	-3.524	-2.373	-1.592	-1.064	-0.709
Zambia	-14.395	-3.427	0.388	0.228	0.136	0.095
South Africa	-22.967	-3.822	1.202	0.481	0.149	0.058
Zimbabwe	-3.611	-1.205	0.230	0.063	0.001	-0.002
Row	30.802	9.910	-1.743	-0.892	-0.452	-0.281

The second simulation also met the a priori expectations. Inflationary pressures have the immediate effect of increasing nominal prices and thus decreasing consumption in the short run, as can be seen in table 5.6. As incomes and expenditures adjust, real prices tend to decrease and it is for this reason that area harvested is again reduced in period 2. The various effects of inflationary pressures on the individual countries after period 2 depends on the various short and long run elasticities. The increase in inflation in period 1 did however have the expected effect on all the countries in the study.

For SADC as a whole, area harvested and production are not affected in period 1 as farmers can only make their production decision for the following year. Total consumption will however decrease in period 1 by 2.096 % while stock change and net trade will increase by 9.15 and 6.55 % respectively. Most of these effects however begin to reverse themselves as inflation returns to normal and consumers and producers adjust to the new price levels.

Table 5.5: Actual Change Due to a 35 Percent increase in Inflation

PERIOD	1	2	3	4	5	6
Area Harvested (Hectare)						
Malawi	0	-18623	15874	6400	3030	1054
Mozambique	0	-949	796	276	97	34
Tanzania	0	-1199	-1456	-1328	-1079	-823
Zambia	0	16131	1492	2211	1967	1052
South Africa	0	-1787	-10099	-5070	-2803	-1593
Zimbabwe	0	-87391	-11046	1111	457	26
Rest of SADC	0	-5228	-1942	-721	-268	-100
Maize Production (Tons)						
Malawi	0	-26818	22859	9216	4363	1518
Mozambique	0	-892	748	260	92	32
Tanzania	0	-4137	-5022	-4581	-3721	-2839
Zambia	0	26132	2417	3582	3186	1704
South Africa	0	-3734	-21107	-10596	-5858	-3330
Zimbabwe	0	-148565	-18779	1888	777	44
Rest of SADC	0	-6064	-2253	-837	-311	-115
Maize Consumption						
Malawi	-3097	-126	-87	-10	2	1
Mozambique	-874	0	0	0	0	0
Tanzania	388	-171	-117	-31	-14	-9
Zambia	-49	20	-2	0	0	0
South Africa (Human)	-75365	1485	1009	680	456	305
SouthAfrica (Animal)	-231341	8281	5624	3793	2544	1699
Zimbabwe	-1218	-222	-119	-9	2	1
Rest of SADC	5809	0	0	0	0	0
Change in Stock						
Malawi	669	-10283	8160	3367	1616	564
Mozambique	0	-68	57	20	7	2
Tanzania	2804	3894	-220	489	515	264
Zambia	0	0	-922	-5210	-2615	-1446
South Africa	2464	1688	-31	-656	-785	-712
Zimbabwe	212638	-14826	-69102	-8309	932	356
Rest of SADC	9219	0	-2679	-995	-370	-137
Price(Local Currency/Ton)						
Malawi	264	19	13	2	0	0
Mozambique	43823	197	125	26	11	10
Tanzania	204	-7	-4	-3	-2	-1
Zambia	49627	1373	938	250	111	76
South Africa	63539	-40135	3571	651	167	112
Zimbabwe	137	19	10	1	0	0
Row	531964	-165336	-105148	-22202	-9550	-8040

Table 5.6: Percentage Change due to a 35 Percent Increase in Inflation

PERIOD	1	2	3	4	5	6
Area Harvested (Hectare)						
Malawi	0.000	-1.394	1.159	0.470	0.223	0.078
Mozambique	0.000	-0.083	0.069	0.024	0.008	0.003
Tanzania	0.000	-0.033	-0.040	-0.037	-0.030	-0.023
Zambia	0.000	0.929	0.087	0.128	0.114	0.061
South Africa	0.000	-0.315	-1.807	-0.899	-0.495	-0.281
Zimbabwe	0.000	-6.099	-0.732	0.073	0.030	0.002
Rest of SADC	0.000	-2.647	-0.967	-0.357	-0.132	-0.049
Maize Production (Tons)						
Malawi	0.000	-1.394	1.159	0.470	0.223	0.078
Mozambique	0.000	-0.083	0.069	0.024	0.008	0.003
Tanzania	0.000	-0.033	-0.040	-0.037	-0.030	-0.023
Zambia	0.000	0.929	0.087	0.128	0.114	0.061
South Africa	0.000	-0.315	-1.807	-0.899	-0.495	-0.281
Zimbabwe	0.000	-6.099	-0.732	0.073	0.030	0.002
Rest of SADC	0.000	-2.647	-0.967	-0.357	-0.132	-0.049
Maize Consumption						
Malawi	-0.214	-0.009	-0.006	-0.001	0.000	0.000
Mozambique	-0.088	0.000	0.000	0.000	0.000	0.000
Tanzania	0.017	-0.008	-0.005	-0.001	-0.001	0.000
Zambia	-0.004	0.002	0.000	0.000	0.000	0.000
South Africa (Human)	-2.200	0.042	0.029	0.019	0.013	0.009
South Africa (Animal)	-6.794	0.227	0.154	0.104	0.070	0.047
Zimbabwe	-0.085	-0.016	-0.008	-0.001	0.000	0.000
Rest of SADC	1.709	0.000	0.000	0.000	0.000	0.000
Change in Stock						
Malawi	0.273	-4.392	3.231	1.359	0.657	0.230
Mozambique	0.000	-0.209	0.174	0.061	0.021	0.007
Tanzania	2.022	2.786	-0.162	0.359	0.378	0.194
Zambia	0.000	0.000	-1.284	-7.720	-3.732	-2.029
South Africa	0.162	0.111	-0.002	-0.043	-0.052	-0.047
Zimbabwe	42.723	-5.486	-31.996	-3.002	0.326	0.125
Rest of SADC	-55.907	0.000	9.437	3.727	1.418	0.531
Price(Local Currency/Ton)						
Malawi	23.093	2.109	1.472	0.178	-0.036	-0.022
Mozambique	23.417	0.137	0.087	0.018	0.008	0.007
Tanzania	24.753	-1.080	-0.731	-0.492	-0.329	-0.220
Zambia	24.030	0.867	0.594	0.159	0.071	0.048
South Africa	23.056	-23.347	1.656	0.306	0.079	0.053
Zimbabwe	8.791	1.293	0.700	0.051	-0.014	-0.003
Row	6.550	-2.227	-1.405	-0.293	-0.126	-0.106

5.9 Summary

In this chapter the estimated results of the SADC maize sector are reported and discussed. The estimated equations were generally satisfactory. The fit measured by the R-Squared were reasonable, with fourteen equations having an R-Squared better than 0.8, whereas there were five equations with an R-Squared of 0.7, six equations had an R-square of 0.6, and the remaining three equations had an R-Squared below 0.5. Based on the performance tests and the model validation test, the results suggest that the model replicates the SADC maize sector quite well, i.e., the developed model has satisfactory predictability power. The relevant elasticities were computed at the mean of the variables. Table 4.6 summaries the relevant elasticities of the model.

Table 5.6: Summary of Elasticities

Country	Short Run Price Elasticity (Supply)	Long Run Price Elasticity (Supply)	Own Price Elasticity (Demand)	Income Elasticity
Malawi	0.0924	0.1331	-0.0613	0.0761
Mozambique	0.0439	0.0667	-0.1663	0.3313
Tanzania	0.0631	0.1339	-0.1252	0.0054
South Africa	0.0938	0.1519	-0.1871	0.0834
Zambia	0.0708	0.1694	-0.0225	0.0890
Zimbabwe	0.3605	0.4484	-0.0752	0.0972
Rest of SADC	0.0841	0.1338	-0.0006	0.0004

The estimated elasticities suggest some interesting observations. All short run supply elasticities were less than 0.09 with the exception of Zimbabwe, which has a supply elasticity of 0.3605. It is not clear why the elasticities of Zimbabwe are so high. The own price demand elasticities were in the range of –0.0006 to –0.1663, whereas income elasticities were in the range of 0.0004 to 0.3313, which suggest that maize is a basic necessity for SADC countries.

The ex-ante performance of the model was tested using impact multipliers. The results show that the model reacts to exogenous shocks in the expected manner. Tables 5.7 and 5.8 contain a summary of the expected actual and percentage changes

of the endogenous variables given a 15 % increase in yield and a 35 % increase in inflation, respectively.

Due to the fact that the model tracks changes in exogenous variables adequately, it is possible to develop a baseline forecast and different policy scenarios using the model. The results of the baseline forecast and the policy scenarios are presented in the following chapter.

Table 5.7:SADC Actual and Percentage due to a 15 percent increase in yield

PERIOD	1	2	3	4	5	6
Change in Total Area (Hectares)	0	-62885	-41685	-14763	-6661	-3806
Total Area % change	0.00	-0.63	-0.41	-0.15	-0.07	-0.04
Change in Total Production (Tons)	3352397	-110205	-77666	-32474	-17574	-11272
Total Production % change	13.09	-0.50	-0.35	-0.15	-0.08	-0.05
Change in Total Change in Stock (Tons)	62000	977233	-31259	-20374	-7010	-3589
Change in Stock % change	2.67	30.18	-1.40	-0.91	-0.31	-0.16
Change in Total Food Use (Ton)	36111	32242	21040	14244	9588	6413
Total Food Use % change	0.242	0.216	0.141	0.096	0.064	0.043
Change in Net Trade (Tons)	3378285	834787	-129965	-67092	-34173	-21273
Net Trade % change	30.80	9.91	-1.74	-0.89	-0.45	-0.28

Table 5.8:SADC Actual and Percentage due to a 35 percent increase in Inflation

PERIOD	1	2	3	4	5	6
Change in Total Area (Hectares)	0	-3442	-77442	-15656	-915	-1553
Total Area % change	0	-0.03	-0.77	-0.15	-0.01	-0.02
Change in Total Production (Tons)	0	-1578	-136476	-34104	-6486	-5859
Total Production % change	0	-0.01	-0.62	-0.15	-0.03	-0.03
Change in Total Change in Stock (Tons)	227795	-19594	-64737	-11294	-700	-1109
Change in Stock % change	9.15	-0.87	-2.95	-0.50	-0.03	-0.05
Change in Total Food Use (Ton)	-305747	9267	6307	4422	2991	1996
Total Food Use % change	-2.096	0.062	0.042	0.030	0.020	0.013
Change in Net Trade (Tons)	531964	-165336	-105148	-22202	-9550	-8040
Net Trade % change	6.550	-2.227	-1.405	-0.293	-0.126	-0.106