

**MINISTRY OF AGRICULTURE AND FISHERIES**  
**Directorate of Economics**  
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**Research Paper Series**

**The Effects of Maize Trade with Malawi on Price Levels in  
Mozambique: Implications for Trade and Development Policy**

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# DIRECTORATE OF ECONOMICS

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# **The Effects of Maize Trade with Malawi on Price Levels in Mozambique: Implications for Trade and Development Policy\***

## **Abstract**

This paper analyzes the effects of the opening of trade with Malawi on producer and consumer prices in Mozambique. It finds that prices were positively and significantly affected by this trade in the north of the country, where agroecological potential is greatest and rural population densities are highest. Prices in the main urban centers of the south and center were unaffected. Overall, most producers benefitted from the trade while most consumers were not affected. The paper concludes that Mozambique should lobby aggressively for open trade in maize within the SADC Trade Protocol. It suggests, however, that the country must look beyond Malawi in developing its export markets, and that the SADC region is likely to provide a market for exports during most years. Finally, it emphasizes that efforts to intensify maize production are likely to fail in the absence of such trade, so that initiatives to deal with the institutional and technical challenges of intensification must be pursued in the context of developing these regional markets.

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## Introduction

Mozambique emerged from a 15 year civil war in 1992 and held its first successful democratic elections in 1994. Since that time, it has aggressively liberalized its economy; in agriculture it eliminated nearly all fixed prices, slashed support to the cereals marketing parastatal, and ended restrictions on external trade for most commodities.<sup>1</sup>

The effects of such liberalization on the poor are hotly debated throughout Africa, including in Mozambique. The country's macroeconomic performance during the liberalization period has been exceptional, with low and stable inflation, falling interest rates, and some of the highest economic growth rates in Africa. Yet the fact that this growth started from an extremely low base<sup>2</sup> and occurred during the first peaceful period in 15 years makes it difficult to determine the relationship between this growth and the new economic policies that the country was pursuing.

This paper sheds light on one aspect of this important issue, evaluating the impacts of the opening of trade in maize with Malawi on producer and consumer maize prices in Mozambique. Specific objectives are to 1) quantify the effects of the opening of trade with Malawi on maize prices in key producer markets of the Center and North of the country, and in key urban retail markets in the South, Center, and North, 2) clarify the reasons for the observed effects, and 3) highlight the implications of these results for trade and broader development policy, especially in the North of the country.

The paper is organized as follows: the next section provides background on Mozambique's agricultural sector, including recent developments in the maize trade, characterizes the markets being studied, and reviews price behavior in these markets over the past six years; next, the results of a Seemingly Unrelated Regression (SURE) Model of maize price levels are presented for three producer and three consumer markets, and the implications of these results for farmer incomes are highlighted; the final section discusses implications of these results for trade and broader development policy in Mozambique. Data for the analysis come from the Mozambican Agricultural Market Information System (SIMA; Statistics Department, Ministry of Agriculture and Fisheries) and a 1998 USAID/MSU household survey in the Center and North of the country.

## Background

***Rationale for free food trade in Mozambique:*** Mozambique's geography makes the issue of trade liberalization especially pertinent for it. The country has a long seacoast, with three good ports spread along its length, and railroads linking these ports with its own interior and with neighboring countries. As a result, imports represent a potentially much cheaper source of supply than for its

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<sup>1</sup> Cotton continues to have fixed producer prices, and cashew is the principal exception to the liberalization of external trade.

<sup>2</sup> Mozambique was listed by the World Bank as the poorest country in the world in the early 1990s.

neighbors to the west, and costs of export should also be much lower.<sup>3</sup> Also, the north of the country has the greatest agroecological potential and the highest rural population densities, but is separated from the key urban consumption centers (Beira in the Center and Maputo in the South) by long distances, an under-developed system of feeder roads, poor north-south road links, and a high-cost coastal shipping industry.

These characteristics result in very high costs of supplying the center and south of the country and, consequently, very low prices to producers (most of them in the north) when such trade does occur.<sup>4</sup> As a result, Southern Mozambique is supplied by the south/center of the country and by South Africa during normal years, while Central Mozambique typically feeds itself and exports surpluses to the South. At best, the North can expect to sell to the Center and South only every 3-7 years (during regional droughts), and even then producer prices will not be highly attractive. The North must look to regional markets if it is to develop its production potential. If it does not, its overall economic growth prospects are quite poor compared to other regions of the country, where manufacturing and services have greater investment potential.

***Recent developments in the maize trade:*** Formal and informal trade between Mozambique and Malawi have been ongoing for several years. For example, Macamo (1998) indicates that, between December 1995 and November 1996, nearly \$2.8 million of goods were exported from Mozambique to Malawi, half informally (without licenses or official registration of the exports); imports totaled \$13.5 million, 21% informal. During this same period, Macamo estimates that 1,121 metric tons of maize were exported informally from Mozambique to Malawi. Tickner (1997), Bowen (1998), and Whiteside (1998) also discuss the importance of this informal trade to the livelihoods of households living in border areas.

However, this trade was relatively small scale and its effects were felt primarily along the border until the 1997/98 marketing season. Production in Malawi in 1997 fell by 34%, and ADMARC and private traders suddenly looked to Mozambique to cover the deficit. In response, Mozambican formal sector wholesalers entered the maize trade, many for the first time, along with the *Instituto de Cereais de Moçambique*. Figure 1 shows that officially registered exports to Malawi surged during the third quarter of 1997, and remained at high levels through the end of 1998, almost entirely replacing exports to other countries. Total official exports to Malawi out of the 1997 harvest (3<sup>rd</sup> quarter 1997 to 2<sup>nd</sup> quarter 1998) were nearly 42,000 metric tons; exports out of the 1998 harvest have continued at a slightly slower pace. Informal exports are extremely difficult to estimate, but field studies by Bowen (1998) in Zambêzia province during 1997 and 1998 revealed a sea change in the volume of informal exports, with a radical shift in product flow to Malawi and away from Nampula and coastal Zambêzia.

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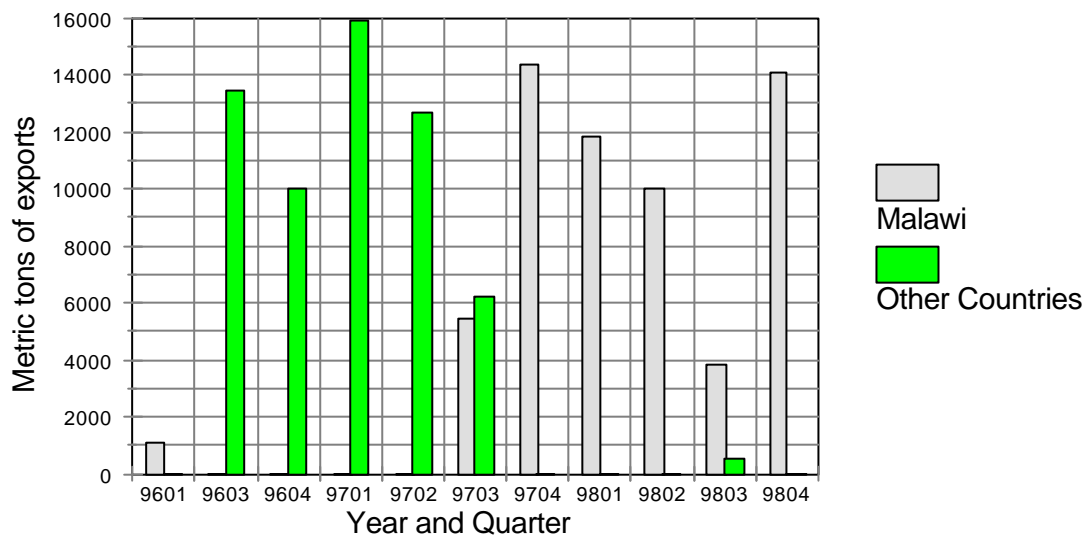
<sup>3</sup> Inefficiencies in the ports and rails have substantially increased the cost of importing and exporting, but are being addressed through major investment and moves towards privatization of port management.

<sup>4</sup> See Coulter (1996) and Tschirley and Santos (1997) for a more detailed discussion of this issue.

Estimates of total formal and informal exports during the 1997/98 marketing year approach 100,000 mt. Bowen and others suggested that these flows had profound effects on prices in Central and Northern Mozambique; we will review price behavior after first describing the markets being studied.

**Description of producer markets:** *Manica* market is located in the central region of Mozambique, very near the border with Zimbabwe (Figure 2). This region is recognized as a surplus production area, with some of the highest maize yields in the country. However, Manica is vulnerable to droughts with the rest of Southern Africa; the regional droughts of 1992 and 1995 badly affected production in this area. This market is well integrated with the south of Mozambique (Donovan, 1995), supplying Beira, Maputo, and consumption centers in-between in addition to meeting its own needs during most years.

**Figure 1.** Officially registered maize exports from Mozambique, by quarter and destination, 1996-1998



*Mocuba* is located in the central-northern province of Zambézia, with good agro-climatic conditions for maize production. This area and areas to the north are much less vulnerable to drought than are the central and southern regions of the country; production in 1992 and 1995 was little affected here. Mocuba is a very active producer and wholesale market where production from other districts converges to be sold or transhipped to larger consumption centers; it is also an important transit point for maize, cassava, pigeon pea and butter beans to others districts and to Malawi. Principal maize flows out of Mocuba are to the provincial capital of Quelimane to the southeast, Malawi to the west, and Nampula city to the northeast. Only during food deficit years is it economical for Mocuba to sell maize in the southern areas of the country. In recent years with the opening of trade to Malawi, Mocuba's importance has increase as a wholesale distribution point for traders.

*Ribaué* is located in the western portion of Nampula province, in the northern region of the country. Like Mocuba, Ribaué has relatively stable rainfall patterns little correlated with those in the rest of the Southern Africa region. The area is a surplus producer of maize during almost all years,

supplying deficit areas within the province, including Nampula City and some areas of the neighboring province of Cabo Delgado. The main transport corridor which links Nacala port to Malawi by rail passes through this market. Ribaué's link with the center and south is weak, due to very long distance and poor roads. With the opening of trade with Malawi, this area became a major assembly point for traders exporting to southern areas of that country.

**Description of retail markets:** Principal consumer markets in the country are Maputo in the south, Beira in the center, and Nampula in the north (Figure 2). **Maputo** is the largest city in the country, with a 1998 population of approximately 1 million. The city is fed by maize grain from the center of Mozambique, and grain and meal imported from South Africa. **Beira**, the second largest city, lies in the central region at the end of the Beira Corridor which links Mozambique with Zimbabwe. Beira is typically fed by surpluses from the central provinces of Sofala and, especially, Manica, but is strongly affected by fluctuations in regional production. **Nampula City** is the largest urban center in the north, with a population of approximately 250,000. Much of the population, however, is peri-urban, and produces maize and other food crops on small plots. Retail food markets in this city are much smaller than those in Maputo and Beira. Consumers here who rely on maize purchases are supplied primarily by production from within the province, sometimes receiving grain from northern Zambêzia.

**Price patterns:** Figure 3 depicts real monthly producer prices (March 1999 = 100) for white maize grain in Manica, Mocuba, and Ribaué. The series in all markets exhibit a similar seasonal pattern with sharp peaks typically during December-February, and troughs in April-June coinciding with the harvest period. Price levels and degree of variability are quite similar in Ribaué and Mocuba from mid-1994 forward. Manica suffered extreme price peaks during the 1994/95 and 1995/96 marketing seasons, reflecting very short supplies in the central area of the country and throughout the Southern Africa region, as a result of the serious regional drought of that year (Table 1 ).<sup>5</sup> Since that time, Manica has tracked the other two markets more closely. During the 1996/97 marketing season, Manica and Mocuba observed the lowest prices of the entire period of analysis due to very good regional and domestic harvests. Prices in Ribaué fell to the lowest levels recorded up to that time.

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<sup>5</sup> Though data show that total production in Mozambique increased in 1995, this increase occurred entirely in the North - production in the Center and South were seriously affected by the regional drought.

**Table 1.** Maize production in Mozambique and Neighboring Countries, 1990-98

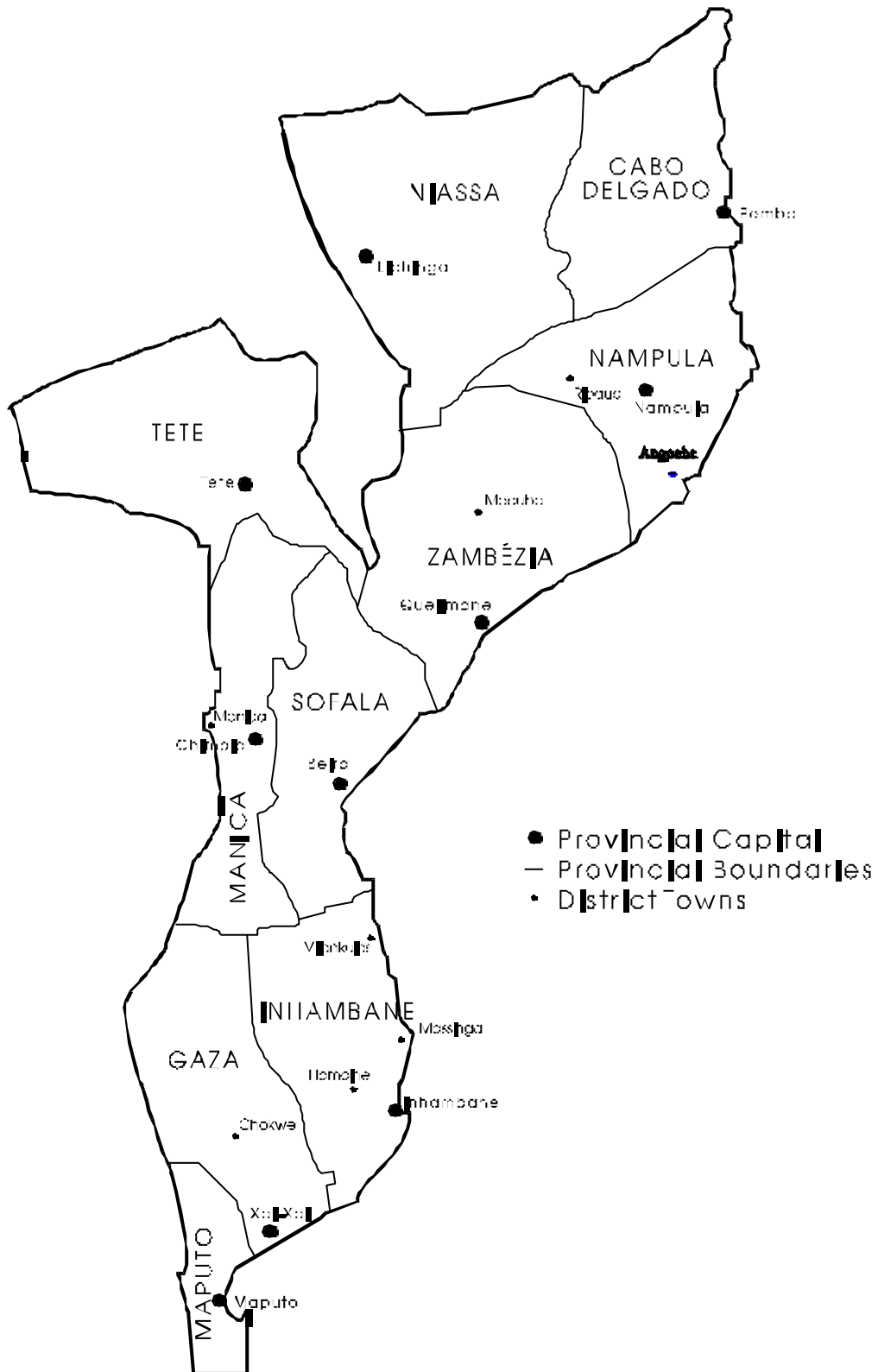
Year	Mozambique ('000 mt)	SADC Neighbors ('000 mt) <sup>1</sup>
1990	453	13878
1991	327	12099
1992	133	4104
1993	533	14400
1994	526	17135
1995	734	7541
1996	947	16323
1997	1042	13744
1998	1124	11647

<sup>1</sup> South Africa, Lesotho, Swaziland, Zimbabwe, Zambia, Malawi

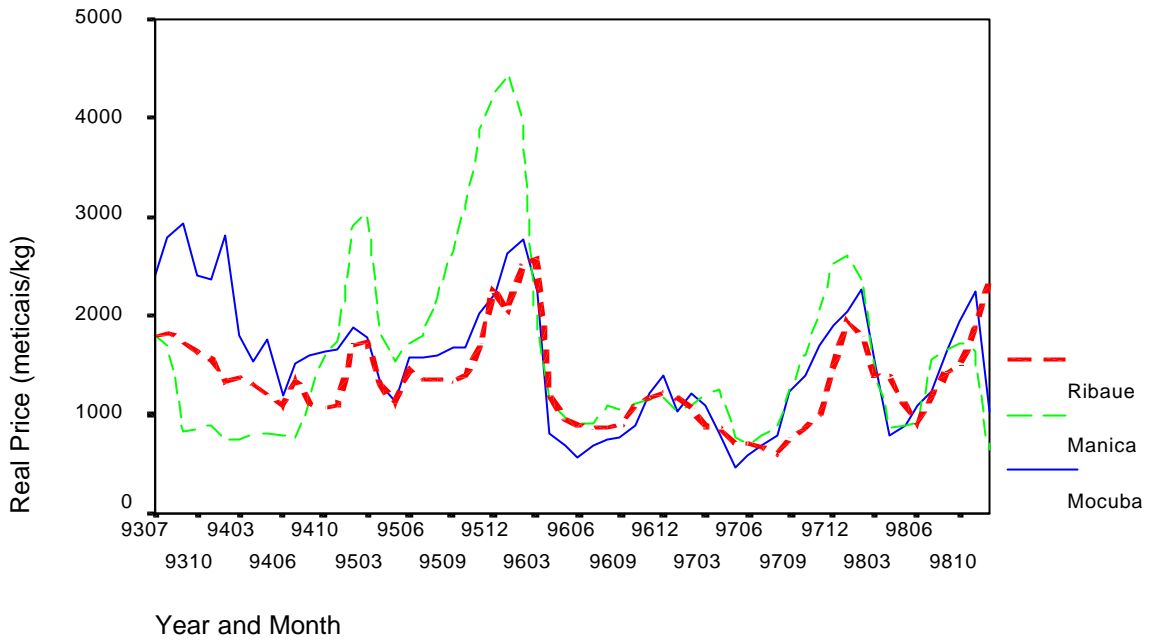
Prices in Manica, Mocuba, and Ribaué fell to similar or lower levels at the beginning of the 1997 harvest, but quickly began to rise and since that time have been at levels far exceeding those of 1996, despite further increases in domestic production in both 1997 and 1998 (Table 1). This pattern can be linked with the beginning of trade with Malawi. Significant quantities of maize produced in Nampula and Zambézia provinces began to be exported to Malawi in August 1997. Though Manica did not directly export to Malawi, observation at the time suggested that prices in Manica were also strongly affected by the trade (Santos, et al., 1998).

Figure 4 depicts real retail prices of maize in Maputo, Beira and Nampula. The extremely high price observed in Maputo in early 1993 year was a result of the devastating regional drought of 1992. All three series show some effect of the less severe drought of 1995, though this is much more pronounced in Beira, where the drought was more severe than in the north, and which had less access to imported supplies than did Maputo. Overall, the retail price pattern in Beira is similar to that observed at the producer level in Manica; in Nampula the pattern is similar to that found in Ribaué at producer level. Prices in Maputo are generally more stable than in the other markets, and show no discernable price trend from 1997 to the present.

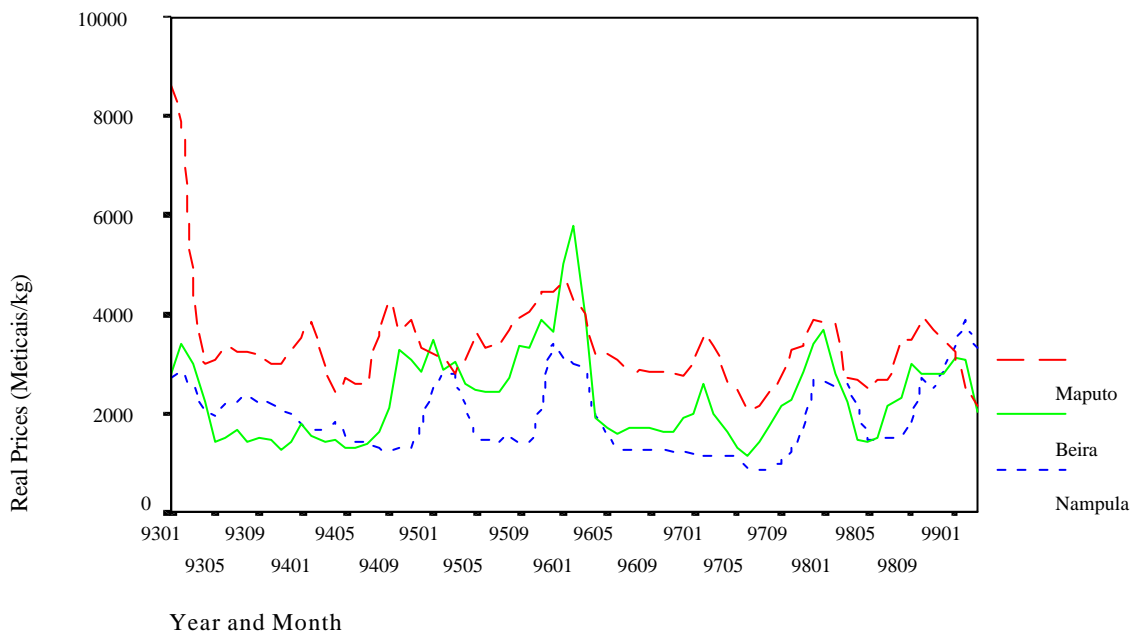
**Figure 2.** Map of Mozambique



**Figure 3.** Real producer prices in Manica, Mocuba, and Ribaué, 7/93 - 2/99 (March 1999=100)



**Figure 4.** Real retail prices in Maputo, Beira, and Nampula City, 1/93-3/99 (March 1999=100)



## Model, Data and Results

To test the effect of the opening of trade with Malawi on price levels in Mozambique, the six markets were analyzed jointly in a SURE framework. The general model is:

$$(1) \quad \text{PRICE}_{m,y} = f(\text{PRODREG}_y, \text{PRODMOZ}_y, \text{FAMOZ}_y, \text{TRADE}, S_m)$$

Where,

- $\text{PRICE}_{m,y}$  is the white maize price during month  $m$  of year  $y$ , in real meticaais,  
 $\text{PRODREG}_y$  is total white maize production during year  $y$  in South Africa, Swaziland, Lesotho, Zimbabwe, Zambia, and Malawi,  
 $\text{PRODMOZ}_y$  is domestic production of white maize during year  $y$ ,  
 $\text{FAMOZ}_y$  is domestic maize food aid arrivals during year  $y$  (white and yellow),  
 $\text{TRADE}$  is a dichotomous variable representing trade with Malawi, equal to zero through July 1997, equal to 1 from August 1997 forward, and  
 $S_m$  is a vector of 11 monthly dichotomous variables.

With the gradual improvement of infrastructure following the end of the war in 1992, Mozambique has been increasingly integrated into the Southern African economy, so that regional production should be expected to have significant influences on domestic prices. Most food aid arriving in Mozambique during the period of analysis has been yellow maize distributed through commercial channels, or white maize distributed through the emergency program. In either case, its effect on market prices for white maize is expected to differ from the effects of local or regional white maize production; the two variables are separated for this reason.

Production and food aid variables take on a single value during the twelve months of a given marketing year (April through March), then change to the new yearly value for the following 12 months. This design is necessary due to the lack of data on monthly regional or domestic production or food aid arrivals. Trade with Malawi was instrumented as a dichotomous variable primarily because quantitative data on exports are inaccurate, as they do not include substantial and changing informal flows. The dichotomous representation is expected to perform well for two reasons: 1) formal maize trade with Malawi began abruptly during the third quarter of 1997, as documented in Figure 1, and 2) informal maize flows shifted radically towards Malawi around the same time, as documented by Bowen (1998) and Whiteside (1998). Altering the beginning of the period by a month in either direction had no substantive effects on results.

Monthly time-series of producer and retail prices for the period 1/93 - 3/99 were used when estimating the model. Prices were inflated with the CPI adjusted to 3/99=100. Missing values in the producer price series of Ribaué and Mocuba were filled-in using the predicted value from a stepwise linear regression of producer prices with retail prices, seasonal dummies, and a time trend.<sup>6</sup> The results

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<sup>6</sup> The three retail series, and Manica at the producer level had no missing values.

of these regressions are found in Appendix 1<sup>7</sup>. Regional production was obtained from the SADC data base. Data on food aid come from the Ministry of Agriculture and Fisheries/Michigan State University Project data base.

OLS regression on time series of this type typically shows autocorrelated residuals. To control for this, equation (1) was first estimated separately for each market. If the *durbin-watson* statistic from the regression was less than  $d_u$  (the upper critical value in the distribution), equation (1) was re-estimated with a lagged value of the independent variable and tested for autocorrelated errors with the Durbin h test.<sup>8</sup> Additional lagged values of the dependent variable were added until this test indicated that the residuals were white noise at  $p=0.05$ . Autocorrelation test results are found in Appendix 2. After identifying the needed lags in each market, the six markets were jointly estimated in a SURE framework with the appropriate number of lags in each.

Table 2 presents the SURE model results. They suggest that the opening of trade with Malawi, as measured by the coefficient on TRADE, had no significant effects on prices in the south and center of the country (retail markets in Maputo and Beira, producer market in Manica), with relatively large and significant effects at the producer and retail levels in the north (producer markets in Mocuba and Ribaué, retail market in Nampula City). On average since August 1997, the opening of trade added 205 mts/kg to producer prices in Ribaué, 332 mts/kg to producer prices in Mocuba, and 246 mts/kg to retail prices in Nampula. These results are consistent with prior studies realized concerning the effects of trade on price. Bowen (1998) refers to the longer term potential of the Malawi market through its contribution to higher prices for producers in much of Zambezia. Whiteside (1998) refers to Malawian markets as extremely important for maize, bean and pigeon pea producers in northern Mozambique.

The insignificant coefficient on TRADE in Manica may be a statistical artifact. Close observation of this market during 1997 suggested strongly that the large price rise that year was due to the trade with Malawi; domestic production in 1997 was the highest to date and more than 10% above the previous year. Prices in Manica during the 1998 marketing year fell from their 1997 levels, but remained well above the levels of 1996 despite another year of record domestic production (Table 1).

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<sup>7</sup> No correction for autocorrelation was made in these regressions, because the interest was in obtaining the best fit between the price series, not in estimating structural parameters. See Kennedy (1998) p. 123 for a discussion of this issue.

<sup>8</sup> The standard Durbin-Watson test is biased towards 2.0 and thus invalid in the presence of lagged dependent variables. Greene (2000) suggest that the Pierce-Cox Q test is also invalid under these circumstances, and recommends the Durbin h statistic.

**Table 2. SURE price model results**

Variable	Retail Markets						Producer Markets					
	Maputo		Beira		Nampula		Manica		Mocuba		Ribaué	
	Coef	<i>p</i>	Coef	<i>p</i>	Coef	<i>p</i>	Coef	<i>p</i>	Coef	<i>p</i>	Coef	<i>p</i>
Constant	2681.0	.000	2638.8	.000	1861.1	.000	1460.9	.021	2154.8	.000	2192.8	.000
Prodreg	-0.049	.000	-.063	.002	-.026	.008	-.032	.142	-.031	.000	-.038	.000
Prodmoz	-0.41	.048	-.68	.057	-.44	.068	-.23	.490	-1.03	.000	-.74	.000
FAMoz	-0.45	.025	.16	.648	.11	.622	.12	.713	.010	.953	-.20	.261
Trade	125.5	.212	86.3	.625	245.9	.032	2.3	.989	332.0	.000	204.5	.017
Jan	96.7	.561	499.4	.100	-675.7	.000	-131.6	.636	-59.9	.692	-61.6	.672
Feb	52.8	.761	269.8	.387	-605.0	.002	-362.6	.198	108.0	.477	-38.0	.796
Mar	-505.5	.002	-614.2	.038	-541.1	.003	-812.4	.003	-436.5	.002	-206.0	.138
Apr	-645.9	.000	-974.5	.000	-897.1	.000	-788.2	.005	-781.8	.000	-532.3	.000
May	-326.3	.051	-707.7	.012	-1026.6	.000	-645.8	.022	-502.0	.000	-549.4	.000
Jun	-532.6	.001	-653.1	.023	-854.4	.000	-540.2	.054	-451.9	.002	-485.1	.000
Jul	-437.5	.011	-509.1	.091	-811.8	.000	-543.0	.060	-316.1	.036	-420.5	.002
Aug	-247.1	.169	-364.2	.246	-812.4	.000	-348.7	.246	-439.4	.005	-550.6	.000
Sep	-219.1	.186	-290.7	.323	-851.1	.000	-509.3	.063	-154.0	.282	-426.8	.002
Oct	-125.6	.406	-229.3	.391	-603.5	.000	-243.0	.342	-249.4	.059	-373.8	.003
Nov	-95.9	.636	-205.0	.441	-618.5	.000	-215.1	.386	-51.9	.694	-253.4	.043
lag(1)	.558	.000	.61	.000	.76	.000	.87	.000	.54	.000	.43	.000
lag(2)	.013	.899			-.067	.548	.142	.224				

Results for other variables are generally as expected. PRODREG and PRODMOZ are negative and significant (no worse than  $p=0.068$ ) in all markets except Manica, where they are negative but insignificant. FAMOZ is negative and significant ( $p=.025$ ) in Maputo, as expected, and insignificant elsewhere.<sup>9</sup> The signs and relative sizes of the seasonal coefficients are as expected.

## Discussion

The most striking result from this analysis is that maize exports benefit most rural households while having no negative effect on most consumers. This result is driven by Mozambique's geography, with urban population centered in the south and, to a lesser extent in Beira in the center, while production potential and rural population concentrated in the north. In 1996, Zambêzia and Nampula provinces contained 37% of all maize producers in the country, and accounted for 40% of all maize sales (1996 National Agricultural Survey), higher shares than for any other two provinces.

Based on the regression coefficients on TRADE, Figures 5 and 6 present producer price paths in Mocuba and Ribaué with trade (the actual series) and without trade with Malawi. On average, prices in Mocuba would have been 21% lower, and in Ribaué 15% lower without trade. Table 3 shows that cash income during 1998 in Nampula and Zambêzia provinces from the sale of maize was US\$1.5 million higher than it would have been without trade. Available data suggest that the percentage of net buyers of maize in rural areas of the north is low: during the 1994/95 marketing year, between 12% and 25% of all households in surveyed areas of Nampula and southern Cabo Delgado province immediately to the north were net maize buyers (Strasberg, 1998). With large increases in maize production since that time, it is likely that these figures have not increased significantly, and may have decreased, meaning that large majorities of rural households benefitted from these price increases.

## Conclusions and Policy Implications

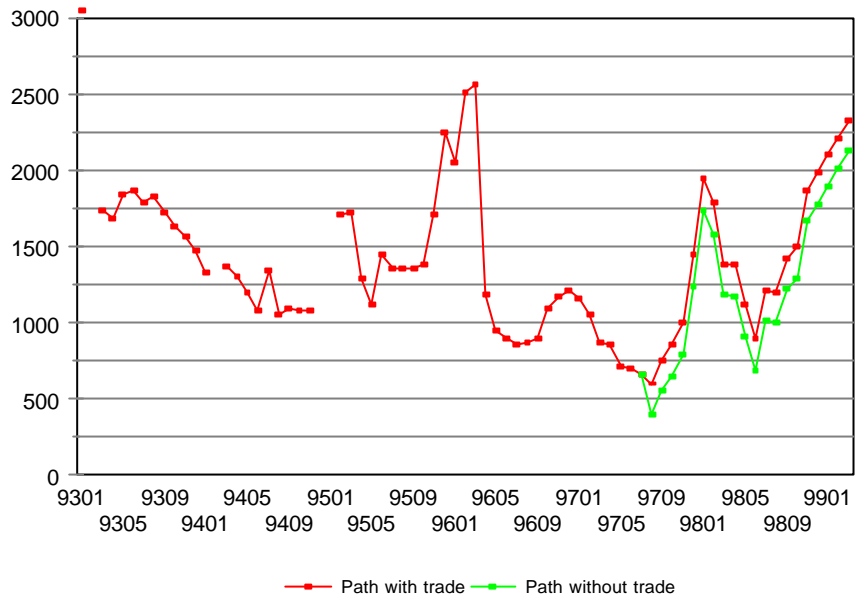
Three policy implications emerge from these findings. First, an open trade regime is clearly in Mozambique's national interest. Policy makers should expect the north and perhaps the center to export maize regularly, and the south to import every year, and should design policies and programs that reduce the cost of doing so.<sup>10</sup> In addition to the efforts already

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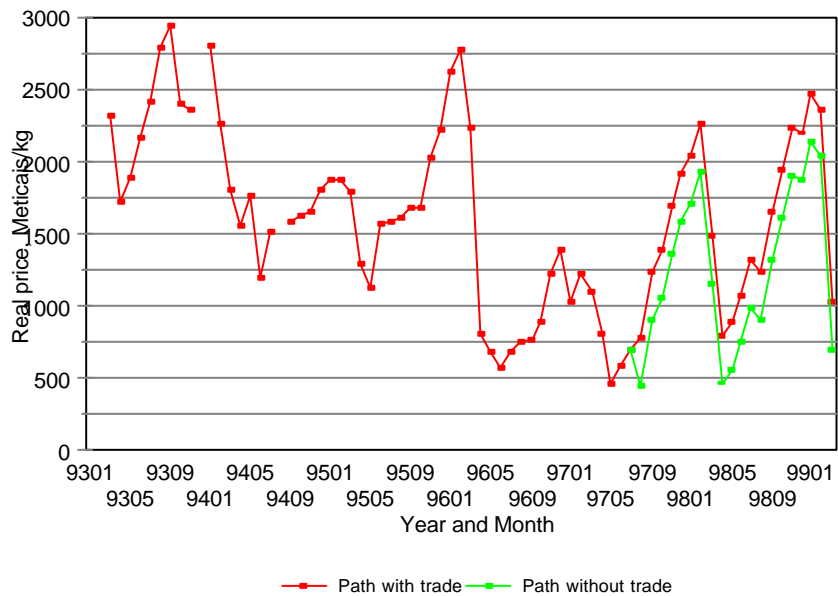
<sup>9</sup> See Donovan (1996), Tschirley, et al (1996), and Tschirley (1998) for more information on the effects of food aid on white maize prices. These effects were especially strong in Maputo, as shown also by the present analysis.

<sup>10</sup> Kyle and Dengo (1999) suggest that southern Mozambique has never since colonial times received significant quantities of food from domestic sources, instead relying primarily on imports. They point out that "unlike other parts of the country where attaining food self sufficiency would mean the rehabilitation of production and marketing links that previously existed, the provision of food to Maputo from domestic sources would require the development of marketing links that until now never existed" (p. 20-21). Clearly center-south links are now quite strong, but Kyle and Dengo's statement applies quite well to the issue of north-south trade.

**Figure 5.** Producer price paths for maize in Ribaué with and without trade with Malawi



**Figure 6.** Producer price paths for maize in Mocuba with and without trade with Malawi



**Table 3.** Increases in value of maize production and cash earnings from maize sales due to trade with Malawi, 1998 marketing season<sup>1</sup>

Province	Increase in total value of maize production (‘000 US\$)	Increase in cash earnings from maize sales (‘000 US\$)
Nampula	1961	677
Zambêzia	3061	827
Manica	0	0

**Source:** MSU/USAID Focus Area Household Income Survey

**Notes:** 1) Price increase due to trade is taken as the estimated regression parameter from the opening of trade regressions: 205 Mts/kg in Nampula, 332 Mts/kg in Zambêzia (Mocuba market), 0 in Manica (coefficient on TRADE was insignificant).

underway to improve the physical facilities at the ports, and to privatize port management, at least three specific steps should be taken. First, in the negotiations on the SADC Trade Protocol, Mozambique should push for rapid liberalization of maize trade in the region. Second, Ministry of Agriculture and Fisheries (through SIMA) and Ministry of Commerce should collaborate to provide timely and improved regional outlook information and regional policy monitoring; since many governments in the region remain active in their maize markets, monitoring of production and anticipated prices must be complemented by information about what the public institutions in those countries are planning to do. Finally, the government at local and national levels should continue to simplify and thus facilitate the export process. Bowen (1998), reports that national authorities are discussing decentralization to the provincial level of the documents required to obtain an export license, but obstacles remain. The most important are the requirement that the applicant have a physical trade establishment and provide his/her criminal record, which must be processed in Maputo, the capital city.

The second major policy implication is that Mozambique needs to look beyond Malawi in developing its market for maize. Malawian maize production in 1999 jumped to record levels, and the country has an anticipated surplus of 400,000 mt. Production in Mozambique increased once again in 1999. With little or no maize flowing to Malawi, prices in the north have fallen to levels last seen during 1996, prior to the surge in Malawian exports. Yet Zambia and Zimbabwe had relatively poor harvests and will require imports, and the SADC region has a projected overall maize deficit of nearly 1,400,000 mt (MICTUR, 1999). Such a pattern of some countries enjoying good harvests while others require imports will not be uncommon; though maize production is positively correlated across countries in the region, no country-by-country correlation coefficient of annual production exceeds

0.69, and most are near or below 0.50. Mozambique is well positioned geographically and with its rail links to serve regional markets beyond Malawi, but needs to develop them more aggressively.

The final policy implication relates to efforts to intensify maize production in Mozambique. Successful intensification is a function of many factors beyond the scope of this paper, but studies to date make it clear that prices will be too low to sustain maize intensification in the absence of regional trade. Howard et al. (1999) calculate break-even prices at mean yields for high external input technology (HEIT) maize in the better agroecological zones of US\$50-69/metric ton. During the period of exports to Malawi (since August 1997), 88% of all monthly producer prices in the four markets have exceeded US\$69/ton; 94% have exceeded US\$50/ton. These prices have obtained despite very good production in Mozambique and no serious shortages in the region. By substantially increasing the probability of remunerative prices for northern Mozambican producers even during years of overall regional surplus, this trade improves the chances for successful intensification. Efforts to deal with the institutional and technical challenges of intensification must be pursued in the context of developing these regional markets.

## Appendix 1

Table A1. Entered independent variables used on regression of producer level prices in Ribaué and Mocuba (1/93 - 3/99)<sup>1</sup>

	Mocuba		Ribaué	
	Coef	Sig.	Coef	Sig.
<b>Entered Independent Vars</b>				
Const	355.9	0.000	1247	0.000
pmoc	0.868	0.000		
prrib			0.705	0.000
emar_jun				
ejul-oct				
t	-3.6	0.008	-22.8	0.000

<sup>1</sup> Dependent variable is producer price in the respective market

## Appendix 2: Autocorrelation test results

Autocorrelation statistic	Maputo Retail	Beira Retail	Nampula City Retail	Manica Producer	Mocuba Producer	Ribaué Producer
Durbin-Watson statistic with no lags	0.76	0.49	0.52	0.56	0.70	0.67
Durbin h with ...						
1 lag	0.02	0.21	0.02	0.03	0.20	0.45
2 lags	0.86		0.73	0.41		

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