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The Effect and Cost of Philippine Government Intervention in Rice Markets

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**Rice Policies in
Southeast Asia
Project**

International Food Policy Research Institute,
International Fertilizer Development Center,
and the International Rice Research Institute

THE EFFECTS AND COST OF PHILIPPINE GOVERNMENT INTERVENTION
IN RICE MARKETS

by

Laurian J. Unnevehr

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FOREWORD

The Rice Policies in Southeast Asia Project is a collaborative effort involving the International Food Policy Research Institute, the International Rice Research Institute, the International Fertilizer Development Center, and researchers and institutions in Indonesia, Malaysia, the Philippines, and Thailand.

As part of the project, working papers were commissioned to estimate the benefits and costs of trade and reserve stock policies to stabilize rice prices in Indonesia and the Philippines. The papers review and summarize available information on the production, consumption, trade, stocks, and prices of rice in the countries, and formulate simple buffer stock models incorporating rice supply and demand relationships to assess the effects of alternative import and reserve stock policies on rice prices.

The working papers are intended to provide a preliminary assessment of the potential that reserve stock management in the two countries has for rice price stabilization and to identify key issues for further study. Rigorous analyses of some of the important issues, including efforts to derive optimal storage rules and assess the impact of reserve stock policy on seasonal prices, are now being made by researchers at IFPRI and in the collaborating countries.

Mark W. Rosegrant
Coordinator, Rice Policies
in Southeast Asia Project
December 1983

1. INTRODUCTION

The Philippines was a marginal rice importer before 1977 and its market intervention policy was focused on buffering consumer prices from variations in domestic production and world prices. Sustained growth in production led to export surpluses and declining real rice prices from 1977 to 1982. Domestic self-sufficiency since 1977 has provided low stable prices for consumers but declining incentives for producers. A reassessment of market intervention strategy is now needed to find ways of maintaining producer incentives.

This paper measures the effects and costs of Philippine government intervention in domestic rice markets. Philippine rice price policy has been implemented through market intervention in support of floor and ceiling prices, accompanied by government control of international trade. There are two sources of hidden costs in the use of these price policy instruments. First, as a consequence of the government monopoly on international trade, world market price differences for quality are not reflected in the domestic price structure. This reduces export values, increasing the costs of disposing of the domestic surplus. Second, because of the desire to provide both high prices to producers and low prices to consumers, official floor and ceiling prices are often set without regard to marketing costs. When the difference between official prices is less than the private trader's costs, an implicit result of intervention is to alter margins among domestic prices. Altering price margins and levels is more costly than altering price levels alone, yet the government often acts as if it were unaware of these additional costs when setting official prices.

The paper begins with a review of the theory of price and margin formation, and then considers how government intervention can affect prices. The effects of Philippine government market intervention on the levels and margins of domestic rice prices are measured, and the implicit costs of intervention are estimated. Government intervention has not always held actual market prices equal to official prices, and therefore the analysis considers the partial effects of inadequate intervention and the potential costs of successful intervention.

2. A MODEL OF PRICES, MARGINS, AND GOVERNMENT INTERVENTION

The average annual national rice price is determined by the intersection of total domestic demand with total supply, including production, net imports, and net changes in stocks carried between years. When there is free trade, imports or exports will adjust to keep the domestic price equal to the c.i.f. or f.o.b. price.

All domestic prices are directly or indirectly affected by total supply, but marketing costs separate prices in different locations and months. Generally the maximum market price is the off-season consumer price and the minimum is the harvest-season farm price. Because the government defines its intervention role as placing limits on domestic price fluctuations, it is useful to consider the determinants of the margin between these two prices. The costs of transportation and processing are assumed to put a fixed margin between producer and consumer prices. (This assumption is discussed in Appendix 1.) The following analysis considers how costs of storage cause prices to rise between the harvest season and the off-season.

The main rice crop is harvested between November and December and a smaller dry-season crop is harvested in May. Rice is stored to meet demand throughout the year. In a competitive market with no uncertainty, stocks are carried up to the point where prices rise between seasons by the amount of storage costs. Price is lower and consumption higher in the harvest season, and price rises and consumption falls in the off-season.¹

¹A larger dry-season harvest does not affect seasonal price movements in a simple two-period model. It reduces the amount stored, but the seasonal price rise is still equal to storage costs. In a multiperiod model a larger dry-season crop could affect prices if it reduces the average length of time that stocks are held and hence reduces average costs. The dry-season crop increased from 30 to 40 percent of crop-year production in the 1970s. However, informal interviews with rice millers in the regions of Central Luzon and Western Visayas indicate that most storage is from the wet-season harvest in November to August. The dry-season crop is turned over quickly. For a complete discussion of the underlying theory see R. H. Goldman, "Seasonal Rice Prices in Indonesia, 1953-69: An Anticipatory Price Analysis," Food Research Institute Studies 13 (No. 2, 1974), pp. 99-143.

If there were perfect information about future supplies, storage decisions would lead to a seasonal price increase just equal to storage costs. But storage decisions are made without perfect information regarding the future. Stocks and prices can only adjust to unexpected changes in supply as the extent of the shortfall or surplus becomes known. If the dry-season harvest is less than expected, for example, prices will increase to allocate the reduced supply until the next harvest. Or if the dry-season harvest is large, prices will fall as the market absorbs the extra supply. Seasonal price increases therefore vary in individual years but should average out to equal storage costs over many years.²

Changes in stocks carried from year to year can offset the effects of uncertainty on the seasonal price rise.³ Fewer stocks will remain at the end of the year if there is an unexpected shortfall in supply within the year. Thus adjustments in year-end stocks will reduce seasonal price fluctuations due to unexpected changes in supply.

Government intervention in markets can affect prices and margins in several ways. First, control of international trade can alter imports or exports and hence cause total annual supply and average annual prices to deviate from the free trade situation. Control of imports may be accompanied by an import subsidy, but this import subsidy will only lower prices if the quantity imported is sufficient to meet domestic demand at the subsidized price.

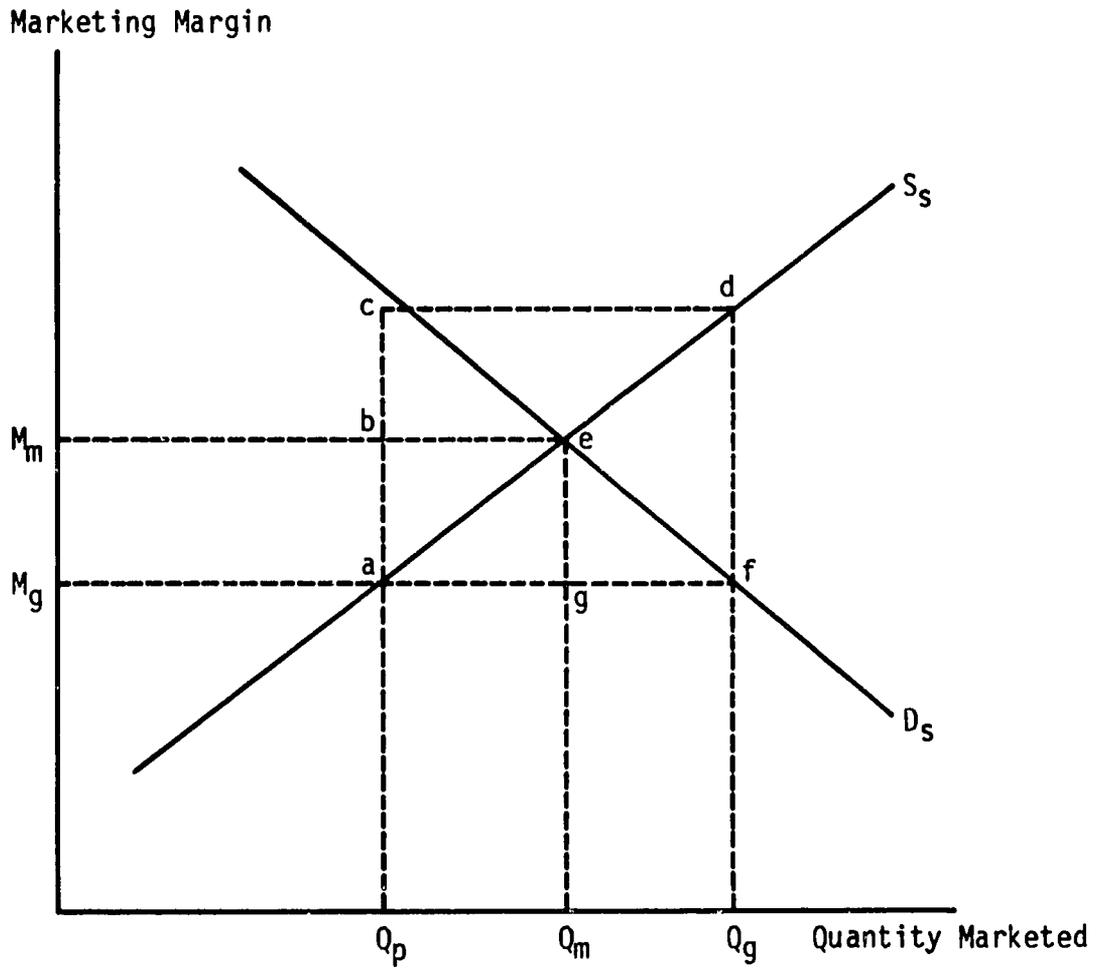
Government market intervention also places limits on domestic price fluctuations within a year, by setting an official floor for prices paid to farmers and an official ceiling on prices paid by urban consumers. When the difference between these official prices (the official margin) is not large enough to cover private costs of processing, transportation, and storage, then the government must subsidize its marketing costs and assume some portion of the private trade.

The effects of this intervention are illustrated in Figure 1, where S_s and D_s represent the supply of and demand for marketing services. The "consumers" of these services are both the producers and consumers of rice, whereas the "producers" are the private traders. Without intervention, the "price" of marketing services is the margin M_m . If the government wishes to enforce a smaller margin, M_g , then it must purchase the additional quantity $Q_g - Q_m$ offered by producers and demanded by consumers. Because the returns to trading activities have declined, private trade is only willing to market Q_p and the govern-

²Ibid.

³See A. E. Peck and H. S. Baumes, "Seasonal Price Behavior for Indiana Farm Commodities," Station Bulletin 90, Department of Agricultural Economics, Agricultural Experiment Station, Purdue University, Lafayette, Indiana, 1975.

Figure 1--The effects of government intervention to reduce marketing margins



ment must also handle $Q_m - Q_p$. Thus the government markets additional quantities and also replaces some portion of the private trade as less efficient trading firms withdraw from marketing.

Private traders lose the producer surplus associated with trading $Q_m - Q_p$ ($M_m e a M_g$), while the producers and consumers of rice gain the consumer surplus ($M_m e f M_g$) from the additional marketing services. The government subsidy equals $a c d f$ because the prices of domestic factors used in marketing services are bid up.⁴ This subsidy must be financed by the government budget unless the public marketing agency is more cost-efficient than private trade.⁵

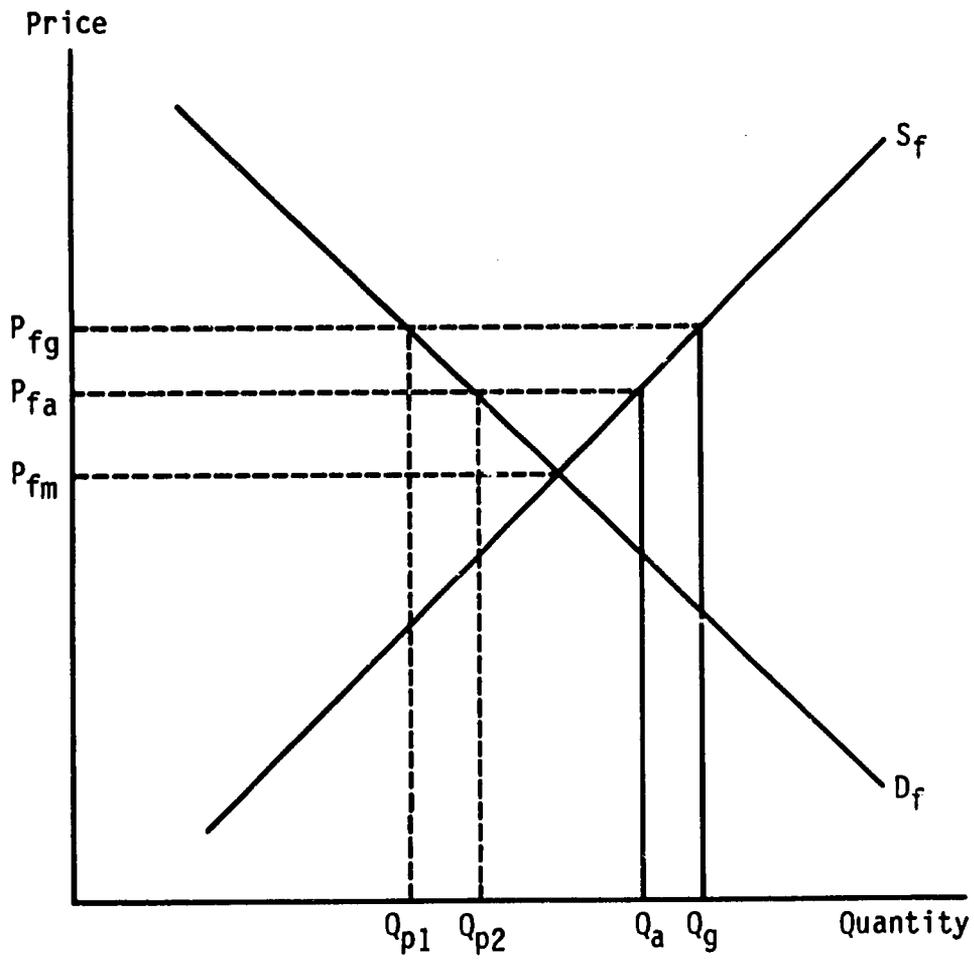
As the seasonal price increase represents the margin that arises from storage costs between seasons, the government can reduce seasonal price increases by carrying stocks and subsidizing storage costs. In addition, the government can offset seasonal price fluctuations due to unexpected changes in supply. If government imports or exports are planned to meet the expected surplus or deficit in supply, then a change in government stocks (procurements minus disbursements plus net imports) will equal zero when actual domestic supply does not vary from expected supply. A change in stocks indicates an unplanned change in procurements, disbursements, or net imports. This change can offset unexpected changes in production in the same way as changes in private stocks carried between years. Such government stock changes would reduce price fluctuations and hence returns to private arbitrage across years. Changes in government stocks as the result of poor planning, however, may only add to unexpected changes in supply and exacerbate seasonal price fluctuations.

When the government is not willing or able to assume a large enough proportion of trade to enforce the narrow price band, actual prices will diverge from official prices. In importing years off-season consumer prices will rise above the official ceiling, whereas in exporting years harvest-season producer prices will fall below the floor. Any government purchase or sale will have some effect on price, however, even if it is inadequate to hold official prices. The situation for a particular producing region in an exporting year is illustrated in Figure 2. The demand curve D_f , is derived from retail consumer demand and represents demand at the farm gate. If the government does not intervene, farmers receive P_{fm} . But if the government wishes to raise prices to P_{fg} , the purchase of $Q_g - Q_{p1}$ is required. If the government is only able to purchase $Q_a - Q_{p2}$, perhaps due to budget limitations, prices are raised to P_{fa} . This price,

⁴This assumes that marketing inputs are nontradable. Otherwise additional inputs could be imported at constant cost.

⁵The assumption that private trade is inefficient and that government can operate more cheaply is often the justification for the creation of a public marketing agency.

Figure 2--The effects of inadequate intervention on producer prices



P_{fa} , is lower than the official price, P_{fg} , but higher than the price without intervention, P_{fm} . All rice producers gain from the price increase P_{fm} to P_{fa} , but only those fortunate enough to sell to the public agency gain the additional increment $P_{fg} - P_{fa}$.

This analysis demonstrates that official prices should allow a margin sufficient to cover private costs if the government is not willing to subsidize marketing costs. When the official margin is smaller than private marketing costs, the government marketing agency must replace some portion of private trade and operate at a loss. Similarly, the government can reduce seasonal price fluctuations by taking a loss on changes in stocks between years. When the government is not willing or able to subsidize marketing, actual prices will diverge from official prices, although any intervention will have some effect on market prices. When intervention is inadequate to support official prices, then opportunities to sell or buy at official prices will be rationed.

3. PHILIPPINE RICE PRODUCTION AND RICE MARKET INTERVENTION POLICY

Philippine rice production doubled from 2.5 million to 5 million tons between 1965 and 1980. During the 1960s the 2.8 percent annual growth in production lagged behind a 3.0 percent growth in population, and supply remained about 5.0 percent short of self-sufficiency.⁶ In the late 1960s farmers began adopting modern varieties, and in the early 1970s the government increased investments in irrigation. These changes resulted in an average production growth of 5.0 percent annually from 1975 to 1981, while the rate of population growth slowed to 2.7 percent annually. Although the Philippines had previously exported small quantities, the five years from 1977 to 1982 saw sustained export surpluses (Table 1).

The importance of different price policy instruments has changed with the growth in production. During the 1960s the Rice and Corn Administration (RCA) played a fairly minor role in domestic marketing, usually procuring less than 2 percent of production (Table 1). Government market intervention primarily took the form of disbursement of imports in urban areas. In 1972 the RCA was replaced by the National Grain Authority (NGA), now the National Food Authority (NFA). As part of renewed concern about farmer incentives, the agency was given additional funds in order to play a more active role in domestic marketing. The NFA increased procurements, purchasing at least 5 percent of the increased production since 1977. Intervention activities were also spread more evenly throughout the Philippines. Central Luzon procurements were one-third of the national total during 1973-75, but declined to one-fifth in the late 1970s, about the same proportion as the region's contribution to national supply. Disbursements in Manila have declined from half of total government sales in 1973/74 to one-quarter in 1979/80. With growing domestic supplies in the 1970s, total disbursements declined as a percent of production (Table 1). The NFA's principal task became the disposal of surplus production through exports and increased government stockholding.

RCA and NFA apparently followed different policies in setting the margin between official floor and ceiling prices. During RCA's years of administration from 1963 to 1971, the difference between the ceiling price and the floor price adjusted for milling losses was very small and sometimes negative (Table 2). This small official margin

⁶S. Apiraksirikul, "Rice Trade Policy as It Relates to National Objectives in the Philippines" (M.S. thesis, University of the Philippines at Los Baños, Laguna, Philippines, 1976).

Table 1--Rice production, international trade, and government market intervention in the Philippines, 1962/63-1980/81

Year	Production	Net Imports	Government Procurement	Government Disbursements
(1,000 metric tons milled)				
1962/63	2,578.6	256.2	156.5	366.0
1963/64	2,497.9	299.9	26.4	311.6
1964/65	2,596.4	569.2	2.1	402.3
1965/66	2,647.2	108.2	22.9	252.9
1966/67	2,661.1	238.6	56.1	150.4
1967/68	2,964.5	-40.3	151.6	29.6
1968/69	2,889.1	-0.5	145.3	169.0
1969/70	3,401.7	---	50.1	60.1
1970/71	3,472.9	369.3	2.1	108.7
1971/72	3,315.1	440.1	0.4	541.3
1972/73	2,869.5	308.1	4.8	252.2
1973/74	3,636.2	169.3	22.0	189.8
1974/75	3,679.0	145.3	95.9	238.2
1975/76	4,003.7	55.2	163.9	259.1
1976/77	4,196.5	15.6	273.9	198.8
1977/78	4,481.7	-13.4	451.5	136.7
1978/79	4,678.1	-38.0	423.1	74.7
1979/80	5,093.4	-236.0	403.1	268.2
1980/81	5,020.0	-175.0	280.5	255.1

Sources: Production data were obtained from the Philippines Bureau of Agricultural Economics. Data on net imports, procurements, and disbursements are from the National Food Authority of the Philippines.

Note: The dash indicates that the quantity was negligible.

Table 2--Average official floor and ceiling prices for rice in the Philippines, 1962/63-1980/81

Crop Year	Paddy Support Price	Rice Ceiling Price	Margin (after milling recovery of 65 percent)
	(pesos/kilogram)		
1962/63	0.26	0.36	-0.04
1963/64	0.28	0.34	-0.09
1964/65	0.28	0.46	0.03
1965/66	0.28	0.55	0.12
1966/67	0.38	0.59	0.01
1967/68	0.38	0.59	0.01
1968/69	0.38	0.59	0.01
1969/70	0.38	0.59	0.01
1970/71	0.41	0.59	-0.04
1971/72	0.54	1.07	0.24
1972/73	0.66	1.33	0.32
1973/74	0.81	1.86	0.61
1974/75	1.00	1.90	0.36
1975/76	1.06	2.02	0.39
1976/77	1.10	2.10	0.41
1977/78	1.10	2.10	0.41
1978/79	1.25	2.36	0.44
1979/80	1.36	2.51	0.42
1980/81	1.51	2.75	0.43

Sources: Data were obtained from the National Food Authority; S. Apiraksirikul, "Rice Trade Policy as It Relates to National Objectives in the Philippines" (M.S. thesis, University of the Philippines at Los Baños, Laguna, Philippines, 1976); and L. A. Mears et al., The Rice Economy of the Philippines (Quezon City: University of the Philippines Press, 1974).

Note: Margin = Rice Ceiling - (Paddy Support ÷ 0.65).

was unlikely to have covered the costs of transportation between producing and consuming areas, and was certainly too small to cover costs of storage.

The NFA considers milling and transportation costs explicitly when setting official prices, and thus official margins have been larger in the 1970s (Table 2). The cost of 8 to 10 months of storage between main harvests is not considered, however. With 10 percent product losses and 21 percent interest on working capital, a 26 percent increase in prices is needed to cover the cost of 8 months storage.⁷ Table 3 presents the estimated returns to storage in Central Luzon allowed by official prices in the 1970s. As inflation in rice prices reduces the value of working capital in rice trade, the ceiling price minus transportation costs is adjusted to correct for the upward trend in rice prices. If the seasonal price increase is normally estimated by

$$(P_A/CMA_A - P_N/CMA_N)/(P_N/CMA_N),$$

where

P = price,

CMA = a 12-month centered moving average, and

A and N = August and November,

then

$$SI_G = [P_C \cdot (CMA_N/CMA_A) - P_F]/P_F,$$

where

SI_G = seasonal increase in official prices,

P_C = ceiling price, and

P_F = floor price adjusted for milling losses.

The returns to storage allowed by official prices were only adequate to cover private costs in 1973/74 and in 1978/79 (Table 3).

The marketing costs used here are low estimates and only represent costs between Manila and a nearby wholesale market. Costs from the farm gate to the wholesale market or from more remote regions have not been included. If the government is committed to buying at the farm gate throughout the Philippines, the task it faces in supporting official prices is formidable.

⁷The principal costs of storage are product losses and the cost of working capital tied up in stocks. Losses in storage of paddy, mostly from shrinkage, range from 5 to 10 percent for a six-month period. The unregulated annual interest rates on long-term bank loans were 21 to 25 percent in 1982, and this approximates the cost of working capital. See Appendix 2, Table 12, for the computation of the seasonal price increases needed to cover storage costs.

Table 3--Returns from storing rice in Central Luzon allowed by official floor and ceiling prices, 1972/73-1980/81

Crop Year	Average Floor Price (Nov.-Jan.)	Floor Price in Rice Equivalent	Average Ceiling Price (Aug.-Oct.)	Ceiling Price Minus Transport	CMA Nov. CMA Aug.	Deflated Increase in Official Prices
	(pesos/kilogram)					(percent)
1972/73	0.54	0.83	1.45	1.26	0.80	21.4
1973/74	0.70	1.08	1.90	1.70	0.91	43.2
1974/75	0.93	1.43	1.90	1.68	1.01	18.7
1975/76	1.00	1.54	2.10	1.86	0.87	5.1
1976/77	1.10	1.69	2.10	1.85	0.99	8.4
1977/78	1.10	1.69	2.10	1.83	1.00	8.3
1978/79	1.10	1.69	2.45	2.17	1.04	33.5
1979/80	1.30	2.00	2.60	2.30	0.89	2.4
1980/81	1.45	2.23	2.85	2.53	0.86	-2.4

Sources: Ceiling and floor prices were obtained from the National Food Authority (NFA). Transport, handling, and milling costs from Central Luzon to Manila are from L. A. Mears et al., The Rice Economy of the Philippines (Quezon City: University of the Philippines Press, 1974) and NFA.

Notes: CMA is the 12-month centered moving average of wholesale prices on the Cabanatuan market in Central Luzon. The floor price in rice equivalent is derived by dividing the average floor price from November to January by 0.65. Ceiling price is multiplied by the ratio of the CMA in November to the CMA in August to correct for the trend in rice prices.

4. THE EFFECTS OF GOVERNMENT INTERVENTION ON PRICE LEVELS

The government monopoly on international trade has been the principal means of controlling domestic supply and prices. This chapter considers whether government control of trade caused domestic rice prices to diverge from world prices. Because, during the last 20 years, the Philippines has normally met consumption needs by importing rice the impact of trade controls on domestic prices can best be measured by determining the ratio of prices in Manila, the principal port and consuming center, to c.i.f. or f.o.b. prices. This average nominal protection coefficient is close to 1.00 for the period 1960-80. Domestic prices have generally followed the trend of world prices during the last two decades (see Table 4; Appendix 2, Table 9; and Figure 3), but they tended to be above world prices in the 1960s and below them in the late 1970s.

The controls on quantities imported caused domestic prices to be above world prices in the 1960s, even though official ceiling prices were at or below world prices. From 1964 to 1970 domestic prices were above world prices and therefore usually above the official ceiling price as well. Government-controlled imports in the 1960s were usually not large enough to hold domestic prices at either world or official levels, with the result that domestic prices slightly favored producers over consumers.⁸

Philippine production declined in 1972 and 1973 while world prices rose sharply due to global production shortfalls. The newly organized NGA implemented rationing and subsidized imports from 1973 to 1975.⁹ Even though domestic prices rose above ceiling prices in 1974-75, they were still 40 percent below world prices. Domestic prices followed the rising trend of world prices but a combination of subsidized imports and domestic rationing were sufficient to buffer domestic prices from the abnormally high world prices in 1974.

Since 1976, supplies have been adequate to keep domestic prices below ceiling prices and to export substantial quantities in 1979 and 1980. On the basis of a comparison with export unit values, domestic prices have been about equal to world prices since 1977 (Table 4).

⁸For a discussion of the reasons behind government decisions to import, see Howarth Bouis, "Rice Policy in the Philippines" (Ph.D. thesis, Food Research Institute, Stanford University, 1982), Chapter 2.

⁹Apiraksirikul, "Rice Trade Policy."

Table 4--Comparison of world, domestic, and official rice prices, 1960-82

Period	The Ratio of the Manila Wholesale Price to the		
	c.i.f. or f.o.b. Value	Thai f.o.b. 35 Percent Price	Official Ceiling Price
Importing years			
1961-67	1.15	1.34	1.28
1971-76	1.06	1.12	1.12
Exporting years			
1977-81	0.99	0.90	0.93
All years			
1960-82	1.06	1.18	1.11

Sources: The prices and values are given in Appendix 2, Table 9. c.i.f. and f.o.b. values are from Teresa L. Andea and Adelita C. Palacpac, Data Series on Rice Statistics in the Philippines (Los Baños: International Rice Research Institute, 1976), Table 11, for 1963-67 and 1971-73. Other years are from the Philippine National Census and Statistics Office (NCSO). Thai f.o.b. prices are from the Rice Committee of the Board of Trade, Thailand. Manila wholesale prices are collected by the Central Bank. Ceiling prices are from the Rice and Corn Administration/National Food Authority.

Note: These figures are the average annual values for the periods shown.

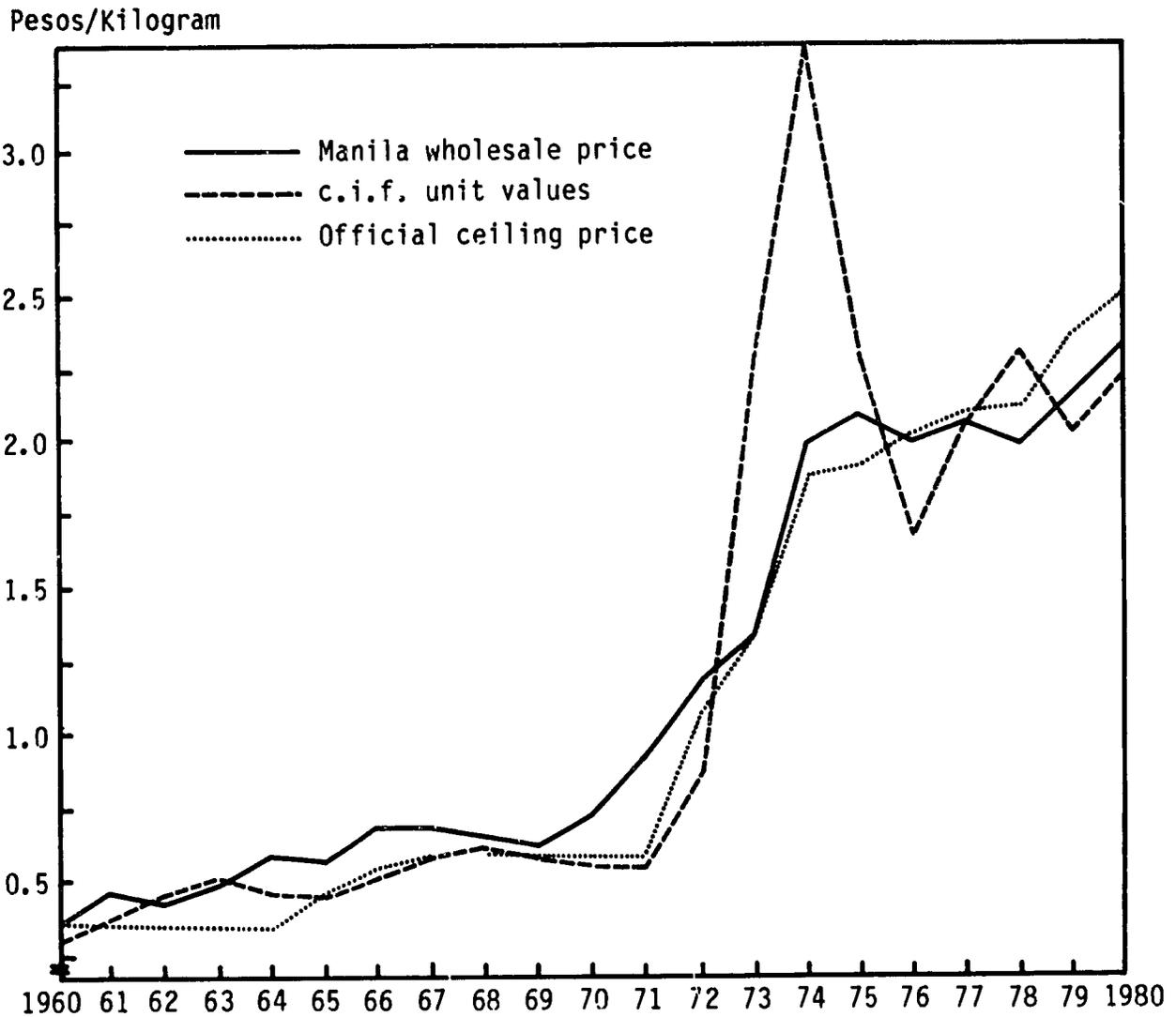
But f.o.b. values in 1979 and 1980 were well below the Thai spot price for comparable quality, and in spite of these low prices, considerable government stocks accumulated that could not be exported. Furthermore, the government reportedly lost 90 million pesos (P) in export subsidies between 1977 and 1979 because rice was separated and graded to meet quality standards.¹⁰

There are two reasons for the apparent contradiction between low f.o.b. prices and the need for export subsidies. First, it seems likely that the world market cannot absorb low-quality Philippine exports at the Thai 35 percent broken price. World market demand for low-quality head rice (10 to 45 percent broken) fluctuates much more than demand for high-quality rice.¹¹ For example, export possibilities were limited in 1981 because Indonesia, the world's steadiest

¹⁰Business Day, July 1982.

¹¹S. Soomboonup, "The Pattern of Thai Rice Exports, 1955-1972" (Master's thesis, Kasetsart University, Bangkok, Thailand, 1975).

Figure 3--Manila, c.i.f., and official ceiling prices of rice, 1960-80



Sources: c.i.f. (f.o.b.) values are from Data Series on Rice Statistics in the Philippines (Table 11) for 1963-67 and 1971-73. Other years are from the Philippine National Census and Statistics Offices. Thai f.o.b. prices are from the Rice Committee of the Board of Trade, Thailand. Manila wholesale prices are collected by the Central Bank. Ceiling prices are from the Rice and Corn Administration/National Food Authority.

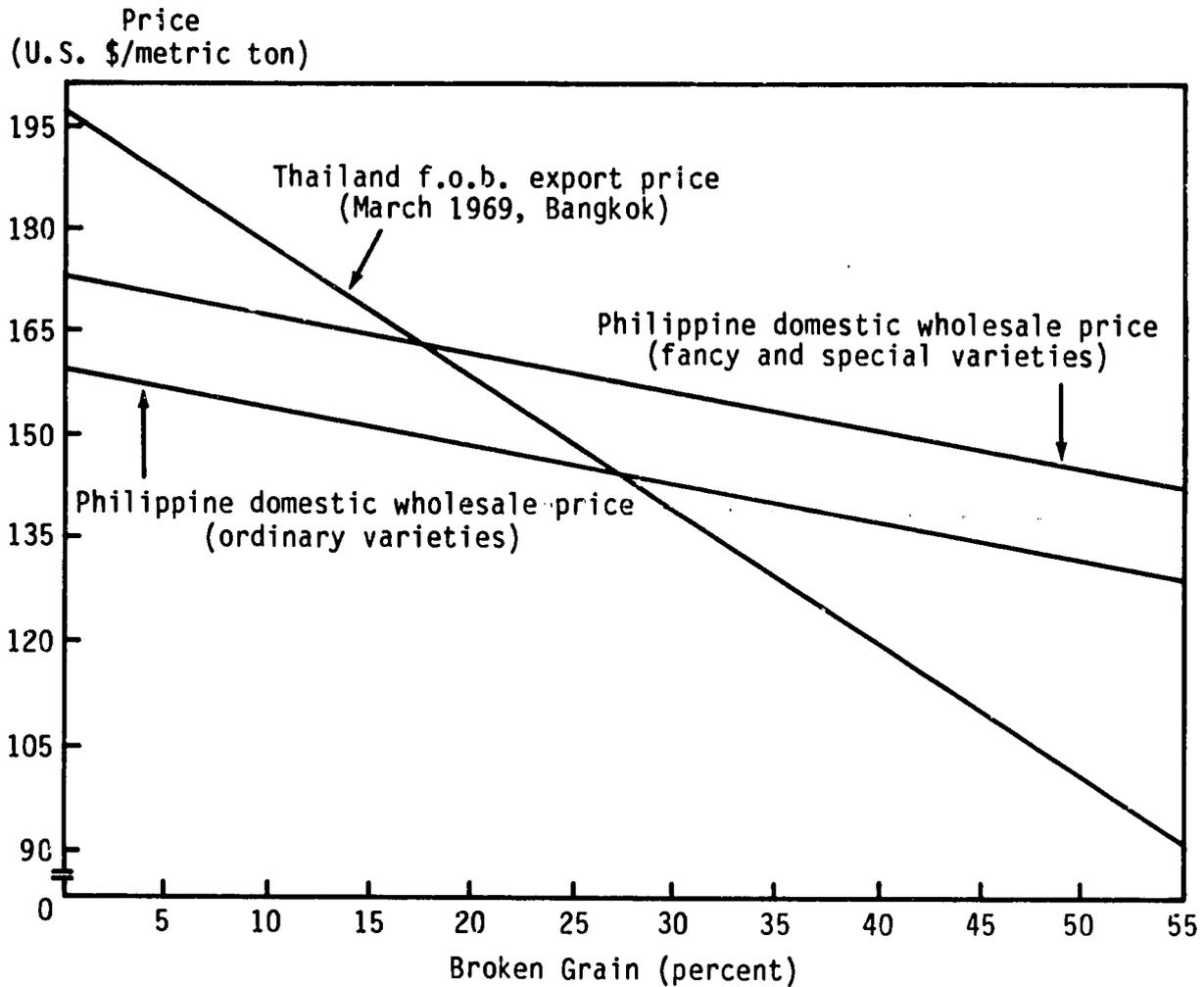
buyer of low-quality rice, imported only half a million tons in contrast to 2 million tons in 1980. World demand for low-quality Philippine exports may not be perfectly elastic, and the marginal export price is lower than the Thai spot price.

The second and most important reason for the poor profitability of exports is the insulation of domestic markets from world market standards. The quality factors that determine prices on world markets differ from those that determine prices in domestic markets. Appearance and cooking quality are more important determinants of domestic rice prices than the percent of broken grains.¹² On world markets, however, the percent broken is the most important determinant of quality. World market prices vary more sharply than domestic prices with regard to percent broken (Figure 4).

Because exports are controlled by the government, world quality premiums are not reflected in domestic prices. The domestic milling industry therefore has no incentive to become competitive in higher quality international markets. The result has been subsidies for high-quality exports and a buildup of government stocks. These interventions have raised prices above what they would have been under autarky, but they are an expensive way of disposing of the domestic surplus. If private exports were allowed, world quality premiums would be reflected in domestic prices and Philippine exports could become competitive on world markets. This would reduce the cost of maintaining producer incentives.

¹²R. A. Aspiras, "The Relationship between Quality and Price in Philippine Wholesale Rice," Department of Agricultural Economics, International Rice Research Institute, Los Baños, 1970 (mimeographed); and L. J. Unnevehr, B. O. Juliano, C. Perez, and E. Marciano, "Consumer Demand for Grain Quality," Department of Agricultural Economics, International Rice Research Institute, Los Baños, 1983 (mimeographed).

Figure 4--Comparison of the Thailand export price with the Philippine domestic wholesale price, 1969



Source: R. A. Aspiras, "The Relationship between Quality and Price in Philippines Wholesale Rice," Department of Agricultural Economics, International Rice Research Institute, Los Baños, 1970 (mimeographed).

5. THE EFFECTS OF GOVERNMENT INTERVENTION ON PRICE MARGINS

Official margins have not usually covered costs and this section considers how successfully the government has defended the narrow official band between floor and ceiling prices. Retail rice prices in the off-season (August) are compared with official ceiling prices, and paddy prices during harvest (November) are compared to the official floor price for the average of 12 regional markets (Table 5). (Individual ratios for the 12 regions are presented in Appendix 2, Tables 10 and 11.) There has been no year in which both actual producer and consumer prices have been within the official price bounds. Retail rice prices in August were above the ceiling from 1973/74 to 1978/79. Prices were highest and varied most widely among regions in 1973/74, indicating the difficulty of supplying outlying markets in that year of large imports. In 1979/80 and 1980/81 off-season retail prices were below the ceiling price.

This comparison of the trends in paddy and rice prices indicates that the seasonal price rise became smaller in the late 1970s. Paddy prices at harvest did not fall as much in relation to the floor as off-season retail prices fell below the ceiling. The increased proportion of production purchased by NFA during the 1970s and the broader regional coverage seem to have reduced the wholesale-retail price spread throughout the Philippines. Intervention, however, has had a greater effect on consumer prices than on producer prices.

Inadequate intervention in support of floor prices for paddy implies that opportunities to sell at the official floor price have been rationed. A number of administrative requirements raise farmers' transaction costs in selling to NFA. Farmers who sell to NFA must hold passbooks issued by provincial NFA offices. The passbook entitles a legally recognized operator of rice farms to sell a certain amount per hectare to NFA. Rice in excess of this amount or rice produced by illegal tenants cannot be sold to the government agency. Rice of poor quality may also be refused. Furthermore, NFA pays by check, and farmers must travel to certain banks to obtain payment.

Results of an International Rice Research Institute (IRRI) survey of 72 Central Luzon farmers indicate the importance of administrative costs in reducing the incentive to sell to NFA. Only 14 percent of these farmers sold to NFA, and the amount sold was 9 percent of sales volume in the total sample. Farmers who sold to NFA were paid by check and obtained cash three to four days after sale. Those who did not sell to NFA indicated that quality restrictions, the difficulty of getting cash payment, and better prices elsewhere were the reasons for their choice (Table 6). Very few farmers were deterred from selling

Table 5--Average ratios of market and official rice prices in 12 regional markets, 1972/73-1980/81

Year	Ratio of Wholesale Paddy Price in November to Floor Price		Ratio of Retail Paddy Price in August to Ceiling Price	
	Average of 12 Regions	Standard Deviation	Average of 12 Regions	Standard Deviation
1972/73	0.87	0.09	1.55	0.23
1973/74	0.96	0.09	1.15	0.07
1974/75	0.87	0.05	1.05	0.07
1975/76	0.87	0.09	1.03	0.06
1976/77	0.92	0.05	1.03	0.05
1977/78	0.90	0.06	1.02	0.06
1978/79	0.86	0.08	0.97	0.06
1979/80	0.81	0.09	0.98	0.06
1980/81	0.85	0.08	1.02	0.05

Sources: See Appendix 2, Tables 10 and 11, for individual ratios in the 12 markets. Price data were obtained from the Philippine Bureau of Agricultural Economics.

Note: The 12 markets (listed sequentially by region number) are Laoag, Tuguegarao, Cabanatuan, Santa Cruz, Legaspi, Iloilo, Cebu, Tacloban, Zamboanga, Cagayan de Oro, Davao, and Cotabato.

to NFA by lack of information or obligations to a private trader. Thus it is the administrative requirements imposed by NFA that limit farmers' sales at the official floor price.

Whereas injections of rice into the retail market are triggered by price, the government does not stand ready to purchase all paddy offered at the floor price. Thus government market intervention is designed to be more responsive to increases in consumer prices above the ceiling than to the fall of producer prices below the floor. Because domestic supply has been abundant since 1978, the government has been able to maintain retail prices constant in real terms and with little or no seasonal price rise. When the government has been unable to enforce the narrow official margin, producer prices have fallen below the floor in the harvest season.

Even though the government has not maintained floor prices, government actions should have reduced the seasonal fluctuations in producer prices. Without government intervention, seasonal price increases are a function of marketing costs and deviations of actual supply from expected supply. Thus,

$$SI = a + b (Q - Q^*),$$

where

SI = the annual seasonal price increase,

Q = actual production, and

Q* = expected production.

The constant, a, can be interpreted as average storage costs. As discussed above, government actions influence the seasonal price increase in two ways. As the amount government buys, stores, and sells within the same crop year increases, the observed seasonal price increase should decline. The size of this intervention quantity depends on government's commitment to enforcing a narrow margin. Second, the government can add to or reduce unexpected changes in supply through changes in government stocks.

The impact of government actions on the seasonal price increase is estimated by the following model:

$$SI = a + b INT + c NCUS,$$

Table 6--Reasons given by Central Luzon farmers for not selling paddy to the National Food Authority (NFA), 1981/82

<u>Reason</u>	<u>Percent of Responses</u>
Quality restrictions at NFA	24
Payment difficult to get	19
Price better elsewhere	11
Priority given to large farmers	11
Don't have NFA passbook	10
Too much time required at NFA	7
Transportation expensive	9
Obligated to private trader	3
Other	6
Total	100

Source: The survey of 72 Central Luzon farmers regarding sales of paddy in 1981/82 was conducted by the International Rice Research Institute. An open-ended question about reasons for not selling to NFA was asked of 76 farmers who sold to private traders. Several farmers gave more than one reason.

where

INT = intervention quantity as a proportion of production, and

NCUS = [(Q - Q*) minus the change in government stocks]
as a proportion of production.

The intervention quantity variable measures the effects of government actions on the average returns to storage. The effect of government stock changes on unexpected supply is captured by subtracting these changes from the unexpected variation in supply, Q - Q*, to obtain the net change in unexpected supply, NCUS. The dependent variable observations are annual seasonal increases (corrected for trend) from 1962/63 to 1980/81 in the wholesale price of paddy delivered to mills in the city of Cabanatuan, Central Luzon. Because most storage is done at the mill, this price seems appropriate for testing changes in the returns to storage. The data required for the model are summarized in Appendix 2, Table 12.

Variations in seasonal price increases are explained fairly well by this model, as the following estimations show (t-statistics are in parentheses).

$$SI = 24.61 - 2.44 INT - 0.84 NCUS;$$

(8.95) (-2.74) (-2.67)

$$R^2 = 0.57, D.W. = 1.62.$$

$$SI = 27.22 - 3.02 INT - 0.35 (Q - Q*);$$

(9.07) (-2.97) (-0.81)

$$R^2 = 0.40, D.W. = 1.97.$$

Increases in government intervention have significantly reduced seasonal price increases, and during this period of observations they had the most important influence on seasonal price increases. The estimated coefficients indicate that if government buys and sells an additional 1 percent of the crop during the year, the result is a drop of 2.4 percent in the seasonal price increase.

Seasonal price changes also show a relationship to unexpected supply. If the total supply is larger than expected, the seasonal price change is smaller and vice versa. In order to test whether changes in government stocks had an effect on price increases, the model was also estimated with the variation in production (Q - Q*) only. The coefficient of Q - Q* has the expected sign but is less significant than the coefficient of NCUS. Furthermore, the model including government stock changes explains more of the variation in seasonal price increases.

These results are consistent with Bouis, who finds that uncertainty about the timing of imports caused unusual seasonal variations

in Manila rice prices from 1961 to 1973.¹³ The model here includes the effect of untimely imports through the government stock changes variable. Late imports are not disbursed and cause an unintended buildup of stocks. Theoretically, the government can reduce seasonal price increases by purchasing extra supplies when there are bumper crops or drawing down stocks when harvests are bad. In fact, the correlation between changes in government stocks and $Q - Q^*$ is -0.12 and is not statistically significant. Thus government actions have added to supply uncertainty as often as they have reduced it.

¹³Howarth Bouis, "Seasonal Rice Price Variation in the Philippines -- Measuring the Effects of Government Intervention," Food Research Institute Studies 19 (No. 1, 1983): 81-92.

6. THE COSTS OF INTERVENTION TO REDUCE MARGINS

A narrow spread between official prices forces the government to subsidize its own storage activities. The subsidy cost per unit stored is estimated by the difference between normal storage costs (computed in Appendix 2, Table 13) and the actual seasonal price increase, multiplied by the harvest-season price. This loss is then multiplied by the intervention quantity to obtain the total subsidy (Table 7). During the NFA administration, the average subsidy per ton stored was P117 and the total cost of intervention was as high as P95 million in 1980/81. These costs are not actually paid by the NFA, however, because the agency receives capital at subsidized interest rates of 6 percent per year from the Central Bank. Thus the marketing subsidy to producers and consumers of rice is paid by the Central Bank through forgone interest. Some of this marketing subsidy is retained by NFA in the form of gains from marketing activity. Because the NFA has cheaper working capital than private trade, the NFA should have generated profits on market intervention in most years (Table 7).

As government intervention has not maintained official prices in most years, these actual subsidies are less than the potential cost of effective defense of a narrow margin. The amount of government intervention necessary to eliminate the seasonal price increase is estimated using the above model. The results in Table 7 show that the market intervention quantity would have been 2 to 10 times higher than actual intervention. To eliminate the seasonal price increase would have required government storage of 10 percent of production (20 percent of marketed supply) and a total subsidy of P183 million in 1980/81.

These estimates do not include the costs of subsidized capital loaned to rice millers and traders. One of the government's stated objectives is not to displace the private trade. Subsidized loans are offered to rice traders under two different programs, presumably to lower private marketing costs. The Grains Quedan program makes loans at 10 percent annual interest with stocks bonded by NFA as security. P516 million were disbursed under this program from 1978 to 1982, primarily for stocks of paddy. A joint program of the Development Bank of the Philippines and the International Bank for Reconstruction and Development offers loans for investment in rice milling and working capital for storage at 14 to 18 percent annual interest. This program disbursed P297 million between 1971 and 1980. The cost of subsidized capital extended through these programs is an indirect cost of enforcing a narrow marketing margin.

Table 7--Estimated cost of the marketing subsidy, 1973/74-1980/81

Year	Loss ^a (peso/ metric ton)	Government Intervention ^b (1,000 metric tons)	Total Marketing Subsidy ^c (million pesos)	Estimated NFA Profits ^d (million pesos)	To Eliminate Seasonal Price Increases:	
					Government Intervention ^e (1,000 metric tons)	Marketing Subsidy ^f (million pesos)
1973/74	65.3	22.0	1.4	51.2	284.5	59.9
1974/75	96.0	95.9	9.2	-0.5	404.9	91.4
1975/76	74.6	163.9	12.2	4.9	375.2	102.8
1976/77	32.6	198.8	6.5	15.5	465.5	127.6
1977/78	20.8	136.7	2.9	11.7	534.5	138.3
1978/79	22.7	74.7	1.7	6.2	560.9	158.1
1979/80	248.3	268.2	66.6	-24.2	416.2	141.2
1980/81	373.5	250.1	95.3	-45.4	467.8	183.2

Sources: The intervention quantity was provided by the National Food Authority. The paddy price used to estimate the subsidy is the Cabanatuan wholesale price obtained from the Philippine Bureau of Agricultural Economics.

^a Loss is the difference between the normal price increase (26.1 percent) needed to cover the costs of eight months storage and the actual seasonal price increase, multiplied by the actual price per ton in November.

^b Government intervention is the amount of rice procured and distributed by the government within the crop year.

^c The total marketing subsidy is obtained by multiplying the loss by the intervention quantity.

^d The difference between the actual seasonal price increase and 15.6 percent (6 percent interest and 10 percent losses over eight months) is multiplied by the actual price in November to obtain the profit per unit stored. This is multiplied by the intervention quantity to obtain total estimated profits of the National Food Authority.

^e This column indicates the quantity the government must buy and sell within the crop year in order to eliminate the seasonal price increase. This is estimated from the model on page 21.

^f The normal price increase (26.1 percent) is multiplied by the actual price in November to obtain the loss per unit stored, and this is multiplied by the estimated intervention quantity necessary to eliminate the seasonal price rise.

7. CONCLUSIONS

During the 1970s domestic rice prices in the Philippines declined in real terms.¹⁴ This price decline resulted from the implementation of the government price policy as well as from growth in rice supply.

Two sources of hidden costs in market intervention have made it difficult to maintain producer incentives. First, the government monopoly on international trade prevents world market quality premiums from being reflected in domestic prices. Therefore, domestic processors have little incentive to produce high-quality rice. This reduces export values and raises the cost of disposing of the domestic surplus because the government must subsidize sorting and grading.

Growth in domestic demand may eventually erode the Philippines' domestic surplus. But because there will probably be surpluses now and then, it is important to ascertain whether high-quality rice exports are socially profitable for the Philippines. Further study is needed to answer three broad questions:

1. What incentives do world prices provide for increased grain quality and how stable are these incentives from year to year?
2. How can these incentives be most effectively transmitted to farmers and processors?
3. Are these incentives large enough to cover the additional costs of improving grain quality?

A second source of hidden costs in market intervention is the marketing subsidy made necessary by the narrow difference between official floor and ceiling prices. In most years since 1974, the margin allowed by official prices has not been as large as private costs of storage. Therefore, an implicit goal of price policy is to reduce seasonal price increases. This requires that government storage activities be subsidized and that some portion of private stocks be replaced.

The seasonal price rise has been declining throughout the Philippines as government market intervention grew in the 1970s. Because sufficient domestic stocks are available to allow for market injections, retail prices are now below the ceiling prices. Although producer prices remain below the floor, seasonal fluctuations in paddy

¹⁴C. C. David, "Economic Policies and Philippine Agriculture," Philippine Institute for Development Studies, Working Paper 83-02, 1983 (mimeographed).

prices have been reduced by government intervention. Intervention has been inadequate to maintain producer prices at the floor, however, and this has led to rationing of access to official prices. Rationing is accomplished indirectly through administrative procedures that raise transaction costs for farmers who sell to NFA.

The cost of government storage, though relatively small, also grew during the 1970s. The average loss per ton stored is P117 and the highest total cost of P95 million was paid in 1980/81. This cost is paid by the Central Bank in the form of subsidized interest rates on working capital loaned to NFA. The cost of completely eliminating seasonal price fluctuations would be much higher, however. It would have required the government to handle 20 percent of marketed supply and to incur losses of P183 million in 1980/81.

Reducing the costs of market intervention requires a reevaluation of intervention goals. Official floor and ceiling prices should be set to cover normal private costs of storage, unless reduction of marketing margins is an explicit policy goal. Intervention would then provide price stability only when there are unexpected changes in supply. For interventions to be effective, the government must stand ready to buy all paddy of a given quality at the floor price, regardless of whether the seller holds a passbook.

The difficulties associated with the price policy implementation discussed here are the problems associated with the success of production promotion efforts. The growth of domestic supply and the increasing stability of domestic prices are substantial achievements. With the security that these provide, it should be possible to adjust policy to allow for less costly implementation.

APPENDIX 1: THE IMPLICATIONS OF THE CHANGING TRADE BALANCE
FOR SETTING OFFICIAL PRICES

In addition to storage costs, there are transportation costs between rural areas and urban consumer markets that separate domestic prices. The effect of these costs on margins is straightforward in the harvest season. The price in Manila is simultaneously determined with excess supply in all producing regions. In any particular region the Manila price minus transportation costs is given, and the amount supplied to Manila is determined by this price and local supply and demand. In each region, harvest-season production is divided among harvest-season consumption, stocks to meet off-season regional consumption at a price determined by storage costs, and shipments to Manila. The observed difference between the harvest-season price in the countryside and in Manila reflects transportation costs.

The off-season margin between regional markets and Manila will vary depending upon whether there are imports. Imports hold the off-season Manila price equal to the c.i.f. price. These imports replace some domestic stocks that would otherwise be transported from producing areas to the consuming center. Regional markets that supply Manila in the off-season are nearby or have late harvests and thus can supply at prices competitive with imports. Some markets will have prices too high to supply Manila, and stocks held there will be sold in the countryside to regional consumers. Thus price in any region will be in the range:

$$\text{c.i.f.} - t \leq P_r \leq \text{c.i.f.} + t,$$

where

c.i.f. = price of imported rice in Manila,

t = transportation costs between the region and Manila, and

P_r = regional price.

If P_r rises to c.i.f. + t, imports will be shipped to the regional market. Thus regional prices are independent of Manila prices over the range 2t.¹⁵

¹⁵For the development and application of this model to Indonesian rice prices, see C. P. Timmer, "A Model of Rice Marketing Margins in Indonesia," Food Research Institute Studies 13 (No. 2, 1974).

In exporting years all off-season supplies to Manila will be drawn from domestic stocks held in the countryside, and transportation costs will be incurred on all supply. More regional markets will ship to Manila in the off-season than in importing years, but distant markets will still ship only in the harvest season. In exporting years the total price margin from farm gate to urban consumers in the off season includes both storage and transportation costs. Average annual margins should therefore be higher in exporting years than in importing years.

If the official margin is sufficient to cover transportation costs but not storage, then no marketing subsidy will be necessary in the harvest season, but a subsidy on off-season sales will be needed. The off-season marketing subsidy will be larger in exporting years because the private costs of supplying Manila in the off-season includes both domestic storage and transportation costs. Thus maintaining a narrow margin will be more expensive in exporting years than in importing years.

Including storage costs in the official margin is more important in exporting years, because the above model predicts that margins will increase as the country reaches self-sufficiency in rice. Observed differences between Manila prices and prices in the producing areas of Western Visayas (Iloilo City) and Central Luzon (Cabanatuan) support this hypothesis. Monthly price differences are defined as

$$M = P_c - P_f,$$

where

P_c = Manila wholesale rice price, and

P_f = wholesale price of rice sold at the mill in the regional market.

These differences are regressed on a series of 0-1 dummy variables defined for each quarter of the crop year. The model also includes a dummy variable that equals 1 in exporting years (1977-81) and 0 in importing years (1972-76) in order to test for changes in margins with changes in the international trade balance. The parameter estimates are equal to the average margin for each quarter in importing years and the estimate for the export dummy indicates the average change in margins between importing and exporting years.

The results in Table 8 show that price relationships between producing areas and consuming centers have changed as the country's trade balance shifted. Margins increased greatly during exporting years. Margins in Iloilo varied from season to season in both importing and exporting years, indicating that this market probably supplies Manila only during the harvest, even in exporting years. Cabanatuan margins show little seasonal variation, probably because this market is close to Manila. Trade may flow from this market to Manila all year in

Table 8--Margins between wholesale rice prices in regional centers and Manila, 1972-81

Market	Quarter				Exporting Years	R ²
	1	2	3	4		
Cabanatuan	-0.04 (2.09)	-0.02 (1.08)	-0.01 (0.39)	-0.02 (1.18)	0.10 (6.56)	0.35
Iloilo	0.16 (6.78)	0.05 (1.93)	0.00 (0.09)	-0.03 (-1.14)	0.10 (4.84)	0.58

Sources: Price data are from the Philippine Bureau of Agricultural Economics.

Notes: t-statistics are in parentheses. The first quarter begins in November in Cabanatuan and in October in Iloilo.

exporting years. Surprisingly, observed margins in this market were negative in importing years. During the period 1972-74, which was part of the importing period included in this estimation, imports were unusually large, and crop failures were more severe in the Central Luzon region than elsewhere. During these years only a little rice may have moved from Central Luzon to Manila, even during the harvest season.

These results indicate that official prices in exporting years should allow a margin for both storage in the countryside and transportation to the consuming center. Setting official prices to cover private marketing costs was more important during the 1978-82 period than previously.

APPENDIX 2: SUPPLEMENTARY TABLES

Table 9--Comparison of world and domestic rice prices, 1960-82

Year	c.i.f. Value	Thai f.o.b. 35 Percent Broken	Manila Wholesale Price	Retail Ceiling Price	Ratio of the Manila Price to		
					c.i.f. (f.o.b.) Price	Thai Price	Ceiling Price
(pesos/kilogram)							
1960	(0.28)	0.20	0.36	0.36	1.29	1.80	1.00
1961	---	0.20	0.45	0.36	--- ^b	2.25	1.25
1962	0.44	0.40 ^a	0.41	0.36	0.93	1.03	1.14
1963	0.50	0.43 ^a	0.47	0.36	0.94	1.09	1.31
1964	0.45	0.44 ^a	0.57	0.34	1.27	1.30	1.66
1965	0.44	0.45 ^a	0.55	0.46	1.25	1.22	1.20
1966	0.51	0.53 ^a	0.67	0.55	1.31	1.26	1.22
1967	0.58	0.55 ^a	0.68	0.59	1.17	1.24	1.15
1968	(0.63)	0.57	0.64	0.59	1.02	1.12	1.08
1969	---	0.55	0.60	0.59	--- ^b	1.09	1.02
1970	---	0.65	0.72	0.59	--- ^b	1.11	1.22
1971	0.54	0.55 ^a	0.91	0.59	1.69	1.65	1.54
1972	0.85	0.71 ^a	1.15	1.07	1.35	1.62	1.07
1973	2.24	1.75 ^a	1.31	1.33	0.58	0.75	0.98
1974	3.35	3.37 ^a	1.97	1.86	0.58	0.58	1.06
1975	2.21	2.20 ^a	2.08	1.90	0.94	0.95	1.10
1976	1.66	1.72 ^a	1.99	2.02	1.20	1.16	0.99
1977	(2.06)	1.67	2.05	2.10	1.00	1.00	0.97
1978	(2.28)	2.35	1.96	2.10	0.86	0.83	0.93
1979	(2.02)	2.19	2.14	2.36	1.06	0.98	0.91
1980	(2.57)	2.89	2.29	2.51	0.89	0.79	0.91
1981	---	3.47	2.61	2.75	--- ^b	0.75	0.95
1982	(2.23)	1.96	2.92	2.98	1.31	1.49	0.98

Sources: c.i.f. (f.o.b.) values are from Teresa L. Andea and Adelita C. Palacpac, Data Series on Rice Statistics in the Philippines (Los Baños: International Rice Research Institute, 1976), Table 11, for 1963-67 and 1971-73. Other years are from the Philippine National Census and Statistics Office. Thai f.o.b. prices are from the Rice Committee of the Board of Trade, Thailand. Manila wholesale prices are collected by the Central Bank. Ceiling prices are from the Rice and Corn Administration of the National Food Authority.

^aTen percent is added as an estimate of transport costs in order to approximate the c.i.f. price.

^bThe ratio cannot be calculated because no c.i.f. value is available.

Table 10--Ratio of regional retail rice prices in August to the official ceiling price, 1972-81

Region	Market	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	Laoag	0.91	1.35	1.09	1.00	1.00	1.00	1.00	0.98	0.95	1.00
2	Tuguegarao	1.00	1.53	1.10	1.00	1.00	1.00	n.a.	0.90	0.95	0.99
3	Cabanatuan	1.02	1.68	1.00	1.00	1.00	1.00	0.95	0.86	0.92	0.96
4	Santa Cruz	1.10	1.44	1.22	1.00	1.00	1.07	1.00	0.94	0.94	1.00
5	Legaspi	1.10	1.81	n.a.	1.00	1.00	1.00	1.00	0.94	0.97	1.00
6	Iloilo	1.12	1.62	n.a.	1.07	1.00	1.00	1.00	0.94	0.95	1.00
7	Cebu	1.08	1.63	1.22	1.17	1.07	n.a.	1.10	1.00	0.97	n.a.
8	Tacloban	0.96	1.71	1.21	n.a.	n.a.	1.00	1.00	1.03	0.95	1.00
9	Zamboanga	1.02	1.83	1.18	1.16	1.19	1.11	1.00	1.00	0.97	0.98
10	Cagayan de Oro	1.10	1.46	1.17	1.12	1.00	n.a.	n.a.	1.00	1.03	1.12
11	Davao	1.02	1.01	n.a.	1.00	1.00	1.00	n.a.	1.00	0.95	1.00
12	Cotabato	1.03	1.47	1.19	1.00	1.08	1.14	1.14	1.10	1.15	1.12

Sources: Price data were obtained from the Philippine Bureau of Agricultural Economics and ceiling prices from the National Food Authority.

Note: n.a. is not available.

Table 11--Ratio of regional wholesale paddy prices in November to the official floor price, 1972-81

Region	Market	1972	1973	1974	1975	1976	1977	1978	1979	1980	1981
1	Laoag	0.98	1.14	--	1.00	0.96	1.00	1.00	1.00	1.00	1.03
2	Tuguegarao	0.81	0.82	0.87	0.88	0.91	0.89	0.86	0.82	0.83	0.84
3	Cabanatuan	1.00	1.02	0.92	0.88	0.95	0.95	0.90	0.81	0.87	0.97
4	Santa Cruz	0.85	1.03	0.97	0.96	0.91	0.98	1.00	0.87	0.95	0.84
5	Legaspi	0.68	0.95	0.86	1.00	0.86	0.85	0.80	0.66	0.73	0.77
6	Iloilo	0.86	0.97	0.82	0.82	0.95	0.85	0.78	0.69	0.76	0.71
8	Tacloban	0.84	1.03	0.94	0.85	0.83	0.85	0.84	0.76	0.86	0.87
9	Zamboanga	0.96	0.89	0.83	0.84	0.97	0.92	0.76	0.83	0.83	0.93
10	Cagayan de Oro	0.86	0.90	0.85	0.88	0.89	--	0.84	0.85	0.87	0.94
11	Davao	0.90	0.86	0.82	0.80	0.87	0.81	0.81	0.78	0.92	0.85
12	Cotabato	0.86	0.97	0.84	0.70	0.98	0.94	0.89	0.81	0.83	0.86

Sources: Price data were obtained from the Philippine Bureau of Agricultural Economics and floor prices from the National Food Authority.

Note: Cebu (7) is omitted because no paddy price series is available for this region.

Table 12--Data for estimating the determinants of seasonal price fluctuations, 1962/63-1980/81

Crop Year	Seasonal Price Increase ^a (percent of low seasonal index)	Unexpected Supply ^b	Government Intervention ^c (percent of production)	Net Change in Unexpected Supply ^d
1962/63	8.5	1.52	6.07	-0.29
1963/64	18.2	-2.39	1.06	-2.98
1964/65	27.7	0.61	0.08	-5.90
1965/66	18.7	0.46	0.86	5.07
1966/67	22.1	-3.62	2.11	-9.04
1967/68	15.4	4.26	1.00	1.50
1968/69	25.8	-6.79	2.04	-2.96
1969/70	29.1	4.33	1.77	2.14
1970/71	44.7	2.20	0.06	-5.32
1971/72	15.3	-3.92	0.01	-0.88
1972/73	37.0	-14.08	0.17	-16.20
1973/74	18.0	6.64	0.60	6.59
1974/75	15.0	-2.55	2.61	-2.64
1975/76	19.0	1.10	4.09	2.10
1976/77	23.0	0.73	4.74	-2.89
1977/78	24.0	0.66	3.05	-5.31
1978/79	24.0	-1.56	1.60	-5.49
1979/80	7.0	3.20	5.27	5.58
1980/81	1.2	-0.73	5.08	2.25

Sources: The original data were obtained from the Philippine Bureau of Agricultural Economics and the National Food Authority.

^aThese are the annual seasonal increases in Cabanatuan wholesale paddy prices. A seasonal index was calculated on the basis of a 12-month centered moving average.

^bThis is the difference between actual production and expected production (estimated by a three-year moving average of production).

^cThis is the quantity purchased and sold by the government within the same crop year.

^dThis is the unexpected supply minus the change in government stocks (procurements minus disbursements plus net imports).

Table 13--Price increases needed to cover storage costs for 8 months

Annual Interest Rate (percent)	Interest over 8 Months (percent)	Percent Increase in Purchase Price Needed to Cover Interest Cost Plus Losses of ^a	
		5 Percent	10 Percent
6	4.0	9.5	15.6
10	6.6	12.2	18.4
14	9.1	14.8	21.2
18	11.7	17.6	24.1
21	13.5	19.5	26.1

^aThese percentages were calculated using the equation

$$a_{ij} = 1 - (1+i/1-j),$$

where

i = interest rate, and

j = losses.

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