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The Effects of Food Aid on Maize Prices in Mozambique

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Abstract

This paper evaluates the effects of commercial food aid, in the form of yellow maize imports, on the prices of white and yellow maize in Maputo, the capital of Mozambique The analysis uses weekly data and a vector autoregression model The sample is separated into a war/drought period and a recovery period It is found that positive food aid shocks have a short-run depressing effect on maize prices, particularly prices for yellow maize Historical simulations show that without the food aid, maize prices would have been considerably higher although almost as variable as they were with the food aid The conclusion is that local maize markets are responsive and connected, even during the war/drought period of 1990-1992 Thus, while food aid was able to benefit consumers by increasing domestic cereal availability, it also has the potential to provide disincentives to local production and trade

Key words Food aid, maize prices, Mozambique, vector autoregression

THE EFFECTS OF FOOD AID ON MAIZE PRICES IN MOZAMBIQUE

INTRODUCTION

Peace Accords signed in October 1992 ended a long period of civil war in Mozambique but the war had caused severe constraints on food production Furthermore, a devastating regional drought during 1991-92 put additional pressure on the food system and at the beginning of 1992, a major famine was threatening the country The response was food aid and during 1992/93 food aid represented 60% of total cereals availability among consumers (Tschirley et al , 1996) The country and its economy recovered slowly and food aid gradually declined By 1994/95 the proportion of food aid in total cereals availability had dropped to 15% (Tschirley et al , 1996)

The objective of this paper is to evaluate the effects of commercial food aid in the form of yellow maize imports, on the domestic prices of white and yellow maize in Maputo the capital of Mozambique Maputo is the main port for food aid arrivals and distribution as well as the main consumption market for locally produced cereals The analysis is undertaken using weekly data in order to focus on some of the short run dynamic responses to food aid that cannot be captured in an annual or quarterly model (e g Farzin 1991, Stevens 1979) Furthermore the analysis is undertaken for two distinct periods—the war/drought period of April 1990 through February 1993 and the recovery period from April 1993 through November 1995 The two periods are contrasted to illustrate different effects that food aid can have in different situations

In contrast to many previous structural analyses of the effects of food aid, the approach here is to use a vector autoregression (VAR) model The advantage of the VAR approach is that the dynamics of the model are left unrestricted and identification is based only on contemporaneous relationships between variables in the system (Sims 1980 Fackler 1988 and Myers Piggott and Tomek, 1990) This is a particular advantage in the case of food aid in Mozambique because there is considerable uncertainty surrounding what types of traditional identification restrictions should be imposed during periods of drought and war Furthermore, a traditional structural analysis using a large scale econometric model

would require data that is either unavailable or questionable in the case of maize markets in Mozambique Using minimal identification restrictions a VAR approach provides a vehicle for summarizing historical correlations in food aid arrivals and maize prices, and can be used to estimate the effects of food aid shocks" on market prices for white and yellow maize

THE VAR MODEL

The VAR model is specified as a three equation system in weekly food aid arrivals and weekly retail prices of white and yellow maize in Maputo Food aid arrivals are commercial yellow maize food aid delivered into the hands of private agents each week, either directly at the port or from warehouses The price data are weekly real retail prices in meticais per kilogram, deflated by the consumer price index with a base year of 1989

Figure 1 plots the data used to estimate the VAR with the dotted vertical line indicating March 1993 the transition month between the war/drought and recovery periods Summary statistics for the data are also provided in Table 1 Mean prices are clearly higher in the war/drought period and there are larger mean food aid deliveries There is also much greater variability in all series during that war/drought period A rapid decline in white maize prices occurred when the first post-drought harvest of white maize came onto the market and domestic traders were able to access the production zones This represents a structural shift and suggests estimating separate models for the two periods

Preliminary testing was conducted on each variable in the system to determine their stationarity properties Augmented Dickey-Fuller Phillips-Perron and Kwiatkowski-Phillips-Schmidt-Shin tests were each applied (Hamilton 1994 Banerjee et al 1993) The results generally support the conclusion that each of the series is stationary Given this evidence, the VAR models for both time periods were each specified in the levels of the food aid and real price variables with a linear trend included in all equations

Lag lengths for the VAR were chosen based on Akaike s Information Criterion (AIC), the Schwartz Criterion (SC), and sequential likelihood ratio (LR) tests (Hamilton, 1994) The AIC suggested seven lags,

SC one lag and LR four lags In view of the well known tendency for AIC to overparameterize as the sample size increases and for SC to underparameterize in small samples a lag length of four was chosen for the VAR

One of the most critical aspects of VAR modeling is how to identify and interpret the structural error terms ("shocks ') which drive the dynamics of the system In this study we investigated a range of alternative identifications to determine how sensitive results on food aid effects are to alternative identification schemes that might be used Except for a few cases in which the identification restrictions seemed implausible from an economic perspective the results were not very sensitive to the identification chosen Hence, we report results for just one identification scheme per model

For the war/drought period a recursive identification was chosen with white maize prices (WP) ordered first food aid deliveries (FA) ordered second, and yellow maize prices (YP) ordered last The logic behind this specification is that, during this period, local white maize markets were somewhat isolated sporadic, and dominated by large quantities of yellow maize food aid However, white maize remained the preferred consumption good when it was available Thus, it is hypothesized that WP is not influenced contemporaneously (i e within a week) by the availability of food aid or shifts in yellow maize prices On the other hand, releases of food aid and yellow maize prices may be sensitive to contemporaneous changes in supply and demand conditions for white maize (i e white maize price shocks) Similarly, food aid does not respond contemporaneously to yellow maize prices but food aid shocks can immediately (within a week) influence yellow maize prices through their supply effect

For the recovery period a different recursive identification scheme was selected based on changes taking place in the maize market During the recovery period, white maize supply constraints were released by a combination of increased domestic and regional production, increased movement of traders, continued growth in informal markets, and gradually reduced availability of yellow maize As a result of these changes food aid declined in importance and likely became less responsive to contemporaneous changes in

white maize prices Indeed with the increased importance and integration of white maize markets it is logical to assume that white maize prices are now influenced contemporaneously by food aid arrivals and yellow maize prices This leads to an ordering of FA, YP, WP

Another important event occurred during the recovery period in July 1994 when some donors and non-governmental organizations (the World Food Programme in particular) announced a plan to purchase local white maize for their emergency programs, rather than import yellow maize Maize prices show an abrupt upward shift at this time which cannot be explained by any other observed market phenomenon on the supply or demand side This change is incorporated as a one-time mean shift, following the work of Perron (1989) Seasonality also arises in this period because of increased reliance on local white maize production which comes on line after the harvest begins in June To adjust for this, a seasonality indicator variable was added for the hungry season

VAR ANALYSIS

Analysis of the VAR models was conducted using standard impulse response analysis (Hamilton, 1994) Primary interest lies in the dynamic response of white and yellow maize prices to typical shocks to the amount of food aid being delivered If there is no response then we can conclude that market prices are not influenced by food aid If yellow maize prices respond but white maize prices do not then we can conclude that yellow maize food aid influences domestic yellow maize prices but that white maize markets are isolated from the effects of the food aid On the other hand, if there are significant response in both prices then we would conclude that the markets are connected and yellow maize food aid significantly affects white maize prices

Historical simulation of prices that would have occurred had no commercial food aid been sent can also be conducted using the VAR In this case the yellow maize and white maize price shocks are set at their historical values and then the food aid shocks are altered to ensure that the amount of food aid in each period becomes zero (see Myers Piggott, and Tomek, 1990) The VAR is then simulated with these new

food aid shocks in order to simulate historical price paths in the absence of food aid Price paths with and without the food aid can then be compared to isolate the effects of the food aid

RESULTS AND DISCUSSION

There has been considerable previous research on the effects of food aid on developing economies (e g Isenman and Singer, 1977, and Maxwell 1991) And previous research has also indicated that informal maize markets in Maputo are relatively competitive and responsive (Tschirley et al 1996 MOA/MSU research team, 1993) The results presented in this section support this view of responsive connected markets leading to important food aid effects We first examine the war/drought period and then turn to the recovery period

The War/Drought Period

The results of the VAR analysis conducted here support the argument that informal market prices were responsive to food aid imports, even during the war/drought period The responses of each variable to a one standard deviation shock in each of the structural errors during the war/drought period are plotted in Figure 2 A one standard deviation shock corresponds to 2,600 Mt for food aid, 65 meticais/kg for white maize prices, and 34 meticais/kg for yellow maize prices (in real 1989 meticais) The middle plot in Figure 2 shows the response of each series to a single food aid shock of 2,600 metric tons, holding other shocks to zero Yellow maize prices immediately decline about 0 4 s d (14 meticais/kg) and then gradually return to their previous level by about the eighth week White maize prices do not decline at all immediately in response to a food aid increase because of the identification scheme However, even when no contemporaneous response is allowed white maize prices decline in later periods, although to a lesser degree than yellow maize prices Thus food aid appears to have a strong depressing effect on white maize prices

The historical simulation of maize prices with and without food aid in the war/drought period is shown in Figure 3 It is interesting that elimination of the food aid would have increased the level of both white and yellow maize prices substantially above their actual values, although other supply and demand

shocks in these markets cause the direction and variability of price movements to be similar in the two cases White maize prices would have been 33 percent higher in January and February 1993 on average without the food aid, and yellow maize prices an average of 150 percent higher Clearly the food aid deliveries played a key role in ensuring the availability of maize at an accessible price for Maputo consumers in this period Furthermore, the scarcity of white maize, and its role as a preferred consumption good meant that its price remained relatively high and volatile in spite of the yellow maize arrivals and price movements Nevertheless, the food aid clearly kept white maize prices down as well, though not to the same extent as yellow maize prices

The Recovery Period

The impulse responses for the recovery period are plotted in Figure 4 In this case a one standard deviation shock corresponds to an innovation of 1,250 metric tons of food aid, 20 meticais/kg for the price of white maize, and 12 meticais/kg for the price of yellow maize Comparing these standard errors to those in the war/drought period (2600 metric tons, 65 meticais/kg, and 34 meticais/kg, respectively) it is clear that there was much less uncertainty during the recovery period

The top plot in Figure 4 shows the responses to a typical food aid shock holding all other shocks constant The response of yellow maize prices follows a similar pattern to that in the war/drought period—food aid has a depressing effect on price that dies out after about eight weeks However, the white maize price responds differently The initial (contemporaneous) response of white maize price remains zero but then in the next week there is a WP *increase* This may be a result of the unexpected increase in food aid being interpreted as a signal that white maize supplies are tighter than had been thought resulting in an increase in demand (and price) for the preferred white maize product In subsequent weeks however, the effect of the food aid shock on white maize prices turns negative as it becomes clear that supply and demand conditions for white maize have not changed (remember that other shocks besides food aid are set to zero) and the additional supply of yellow maize food aid begins to depress prices for both types of maize Eventually (after about eight weeks), the food aid shock no longer has any significant price effects

The simulations which show how prices would have evolved through the recovery period in the absence of food aid are shown in Figure 5 The removal of two large food aid shipments in the November 1994 - January 1995 period (a total of 47,600 metric tons) would have led to generally higher yellow and white maize prices through the period The simulated white maize price for February 1995 was 208 meticais/kg, 14 percent higher than the actual real price of 183 meticais/kg For yellow maize the simulated price was 76 percent higher than the observed price (160 meticais/kg compared to 91 meticais/kg) In a period in which overall price fluctuations were relatively small and prices were low compared to earlier times, these represent important effects for traders

CONCLUSIONS

In the war/drought period consumers benefited from increased yellow maize supply and lower yellow maize prices that can be traced to the arrivals of yellow maize food aid on the Maputo market in the 1990-93 period However, the local white maize market was also influenced in very important ways as a result of the food aid Indeed, the results in this paper show that the general level of white maize prices was considerably lower with the food aid than they would have been without it, but that the food aid did little to reduce the tremendous white maize price fluctuations and market uncertainty that characterized this war/drought period

In the recovery period, with agricultural production increasing and the economy beginning to benefit from the Peace Accords, yellow maize food aid arrivals continued to influence white maize prices, as well as their expected strong effect on yellow maize prices The simulation results show that food aid arrivals just prior to and during the hungry season can lower white maize prices in a counter-cyclical fashion long before the next harvest is due This affects traders margins and the ability to recover storage costs, and thus may be affecting storage and marketing investment in the domestic markets Domestic consumers benefit in the short run with lower prices for both yellow and white maize prices, however a disincentive effect on domestic production and marketing cannot be ruled out in the longer run

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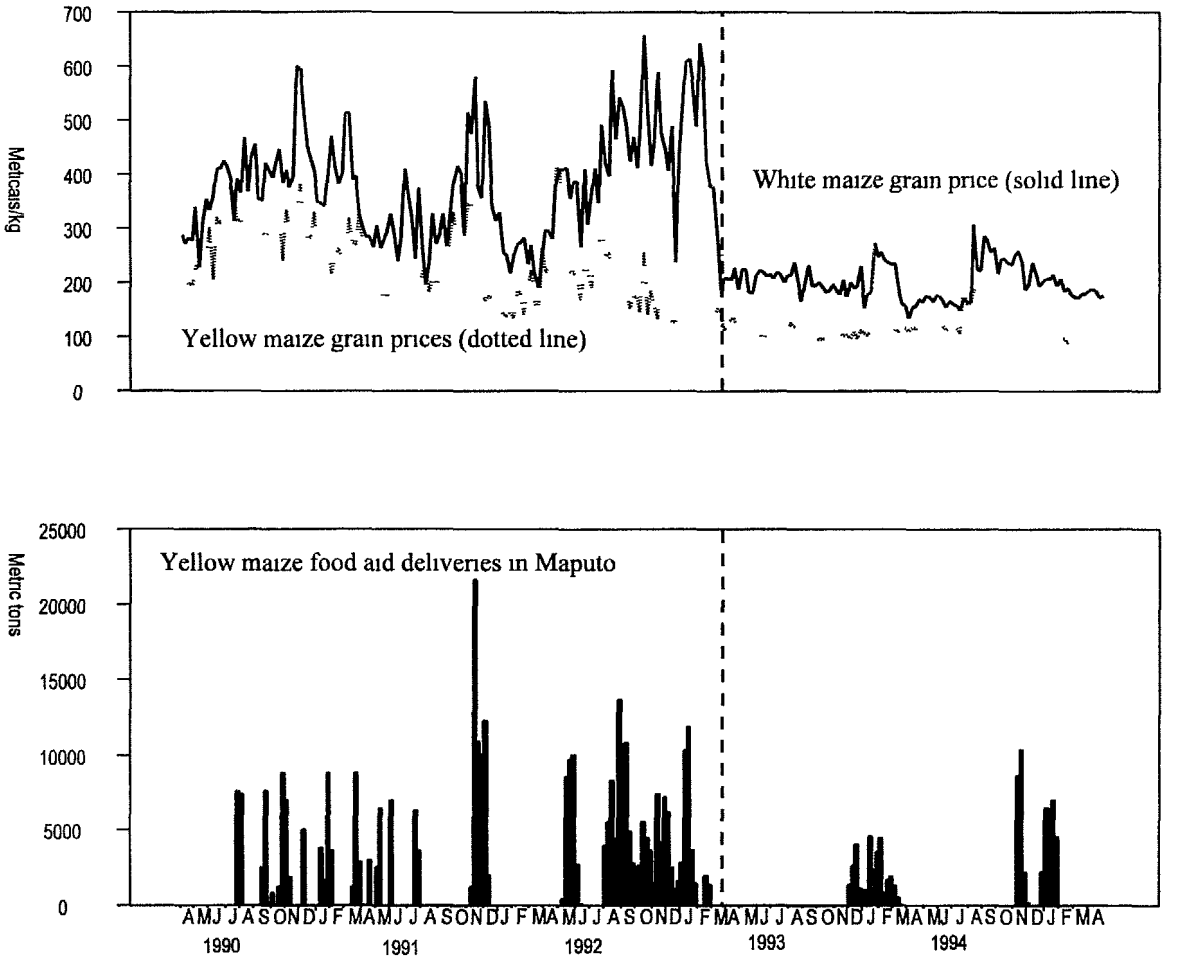
Table 1 Descriptive statistics

Statistic	War/Drought Period (Apr 3, 1990 - Feb 28, 1993)			Recovery Period (Apr 4 1993 -Apr 28, 1995)		
	White maize price meticais/kg	Yellow maize price meticais/kg	Food aid metric tons	White maize price meticais/kg	Yellow maize price meticais/kg	Food aid metric tons
Mean	384 30	234 04	2,276 30	201 72	123 52	733 86
Standard Deviation	102 08	66 38	3,738 17	32 99	31 21	1,867 42
Variance	10,420	4,406	13,973,915	1,088	974	3,487,257
Median	386 19	222 30	0 00	196 69	113 04	0 00
Maximum	658 71	413 92	21,660 00	306 70	204 46	10 414 35
Minimum	191 19	126 50	0 00	135 32	78 63	0 00
Skewness	0 48	0 49*	2 02	0 64*	1 48 **	3 16***
Kurtosis	-0 21	-0 51	4 77 *	0 18	1 17	10 50* *

(Significance level determined according to Banerjee et al 1993)

* indicates significance level of 10%
** indicates significance level of 5%
*** indicates significance level of 1%

Figure 1 Weekly real retail prices and food aid deliveries in Maputo April 1990 -April 1995



Source MOA/MSU SIMA Database, 1995

Note Prices are deflated to a 1989 base year with the CPI deflator Food aid deliveries are the metric tons of yellow maize grain delivered to private agents in Maputo each week, from warehouses or the port of Maputo Dashed vertical line indicates March 1993

Figure 2 Impulse responses for the war/drought period

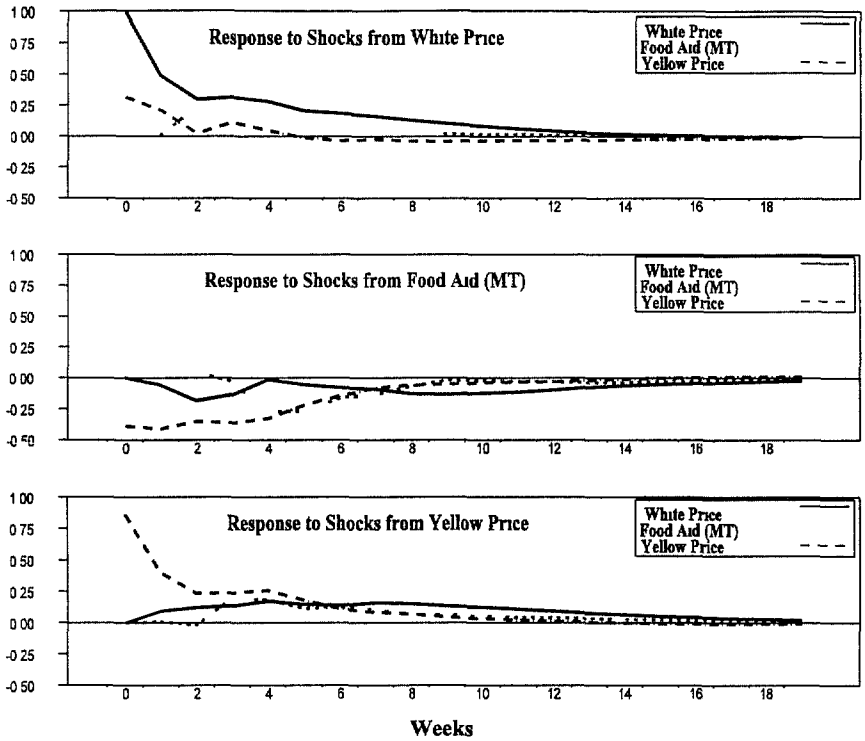


Figure 3 Simulation for the war/drought period assuming no food aid after July 31 1992

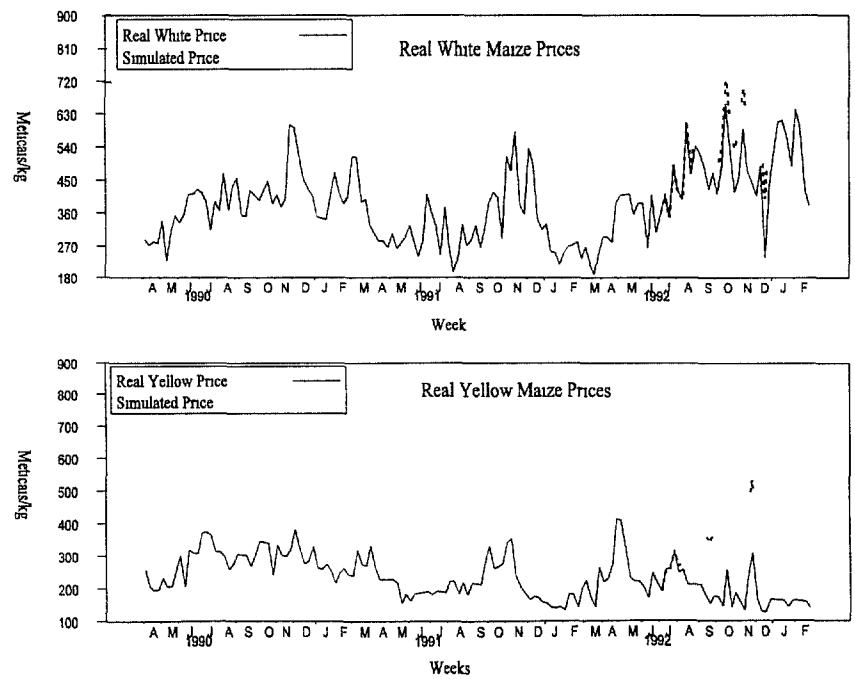


Figure 4 Impulse responses for the recovery period

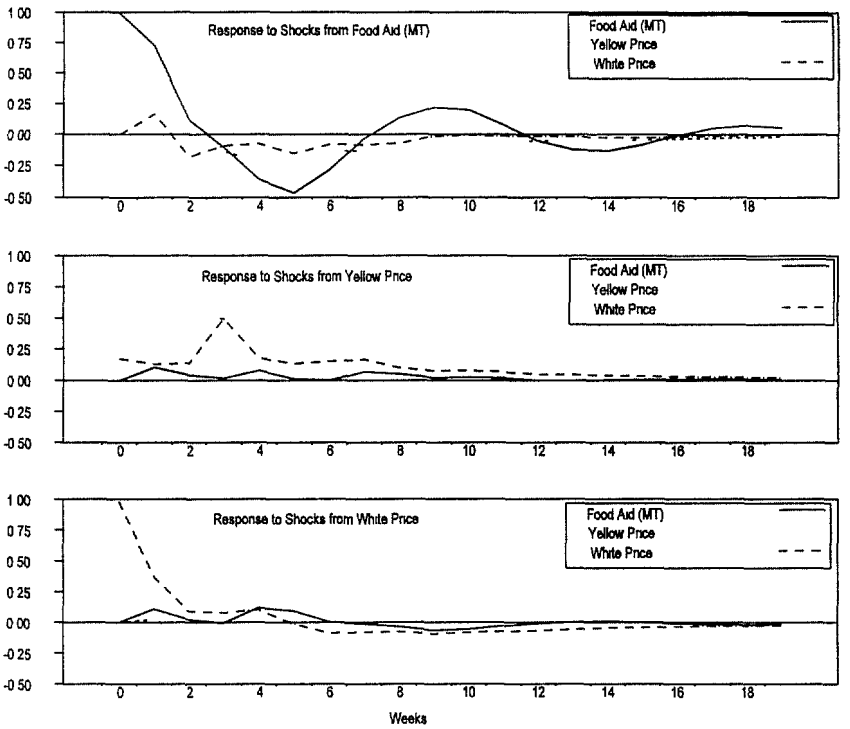


Figure 5 Simulation for the recovery period assuming no food aid from November 1994 - January 1995