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SEASONAL RICE PRICE VARIATION IN THE PHILIPPINES: MEASURING THE EFFECTS OF GOVERNMENT INTERVENTION†

"If markets for farm crops were perfect and expectations of demand and supply precise, the seasonal price of stored commodities might be expected to rise just enough each day to cover the costs of storage" (Mears et al., 1974, p. 8). Indexes of average seasonal prices tend to approximate these conditions, but behavior in any particular year may depart from it widely. Analyses of prices of crops in numerous countries have concluded that the principal cause of this erratic behavior is erroneous expectations, about either supplies or total use.[1] This paper uses Working's anticipatory price model (1958) to show that uncertainty about government intervention was the principal cause of variation in seasonal price changes in the Philippine rice market from 1961 to 1973. Increased intervention from 1974 to the present has reduced this variability. The analysis shows that these reductions could also have been accomplished by less, but more timely, intervention at lower costs than those incurred.

PRICE AND IMPORT POLICIES UNDERTAKEN IN THE POSTWAR PERIOD, 1950 TO 1980

Beginning with resumption of pre-World War II production levels around 1950 and until the second crop year following the declaration of martial law in late 1972, the basic government price policy was to insulate the Philippine rice economy from foreign markets by effectively prohibiting private trade, protecting producers from generally lower import prices, and importing rice when necessary to prevent the retail price from rising too high (Charts 1 and 2). Annual import levels varied with anticipated domestic production and with political compromises between consumer interests, producer interests, and government costs.

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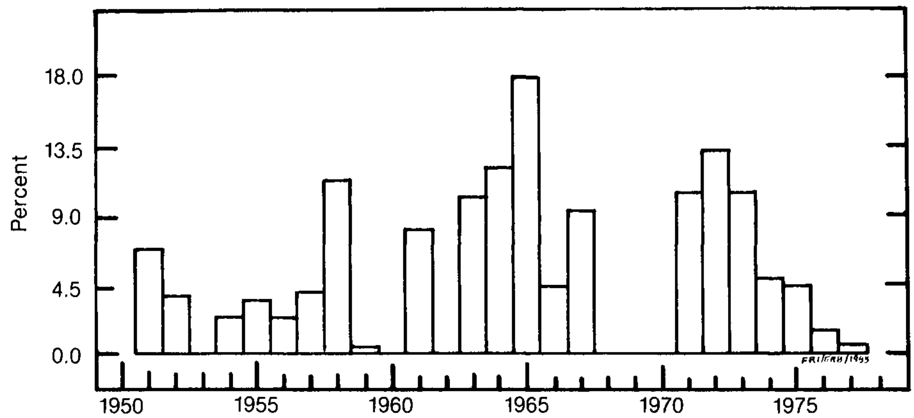
[1]See, for example, Gilbert (1969), Goldman (1974), Jones (1972), and Peck and Baumes (1975).

CHART 1—PHILIPPINE RICE IMPORTS AS A PERCENT OF TOTAL SUPPLY



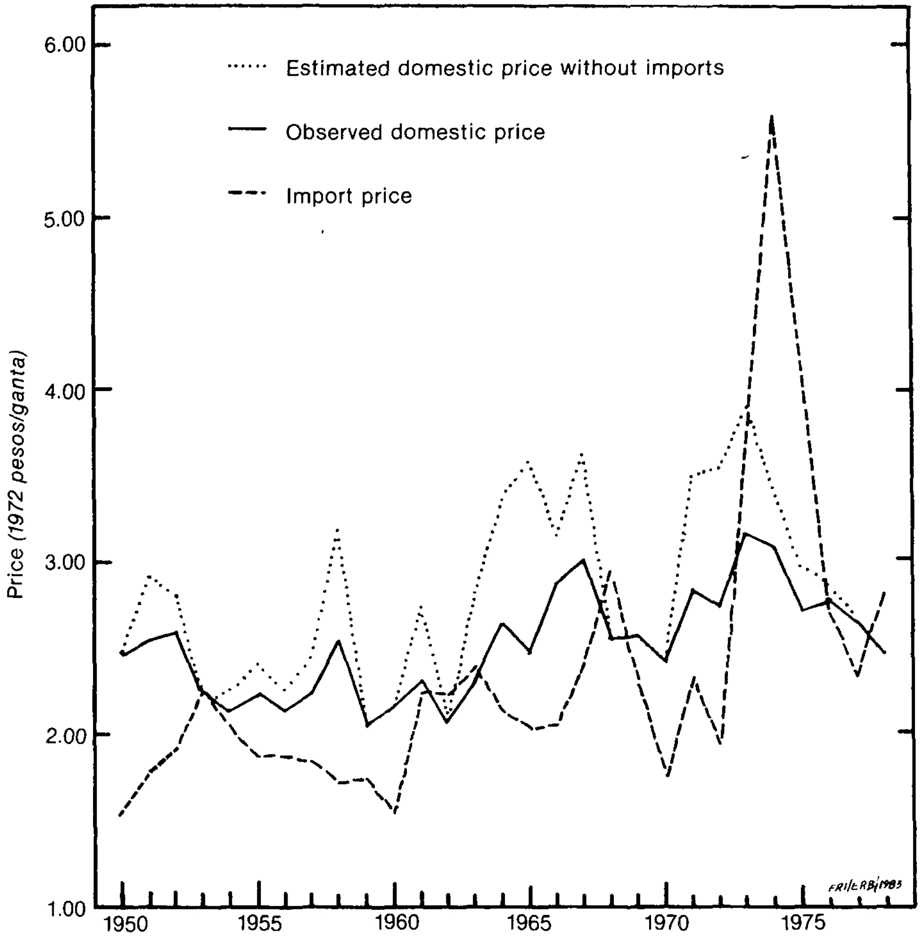
Sources: Based on import data from Leon A. Mears, Meliza Agabin, Teresa Anden, and Rosalinda Marquez, 1974, *Rice Economy of the Philippines,* University of the Philippines Press, Quezon City, Philippines, and production data from Mahar Mangahas, Aida Recto, and Vernon Ruttan, *Production and Market Relationship for Rice and Corn in the Philippines,* International Rice Research Institute Technical Bulletin 9, Appendix A.1. Net exports are reported for crop years 1952/53, 1959/60, 1961/62, 1967/68, 1968/69, and 1969/70.

During the early 1960s, growth in domestic production fell behind population growth as uncultivated land disappeared, leading to a rising domestic price and making increased imports necessary. The introduction of modern varieties of rice and increased investments in irrigation in the late 1960s brought a brief period of self-sufficiency. Poor weather and pest infestation meant a resumption of imports in the early 1970s. Although imports normally arrived during the seasonal high-price months just preceding the wet-season harvest, there was substantial year-to-year variation in the seasonal price rise. For example, the real price of rice in Manila increased as much as 78 percent in one season and actually declined 2 percent in two seasons (Table 1). Seasonal price increases well in excess of normal profit margins for storage were often blamed by Philippine politicians and the Philippine press on monopolistic rice traders.

Development of a second generation of modern varieties and substantial investments by the government after 1972 in irrigation, extension, and credit programs resulted in modest exportable surpluses and a declining domestic price by the end of the 1970s. Pre- and post-martial-law price policies are similar in that the government has continued to ban private imports and exports, but since 1974 a concerted effort has been made to control seasonal (and interregional) variations in price to the point that seasonal price rises have virtually disappeared. For example, the greatest seasonal increase in Manila prices from 1974 through 1978 was only 6 percent.

The National Food Authority (NFA) has been given sufficient financial resources to intervene in the domestic market to successfully defend its stated floor and ceiling prices. Although floor and ceiling prices have been periodi-

CHART 2—PHILIPPINE RICE PRICES



Sources: Price without imports, see text; nominal prices from International Rice Research Institute, *Data Series on Rice Statistics Philippines,* Table 18-a, and Central Bank; import prices based on *Economic Bulletin for Asia and the Far East,* Vol. IX, No. 1, 1958, p. 56, and Food and Agriculture Organization, *Monthly Bulletin of Statistics,* various issues.

cally increased in nominal terms, they have not kept pace with inflation. Floor and ceiling prices are not adjusted regionally or seasonally. The difference in the official retail ceiling and farm floor prices represents only milling and marketing costs. For example, in 1979 the farm price was 65 pesos per cavan of palay or P 1.30 per kilogram. Milling involves a one-third reduction in weight, giving a farm price of P 1.95 per kilogram milled equivalent. Finally, adding average marketing costs of 25 percent gives a retail price of P 2.45 per kilogram, the official retail ceiling price.

These policies serve to reduce overall inflation and provide an increasingly inexpensive wage good. However, they provide little or no incentive for

TABLE 1—SEASONAL INCREASE IN RETAIL RICE PRICES, 1961 TO 1978
(percent)

	Manila	Iloilo	Cotabato City
1961	13	29	42
1962	7	8	0
1963	19	60	66
1964	25	1	14
1965	2	9	28
1966	40	27	27
1967	12	9	11
1968	−2	9	7
1969	21	22	25
1970	4	−5	−1
1971	31	47	34
1972	−2	−11	12
1973	78	82	33
Average, 1961–73	19	22	23
1974	−8	8	−5
1975	0	−3	11
1976	6	7	12
1977	−6	0	−7
1978	−7	10	1
Average, 1974–78	−3	4	2

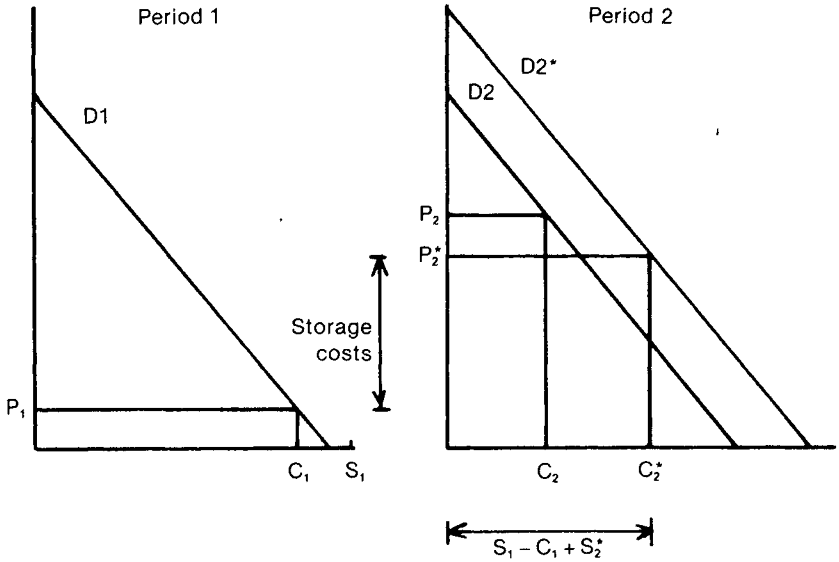
Source: Data from Central Bank and Bureau of Census. All prices were converted to 1972 equivalents before calculating percentage increase from low to high month.

private traders to transport stocks between regions or to store between seasons, forcing the government to take over a larger and larger share of domestic rice markets and to buy and sell in the same crop year. Government purchases on the domestic market averaged 85,000 tons (milled rice equivalent) from 1963 to 1970 (3 percent of domestic production). From 1974 to 1978 average purchases more than doubled, to 197,000 tons (5 percent of domestic production), and reached 494,000 tons in 1978. Average disbursements decreased only 10 percent, from 224,000 tons for 1963 through 1970 to 199,000 tons for 1974 through 1978.[2]

While economists are typically quick to point out to policy makers that a more freely operating market is more efficient, the political costs of wide seasonal price fluctuations like those between 1961 and 1973 may simply be unacceptable to government decision makers. The anticipatory price analysis below will show that the unusually large seasonal fluctuations were in fact a

[2]Annual figures on NFA activity are available in Bouis (1982).

CHART 3—AN ANTICIPATORY PRICE MODEL



result of government intervention, in particular of ineffective management of government imports, and are not inherent in the structure of a free-operating private rice market.

THE ANTICIPATORY PRICE MODEL

Working's theory of anticipatory prices (1958) is outlined in Chart 3. A year is divided into two periods. Supply of a commodity, S_1, is harvested in the first period. S_1 may be all that is produced during the entire year or a second crop, S_2, may be harvested in the second period. For convenience, periods 1 and 2 are selected such that S_1 is greater than S_2. Depending on the position of the demand curves in the two periods, the sizes of S_1 and S_2, and costs of storage, it may be profitable to store a part of S_1 for consumption in period 2. If these variables are known with certainty, the difference in prices between the two periods will never be greater than storage costs. It can be less if S_1 and S_2 are of similar size or storage costs are large relative to the prices.

In adapting this model to the particular circumstances of the Philippine rice economy, the following assumptions are made:

1. The demand curves in periods 1 and 2 are known and are identical.
2. No stocks are carried over into the next crop.
3. Storage costs are a percentage relationship, $P_2^* = P_1(1 + K)$.[3]

[3]The primary cost of rice storage is interest paid (or foregone) on the money required to purchase and hold rice (Mears, 1974, pp. 140–41).

In reality, the demand curves and quantities to be supplied—especially for the second period—are not known with certainty when the initial pricing and inventory decisions must be made. Expectations of S_2 and D2 (S_2^* and D2*) are formed on the basis of past experience. For any given demand schedule in period 2 (say D2*), expected consumption in period 2, C_2^*, which is equal to inventories from period 1 plus S_2^*, implies an expected price in period 2 of P_2^*. Competitive market forces set P_1 such that the difference between P_2^* and P_1 is equal to storage costs and $C_1 + C_2^*$ exhausts $S_1 + S_2^*$.

Deviations of D2 from D2* and of S_2 from S_2^* will result in deviations of P_2 from P_2^*. P_2 may range above P_2^*, as shown in Chart 3, resulting in unusually high profits to storage, or fall below P_2^*, resulting in losses to storage. Thus, over a number of years the average of $P_2 - P_1$ may approximate storage costs, but $P_2 - P_1$ for individual years may be substantially above or below storage costs.

With these additional assumptions, the anticipatory model yields the following equation:[4]

$$\frac{P_2 - P_1}{P_1} = K - b \left[\frac{(C_2 - C_2^*)}{P_1}\right] \tag{1}$$

where b is a measure of the slope of the demand curve.

Since the demand curves are assumed to be stable, differences between actual and anticipated consumption in the second period can only be the result of deviations of domestic production or imports from expectations.

If W(W*), D(D*), and I(I*) equal the observed (expected) sizes of the wet-season crop, dry-season crop, and imports, the consumption variation equals the sum of the supply variations, and equation 1 becomes:

$$\frac{P_2 - P_1}{P_1} = K - b \left[\frac{(W - W^*) + (D - D^*) + (I - I^*)}{P_1}\right] \tag{2}$$

Before estimating equation 2 it is necessary to obtain estimates of W*, D*, and I* (W, D, and I are observed) and to define periods 1 and 2 in order to choose appropriate observations for P_1 and P_2.

Prices

Only 13 years of monthly import data are available for years before 1974. Prices from three locations—Manila, Iloilo, and Cotabato City—were selected for analysis. Each is situated in a major producing region and is relatively isolated from the others. Regional diversity thus supplements time series data in testing the basic model. The average of November and December prices was chosen to serve as P_1, the seasonal low price, and the average of July and August prices served as P_2. The selection is arbitrary; alternative choices do not significantly affect the results.

[4]Completion derivations using both farm and retail prices and relevant marketing margins are available in Bouis (1982).

TABLE 2—PHILIPPINE RICE IMPORTS BY MONTH, 1961 TO 1973
(thousand tons of milled rice)

	Month												
	J	F	M	A	M	J	J	A	S	O	N	D	Total
1961						9	41	34	71	32			187
1962													0
1963						16	24	60	29	43	80	5	257
1964					24	37	66	74	21	78			300
1965			27	73	68	75	105	94	85	9	34		570
1966							8	27	46	27			108
1967			16	19	15	57	58	71	44	13			293
1968													0
1969													0
1970													0
1971				2		22	14	61	23	64	118	64	368
1972	57	22	54	36	58	54	40	50	26	16	16	29	458
1973	12	14	8	5	10	12	39	67	63	41	26	9	306
Total	69	36	105	135	175	282	395	538	408	323	274	107	2,847

Source: Monthly distribution of imports in 1961 from Sri-on Sonboonsup and Delane E. Welsch, 1975, *Thai Rice Export Data, 1955–1972,* Department of Agricultural Economics, Kasetsart University, Bangkok, Thailand; total imports in 1961 and all data for 1962 through 1971 from Leon A. Mears, Meliza Agabin, Teresa Anden, and Rosalinda Marquez, 1974, *Rice Economy of the Philippines,* University of the Philippines Press, Quezon City, Philippines; for 1972 and 1973 from the National Food Authority.

Domestic Production

Expected production in wet and dry seasons was calculated from trend projections of harvested area and yields. Production data for the Central Luzon and Southern Tagalog regions were combined to determine expected production for the Manila-Central Luzon market. Data for the Western Visayas and South and Western Mindanao regions were used for the Iloilo and Cotabato City markets respectively.

Expected Imports

As Chart 1 shows, imports as a percentage of domestic production varied widely between 1961 and 1973. Table 2 shows imports from 1961 to 1973 by month. Most imports (68 percent) in most years (7 out of 9) arrived between June and October. On average, rice prices are highest from June through October because of the cost of storing rice from the preceding wet-season harvest (primarily in November and December). Release of imported rice in these months achieves the political objective of keeping prices from rising even higher and minimizes the cost of storage for the government.

Although arrivals of imports tended to be concentrated between the months of June and October, Table 2 also shows that in some years considerable imports arrived before June and after October. The timing of these arrivals may not have been intended. Post-October imports arrive after the harvest of the wet-season crop is well under way. On average, prices paid to farmers are at or near their seasonal low and retail prices have begun to fall. Post-October imports merely augment the seasonal oversupply. Had they arrived in September or October, they might have served the political objective of curbing the pre-harvest price rise. Thus, most imports arriving after October were probably delayed in transit.

Imports that arrive too early (before June) are also undesirable because they must be stored until sale in the seasonal high-price months. The government must, of course, allow for unforeseen delays in the arrival of shipments. Cost of storage, however, is an increasing function of the margin of error the government will allow itself. This discussion suggests the testable proposition that expected imports differ from realized imports only in their timing, that is:

1. The private trade's expectation that known government import targets for the year will be met is correct; and
2. The private trade's expectation that imports will arrive in equal monthly shipments from June through September is often wrong.[5]

In Table 3, these propositions have been applied to the cumulative monthly record of imports for each year. Imports arrived significantly earlier than anticipated in 1965, 1967, and 1972, and significantly later than expected in 1961, 1963, 1966, 1971, and 1973. Imports arrived roughly on schedule in 1964. There were no imports in 1962, 1968, 1969, and 1970. The average of the July and August vectors reported in Table 3 was used in the regression estimations as a measure of the difference between expected and actual import arrivals.

Estimation Results

In equation 2, each of the three independent variables has an identical coefficient (b). However, deviations in imports from expectations can only be measured at the national level, whereas the wet- and dry-season harvest variables are regional. Furthermore, the size of the wet-season harvest is more certain than that from the dry season, if only because it is in progress when the expectations are formed. Therefore, deviations from trend for wet-season production are overstated relative to deviations from trend for dry-season production. In fitting the function, therefore, each independent variable was permitted to have a unique coefficient. The results of these estimations are:

[5]The choice of June through October in equal installments as the expected timing of import arrivals is somewhat arbitrary. The number of months might have been varied as a function of the magnitude of total imports. Or the distribution of expected arrivals might have been varied across months, instead of assuming the monthly percentage of total to be constant. However, since no information is available to specify such functions, it seems best to choose the simplest hypothesis from which differences in expected and realized imports could be calculated.

TABLE 3—CUMULATIVE DIFFERENCES BETWEEN REALIZED AND EXPECTED IMPORTS, 1961 TO 1973*
(thousand tons of milled rice)

	Month											
	J	F	M	A	M	J	J	A	S	O	N	D
1961	0	0	0	0	0	−29	−25	−28	+5	0	0	0
1962	0	0	0	0	0	0	0	0	0	0	0	0
1963	0	0	0	0	0	−36	−63	−54	−77	−85	−5	0
1964	0	0	0	0	+24	+1	+7	+24	−18	0	0	0
1965	0	0	+27	+100	+168	+129	+120	+100	+71	−34	0	0
1966	0	0	0	0	0	−22	−35	−30	−5	0	0	0
1967	0	0	+16	+34	+50	+48	+48	+61	+46	0	0	0
1968	0	0	0	0	0	0	0	0	0	0	0	0
1969	0	0	0	0	0	0	0	0	0	0	0	0
1970	0	0	0	0	0	0	0	0	0	0	0	0
1971	0	0	0	+2	+2	−49	−109	−122	−172	−182	−64	0
1972	+57	+79	+132	+168	+226	+188	+137	+96	+30	−45	−29	0
1973	+12	+26	+34	+39	+49	−81	−183	−258	−335	−436	−409	−400[a]

*Assuming annual imports are known and expected to be distributed equally between June and October. See text.
[a]In 1973 the Thai government cancelled import orders for 400,000 tons that never arrived.

$$\Delta P_M = .112 - \underset{(4.2)}{.00217\Delta I} - \underset{(0.2)}{.00016\Delta W_M} - \underset{(2.1)}{.00262\Delta D_M} \qquad R^2 = .74$$

$$\Delta P_I = .136 - \underset{(5.1)}{.00432\Delta I} - \underset{(0.8)}{.00248\Delta W_I} - \underset{(0.6)}{.00329\Delta D_I} \qquad R^2 = .76$$

$$\Delta P_C = .156 + \underset{(2.9)}{.00425\Delta I} - \underset{(0.4)}{.00061\Delta W_C} + \underset{(0.8)}{.00294\Delta D_C} \qquad R^2 = .51$$

where ΔP is the percentage change in real prices, ΔI is the deviation in imports from actual to expected, and ΔW and ΔD are the deviations in regional wet- and dry-season harvests.[6] The subscripts indicate Manila (M), Iloilo (I), and Cotabato City (C). T-statistics are in parentheses.

The only variable important in explaining seasonal price changes in all three urban areas is the import variable. Uncertainty about the wet-season harvest was never an important explanatory variable. Only for Manila price changes was uncertainty about the dry-season harvest significant. Overall, variability in seasonal price fluctuations might have been substantially reduced had imports, whatever their volumes, been distributed in a timely way during the high-price months of June through October.

The intercept terms in the above equations indicate average percentage returns to storage in a normal year, which rise with distance from Manila. This may result both from a premium that must be paid for the greater risk of storage in the south and from a greater scarcity of capital in the south. Comparing other coefficients among equations, Manila prices are somewhat less responsive to unanticipated deviations in imports than are those in either Iloilo or Cotabato City. If imports (and their deviations) were distributed equally among regions, price elasticity estimates imply exactly the opposite result.

Own-price elasticities for rice, estimated from cross-section data, averaged -0.25 for Luzon, -1.07 for the Visayas, and -1.44 for Mindanao (Bouis, 1982). With equally distributed imports, prices in Manila would have been more variable. That they were less variable as a result of these variations indicates that in the case of import delays (for example), what imports were available were distributed in Manila first. A "Manila first" policy is consistent with the widespread view that government policies tend to have an urban bias. In this case, however, such a policy has a sound economic as well as political basis. Because of higher elasticities in the south, shifting the burden of import delays to the south has a smaller price effect than would be the case in the north.

These results suggest two additional hypotheses. First, seasonal price in-

[6]Adjusting equation 2 to account for inflation leads to the following specification:

$$\frac{N_2}{N_1}\,\frac{P_{2r}/N_2 - P_{1r}/N_1}{P_{1r}/N_1} + \left(\frac{N_2}{N_1} - 1\right) = K - b\frac{N_2}{N_1}\,\frac{(W - W^*) + (D - D^*) + (I - I^*)}{P_{1r}/N_1}$$

where N_1 and N_2 are price indexes in periods 1 and 2. The values of ΔW, ΔD, and ΔI are then deflated by P_{1r}/N_2. The left-hand expression equals ΔP.

creases will be greater in years of large imports since storage is more risky (both in when these imports will arrive and in where they will be distributed) and stockholders must be compensated for this risk. Second, seasonal price increases will be lower in Manila in election years as it will be politically more important to keep seasonal price rises to a minimum in these years. Scheduling of elections followed a pattern identical to that of the United States, with congressional elections held every two years in early November, just after the high-price months of August, September, and October.

To test these two hypotheses, two variables were added to the regression estimations, IMPSIZE and ELECT, where IMPSIZE is total imports as a percent of total supplies (production plus imports) and ELECT is a zero-one dummy taking the value of one in odd-numbered years from 1961 through 1971. The ΔW and ΔD terms were omitted from the estimations since for the most part they were insignificant and their omission increases the degrees of freedom. In the case of ΔD_M, a high negative correlation between ΔD_M and IMPSIZE resulted in colinearity problems. The results are as follows:

$$\Delta P_M = -.016 - \underset{(7.8)}{.00377\Delta I} + \underset{(5.4)}{2.380\text{IMPSIZE}} - \underset{(2.7)}{1.173(\text{ELECT})(\text{IMPSIZE})} \qquad R^2 = .90$$

$$\Delta P_I = .096 - \underset{(4.9)}{.00444\Delta I} + \underset{(0.7)}{0.584\text{IMPSIZE}} - \underset{(0.2)}{0.126(\text{ELECT})(\text{IMPSIZE})} \qquad R^2 = .73$$

$$\Delta P_C = .012 - \underset{(7.3)}{.00433\Delta I} + \underset{(2.9)}{1.652\text{IMPSIZE}} + \underset{(1.8)}{1.008(\text{ELECT})(\text{IMPSIZE})} \qquad R^2 = .89$$

Addition of the two variables considerably improved the fit of the Cotabato City equation, somewhat improved the fit of the Manila equation, and in both cases increased the significance of the ΔI coefficient. For Manila and Cotabato City, for every 1 percent of total rice availability that was imported, the seasonal price rise increased roughly 2 percent in a nonelection year. In an election year, the equivalent increments were 1 percent in Manila and 3 percent in Cotabato City. No matter whether import arrivals were early or late, total disbursements appear to have been concentrated in Manila in election years at the expense of consumers in Mindanao rather than in the Visayas.

CONCLUSION

The Philippine government, in its effort to control inflation, has undertaken policies to maintain low retail prices of rice, to the extreme of eliminating seasonal rises in price altogether. Stated intrayear retail ceiling prices exceed stated farm floor prices by a markup that does not quite cover all expenses incurred by the National Food Authority in marketing rice. Such policies reduce the profitability of private marketing and storage of rice and tend to force the government to take over a large share of rice marketing.

The statistical results show that abnormal seasonal price rises occurring before effective NFA market control in 1974 were not primarily caused by rice traders' monopolistic behavior, as often charged. Rather, fluctuations in seasonal prices were in large part the result of ineffective government management of its rice-importing and buffer-stock operations. In attempting to control the average price, government intervention resulted in more seasonal price variation than would have been the case in the absence of government intervention. The NFA can take credit for more efficient administration of its import and buffer-stock operations than its predecessor, the Rice and Corn Administration. The task of controlling seasonal variation in price, however, has been made much easier by the recent high rate of production growth (especially dry-season production) and the resulting reduction in level of imports. Imports since 1974 have arrived well ahead of seasonal high-price months.

The evidence presented that the rice market operates efficiently in the absence of government controls suggests that there are less costly ways in which the government can achieve much the same price objectives. In the present situation where the country is self-sufficient at a low price, relatively small injections of rice are required to make up any unexpected shortfalls in the dry-season crop and keep seasonal price rises to a minimum. Dry-season yields are higher than wet-season yields, and as more irrigation is made available for dry-season production the difference in relative sizes of the two crops is diminishing, leading to a more evenly distributed production throughout the year and a natural dampening of the seasonal price increase. Small differences in rice prices between seasons and among regions would provide an incentive for private storage and movement of stocks between surplus and deficit regions and seasons. The level of prices could then be controlled by government purchases of rice in two or three key surplus regions to defend farm floor prices and in government wholesale outlets in the largest cities to defend retail price ceilings. Government costs should decline proportionately with decreased participation in the market, freeing resources for investment in raising the productivity of the rice crop.

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