REGIONAL TRADE AND PRICING OF MAIZE IN SOUTHERN AFRICA

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This paper discusses the potential for intra-regional trade and sub-regional adjustment in the maize economy of the four SADC-countries Botswana, Malawi, Zambia, Zimbabwe and additionally South Africa. Sub-regional adjustments in supply, demand, prices and trade patterns are analysed employing a spatial partial equilibrium model. For the regional staple food product, maize, it can be shown that trade contributes to cost-minimal procurement and distribution of food in the region. Despite of a current degree of self-sufficiency of around one hundred percent in any of the countries (Malawi, Zambia and Zimbabwe) trade with a neighboring country would occur. Furthermore, South Africa would sell considerable amounts of maize to Southern Zimbabwe. Furthermore, the implications of drought for the maize economy are investigated.

1. Introduction

Regional Trade in agricultural products between neighboring countries is rare in Southern Africa. Due to government regulations on international and intra-regional movements of food stuffs, trade in agricultural commodities is limited to special products, only. Especially, basic food stuffs such as maize are heavily government controlled. For example, in Malawi, Zambia and Zimbabwe government still set prices for basic foods and run marketing boards, though already with a reduced mandate. In principle, foreign trade in maize is still government determined. Governments follow different strategies of autarky in food markets in order to prevent their populations from becoming dependent on foreign markets. Contrary to that practice, there is evidence that these countries could engage in considerable trade in agricultural commodities with each other (Koester, 1990). However, recently most countries in the Southern African region have taken measures to liberalize their economies. Furthermore, the developments in South Africa have open the windows for new prospects in trade, even in basic foods. It is the objective of this study, to show how trade between neighboring countries in Southern Africa (Botswana, Malawi, South Africa, Zambia and Zimbabwe) would change their maize economies. Specifically, the paper focuses on regional prices and will show how world market prices internally determine regional pricing in Southern Africa.

This contribution can be seen as an attempt to quantify the effects of the introduction of liberalized maize trade in the SADC region. Obviously, liberalizing trade requires changes in the institutional settings. For example, if private traders could assume responsibilities which are currently borne by parastatals and marketing boards, regional prices are a prerequisite. Liberalization would lead to price differences which are the engine of arbitrage and this regional trade.

Since drought is prevalent in the region, protecting national populations from food shortages is a major concern. Means of increasing food security are carry-over stock which in Zimbabwe, for example, have reached the level of one year's consumption or 1.2 million tons in some years. Since such stocks are very costly means of insurance, other measures to ensure food security such as trade and reduced stock-piling may become simultaneous options in the future. Governments in the region are becoming increasingly aware that autarky policies place heavy burdens on government finance, immobilize capital permanently, and slow down development in other sectors. Koester (1986) suggests that intra-regional trade should be investigated as an option for improving food security. Hence, this contribution will additionally simulate a situation where drought effects regional production, trade and pricing. In such simulations it can be investigated whether South Africa can play a major role in the provision of regional food security.

The paper is organized in three sections. First, the empirical background for calibrating the model will be discussed. This discussion will enable the reader to get a broader understanding of regional surplus and deficit locations in the five countries of investigation (Botswana, Malawi, South Africa, Zambia and Zimbabwe). Second, a brief introduction to major features of the model applied will be provided. This section serves basically as a tool for understanding the results. Third, results from a baseline scenario of liberalized trade and results of a drought scenario will be presented. Both scenarios (liberalized trade in a normal year and in a drought year) focus on trade pattern and regional price differences as expected for the extended SADC region.

2. Empirical background

The empirical background, which constitutes surpluses and deficits according to respective sub-regions for Botswana, Malawi, South Africa, Zambia, and Zimbabwe has already been described (for Malawi, Zambia and Zimbabwe see Nuppenau, 1993) or drawn from recent statistics (for Botswana as on region and South Africa by newly established provinces including homelands see Directorate of Agricultural Information, 1994). Diagram 1 shows the baseline of sub-regional product balances as been used in this study. Figures are derived from an average of 1985, 1986, and 1987 crop years on provincial levels for Malawi, Zambia, and Zimbabwe. Moreover, these figures have been adjusted to 1991 and 1993 national production and consumption figures for these countries as published by the USDA agricultural commodity statistics (USDA, 1994). Deliberately, the year 1992 has been excluded due to the prevalent drought in the region.

Sub-regional supply and demand figures are used as bench marks in the functional approach. Assuming that consumers and producers have decided on these figures, linear supply and demand functions can be constructed. In doing so additional information is required from prevalent prices supply and demand elasticities, respectively. This approach completes the behavioral part of the model.

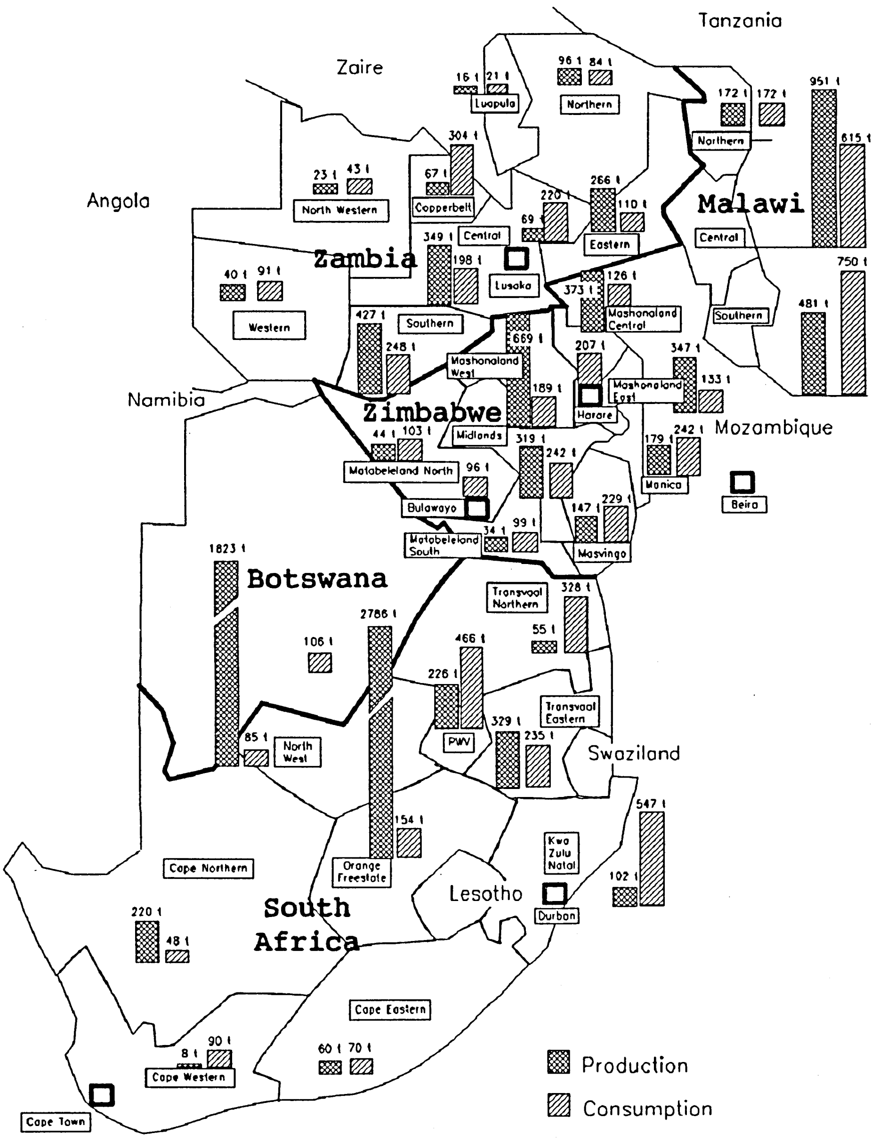

Diagram 1: Regional Deficit and Surplus by Province in the four SADC-Countries and South Africa (in 1000t)

Since no really reliable elasticities on a sub-regional level have been reported so far, standard values are assumed.Throughout, the paper assumes a demand elasticity of -0.4 and a supply elasticity of 1.2 for commercialized sub-regions. For communal or peasant-dominated sub-regions an elasticity of 0.8 has been applied for any sub-region. These figures coincide with figures from a study of Buccola and Sukume (1987) who report for Zimbabwe a global demand elasticity of -0.4 and a supply elasticity of 1.0 for national supply. Respective nominal pan-territorial prices have been US$ 71 in Malawi, US$ 110 in Zimbabwe, and US$ 133 in Zambia (Valdes and Thomas, 1990). South African prices are reported on provincal level according to statistical information from (Directorate of Agricultural Information and Van Zyl, 1994). These information are prerequisites for the design of sub-regional supply and demand functions. Transport costs are drawn from an estimation of Louis Burger (1986) which seems to be a slight under-estimation of the situation in the late 1980s and early 1990s. Because of the crisis in the transport systems which has become more severe, actual financial costs may be even higher. New model runs might be appropriate with improved data. However, the informations is not available yet and a conservative strategy should be to stick to published data. South African and Botswana transport costs assume back-loading activities while Malawi, Zambia and Zimbabwe transport costs are directly drawn from medium values of Louis Burger (1986). Table 1 shows major transport links and the corresponding transport costs. However, these data only provides the frame for an extended matrix which links, in principle, each individual source of the commodity with its corresponding target region.

3. Model-building

To begin with a description of the formal framework employed, a spatial equilibrium model of the type that is well established in the economic literature has been used.

Table 1: Transport Routes and Costs between Provinces

	From:	To:	US-$/t
Malawi:			
I	Northern (Chilumba)	Central(Lilongwe)	35.70
II	Central (Lilongwe)	Southern (Blantyre)	24.50
III	Northern(Chilumba)	Northern Zambia(Kasama)	28.00
IV	Central(Lilongwe)	Eastern Zambia(Chipata)	12.70
V	Southern(Blantyre)	Mashonaland East (Nyamapanda)	23.90
Zambia:			
VI	Northern (Kasama)	Central (Kapiri Mposhi)	40.50
VII	Central (Kapiri Mposhi)	Lusaka	22.20
VIII	Central (Kapiri Mposhi)	Luapula (Mansa)	29.80
IX	Copperbelt (Ndola)	Central (Kapiri Mposhi)	17.00
X	North Western (Solwezi)	Copperbelt (Ndola)	12.50
XI	Western (Mongu)	Lusaka	30.50
XII	Southern (Livingstone)	Lusaka	54.70
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XXXVII	Orange Free State (Bloemfontein)	Kwa Zulu Natal (Pietermaritzburg)	31.70
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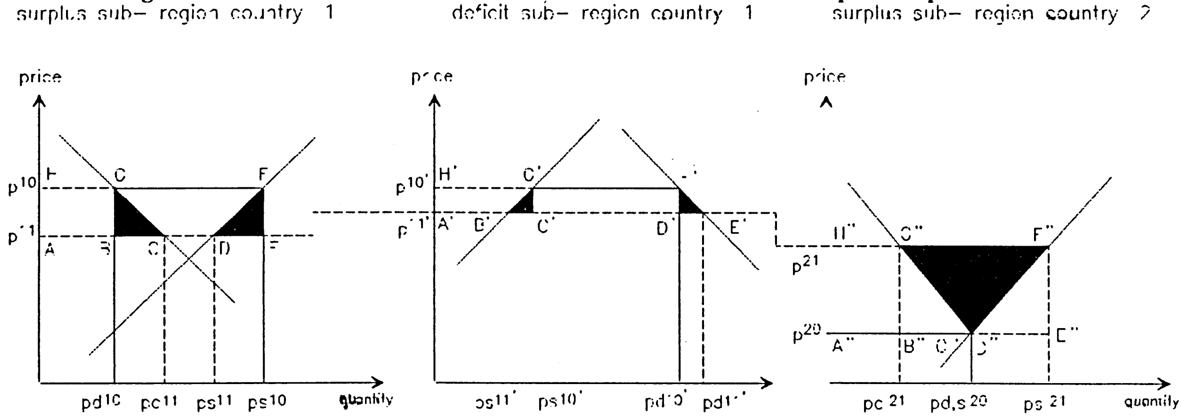
Source: Based on Data from L. Berger, Southern Africa Regional Transportation Strategy Evaluator, Database Update (study prepared for U.S.A.I.D., Washington, D.C. 1986)

The pioneering work can be found in Takajama-Judge (1971) and the presented mathematical approach is closely linked to Hazell and Norton's (1986) description of a sectoral model for investigating spatial market equilibria. Theoretically, the model operates with the objective function of maximizing consumer surplus minus production, transport, and stock-piling costs. Stock-piling costs are relevant, because a two-year model is used to simulate stockpiling in the first year in anticipation of a drought in the sub-regional prices and production levels and costs. The quadratic objective function has been designed according to standard approaches documented and applied by Bale and Lutz (1981). Demand and supply function are assumed linear in order to keep the approach as simple as possible.

Diagram 2: Model Framework to Evaluate Trade Liberalization in a Spatial Equilibrium Model



This may become a problem if large changes occur, but may serve as a first order approximation. In its operation the model can be described by a simplified diagram (Diagram 1), which comprises three subregions and displaying the initial approach in a normal year. More details on the model are discussed in Nuppenau (1993). In diagram 1 a situation with no price differentiation between sub-regions in country 1 (pan-territorial pricing) and no price interaction with country 2 is compared with an alternative situation where transport costs matter and prices interact via trade between and within countries. Abolishing pan-territorial pricing in country 1 (p10 and p10') and allowing trade between the two countries, the situation changes to an integrated market depicted by the dotted price and quantity lines. Individual prices p11, p11' and p20 in the surplus region depend on distance to the deficit region. If country 2's surplus region is relatively far away, its price level will be lower than that in country 1's surplus sub-region. Additionally, the shaded area shows the welfare gains from trade.

From a theoretical point of view the model structure does not change substantially if international trade will be introduced into the model. International trade can be seen as trade with a further sub-regions which happens to be characterized by an infinite elastic supply function or demand function at the world market price. Furthermore, a differentiation between fob price and cif prices in harbours makes the model more realistic than simple trade modols.

4. Results

In this section two model runs and their results are presented. The presentation depicts a situation with total trade liberalization in all countries. It starts with a normal year and the situation in a drought year will also be presented.

4.1 Normal year

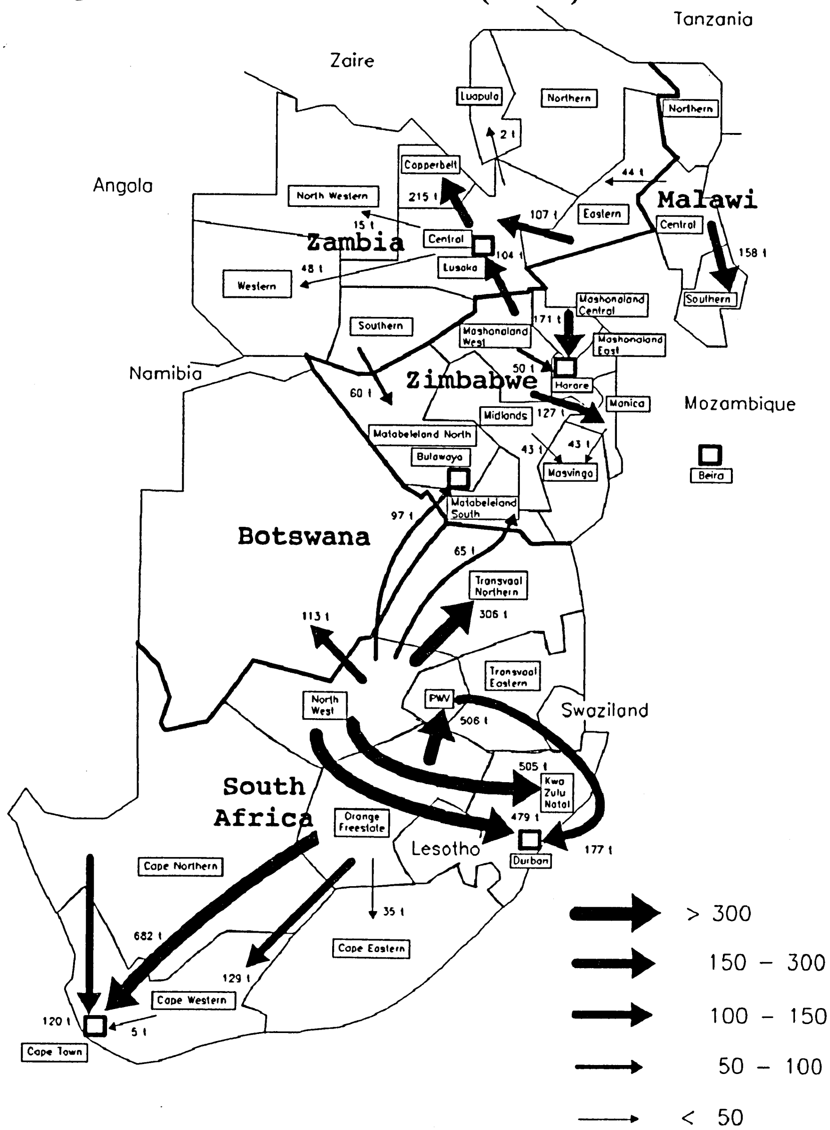
In order to appreciate potential changes in trade volumes and other changes, which occur due to the policy change directed towards trade liberalization, the model results of Diagram 3 have to be compared with a situation of no border crossing trade. Currently only Botswana regularly imports from South Africa. Due to the aggregation of national deficits and surpluses each country beside Botswana (Malawi, South Africa, Zambia, and Zimbabwe) is self-sufficient in maize in a normal year. On contrast to this observation, model results in Diagram 3 shows sub-regional border crossing trade.

For example, it would be cheaper for the Zambian capital Lusaka to import it deficits from Zimbabwean Mashonaland West than to ship maize from remoter Zambia Southern province (104,000 t) as currently done under self-sufficiency policy. The same applies to Western deficit areas of Zimbabwe. Here one would expect imports from Zambia-Southern province (60,000t to Matabeleland North in a situation of free trade. In order to summarize, considerable trade volumes may prevail between sub-regions of SADC countries (additionally between Malawi Central an Zambia Eastern, 44,000t) despite of national self-sufficiency. Concerning South Africa's position Western Transvaal would deliver 97,000 t to Bulawayo and 65,000 t to Matabeleland South due to relatively cheap rail transport through Botswana. Obviously, Botswana would receive its deficits (113,000 t) from the same South African Province.

However, introducing trade and transport activities which finance themselves by charging transport margins, would imply price differences between sub-regions. Furthermore, if governments let such price differences prevail in any sub-regions, we would expect adjustments in production and consumption (not depicted) compared to the baseline (Diagram 2). These adjustments will be forced by local price changes. From the economic point of view adjustments due to sub-regional price changes reflect marginal production costs and consumption preference. Recursively these changes may alter sub-regional procurement costs and imply changes in trade pattern.

The following deliberations on price pattern are based on nominal prices in US$ reflecting the average of the 1985,'86 and '87 price level. The results from the trade liberalization model run, with regard to changes in the price pattern, are given in Diagram 4. They are depicted as relative deviation from US$ 110 which is the price prevailing at the port of Beira, Durban and Cape Town.

Diagram 3: Regional Maize Trade in Southern Africa (in 1000t)

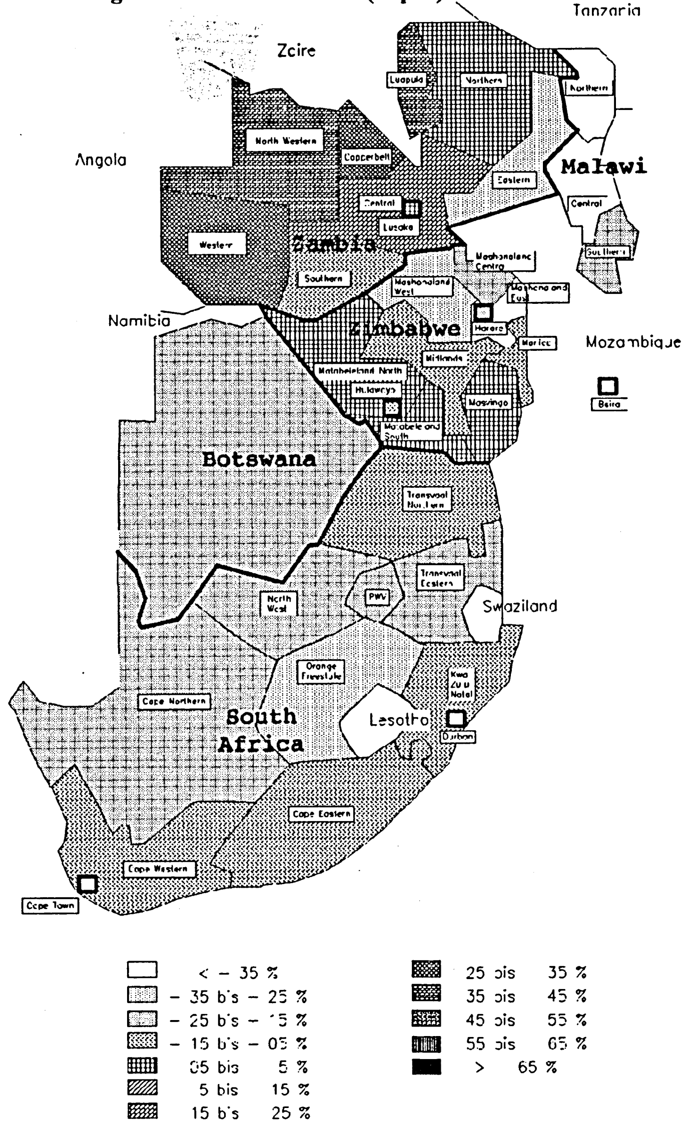


The lowest prices in the region will be in the surplus sub-regions of Malawi Northern, Malawi-Central, and Mashonaland-East, Zimbabwe. Less than 35 p.c. of the world market price level will only be obtainable by farmers. However, from a redistribution point of view Malawian losses are small compared to current prices which are already 30 p.c. below world market prices. An additional 10 p.c. price drop would be only marginal in Malawi. The opposite applies to Zimbabwean Mashonaland which would incur a considerable price drop due to liberalization, since current prices (1991) are approximately at world market prices (converted by the nominal exchange rate).

On the other side of the regional price pattern, in a normal year, deficit and densely populated sub-regions like the Zambian Copperbelt and Central province of Zambia will have prices being 25 to 35 p.c. or 15 to 25 p.c., respectively, above world market prices. However, this is still in range with current pricing in Zambia. Prices in the Zambian capital Lusaka will be close to world market prices due to cheap imports from Zimbabwe which shows an improvement for consumers. Simultaneously, after trade liberalization, the Zimbabwean capital Harare, which is the sub-region of highest population concentration in Zimbabwe, will enjoy relative depressed prices of 15 to 25 p.c. below the world market price.

South Africa, however, will face a decline in prices, which are currently close to world market prices (in nominal terms, taking the nominal exchange rate). Since major surplus areas (Orange Free State and Western Transvaal) are in the hinterland, transport costs to Cape Town and Durban will keep prices low in this country. To summarize, the price pattern will be individually determined by the relative position towards surplus/deficit sub-regions and the ports which have been assumed to be the sole international trade opportunity.

Diagram 4: Pattern of Regional Price Differences (in p.c.)



4.2 Drought year

As mentioned above drought is a major problem in the SADC region. Since drought has unequal effects on supply in the region, regional price structure must adjust to restore market equilibrium. In the model applied here, adjustment takes place in various consumption areas simultaneously. A crucial question is whether trade and/or stock-piling can alleviate production shortfalls by spreading the effects on more participants. In order to investigate this questions, a two-period model of trade and stock-piling has been designed.

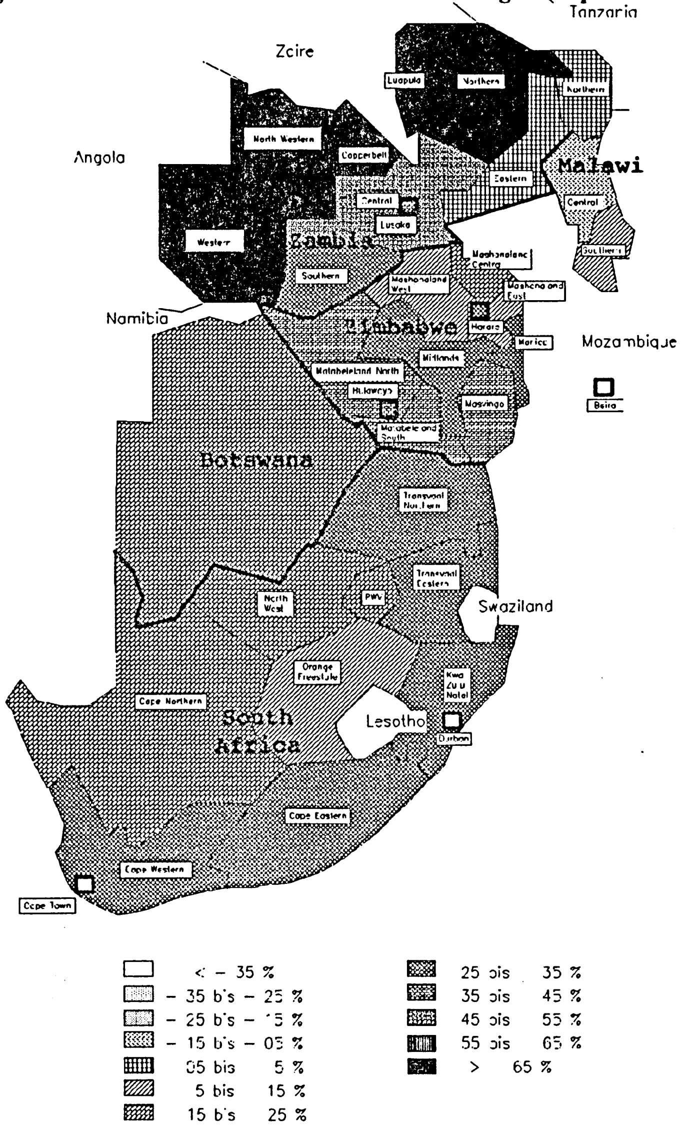
This model adds to the one-period model by simulating drought conditions in the second period (for more details see Nuppenau, 1993). Stocks built up in the first period are allowed to alleviate shortfalls in the second period anticipated already in the first period.

It is assumed that stocks are built up in the correct anticipation of typical drought conditions. Price differences between the two periods guarantee the viability of stock holding business. Note, that the question of private versus government stock-piling is not addressed here. Furthermore, it is assumed that governments can control prices in urban areas. The approach is deterministic in the sense that the shortfall is known in advance and only certain typical drought episodes based on past probabilities are investigated.

In reality, the question of strategic stock-piling involves risk aversion, shortage expectations and other interactions which are beyond our limited approach.

The "drought" envisaged may occur with a probability of 16 p.c.. Further details describing the construction of a drought simulation are reported in Nuppenau (1990).

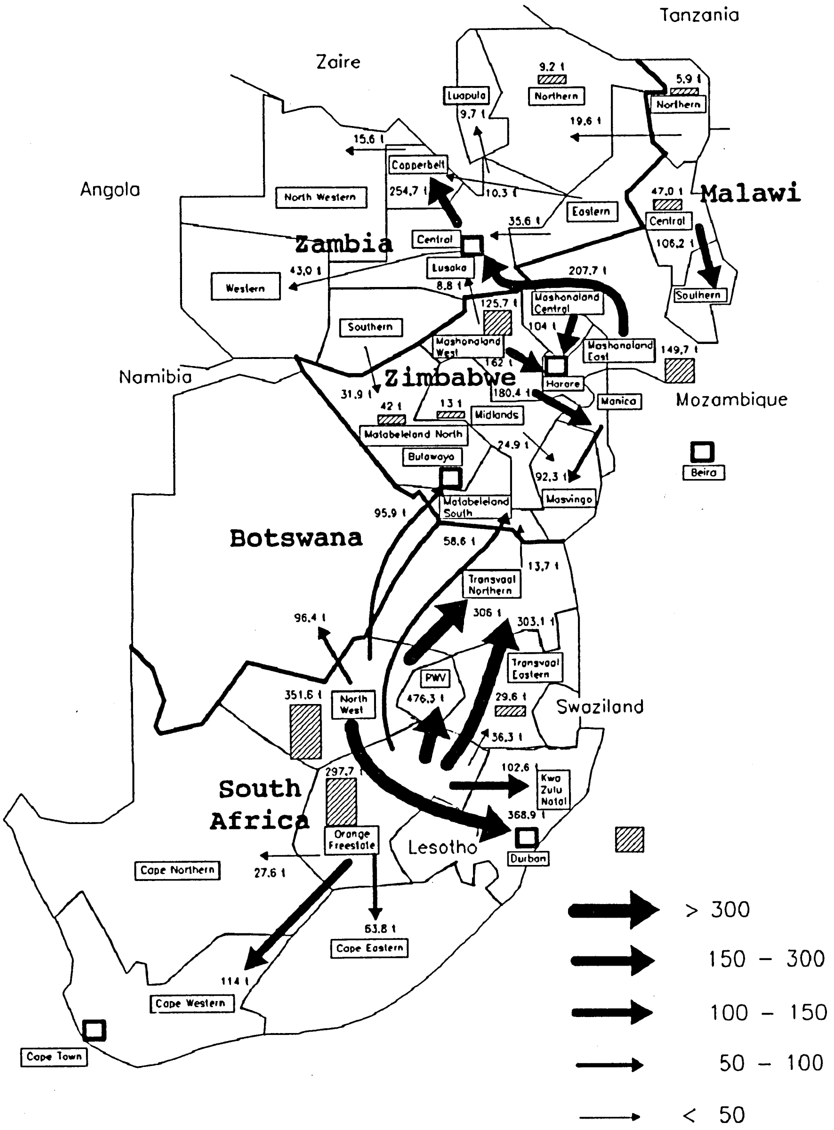
Diagram 5: Regional Price Pattern in the Case of a Severe Drought (in p.c. of world market price)



In principle, we are discussing a drought which may occur in 1 year of every 7 years. According to probability theory, obviously, a drought in reality will not be exactly the same as a simulated drought. Simply, nobody can exactly predict future production shortfalls in the case of a drought. Simulations can only display fixed points in a continuum of possible effects on production shortfalls. Obviously, the choice of particular production shortfalls inherits subjective decisions (see Nuppenau, 1993). As Diagram 5 shows prices will be the highest in remote Zambia. Malawi will have still lower prices than elsewhere in the region, partly due to stock-piling (see Diagram 6). Zimbabwe's North (Mashonaland) will equally enjoy low prices. Stock-piling is most prevalent in this region. South African prices will rise substantially by 50 p.c., but will stay low compared to the other countries. Zimbabwe's South (Matabeleland) will exhibit a threshold of higher prices between these low prices down south and lower prices in the middle of the region (Mashonaland).

Trade quantities associated with the "drought" are depicted in Diagram 6. The simulation shows that Zimbabwe contributes 110,000 t more in Lusaka procurements, but reduces its Matabeleland imports by 28000 t. It must be mentioned that competitive imports from all ports are part of the puzzle in a free trade situation, but are not chosen in the simulation. Since stocks can be made available as a substitute for external trade, procurement of stocks in the first period are a major component. As Diagram 6 shows stocks of roughly 330,000 t would be procured in Zimbabwe. Furthermore, these stock-piling activities are more competitive than additional imports from South Africa. As Diagram 6 reveals imports from South Africa to Zimbabwe only slightly change. Obviously, these results crucially depend on transport costs and stock-piling costs in the model. Hence, from a policy analysis point of view it makes sense to alter these costs and observe corresponding results.

Diagram 6: Regional Trade Pattern in the Case of a Severe Drought, Second Year (in p.c. from World market price)



5. Summary

In this contribution the potential for intra-regional trade and sub-regional adjustment has been investigated for the SADC-countries Botswana, Malawi, Zambia, Zimbabwe and additionally South Africa. Sub-regional adjustments in supply, demand, and trade patterns are determined by changes in sub-regional price patterns due to liberalization. Applying a spatial partial equilibrium model of trade liberalization for the regional staple food product, maize, it can be shown that trade contributes to cost-minimal procurement and distribution of food in the region. Despite of a current degree of self-sufficiency of around one hundred percent in any of the countries (Malawi, Zambia and Zimbabwe) trade with a neighboring country would occur. Furthermore, South Africa would sell considerable amounts of maize to Southern Zimbabwe.

From a regional welfare point of view neighboring countries are better off opening their economies for maize trade. Assuming regional welfare maximization without giving preferences for any of the participating groups - consumers, producers, and Diagram 6: governments in any country-, trade will be part of a regional strategy of efficient marketing. However, introducing intra-regional trade, subregional price differences will emerge reflecting transport costs. These price difference would impose negative distributional consequences especially for consumers in remote areas of Zambia.

As shown in this contribution, trade liberalization will alter sub-regional competitiveness for producers. Due to the model design of supply and demand responses consumers and producers adjust to price changes simultaneously. As expected surplus sub-regions of Zimbabwean Mashonaland provinces and regionally remote Malawian provinces will have the lowest prices, whilst Zambian deficit sub-regions like the Copperbelt and Zimbabwean deficit sub-regions in the South-West will be confronted with considerably higher prices. South Africa will have the closest link to world market

Table 1: Transport Routes and Costs between Provinces

	From:	To:	US-$/t
Malawi:			
I	Northern (Chilumba)	Central(Lilongwe)	35.70
II	Central (Lilongwe)	Southern (Blantyre)	24.50
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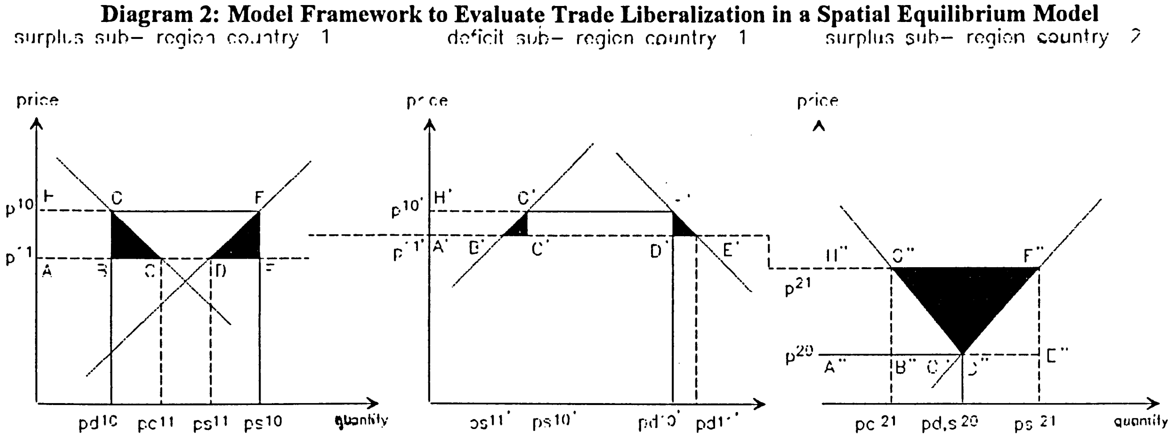

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4. Results

In this section two model runs and their results are presented. The presentation depicts a situation with total trade liberalization in all countries. It starts with a normal year and the situation in a drought year will also be presented.

4.1 Normal year

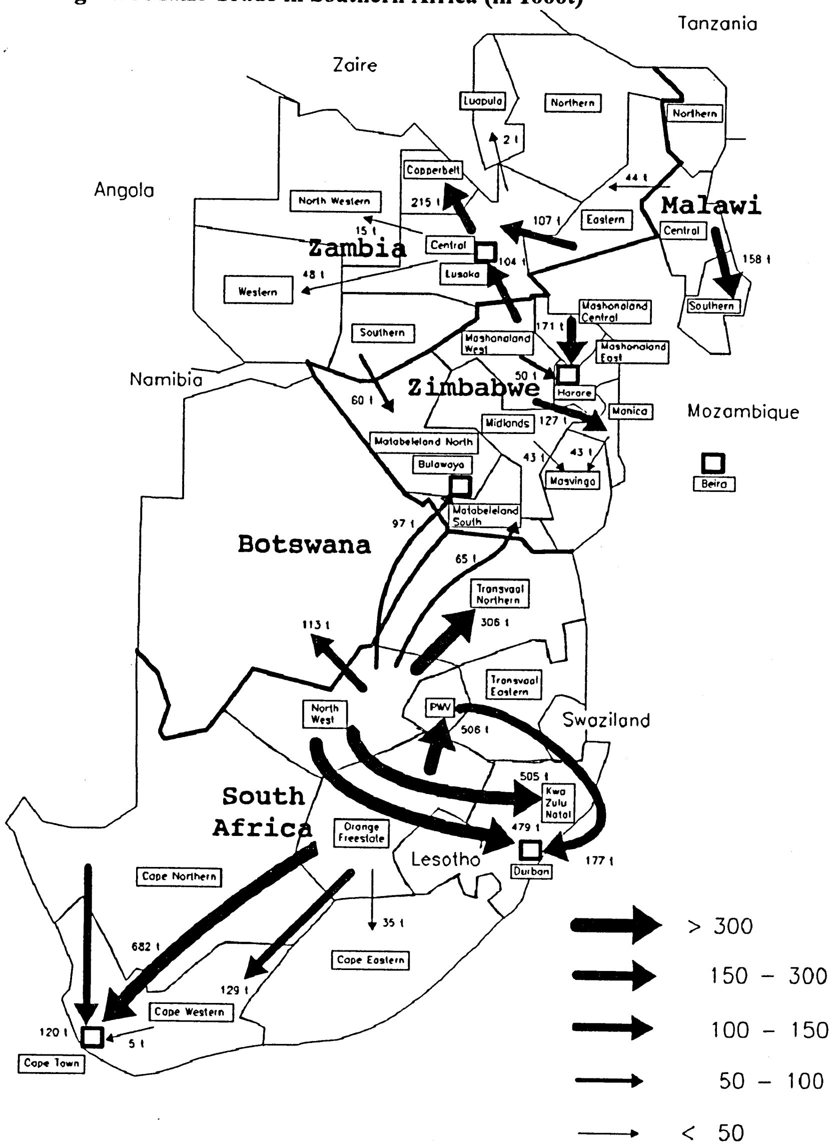
In order to appreciate potential changes in trade volumes and other changes, which occur due to the policy change directed towards trade liberalization, the model results of Diagram 3 have to be compared with a situation of no border crossing trade. Currently only Botswana regularly imports from South Africa. Due to the aggregation of national deficits and surpluses each country beside Botswana (Malawi, South Africa, Zambia, and Zimbabwe) is self-sufficient in maize in a normal year. On contrast to this observation, model results in Diagram 3 shows sub-regional border crossing trade.

For example, it would be cheaper for the Zambian capital Lusaka to import it deficits from Zimbabwean Mashonaland West than to ship maize from remoter Zambia Southern province (104,000 t) as currently done under self-sufficiency policy. The same applies to Western deficit areas of Zimbabwe. Here one would expect imports from Zambia-Southern province (60,000t to Matabeleland North in a situation of free trade. In order to summarize, considerable trade volumes may prevail between sub-regions of SADC countries (additionally between Malawi Central an Zambia Eastern, 44,000t) despite of national self-sufficiency. Concerning South Africa's position Western Transvaal would deliver 97,000 t to Bulawayo and 65,000 t to Matabeleland South due to relatively cheap rail transport through Botswana. Obviously, Botswana would receive its deficits (113,000 t) from the same South African Province.

However, introducing trade and transport activities which finance themselves by charging transport margins, would imply price differences between sub-regions. Furthermore, if governments let such price differences prevail in any sub-regions, we would expect adjustments in production and consumption (not depicted) compared to the baseline (Diagram 2). These adjustments will be forced by local price changes. From the economic point of view adjustments due to sub-regional price changes reflect marginal production costs and consumption preference. Recursively these changes may alter sub-regional procurement costs and imply changes in trade pattern.

The following deliberations on price pattern are based on nominal prices in US$ reflecting the average of the 1985,'86 and '87 price level. The results from the trade liberalization model run, with regard to changes in the price pattern, are given in Diagram 4. They are depicted as relative deviation from US$ 110 which is the price prevailing at the port of Beira, Durban and Cape Town.

Diagram 3: Regional Maize Trade in Southern Africa (in 1000t)

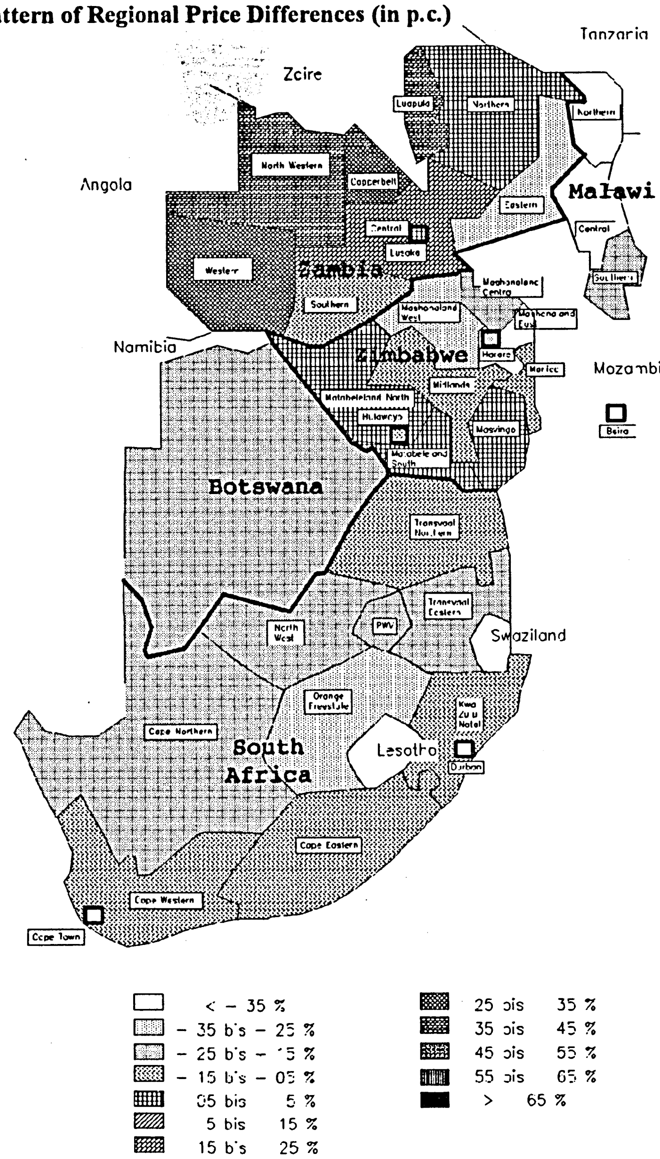


The lowest prices in the region will be in the surplus sub-regions of Malawi Northern, Malawi-Central, and Mashonaland-East, Zimbabwe. Less than 35 p.c. of the world market price level will only be obtainable by farmers. However, from a redistribution point of view Malawian losses are small compared to current prices which are already 30 p.c. below world market prices. An additional 10 p.c. price drop would be only marginal in Malawi. The opposite applies to Zimbabwean Mashonaland which would incur a considerable price drop due to liberalization, since current prices (1991) are approximately at world market prices (converted by the nominal exchange rate).

On the other side of the regional price pattern, in a normal year, deficit and densely populated sub-regions like the Zambian Copperbelt and Central province of Zambia will have prices being 25 to 35 p.c. or 15 to 25 p.c., respectively, above world market prices. However, this is still in range with current pricing in Zambia. Prices in the Zambian capital Lusaka will be close to world market prices due to cheap imports from Zimbabwe which shows an improvement for consumers. Simultaneously, after trade liberalization, the Zimbabwean capital Harare, which is the sub-region of highest population concentration in Zimbabwe, will enjoy relative depressed prices of 15 to 25 p.c. below the world market price.

South Africa, however, will face a decline in prices, which are currently close to world market prices (in nominal terms, taking the nominal exchange rate). Since major surplus areas (Orange Free State and Western Transvaal) are in the hinterland, transport costs to Cape Town and Durban will keep prices low in this country. To summarize, the price pattern will be individually determined by the relative position towards surplus/deficit sub-regions and the ports which have been assumed to be the sole international trade opportunity.

Diagram 4: Pattern of Regional Price Differences (in p.c.)



4.2 Drought year

As mentioned above drought is a major problem in the SADC region. Since drought has unequal effects on supply in the region, regional price structure must adjust to restore market equilibrium. In the model applied here, adjustment takes place in various consumption areas simultaneously. A crucial question is whether trade and/or stock-piling can alleviate production shortfalls by spreading the effects on more participants. In order to investigate this questions, a two-period model of trade and stock-piling has been designed.

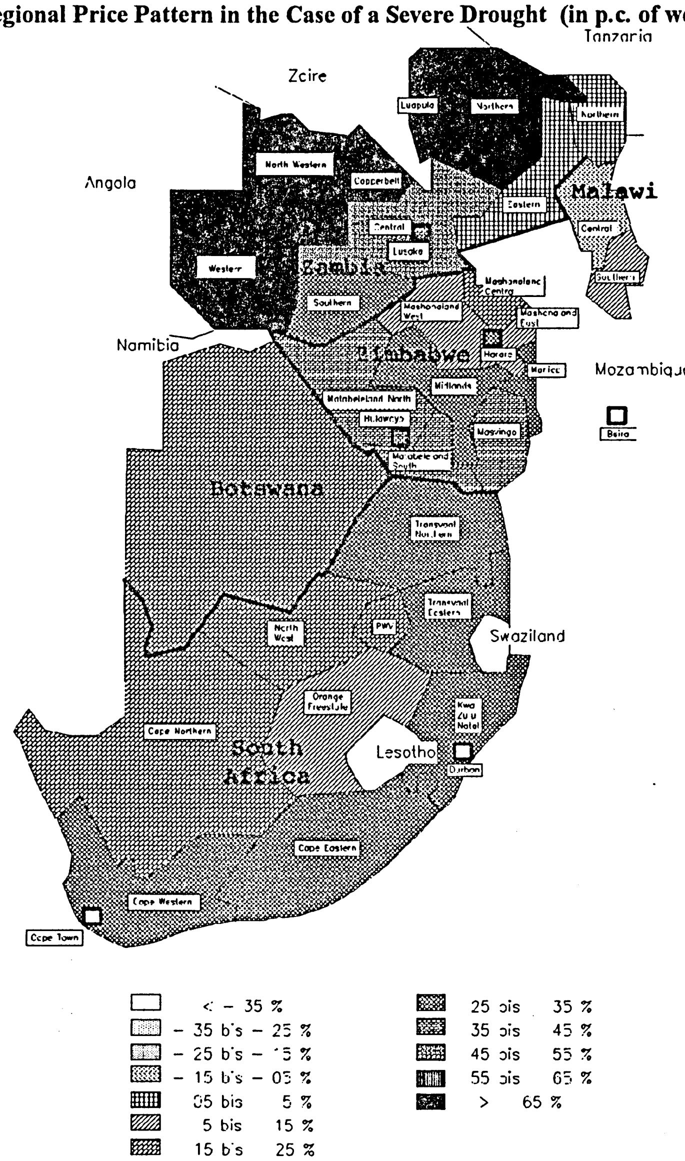
This model adds to the one-period model by simulating drought conditions in the second period (for more details see Nuppenau, 1993). Stocks built up in the first period are allowed to alleviate shortfalls in the second period anticipated already in the first period.

It is assumed that stocks are built up in the correct anticipation of typical drought conditions. Price differences between the two periods guarantee the viability of stock holding business. Note, that the question of private versus government stock-piling is not addressed here. Furthermore, it is assumed that governments can control prices in urban areas. The approach is deterministic in the sense that the shortfall is known in advance and only certain typical drought episodes based on past probabilities are investigated.

In reality, the question of strategic stock-piling involves risk aversion, shortage expectations and other interactions which are beyond our limited approach.

The "drought" envisaged may occur with a probability of 16 p.c.. Further details describing the construction of a drought simulation are reported in Nuppenau (1990).

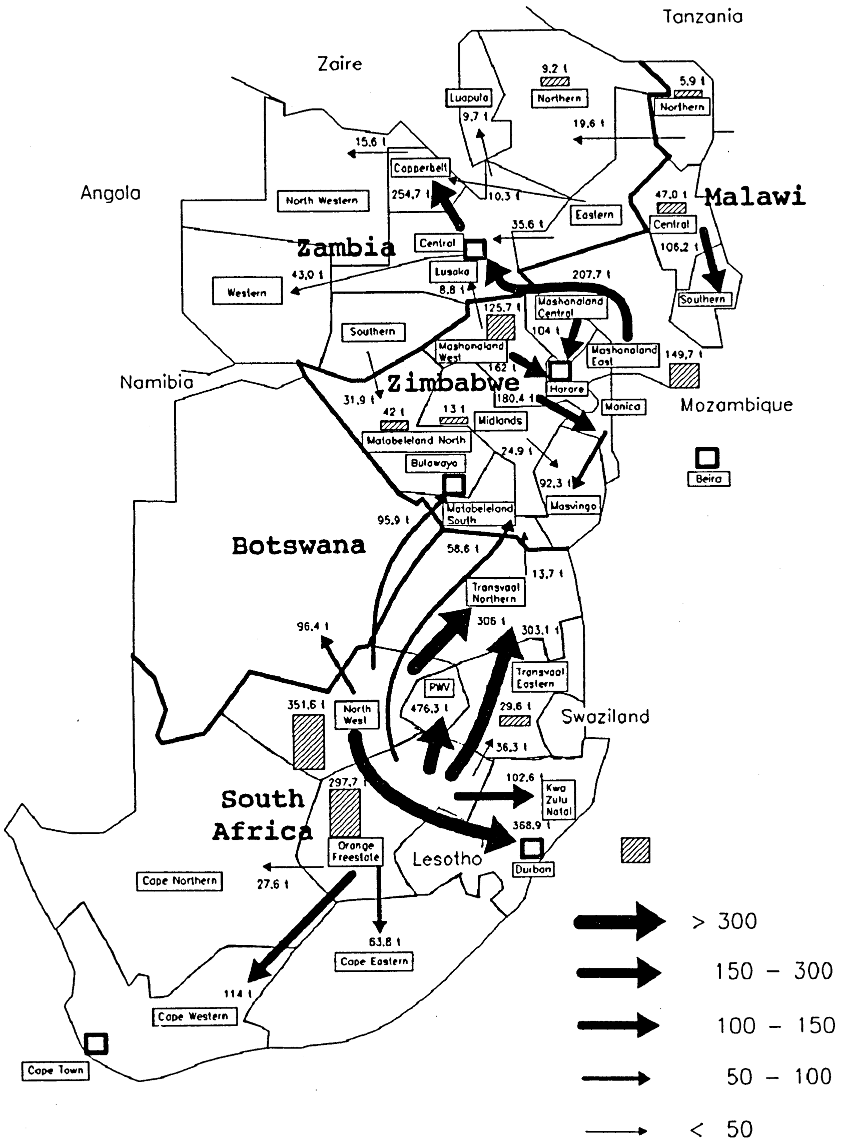
Diagram 5: Regional Price Pattern in the Case of a Severe Drought (in p.c. of world market price)



In principle, we are discussing a drought which may occur in 1 year of every 7 years. According to probability theory, obviously, a drought in reality will not be exactly the same as a simulated drought. Simply, nobody can exactly predict future production shortfalls in the case of a drought. Simulations can only display fixed points in a continuum of possible effects on production shortfalls. Obviously, the choice of particular production shortfalls inherits subjective decisions (see Nuppenau, 1993). As Diagram 5 shows prices will be the highest in remote Zambia. Malawi will have still lower prices than elsewhere in the region, partly due to stock-piling (see Diagram 6). Zimbabwe's North (Mashonaland) will equally enjoy low prices. Stock-piling is most prevalent in this region. South African prices will rise substantially by 50 p.c., but will stay low compared to the other countries. Zimbabwe's South (Matabeleland) will exhibit a threshold of higher prices between these low prices down south and lower prices in the middle of the region (Mashonaland).

Trade quantities associated with the "drought" are depicted in Diagram 6. The simulation shows that Zimbabwe contributes 110,000 t more in Lusaka procurements, but reduces its Matabeleland imports by 28000 t. It must be mentioned that competitive imports from all ports are part of the puzzle in a free trade situation, but are not chosen in the simulation. Since stocks can be made available as a substitute for external trade, procurement of stocks in the first period are a major component. As Diagram 6 shows stocks of roughly 330,000 t would be procured in Zimbabwe. Furthermore, these stock-piling activities are more competitive than additional imports from South Africa. As Diagram 6 reveals imports from South Africa to Zimbabwe only slightly change. Obviously, these results crucially depend on transport costs and stock-piling costs in the model. Hence, from a policy analysis point of view it makes sense to alter these costs and observe corresponding results.

Diagram 6: Regional Trade Pattern in the Case of a Severe Drought, Second Year (in p.c. from World market price) -



5. Summary

In this contribution the potential for intra-regional trade and sub-regional adjustment has been investigated for the SADC-countries Botswana, Malawi, Zambia, Zimbabwe and additionally South Africa. Sub-regional adjustments in supply, demand, and trade patterns are determined by changes in sub-regional price patterns due to liberalization. Applying a spatial partial equilibrium model of trade liberalization for the regional staple food product, maize, it can be shown that trade contributes to cost-minimal procurement and distribution of food in the region. Despite of a current degree of self-sufficiency of around one hundred percent in any of the countries (Malawi, Zambia and Zimbabwe) trade with a neighboring country would occur. Furthermore, South Africa would sell considerable amounts of maize to Southern Zimbabwe.

From a regional welfare point of view neighboring countries are better off opening their economies for maize trade. Assuming regional welfare maximization without giving preferences for any of the participating groups - consumers, producers, and Diagram 6: governments in any country-, trade will be part of a regional strategy of efficient marketing. However, introducing intra-regional trade, subregional price differences will emerge reflecting transport costs. These price difference would impose negative distributional consequences especially for consumers in remote areas of Zambia.

As shown in this contribution, trade liberalization will alter sub-regional competitiveness for producers. Due to the model design of supply and demand responses consumers and producers adjust to price changes simultaneously. As expected surplus sub-regions of Zimbabwean Mashonaland provinces and regionally remote Malawian provinces will have the lowest prices, whilst Zambian deficit sub-regions like the Copperbelt and Zimbabwean deficit sub-regions in the South-West will be confronted with considerably higher prices. South Africa will have the closest link to world market prices being approximately 15 p.c. below world market prices.

Furthermore, an investigation of the effects from a severe drought in the whole region has been conducted assuming free adjustments in sub-regional prices. It was shown that prices in Zambia will be highest and that Zimbabwe will be a major stock-piling area. South African exports to the region will not increase. Third country imports do not play an important role in interlinked Southern African maize market.

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