RESEARCH REPORT

SUPPLY RESPONSE TO PRICES OF MAIZE, WHEAT, AND TOBACCO IN ZIMBABWE, 1961-1975

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THIS RESEARCH REPORT SETS out to test the hypothesis that the production of maize and wheat in the period 1961–75 was responsive to prices while that of tobacco was not. It should be noted that the first five years of the period precede U.D.I., while the latter ten years cover the U.D.I. period, during which economic sanctions were imposed against colonial Zimbabwe by the United Nations. My analysis is based on the 'static' assumptions of the Nerlovian (1958) theory of price response, which is a common and widely used tool in the field of supply response studies. Simply stated, the model asserts that 'supply is a function of expected price level based on previous experience':

Equation (1) $P_t - P_{t-1} = B P_{t-1}$
(i.e., adjustment equation; see Koutsoyiannis, 1975, p.310.)

(2) $S_t = b_0 + b_1 P_t + U_t$
(i.e., supply response as a function of price.)

Where: P_{t-1} = expected price
P_t = actual price
b = coefficient of expectation
S_t = commodity supply
U_t = error term

Transforming the equation into supply:
(3) $S_t = b_0 + b_1 P_{t-1} + U_t$

In fitting the Nerlovian model to his data, Sanders (1968, p.82) states that 'An analysis of the long-run price elasticities . . . reveals a close and positive correspondence between the size of the elasticity and the availability of land', implying that the response is evident where input factors are not a constraint. Abalu (1976, p.39) found that 'The results of the model suggest that price expectation is an important determinant of supply response of groundnut producers'.

It can be asserted that the Nerlovian adjustment model used by the above-mentioned scholars, and their concurrent conclusions (with some variations), offer a reasonable model for supply response analysis. There are some differences in the assumptions made by each of these authors, but they do not seem to invalidate either set of results. Generally, technology is assumed to be static at the

Table

PRICE RESPONSE STATISTICS FOR MAIZE, WHEAT & TOBACCO IN ZIMBABWE, 1961–75

	Variable	Constant	Price B	Standard Errde B	Elasticity	$\bar{R}^2$	F	T	DW†
MAIZE	PRICE	65442.825	21927.876	8766.9009	.064854	.28791	6.25606	2.5012118	1.66744
	PEACE/WAR	89966.800	134731.76	36596.395	.51684	.49127	13.55387 *.003	3.6815582	2.37083
	WEATHER	—	—	—	—	—	—	—	—
WHEAT	PRICE	−25627.095	6555.8998	2404.4809	1.91555	.33107	7.43399 *.018	2.7265344	.49643
	PEACE/WAR	1955.8000	36449.000	11762.716	.93013	.39820	9.60187	3.0986890	.45721
	WEATHER	—	—	—	—	—	—	—	—
TOBACCO	PRICE	60601.452	−25589.405	10285.338	−.83328	.28532	6.18989 *.029	−2.4879498	.77987
	PEACE/WAR	46228.000	−18440.400	3515.6604	−.8344442	.67099	27.51230 *.000	−5.2452166	1.64782
	WEATHER	—	—	—	—	—	—	—	—

* = level of significance   † = Durbin Watson statistic

Sources: F.A.O., Commodity Review and Outlook, 1979–80 (Rome, U.N. Food and Agriculture Organization, 1980); F.A.O., Production Year Books (idem, 1965–1975).

time of each analysis, and profit (yield) maximization is taken as a given and rational goal. These assumptions are given equal weight in this study.

This study also involves time horizon, and uses the statistical regression approach which is commonly applied to 'problems of estimating aggregate supply . . . where time series data exist' (Ogunfowora, 1972, p.82).

VARIABLES

A regression analysis of the variables was carried out with output as a dependent variable while the price and the peace/war were independent variables; however, the peace/war variable was inserted as a dummy to reduce discrepancies arising from the situation of economic sanctions (1965–75). With the introduction of this dummy, we can conclusively argue that the price coefficient, the 'F' test and $\bar{R}^2$, do not contain war discrepancies, and this allows us comfortably to accept the results and the hypothesis postulated earlier. However, the weather variable was not included owing to lack of data. Emphasis is laid on statistics from the computer print-out of the analysis, the crucial statistics being the $\bar{R}^2$, 'F' test, coefficient and elasticities.

It can be seen from the Table that tobacco price and war elasticities are about equal, which supports the argument that sanctions affected performance. But the war elasticities for maize and wheat are far below price elasticities, showing that the two crops were more influenced by considerations of price. However, the conditions of the war bore a greater influence on maize elasticity than on wheat elasticity, given that the war elasticity of the former is higher than that of the latter.

CROP-BY-CROP RESULTS

The price coefficients of each crop are given, and their elasticities with respect to expected price are also given. The Table shows the statistics resulting from a regression with one period lagged: (1) for maize, a price elasticity of 0.65 (rounded) is considered reasonable to support the hypothesis postulated earlier; (2) for wheat, the price elasticity is even higher at 1.92—both maize and wheat give anticipated results; (3) the tobacco price elasticity is −0.83, which arguably supports the hypothesis postulated. From these statistics the assertion is sustained.

OTHER STATISTICS

The $\bar{R}^2$, which shows the magnitudes of price influence on yield, is equally reasonable considering that there are other factors not quantified—such as weather—which affect yield performances. The 'F' test magnitudes given are similarly acceptable at their respective levels of significance.

It is therefore logical to assert and accept the hypothesis that maize and wheat were responsive to price while tobacco was not on both *a priori* and *ex post facto* grounds. Using, as we did, the Nerlovian theory on the data, credence is given to the concept of 'supply as a function of previous level of price'.

SUMMARY

The economic sanctions imposed by the United Nations from November 1965

seem to have produced not only a negative coefficient but also negative elasticities for tobacco. On the other hand, during the period under review maize was not significantly affected by the imposition of economic sanctions, partly because it has had a steadily growing home market resulting from population increase and livestock input.

Effects of the economic sanctions on maize are almost non-existent if not negligible. Wheat shows an interesting phenomenon: imported until 1965, it showed a remarkable increase in production following sanctions because of the effects of price and of import substitution.

Generally, there have been gains and losses in the economy resulting from the economic sanctions. It seems, however, that gains to the economy came from crops previously imported but now produced within the country. The adverse effects of sanctions were felt in export-orientated crops, which would in the long run suffer a drawback in that after the lifting of sanctions the established markets, having developed alternative sources of supply, would no longer be open. Again, competitive producers for the international market would have increased their supply, and thereby their share of the market, and of goodwill, too. Another drawback is that in emerging from sanctions it requires time to rehabilitate some of the traditionally exported crops to their previous production levels; certain skills in the farming of some crops may also have been lost both by natural wastage and emigration. These drawbacks are particularly relevant to tobacco.

From the data, however, maize shows a neutral response to sanctions, but a positive one to prices; wheat shows a marked response to prices and a positive gain from economic sanctions, while tobacco loses ground. Logically, the performance of agriculture during the period under review can be identified, crop by crop, within any one of three categories.

The performance of agriculture in the country over this period is to be conceptualized in the framework of a besieged economy where the performance of the export-orientated sectors is adversely affected, while crops previously imported are now produced unhampered by external competition. The logistics of such an environment suggest a re-orientation of crops to be produced in response to market conditions.

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