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Abstract

This study investigated the motivations for and the consequences of government intervention in the Philippine rice market. In particular, an econometric model comprising four government policy instruments (price support for paddy, price ceiling for rice, buffer stock requirement, net imports) and four market behavioral equations (farmgate price of paddy, retail price of rice, supply and demand) was estimated. Furthermore, the neoclassical social gain-and-loss approach was utilized to evaluate the overall effects of the market intervention.

The model was successful in highlighting the importance of actual economic conditions to the government's choice of the levels of implementing its policy instruments. Meanwhile, the analysis of the rice market policy provided the following evaluation of market intervention; i.e., producer and consumer loss, and government gain; saving of foreign currency; price instability ; and stabilization of supply.

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Introduction

For the majority of Asian countries where rice is the staple food and main source of livelihood of the populace, government intervention prevails in the rice market. Because of such political importance of rice, most Asian governments are still confronted with the question of how to maintain low and stable rice prices to consumers, increase farmers' income and attain self-sufficiency for the country.

In the Philippines, the pursuit of such goals has long served to justify the government's prevalent intervention in the rice market. At present, the National Food Authority (NFA) is the agency especially mandated to administer the government's role in the rice market. Among other means of intervention, the NFA directly controls the rice market through the setting of support and ceiling prices, maintenance of buffer stocks for stabilization purposes and a monopoly of external trade.

Despite the intervention, however, the rice market is not free from the usual problems of unstable supply and prices. The rice crisis in 1995 strongly attests to this, thereby casting doubts on the government's capability of effective market intervention. In view of the foregoing, this study was conducted to investigate the motivations for and the consequences of the government intervention policy for the rice market.

The objectives of this study are (1) to estimate relevant government policy equations and market behavioral equations for rice; (2) to evaluate the effects of the intervention policy with respect to the goals of equity, growth, price stability, and self-sufficiency; and (3) to suggest some policy recommendations.

Review of Related Literature

This review first presents a brief summary of the various assessments made on the government intervention in the rice market. Secondly, selected studies incorporating government behavior into commodity market models are presented inasmuch as they serve as the basis for the current research. The studies related to the quantification of the effects of government intervention are also referred to.

Past studies on the price stabilization policy for rice have shown the limited capability of the government to effectively intervene in the market. For one thing, the government is unable to maintain a margin between the floor and the ceiling prices in excess of the normal costs of marketing. The twin objectives of providing high prices to producers and of ensuring low prices to consumers resulted in the setting of official floor and ceiling prices without regard to marketing costs (see Unnevehr, 1983). Budgetary restrictions, among other reasons, severely limit the government's involvement in rice trading, bringing about inadequate intervention in both the procurement of paddy and the distribution of rice.

The government's limited rice trading has relevant implications to buffer stocking, an altenative policy measure for the stabilization of supply and prices. Te (1977) asserted that the practice of foreign trade actually stabilizes rice prices significantly. The import instead of the reserve stock is regarded as the most economical way of achieving domestic price stability. However, the government monopoly of imports has not been adequate to prevent a price rise in periods of short domestic production (see Alcalde, 1991). Considering further that the domestic price of rice has generally been higher than the prevailing world price of rice, the delimited volume of importation would incur a welfare loss to the economy.

The current research attempts to take another look at the Philippine rice policy, with an econometric approach and a time period of analysis extended up to the present. The econometric modelling of government behavior in the present study employs an approach similar to those taken by Gerrard and Roe (1983) and by Riethmuller and Roe

(1986). The first one tackled the government intervention in the foodgrain markets (maize, wheat and rice) in Tanzania, and the latter dealt with that of the rice and wheat economy of Japan. In the case of Tanzania, an econometric model for each crop, comprising four government behavioral equations (government-announced producer and consumer prices, government-held stocks and net imports) in addition to domestic demand and supply equations and the social accounting identity was formulated and estimated. The study focused in particular on the government's motivation for price controls and the impacts of these controls on external trade. Meanwhile, the conceptual model of the Japanese rice and wheat economy postulated that the government chooses the level of policy instruments (consumer and producer prices, level of net foreign trade, deficiency payments) that directly affect the grains economy as though it sought to maximize a utility function whose arguments are the welfare of consumers and producers and the government's net treasury position resulting from intervention.

While the econometric modelling is similar to the works of Roe and others, the social gain-and-loss analysis is the same as that of the Asian Development Bank (ADB) project study in 1988. This Bank's project study evaluated rice market intervention policies in such Asian countries as Korea, Malaysia, India and Bangladesh. Each country paper provided (i) a description and interpretation of the evolution of the national intervention system over time, (ii) an assessment of the structure and effectiveness of marketing arrangements, and (iii) an evaluation of the level and incidence of the benefits and costs of intervention.

Description of Government Intervention in the Philippine Rice Market

This section provides an overview of the elements of the Philippine rice policy that are important to the development of the model used in the analysis. In the Philippines, the impact of rice prices on economic growth and income distribution is enormous. Reasonable stability in supply and prices of rice has contributed directly to political stability in the country. Therefore, economic and political reasons are viewed as the rationale for market intervention of the government.

David (1989) accounted that the earliest government intervention in domestic pricing of grains dates back to the late 1930's. However, the historical account of government market intervention in more recent years would start from the 1960's in consideration of its important bearing on the present status. Succeeding the defunct Rice and Corn Board (RICOB), the Rice and Corn Administration (RCA) was created in 1962 by virtue of Republic Act (RA) 1352. Among its major functions were price stabilization through market absorption/injection, buffer stocking and the setting of a price support. Ten years after, RCA was followed by the National Grains Authority (NGA) created under Presidential Decree (PD) No. 4. Aside from grain management and price stabilization, it had the more broad and diverse functions of industry development, regulation and supervision. The grain stabilization program was operationalized by means of price support and control, buffer stock, procurement and distribution to support prices, and control of exports and imports.

In 1981, with PD No. 1770, the NGA was reconstituted into National Food Authority (NFA). The new agency had the additional authority to regulate non-grains commodity groups such as fruits and vegetables, livestock and poultry processed goods, etc. Such change allowed the agency to have more available fund for its operations. In 1985, with the passing of Executive Order (EO) No. 1028, the NFA's non-grain marketing activities were phased out and its stabilization functions were limited to rice and corn, and

only when necessary, wheat. Also, the price ceilings were lifted and the importation of wheat and feedgrains was liberalized. With the loss of the exclusive authority to import wheat and feedgrains, the NFA ceased to be financially self-sustaining and started to rely on budgetary appropriations to fund its operations.

Consistent with the deregulation policy of the new government administration installed in 1986, the NFA's role in the market was further trimmed down. The agency is a simple "buyer and seller of last resort". It should participate in the market only when necessary; that is, when the farmers and the grains businessmen alone cannot stabilize demand and supply forces. Government intervention in the rice market is characterized as one of price stabilization, which is mainly through direct market intervention in support of floor and ceiling prices, accompanied by government holding of buffer stocks and a monopoly of external trade.

The price support or the NFA's procurement price is the government's guaranteed ex-farm price which supposedly accounts for the cost of production. The government buys directly from farmers when prices at the farmgate level are below the support price. Meanwhile, price ceilings are imposed to assure food accessibility and protect consumers from unduly rising prices. Whenever commercial retail prices for rice rise above the price ceiling, the government withdraws from its stocks and injects into the market the volume necessary to curb the upward movement of prices.

The 90-day national rice buffer stock policy is another government policy for price stabilization. The national buffer stock in any given date is shared by three sectors, namely, the government which is required to stock for 30 days (33%), the commercial sector which has to stock for 15 days (17%), and the household sector which has the biggest share of 45 days (50%). The buffer stock is maintained by the government through direct procurement from farmers or through imports or other outside sources. The 90-day rule also serves as the traditional guide in making the decision to import or not. In case of excess supply, the government considers exportation of the surplus volume.

Methodology

A. Econometric Model of Government Intervention

The econometric model for the government's market intervention is presented next. The variables used are defined below, with the subscript t being period t :

Qp_t = Total quantity produced

Qd_t = Total quantity demanded

BSr_t = Buffer stock requirement set by the government

BSa_t = Actual buffer stock held by the government

NIm_t = Government-set import/export level

Ps_t = Government-set price support for paddy

Pc_t = Government-set price ceiling for rice

Pf_t = Farmgate price of paddy

Pr_t = Retail market price of rice

Pw_t = World price of rice in time t converted to units of domestic currency at the official exchange rate

Ir_t = Inflation rate

FXR_t = Government-held foreign currency reserves

PCE_t = Private consumption expenditure (or income)

CPP_t = Cost of paddy production

CPI_t = Consumer price index

DMI = Dummy for the years of massive importation (1985,1990=1, otherwise 0)

DYAR = Dummy for years of low total production due to both yield and acreage reduction (1983,1984,1987,1988=1, otherwise 0)

DHDG = Dummy for years with positive growth rates of demand despite positive growth in retail prices, due to temporary reasons (1984,1989,1995=1, otherwise 0)

The complete econometric model of government intervention consists of eight independent equations, namely : the government-set price support and price ceiling, government-held buffer stock, net imports, farmgate price, retail market price, quantity supplied, and quantity demanded. It is hypothesized that the government makes price-setting and stock-holding policy decisions which directly affect market conditions. Specifically, it is assumed that the government directly controls farmgate prices for paddy and retail prices for rice through the annual determination of the price support and the price ceiling, respectively. Moreover, the government enforces or defends these official prices through adjustments in the buffer stock and net imports. While the farmgate and retail prices are a function of both government and basic market forces, they are estimated here as though they are affected by government intervention alone. In such manner, the effect of government intervention may be isolated from other price-determining factors. These market prices, as estimated from the model, are then used to derive the domestic supply and demand equations resulting from the government intervention.

1. Government Policy Equations

Since government policy decisions are believed to be made out of its own discretion, the econometric model is here formulated in such form that the government makes these decisions, basing them on actual economic conditions.

(a) Price support for paddy : $Ps_t = \alpha_0 + \alpha_1 CPP_{t-1} + \alpha_2 Pw_{t-1}$

The price support for paddy is assumed to be established on the basis of its production cost, which could motivate farmers to continue farming so as to achieve self-sufficiency, and of the world price which brings out the pressure of cost reduction to farmers. At the time of price setting, usually during the first crop harvest in May, the available information on prices and costs is that of the previous year.

(b) Price ceiling for rice : $Pc_t = \beta_0 + \beta_1 Ps_t + \beta_2 (Pr/CPI)_{t-1} + \beta_3 IR_{t-1}$

The price ceiling is basically a linear mark-up of the price support. The government sets it at a level above the price support such that the millers, traders and other middlemen are assured of a fair return for the services they perform. The government is assumed to peg the ceiling taking account of the previous year's retaill price and the inflation rate. As rice comprises 13% of the consumer basket, it is believed that setting a price ceiling can one way or another manage the inflation rate.

(c) Buffer stock requirement : $BSr_t = \sigma_0 + \sigma_1 Qd_{t-1} + \sigma_2 Pfsgap_{t-1} + \sigma_3 Prcgap_{t-1}$

In setting the buffer stock requirement for the year, the government basically considers the latest level of demand. Besides, since the government's buffer stock also serves to defend the officially-set prices, it is hypothesized that the absolute gap between the price support and the farmgate price (Pfsgap) and that of the price ceiling and the retail price (Prcgap) matter as well for the stock requirement. That is, the greater the price gaps, the more stocks required for the government to effectively intervene in the market.

(d) Net imports : $NIm_t = \delta_0 + \delta_1 BSa_t + \delta_2 Pw_t + \delta_3 FXR_t + \delta_4 DMI$

The decision to import or export depends on the level of the buffer stock at the onset of the lean season. The relevant buffer stock level under consideration here is the actual level of stocks held by the government and not the calculated requirement. Meanwhile, to account for costs or revenue from external trade, the world price of rice and the foreign currency reserves position of the government are taken to be important factors. Moreover, the erratic trend in the actual level of imports suggests the inclusion of a dummy to account for those years where massive importations were observed (i.e., 1985 and 1990).

2. Market Behavioral Equations

(a) Farmgate price of paddy : $Pf_t = \phi_0 + \phi_1 Ps_t + \phi_2 BSa_t + \phi_3 NIm_t$

The farmgate price is estimated here with the actual buffer stocks held by the government, actual level of net import, and the government-set price support.

(b) Retail price of rice : $Pr_t = \rho_0 + \rho_1 Pc_t + \rho_2 BSa_t + \rho_3 NIm_t$

The retail price is similarly estimated as above but with the price ceiling as the relevant official price.

(c) Supply : $Qp_t = \lambda_0 + \lambda_1 Pf_{t-1} + \lambda_2 DYAR$

The supply model here implies that farmers' decision to produce rice is basically a function of the price they receive for their products. This farmgate price is based on the price support, which was evaluated on the basis of production costs. Such high correlation between the farmgate price and the cost variable led to poor estimation results. Hence, only the farmgate price was included in the model for analytical convenience. The price information available to farmers at the time of planting is that of the previous year, thus the lagged paddy price is used. This lagged actual price is equivalent to the current expected price in the case of perfect adjustment in the Nerlovian adaptive expectation model of supply. Furthermore, observation of the data showed that the total production significantly dropped in 1983-1984 and 1987-1988 as a result of both yield and acreage reduction. To account for this, a dummy was included in the model.

(d) Demand : $Qd_t = \pi_0 + \pi_1 (Pr/CPI)_t + \pi_2 (PCE/CPI)_t + \pi_3 DHDG$

The model suggests demand as a function of prices and income. The relevant price here to the consumer is the retail market price deflated by the CPI. Meanwhile, income here is the actual private consumption expenditure, likewise corrected for the effect of inflation. Unusual market demand behavior was observed from the sample data,

thereby requiring the use of a dummy. For the years 1984, 1989 and 1995, the demand for rice grew at a positive rate despite a similar positive growth in its retail price, which may be due to temporary extraneous factors.

B. Social Gain-and-Loss Analysis

The government intervention generally distorts producer incentives and influences the efficiency of resource allocation. The analytical method should therefore involve an entire elimination of distortions from existing price levels to obtain a picture of supply-demand conditions under the no-intervention scenario. It would facilitate the comparison of volumes of production, consumption, and imports/exports at the intervention prices, with those that are consistent with a hypothetical 'no intervention outcome'. The border price of a commodity, for instance, has generally been accepted as an efficiency standard in the international market (see Timmer, 1986). The border price serves as a powerful reminder of the opportunity cost which society incurs in order to pursue an independent price policy.

From the price relativities, the calculation of the economic effects of government intervention could proceed using price elasticities of supply and demand. The price elasticities used are those obtained from the supply and demand estimation in the econometric model mentioned above. The data on intervention and border prices for the 15-year sample period showed three different cases of price relativity. These and their corresponding partial equilibrium calculation of social gain and loss are summarized in Table 1.

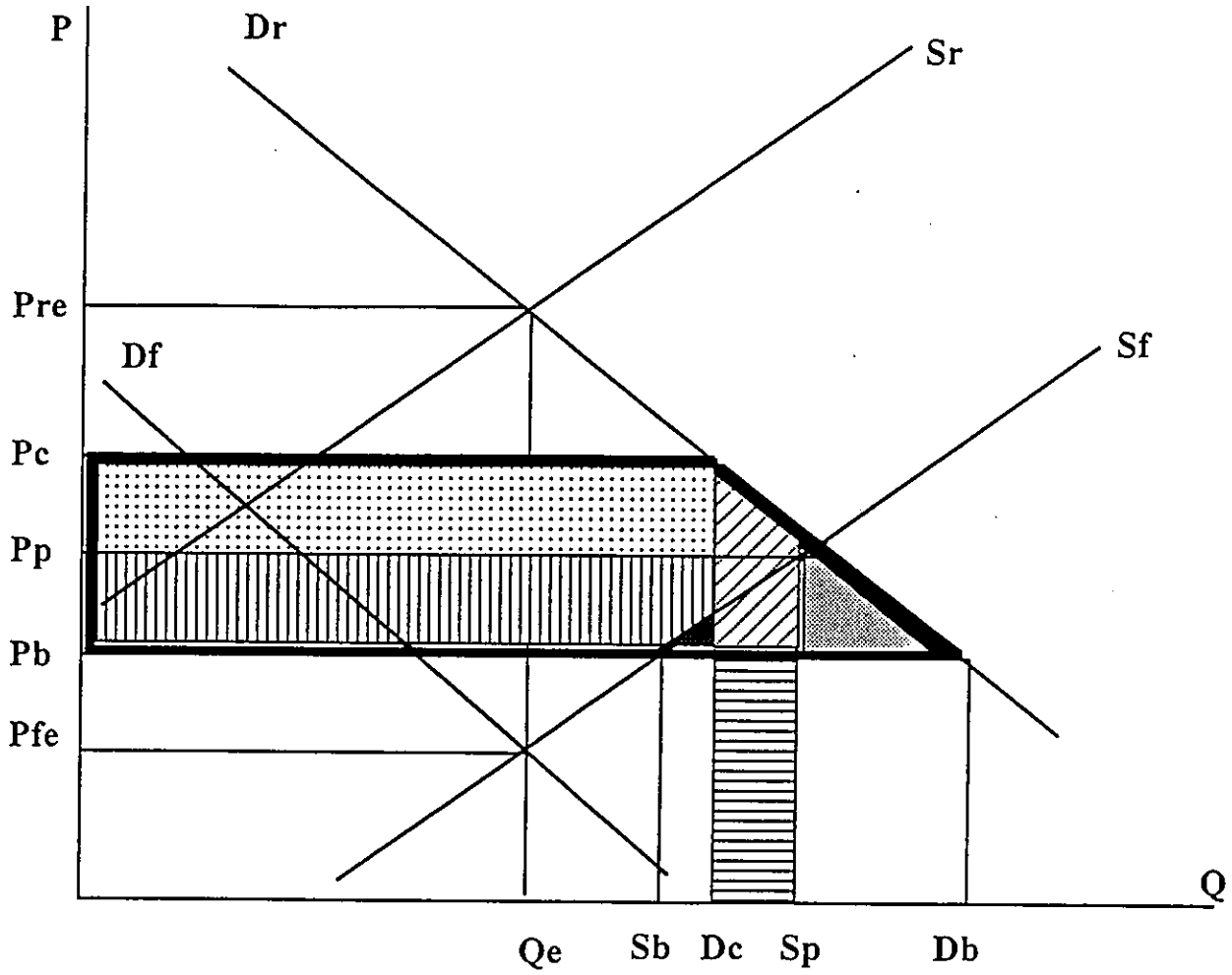
As an illustrative example, case 2 that is most prevalent in the sample period is presented in Figure 1. The figure shows the supply and demand conditions in both the farmgate and the retail markets. The relevant equilibrium prices are the equilibrium retail market price (Pre) and the equilibrium price at the farmgate (Pfe). With government intervention, the resulting producer price (Pp) from price support is set higher than Pfe while the resulting consumer price (Pc) from price ceiling is lower than Pre. These

Table 1. Social Gain-and-Loss Calculation

Relevant Measures	Case 1 Pb > Pr > Pp	Case 2 Pr > Pp > Pb	Case 3 Pr > Pb > Pp
Efficiency Loss in Production (ELP)	1/2 (Qph - Qpa) (Pb - Pp)	1/2 (Qpa - Qph) (Pp - Pb)	1/2 (Qph - Qpa) (Pb - Pp)
Efficiency Loss in Consumption (ELC)	1/2 (Qda - Qdh) (Pb - Pr)	1/2 (Qdh - Qda) (Pr - Pp)	1/2 (Qdh - Qda) (Pr - Pp)
Producer Loss/Gain	Qpa (Pb - Pp) + ELP	Qpa (Pp - Pb) - ELP	Qpa (Pb - Pp) + ELP
Consumer Loss/Gain	Qda (Pb - Pr) - ELC	Qda (Pr - Pb) + ELC	Qda (Pr - Pb) + ELC
Government Expenditure/Revenue	[Qpa(Pr-Pp)+(Qda-Qpa)(Pb-Pr)]	-[Qpa(Pr-Pp)-(Qda-Qpa)(Pr-Pb)]	[Qpa(Pr-Pp)+(Qda-Qpa)(Pr-Pb)]
Foreign Currency Loss/Earning	Pb [Qda - Qpa) - (Qdh - Qph)]	Pb [Qda - Qpa) - (Qdh - Qph)]	Pb [Qda - Qpa) - (Qdh - Qph)]

Qph & Qdh = hypothetical or the no-intervention supply and demand (Qph=Sb, Qdh=Db in Fig. 1)
Qpa & Qda = actual or the intervention supply and demand (Qpa=Sp, Qda=Dc in Fig.1)
Pb = border price; i.e, the world price (FOB) of rice (Pw)
Pp = producer price; i.e., the farmgate price of paddy (Pf) converted to its equivalent for rice
Pr = consumer price; i.e, the retail market price (Pr) (Pr=Pc in Fig. 1)

Figure 1. Illustration of Social Gain and Loss



Consumer Loss (CL)

Producer Gain (PG)

Government Revenue (GR)

Foreign Currency Earning (FCE)

Efficiency Loss in Consumption (ELC)

Efficiency Loss in Production (ELP)

Overlapping Area

intervention prices are usually higher than the border price which would prevail in the case of free trade or no intervention. From the figure, it is apparent how much the producers gain and the consumers lose, respectively, in such a scenario. Moreover, as illustrated, the government enjoys a revenue plus some foreign currency earnings if it decides to export the surplus resulting from the price intervention. While the producers and the government gain, however, the total deadweight costs to society of such price distortion can be enormous.

To interpret the quantitative evaluation of the rice policy in terms of social gain and loss, the results are explained in association with the general objectives of market intervention. The producer and consumer loss or gain, the government expenditure or revenue, and the efficiency losses in production and consumption describe the resulting equity conditions. Meanwhile, the foreign currency loss or earning influences economic growth. The performance measure for price stability (or price variability) is the absolute deviation of prices from that of the previous period (see Rausser and Yassour, 1981). Moreover, the more common measure of price variability; i.e., the coefficient of variation, is computed to validate the result. Lastly, the self-sufficiency ratio is measured as the resulting ratio of supply to demand in both the intervention and the no-intervention scenarios.

C. Data

Philippine time series data for the period 1981 to 1995 were used in this study. The starting year of 1981 marked the creation of the National Food Authority (NFA), the agency presently tasked to administer the government's intervention in the rice market. The data on the government's policy instruments (price support, price ceiling, buffer stock, imports and exports) were gathered from the NFA. Further, basic data on rice such as the supply and demand, farmgate and retail market prices, and the cost of production were from the Bureau of Agricultural Statistics (BAS), Department of Agriculture (DA). The supply data refer to the total quantity of paddy produced in rice equivalent. A milling

recovery of 65.4% was assumed in the conversion. Demand for rice here is the quantity consumed.

The macroeconomic data (inflation rate, consumer price index, foreign currency reserve, exchange rate, and private consumption expenditure), on the other hand, were from the Bangko Sentral ng Pilipinas (BSP) or Central Bank and the National Statistics Office (NSO). The world price of rice refers to the FOB price of Thai rice (5% broken). The 1981-94 data for this price were taken from the USDA Rice Market News while that of 1995 was a projection from the World Bank. The world price of rice (Pw) was used as border price (Pb) or reference price in the analysis of social gain and loss. Since this border price data were only for rice, the farmgate price of paddy had to be converted to its rice price equivalent prior to the gain-and-loss analysis. Again, a 65.4% milling recovery for rice was used as the conversion factor. The farmgate price of paddy (Pf) as converted served as the relevant domestic producer price (Pp) while the retail market price of rice (Pr) was the corresponding domestic consumer price.

Results and Discussion

A. Econometric Results for Government Policy Instruments

(1) Price support

Parameter estimates of the price support equation had the expected signs and were highly significant at the 1% level (Table 2a). The result supports the concept of a price support covering production costs in view of the country's goal of attaining self-sufficiency. The lagged world price turned out to be very significant in explaining variations in the price support. From Figure 2, it is apparent that the government-set price support (Ps) generally followed the upward trend in the world price of rice (Pw). It should also be noted that even in years where the world price (Pw) was on a downward trend (i.e., 1982, 1985, 1992, 1994), the resulting price supports (Ps) in the following year were either increased or maintained at the same level as the previous year. It implies that the government protection through support prices assured farmers of a remunerative price in spite of declining world prices for rice.

(2) Price ceiling

The price ceiling (Pc) appears to be simply a linear mark-up of the price support (Ps). While the middlemen consider that the price ceiling (Pc) should be twice the price support (Pc), the actual margin turned out to be narrow, averaging 1.86 during the sample period. The minimal profit from such a narrow margin discouraged the private sector from trading stocks. This prompts the government to take a stronger position in the procurement and distribution of rice.

(3) Buffer stock requirement

The level of the previous years' demand affects the determination of the buffer stock requirement for the year. The two price gap coefficients were also significant at the 1% level and with the expected positive signs. This implies that with bigger price gaps, the government has to hold more stocks for effective market intervention.

Table 2a. Empirical Estimates for Government Policy Instruments

(1) Price support for paddy :

$$Ps_t = \underset{(0.87)}{0.44} + \underset{(2.43)}{0.00013^{**}CPP_{t-1}} + \underset{(5.01)}{0.54^{***}Pw_{t-1}}$$

$\overline{R^2}$ = 0.92 D. W. = 2.02 F = 50.37***

(2) Price ceiling for rice :

$$Pc_t = \underset{(0.48)}{0.25} + \underset{(58.60)}{1.72^{***}Ps_t} + \underset{(0.16)}{0.01\,(Pr/CPI)_{t-1}} - \underset{(-0.93)}{0.10\,IR_{t-1}}$$

$\overline{R^2}$ = 0.99 D. W. = 2.30 F = 2384.49***

(3) Buffer stock requirement :

$$BSr_t = \underset{(2.71)}{130.56^{***}} + \underset{(5.28)}{0.05^{***}Qd_{t-1}} + \underset{(2.86)}{54.34^{***}\,Pfsgap_{t-1}} + \underset{(2.84)}{41.37^{***}\,Prcgap_{t-1}}$$

$\overline{R^2}$ = 0.96 D. W. = 2.31 F = 47.66***

(4) Net import :

$$NIm_t = \underset{(2.09)}{167.79^{**}} - \underset{(-3.75)}{0.39^{***}BSa_t} - \underset{(-0.17)}{1.83\,Pw_t} + \underset{(1.54)}{0.34\,FXR_t} + \underset{(5.50)}{436.38^{***}DMI}$$

$\overline{R^2}$ = 0.90 D. W. = 2.41 F = 25.36***

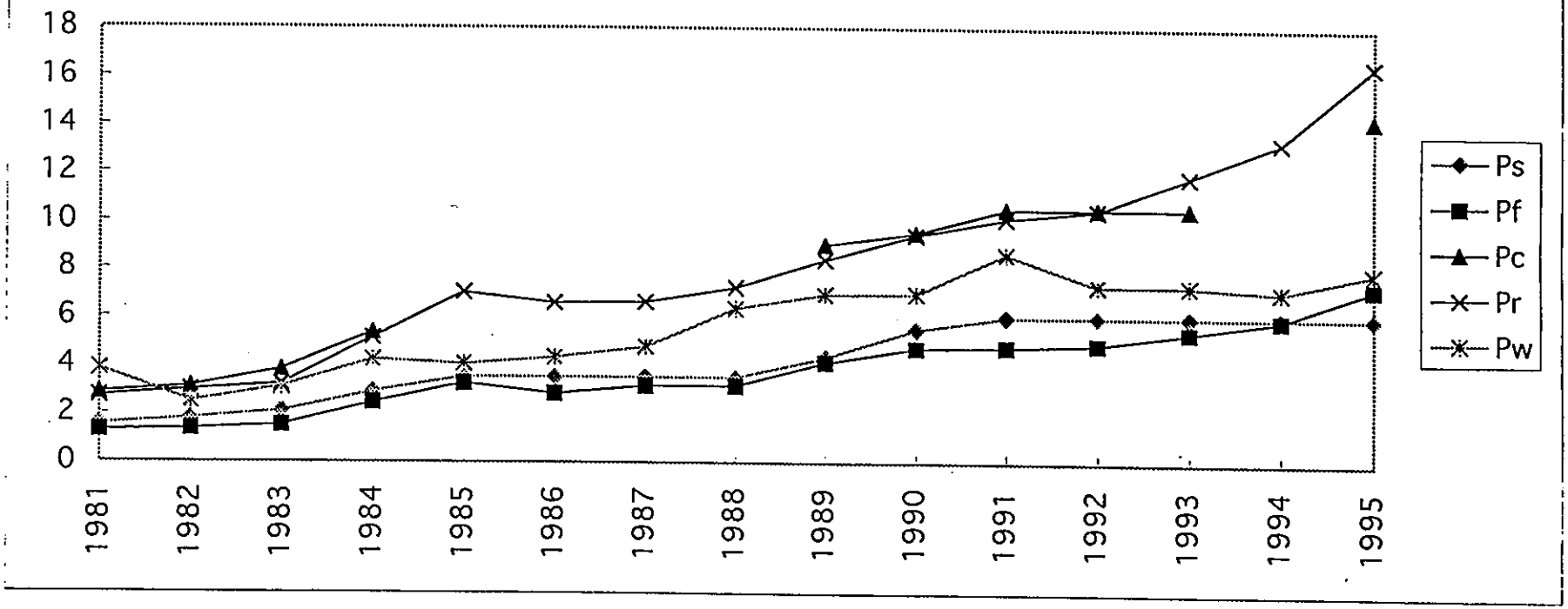
Equation (1) was estimated by the Maximum Likelihood (ML) method while the rest of the equations were estimated by the Cochrane-Orcutt (CO) iterative technique as discontinuous samples were used.

Levels of significance:***1%,**5%,*10%. The values in parentheses are t-values.

$\overline{R^2}$ is the coefficient of determination adjusted for the degrees of freedom; D. W. is the Durbin-Watson statistic; and F is the significance of the model.

Bsrt is the buffer stock required of the government while Bsat is the actual buffer stock held.

Figure 2. Paddy and Rice Prices (Peso/Kg., nominal), 1981-1995



Where :

Ps - government-set price support for paddy

Pf - farmgate price of paddy

Pc - government-set price ceiling for rice

Pr - retail market price of rice

Pw - world price (FOB) of Thai rice, 5% broken

(4) Net import

The world price of rice and the country's foreign currency reserves appeared to have no significant effect on the net import equation whereas the actual buffer stocks held by the government proved important in the annual determination of the net import level. This may be interpreted to mean that the decision for external trade is based on shortage or surplus rather than the cost or the potential revenue associated with it. It may be natural that the dummy for the years of massive importation should have accounted for much of the variation in net import.

B. Econometric Results for Market Behavior

(1) Farmgate price of paddy

The government's policy instruments highly account for the variations in the farmgate price of paddy (Table 2b). The price support proved most significant. This is rather expected since the price support serves to actually determine the level from which the farmgate price should be set.

(2) Retail price of rice

Similar to the farmgate price, the resulting retail market price also depends on the government-set price.

(3) Supply

In spite of the simplicity of the supply equation, it fitted the data well. From the estimated coefficient of the farmgate price, an elasticity of 0.17 was derived. With supply being very inelastic to price changes, it seems that the government policy of encouraging more production through remunerative prices could prove to be futile. In this regard, a reconsideration of the price support policy may be necessary. It should also be noted that the crop failure in 1983-1984 and 1987-1988 accounted for considerable variations in supply. During these periods, both yield and acreage reduction occurred.

Table 2b. Empirical Estimates for Market Behavior

(1) Farmgate price of paddy :

$$Pf_t = \underset{(1.85)}{0.88^*} + \underset{(15.33)}{0.91^{***}}Ps_t - \underset{(-2.82)}{0.0024^{**}}BSa_t - \underset{(-2.08)}{0.0006^*}NIm_t$$

$\overline{R^2}$ = 0.94 D. W. = 1.39 F = 68.38***

(2) Retail price of rice :

$$Pr_t = \underset{(-0.50)}{-1.05} + \underset{(5.42)}{1.19^{***}}Pc_t - \underset{(-0.55)}{0.0008}\,BSa_t + \underset{(0.91)}{0.0009}\,NIm_t$$

$\overline{R^2}$ = 0.83 D. W. = 1.01 F = 10.64***

(3) Supply :

$$Qp_t = \underset{(19.68)}{5063.84^{***}} + \underset{(4.53)}{271.04^{***}}Pf_{t-1} - \underset{(-1.73)}{309.43^*}DYAR$$

$\overline{R^2}$ = 0.78 D. W. = 1.86 F = 23.44***

(4) Demand :

$$Qd_t = \underset{(3.10)}{5355.65^{***}} - \underset{(-2.76)}{490.54^{***}}(Pr/CPI)_t + \underset{(6.51)}{0.0068^{***}}(PCE/CPI)_t + \underset{(4.75)}{639.46^{***}}DHDG$$

$\overline{R^2}$ = 0.99 D. W. = 2.63 F = 127.19***

Equation (1) was estimated by the Ordinary Least Squares (OLS) method, and equation (3), by the Maximum Likelihood (ML) method. Meanwhile, equations (2) and (4) were estimated by the Cochrane-Orcutt (CO) iterative technique.

Supply and demand estimation were done using the fitted values of the farmgate price ($\hat{Pf}_t$) and the retail price ($\hat{Pr}_t$).

Calculated from the mean values, the price elasticities of supply and demand were 0.17 and -0.56, respectively. Income elasticity was computed to be 0.63.

(4) Demand

The estimated coefficients associated with the demand equation suggest demand for rice as a function of price and income. Both price and income coefficients were significant at 1%. In 1984, 1985 and 1995, demand grew at a positive rate despite an upward trend in the retail price. This unusual market behavior was included as a dummy variable and was found to be significant. Rice remains to be the staple food and with no close substitute, not even bread or corn. This lack of a close substitute could be the same reason why demand is very price-inelastic with -0.56 as the computed elasticity. Again, the fact that demand is price-inelastic has important implications on the effectivity of the price ceiling policy as a means to improve consumer welfare.

Income elasticity was computed to be 0.63 which is substantially higher than the previous estimates, ranging from 0.11 - 0.32 (see Huang and David, 1993). These estimates may not be directly comparable since the latter were based on a different sample period. Moreover, previous studies used the country's gross national product (GNP) or gross domestic product (GDP) as income variable whereas the present study used the more specific private consumption expenditure data to represent income. Since the specific concern of this study is the income elasticity of demand for price, the private consumption expenditure was deemed more appropriate for the estimation. The positive sign of the coefficient supports the conclusion that rice is still a normal good in the Philippines (see Ito, Peterson, and Grant, 1989).

C. Economic Effects of Government Policy

In order to obtain insights into the effects of government intervention in the rice market, the neoclassical social gain-and-loss analysis was utilized. The overall results of the analysis are shown in Tables 3a,3b and 3c. The results were arranged according to the four general goals of market intervention, which are equity, growth, price stability and self-sufficiency. The economic effects of government intervention were estimated in the partial equilibrium framework through a comparison of the resulting supply, demand and trade

Table 3a. Social Gain-and-Loss Analysis of Government Intervention in the Rice Market, 1981-1995 : Assumptions

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Production (1000MT)	5174	5450	4771	5120	5759	6048	5585	5867	6186	6095	6327	5970	6170	6892	6893
Net Import (1000MT)	-83	0	-40	190	541	6	-111	181	220	621	-10	-29.7	210	0	247
Consumption (1000MT)	5091	5450	4731	5310	6300	6054	5474	6048	6406	6716	6317	5940	6380	6892	7140
Border Price (Pb), P/Kg.	3.82	2.50	3.08	4.21	4.02	4.30	4.73	6.35	6.96	6.98	8.63	7.32	7.32	7.08	7.89
Consumer Price (Pr), P/Kg.	2.72	2.96	3.19	5.10	7.00	6.56	6.61	7.23	8.39	9.42	10.11	10.44	11.84	13.29	16.47
Producer Price (Pp), P/Kg.	1.99	2.08	2.34	3.78	4.95	4.31	4.83	4.83	6.31	7.23	7.29	7.48	8.24	9.04	11.10
Nominal Protection Coefficient (Pp)	0.52	0.83	0.76	0.90	1.23	1.00	1.02	0.76	0.91	1.04	0.85	1.02	1.13	1.28	1.41
Nominal Protection Coefficient (Pr)	0.71	1.18	1.04	1.21	1.74	1.53	1.40	1.14	1.21	1.35	1.17	1.43	1.62	1.88	2.09
Consumer Price Index (CPI) (1988=100)	43.1	46.8	49.3	72.5	89.5	89.1	91.8	100.0	112.2	128.1	152.0	165.6	178.2	194.3	210.0

Table 3b. Social Gain-and-Loss Analysis of Government Intervention in the Rice Market, 1981-1995 : Intervention vs No-intervention

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995
Shift to No Intervention															
Movement from Pr to Pb (%)	40	-15	-4	-17	-43	-34	-28	-12	-17	-26	-15	-30	-38	-47	-52
Movement from Pp to Pb (%)	92	20	32	11	-19	0	-2	31	10	-4	18	-2	-11	-22	-29
Increase/Decrease in Production (1000MT)	809	188	256	99	-185	-3	-20	313	107	-37	197	-21	-117	-254	-338
Increase/Decrease in Consumption (1000MT)	-1148	472	93	520	1502	1167	872	412	613	975	518	993	1363	1803	2082
No Intervention Outcome															
Supply (1000 MT)	5983	5638	5027	5219	5574	6045	5565	6180	6293	6058	6524	5949	6053	6638	6555
Demand(1000 MT)	3942	5922	4824	5830	7802	7221	6346	6461	7019	7691	6835	6934	7743	8695	9222
Imports(1000 MT)	-2040	284	-203	611	2228	1176	780	280	726	1633	312	985	1690	2057	2667
Intervention Outcome															
Supply (at Pp)	5174	5450	4771	5120	5759	6048	5585	5867	6186	6095	6327	5970	6170	6892	6893
Demand (at Pr)	5091	5450	4731	5310	6300	6054	5474	6048	6406	6716	6317	5940	6380	6892	7140
Imports	-83	0	-40	190	541	6	-111	181	220	621	-10	-30	210	0	247

Table 3c. Social Gain-and-Loss Analysis of Government Intervention in the Rice Market, 1981-1995 : Results (Billion Pesos)

	1981	1982	1983	1984	1985	1986	1987	1988	1989	1990	1991	1992	1993	1994	1995	Total
Producer Loss/Gain	9.46	2.30	3.52	2.21	-5.38	-0.06	-0.57	8.90	3.96	-1.56	8.44	-0.93	-5.67	-13.49	-22.10	-10.94
	(21.94)	(4.92)	(7.15)	(3.05)	(-6.02)	(-0.07)	(-0.62)	(8.90)	(3.53)	(-1.21)	(5.56)	(-0.56)	(-3.18)	(-6.94)	(-10.52)	(25.93)
Consumer Loss/Gain	-5.58	2.49	0.53	4.74	18.78	13.67	10.29	5.33	9.19	16.41	9.36	18.52	28.82	42.80	61.23	236.58
	(-12.94)	(5.33)	(1.07)	(6.53)	(20.98)	(15.35)	(11.21)	(5.33)	(8.19)	(12.81)	(6.16)	(11.18)	(16.17)	(22.03)	(29.16)	(158.56)
Government Expenditure/Revenue	3.88	4.80	4.05	6.94	-10.17	-13.58	-10.14	14.23	13.15	-11.82	17.80	-17.78	-21.25	-29.31	-34.90	-84.09
	(9.00)	(10.25)	(8.22)	(9.58)	(-11.36)	(-15.24)	(-11.05)	(14.23)	(11.72)	(-9.22)	(11.72)	(-10.74)	(-11.93)	(-15.09)	(-16.62)	(-26.53)
Foreign Currency Loss/Earning	7.47	-0.71	0.50	-1.77	-6.78	-5.03	-4.22	-0.63	-3.52	-7.06	-2.78	-7.43	-10.84	-14.56	-19.11	-76.47
	(17.32)	(-1.52)	(1.02)	(-2.44)	(-7.58)	(-5.65)	(-4.59)	(-0.63)	(-3.14)	(-5.51)	(-1.83)	(-4.49)	(-6.08)	(-7.50)	(-9.10)	(-41.70)
Efficiency Loss in Production	0.74	0.04	0.09	0.02	0.09	0.00	0.00	0.24	0.03	0.00	0.13	0.00	0.05	0.25	0.54	2.24
	(1.72)	(0.09)	(0.19)	(0.03)	(0.10)	(0.00)	(0.00)	(0.24)	(0.03)	(0.00)	(0.09)	(0.00)	(0.03)	(0.13)	(0.26)	(2.89)
Efficiency Loss in Consumption	0.63	0.11	0.01	0.23	2.24	1.32	0.82	0.18	0.44	1.19	0.38	1.55	3.08	5.60	8.93	26.70
	(1.46)	(0.23)	(0.01)	(0.32)	(2.50)	(1.48)	(0.89)	(0.18)	(0.39)	(0.93)	(0.25)	(0.94)	(1.73)	(2.88)	(4.25)	(18.45)
Total Deadweight Cost	1.37	0.15	0.10	0.25	2.33	1.32	0.82	0.42	0.47	1.20	0.52	1.55	3.13	5.85	9.47	28.94
	(3.17)	(0.32)	(0.20)	(0.35)	(2.60)	(1.48)	(0.89)	(0.42)	(0.42)	(0.93)	(0.34)	(0.94)	(1.76)	(3.01)	(4.51)	(21.34)

Case 1: Pb>Pr>Pp (1981); Case 2: Pr>Pp>Pb (1985-1987,1990,1992-1995); Case 3: Pr>Pb>Pp (1982-1984,1988-1989,1991)

*A positive (+) value indicates a loss/expenditure/cost while a negative (-) value represents a gain/revenue/earning.

** The values in parentheses are the values in real terms (at 1988 prices).

levels in the intervention and the no-intervention scenarios. The intervention scenario shows the actual volumes of production, consumption, and imports/exports at the distorted domestic market prices. On the other hand, the no-intervention outcome refers to the hypothetical supply, demand, and trade condition as evaluated at world market prices.

Equity

With given price elasticities of demand and supply, the welfare trade-off between producers, consumers, and the government depends on the difference between the intervention and border prices of rice. In the sample period, three cases of price relativity emerged with differing results. Case 1, observed only in 1981, was where the border price was greater than the intervention prices (Pb>Pr>Pp). With lower prices than those that prevail in a free trade, the consumers gained and the producers lost from the intervention. The opposite case (Pr>Pp>Pb) was evident in 1985-1987, 1990, and 1992-1995. In this case, the consumers lost from the higher retail price while the producers gained from the higher producer price. Case 3 was a situation between the two aforementioned cases (Pr>Pb>Pp). . During the years 1982-1984, 1988-1989 and 1991 when this case was observed, the consumers suffered from higher prices and the producers received lower prices.

Both the producers and the government gained in about half of the period covered while the consumers were losers in the whole period. In Table 3c, producer gain was P10.94 billion (pesos); consumer loss, P236.58 billion; and the government supposedly earned a revenue of P 84.09 billion from its market intervention. In real terms (at 1988 prices), however, these translate to a producer loss of P 25.93 billion; consumer loss of P 158.56 billion; and government gain of P 26.53 billion. Apparently, the supposed gain of producers turned out to be a loss in real terms. Corrected for the effect of inflation, producer losses in the early 1980's became bigger while gains in the 1990's decreased considerably. Thus, the overall result of market intervention for producers was a loss in real terms. For the 15-year period covered, efficiency losses in consumption and

production amounted to P 26.70 billion and P 2.24 billion (P 18.45 billion and P 2.89 billion at 1988 prices), respectively. These sum up to a deadweight efficiency loss of 28.94 billion pesos (21.34 billion pesos in real terms) for the Philippines during the entire period.

Growth

The change in the foreign currency level was observed to vary with the three cases of price relativity. Either the intervention results in losses or earnings of foreign currency depended on differences in the supply and demand levels. On the overall, a saving in foreign currency equivalent to P 76.47 billion (P 41.70 billion at 1988 prices) was realized which could be spent on the import of productive materials, yielding a far-reaching effect on economic growth.

Price Stability

The general pattern of price variation was rather erratic during the 15-year sample period. In particular, domestic intervention prices were more unstable than the border price. The average absolute deviation was P 0.74/kg for producer price and P 1.04/kg for consumer price, as compared to P 0.73/kg for border price. This is further supported by the computed coefficients of variation of P 0.47, P 0.49, and P 0.34 for all three prices.

The retail price usually tended to be most unstable among the three prices. However, during the period coinciding with the lifting of the price ceiling, variations in the retail price were less than those at the farmgate. From this, it may be well said that the retail price appears to be more stable in the absence of market intervention.

Self-sufficiency

A comparison of the resulting self-sufficiency ratios in the intervention and no-intervention cases suggests that the self-sufficiency ratio was substantially higher in the case where intervention existed. Self-sufficiency ratios of 100% and over were achieved in half of the period covered. During these years, exportation was made possible, thus,

earning for the country some foreign currency. In the other half of the period, however, the self-sufficiency was not completely realized so that importation was resorted to in order to fill the shortage of rice. The average self-sufficiency for the whole period was 98%. On the one hand, the outcome for the hypothetical no-intervention case showed the average of 90% self-sufficiency. The annual self-sufficiency levels were also more erratic in the case of no intervention, showing 152% in 1981, but 71% in 1985 and 1995. Consequently, market intervention appears to stabilize supply thereby reducing the country's dependence on the world market for additional supply.

Conclusion and Policy Implications

The estimated model of government intervention fitted the data well, and was successful in providing insights into the government's policy decisions for the rice market. The results suggested a price support based on production costs and the world price, and a price ceiling which is simply a linear mark-up of the price support. Meanwhile, the buffer stock requirement was found to be responsive to the changing level of demand as well as the gap in the official and market prices. The net import equation, on the other hand, revealed that trade decisions were based on shortage or surplus as gauged from the actual level of buffer stocks held by the government. In summary, these results highlighted the importance of actual economic conditions to the government's policy implementation.

The estimation results showed that farmgate and retail prices conformed with the government-set price support and price ceiling. The fitted supply and demand equations revealed apparent inelasticity to prices, with price elasticities of 0.17 and -0.56, respectively. The price inelasticity revealed in both equations may have important implications such that they could render the price support and price ceiling policies ineffective if not futile in achieving their objective of stabilizing supply and demand for rice. Meanwhile, income was an important determinant of demand with elasticity computed to be 0.63, which implies that rice is still a normal good in the Philippines.

The use of social gain-and-loss analysis in the partial equilibrium framework provided insights into the effects of the government intervention. In real terms, the market intervention resulted in losses for both producers and consumers. Producer losses were less than those of consumers. In fact, producers gained in nominal terms. The price support given to farmers created a sort of money illusion which actually encouraged them to plant more rice. Hence higher self-sufficiency ratios were realized in the case of intervention. Commitment to the GATT, however, suggests doing away with domestic subsidies in order to encourage efficiency in production and promote harmonious relations

with other nations. Moreover, with producer and consumer losses resulting from the price intervention, a reconsideration of the price support and price ceiling policies is deemed necessary.

References

Alcalde, J.V. 1991. "Economic Analysis of Philippine Price Stabilization Policy : Case of Rice (1972-1991)", (Unpublished Thesis, College of Economics and Management, University of the Philippines at Los Banos, College, Laguna, Philippines).

Asian Development Bank. 1988. Evaluating rice market intervention policies : some Asian examples. Manila : ADB.

David, C. 1989. "Price policy in transition," in Food price policy in Asia. Cornell University Press : Ithaca & London.

Gerrard, C.D. and T. Roe, 1983. "Government Intervention in Commodity Markets - An Econometric Study of Tanzania", Journal of Development Economics 12: 109-132.

Huang, J. and C.C. David, 1993. "Demand for Cereal Grains in Asia : the Effect of Urbanization", Agricultural Economics 8 : 107-124.

Ito, S., W.F. Peterson, and W.R. Grant, 1989. "Rice in Asia : Is it Becoming an Inferior Good?", American Journal of Agricultural Economics 71 : 32-42.

Rausser, G.C. and J. Yassour, 1981. "Multiattribute Utility Analysis : The Case of Filipino Rice Policy", American Journal of Agricultural Economics 63 : 484-494.

Riethmuller, P. and T. Roe, 1986. "Government Intervention in Commodity Markets : The Case of Japanese Rice and Wheat Policy", Journal of Policy Modelling 8 : 327-349.

Te, A. 1977. "An Economic Analysis of Reserve and Stock Program for Rice in the Philippines", (Unpublished Ph.D. Thesis, School of Economics, University of the Philippines, Diliman, Quezon City, Philippines).

Timmer, C.P. 1986. Getting Prices Right, Cornell University Press, Ithaca.

Unnevehr, L.J. 1983. "The Effect and Cost of Philippine Government Intervention in Rice Markets", Rice Policies in Southeast Asia Project by IFPRI, IFDC and IRRI, Working Paper No. 9.