GOVERNMENT INTERVENTION AND WELFARE: THE PHILIPPINE SUGAR CASE

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Abstract

An empirical framework for analyzing the rationale behind government pricing decisions and for deriving efficient pricing rules is developed, using the Philippine sugar sector as a case study. Empirical results indicate the importance of sectorial and macroeconomic factors influencing pricing decisions and the welfare implications of current vis-a-vis efficient pricing.

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Government intervention in commodity markets has long been a focus of academic and political debate. Although the rationale for government intervention has often been to address market failures, more often than not, government behavior has been cast as a deliberate result of a political-economic process influenced by political or rent-seeking pressure exerted by societal groups (Becker; Krueger; Roe and Shane). From this standpoint, the outcome is to redistribute income at a possible allocative efficiency trade-off.

Given the importance of government intervention in commodity markets, much research has been devoted to endogenize the economics of political action (Becker; Krueger; Roe and Shane; Lopez). The efficiency and welfare consequences of such intervention have been well documented for a variety of scenarios. The objective of this paper is to develop and estimate a model of government behavior for the Philippine sugar market and to assess the welfare consequences for various market participants.

The Philippine Sugar Case

The Philippine sugar market offers a reasonable case for government intervention in agricultural commodity markets.[1] For organizational purposes, government intervention affecting the Philippine sugar market is discussed at three levels: the U.S. sugar policy, national/macroeconomic policies, and sectorial policies especially targeted at the sugar market.

Phillipine sugar production dates back to Spanish colonial times, and its growth has been a result of colonial and postcolonial ties to the United States (Nelson). Through its sugar policy, the United States pays more than the world market price to the Philippines under an import quota. In the 1960s, the U.S. reallocated and increased the quota to the Philippines as a result

of the embargo on Cuba, further stimulating U.S.-bound sugar exports. In 1974, the U.S. abolished the Sugar Act and allowed relatively free trade for a brief period (1974-81). In 1982, the U.S. reintroduced the import quota, but drastically reduced imports due to continued gains in the U.S. caloric market share by the U.S. corn sweetener producers. By 1987, the U.S. was importing only 20% of the amount imported from the Philippines 10 years earlier.

At the national level, policies affecting sugar production are mainly derived from trade and exchange-rate policies. Bautista points out that trade and exchange policies in the Philippines have been biased against agriculture and in favor of imports and industrialization. To rebuild its devastated economy after World War II, the Philippine government followed a policy of multiple exchange rates to encourage import substitution (Bautista). Thus, traditional agricultural export commodities, such as sugar, were taxed to facilitate import substitution. In the late 1950s, the multiple-exchange-rate system was dismantled due to worsening trade deficits that stimulated to the sugar industry by raising the price of sugar in pesos. Between 1974-80, the government followed expansionary policies financed by domestic deficits and foreign borrowing. This led to an overvaluation of the domestic currency that lowered agricultural prices as much as 25 percent (Bautista). In the 1980s, the country is underwent a severe economic and foreign exchange crisis prompted by large domestic and foreign debt. The political climate and rural agenda changed after the ousting of Ferdinand Marcos in 1986 and the institution of the government of Corazon Aquino.

At the sectorial level, the Philippine government has intervened directly in the postwar period by enacting a system of domestic and export quotas.[2] It is clear that the objective of this quota system has been to ensure foreign exchange earnings from exports to the U.S. and to ensure low prices to con-

sumers (Nelson and Agcaoili). After 1974, the government undertook direct control of sugar marketing by setting prices and enforcing quotas through such parastate organizations as Philex (the Philippines Exchange Company Incorporated), Philsucom (the Philippines Sugar Commission), and NASUTRA (National Sugar Trading Company). Philex was in operation during the 1974-78 period and was replaced in 1978 by the latter two organizations (Nelson and Agcaoili).

Conceptual Framework

Intervention in the Philippine sugar market has resulted from the government's objectives of addressing the interests of consumers and producers and larger economic and political factors reflected in sectorial policies. Government intervention can affect commodity markets directly through taxes, subsidies, price-setting in output and input markets, supply or marketing control, as well as indirectly through macroeconomic or nationwide policies. Given the wide spectrum of policy instruments available, this article focuses on producer and consumer prices for sugar.[3]

A Model of Government Intervention

Government intervention is conceptualized as consisting of hierarchical or multilevel, decision making. The U.S. government decisions on the U.S. price and the import quota are exogenous to the Philippine government. At another level is the Philippine government's pursuance of macroeconomic or nationwide policies within which sectorial policy decision making takes place. At a lower level is the sectorial policy decision making, which takes the macroeconomic policies as exogenous. At yet a still lower level are the producers and consumers who make choices, taking the sectorial policies (set

prices) as given. Only through lobbying or political pressure can the lower levels feed back into the higher levels of decision making.

The choices of producers and consumers are depicted by the supply and demand equations given by

$$Q_s = Q_s(P_s, Z^s; \beta), \tag{1}$$

$$Q_d = Q_d(P_d, Z^d; \alpha), \tag{2}$$

where P_s and P_d are producer and consumer prices, Z^i denotes other exogenous variables, and β and α denote supply and demand parameters.

Following Riethmuller and Roe and Lopez, it is presumed that the Philippine government reacts to the welfare of the various market participants (e.g., producers and consumers), and to the budgetary consequences of its sectorial decisions, which can be viewed as income claim to others. Furthermore, it is assumed that government authorities at this level take the macroeconomic environment as given. Thus, a government utility function at the sectorial level is designated as

$$U = U(PS, CS, BS, M; \Gamma) \tag{3}$$

where PS is producer surplus, CS is consumer surplus, BS is government surplus, M is a set of variables defining the state of the macroeconomy, and Γ is a vector of parameters.

Following Just et al., equations (1) and (2) can be proxies for the welfare of producers and consumers by using producer and consumer surplus, denoted as $PS = PS(P_s, Z^s; \beta)$ and $CS = CS(P_d, Z^d; \alpha)$.

The budget surplus for an intervening government that set prices for consumers and producers and received the export earnings from sugar is given by

$$BS = P_{us}X_{us} + P_w(Q_s - Q_d - X_{us}) - P_sQ_s + P_dQ_d, \tag{4}$$

where X_{us} is the U.S. sugar quota, P_{us} is the U.S. price, P_w is the world price for sugar, and the other variables are as defined above. For simplicity, stock levels are set to zero. Assume that the government behaves to maximize (3) with respect to producer and consumer prices, which are considered the sole policy instruments that can be decided upon at this level. The first-order conditions for utility maximization are given by

$$Up_s = U_{ps}CSp_s + U_{bs}BSp_s + U_mMp_s = 0, \quad (5)$$

$$Up_d = U_{cs}CSp_d + U_{bs}BSp_d + U_mMp_d = 0. \quad (6)$$

It is further assumed that the policy instruments under question have a negligible effect on the macroeconomic environment ($\partial M/\partial P_i = 0$). Following Riethmuller and Roe, these conditions can, in principle, be solved for the two policy instruments by invoking the implicit function theorem, i.e.,

$$P_i = P_i(P_{us}, X_{us}, P_w, Z^i, M; \alpha, \beta, \Gamma), \quad (7)$$

where $i = s$ or d. Equation (7) represents the government choices for producer and consumer prices. Any exogenous change in the export or domestic market conditions or in the macroeconomic environment will have an effect on the consumer and producer prices to the extent that they affect government utility. Further, equations (1), (2), and (7) constitute a recursive system of equations that stem from the nature of the hierarchical decision making in setting sugar prices.

Allocative Efficiency

Given the above model, domestic welfare resulting from sugar policies have three components: sugar consumers, sugar producers, and government treasury. The effects on world markets are precluded, because any individual exporting country has a negligible effect on the world market. The question

that arises is: What sort of prices should the government set to maximize domestic welfare? If we assume linear demand-and-supply curves for equations (1) and (2), producer and consumer surplus are given by

$$PS = \beta_0(P_s - \hat{P}_s) + .5\beta_1(P_s^2 - \hat{P}_s^2), \tag{8}$$

$$CS = -\alpha_0(P_d - \hat{P}_d) - .5\alpha_1(P_d^2 - \hat{P}_d^2), \tag{9}$$

where α and β are parameters, and P_s and P_d are government-set prices for consumers and producers. $\hat{P}_s$ and $\hat{P}_d$ indicate reservation prices at which supply or demand falls to zero. The other exogenous variables (Z^i) are assumed constant and thus already embodied in the respective intercepts. Government treasury surplus is taken as depicted by (4).

The aggregate domestic welfare maximization problem for a social planner is given by

$$MaxW = PS + CS + BS \tag{10}$$

w.r.t. P_s and P_d. Assuming an interior solution, so that exports are enough to exceed the U.S. quota, the first order conditions to maximize domestic welfare are given by

$$Wp_s = Q_s + \beta_1 P_w - Q_s - \beta_1 P_s = 0, \tag{11}$$

$$Wp_d = Q_d - \alpha_1 P_w + Q_d + \alpha_1 P_d = 0. \tag{12}$$

Condition (11) implies that in setting the producer price the government must balance the increase in producer welfare resulting from a higher set price against government disbursements that work against the welfare of third parties. At a welfare maximum, (11) indicates that the government should set prices where $P_s = P_w$, the world price. This is understandable because the world price is the marginal revenue obtained from additional exports if the U.S. quota is nonbinding, and, according to Corden, it represents the

marginal social cost for production and imports if the exchange rate is in equilibrium.

Similarly, condition (12) indicates that the consumer price should be set where $P_d = P_w$ in order to maximize domestic welfare. For a quota-holding country, the optimal government treasury position at a welfare maximum is $BS = (P_{us} - P_w)X^{us}$, or the quota rents from U.S. sugar exports. The deadweight or efficiency loss from the current pricing system is given by $dW = W(P_w) - W(P_s, P_d) = dPS + dCS + dBS$, which expression indicates the sum of changes in producer and consumer surplus, and government treasury balance.

Empirical Procedures

The model was applied to 1962-83 annual data on the Philippines. Production, consumption, and trade data came from USDA's *Foreign Agricultural Service* and *International Sugar Organization* reports. Domestic producer and consumer prices are from Nelson. Other data sources include the *Philippines Statistical Yearbook* and *International Financial Statistics.* The post-1961 data are used because before 1962, domestic Philippine prices did not differ significantly from the export prices.

Quantity of sugar produced (equation (1)) is assumed to be a function of the producer's sugar price, a price index for inputs (using the wholesale price index as a proxy), a trend variable, and lagged production. The wholesale price index is used to deflate sugar price. Quantity of sugar demanded domestically (equation (2)) is assumed to be a function of consumer's price for sugar, income, the consumer price index, a trend variable, and lagged consumption. The consumer price index is used to deflate sugar price and income, and lagged consumption was deleted from the estimating equation due to poor results and because its exclusion did not significantly affect the other results.

The producer and consumer prices (equation (7)) are presumed to be a function of the level and standard deviation of the average value of sugar exports (to account for the U.S. and world markets), lagged dependent variables, the government's domestic and foreign debt, a ratio of urban to rural employment, a dummy variable (equal to 1 after 1973), and exogenous supply and demand variables. It is hypothesized that a larger government debt increases the desire to tax both producers and consumers (the lower the producer price, the higher the consumer price). Also, the larger the urban employment relative to rural employment, the lower the producer and consumer prices are set in an attempt to gain political support. The inclusion of the average value of exports attempts to capture price transmission from export markets down to domestic producers and the variance of the unit export price attempts to capture the government's desire to stabilize domestic prices. The dummy variable attempts to capture institutional changes under the Marcos regime in which the government undertook direct control of sugar marketing and exports. All peso figures were deflated by the GDP price deflator. This price index is used because it gives an evaluation of prices relative to the overall economy.

Given the possibility of covariance among errors of the equations and the recursive nature of the system of equations, the Three Stages Least Squares (3SLS) technique is used for parameter estimation. The estimated parameters were used to estimate changes in producer and consumer surpluses and government treasury balance, from moving from the status quo pricing to efficient marginal pricing ($P_p = P_c = P_w$). The changes in welfare were deflated by the GDP price deflator (1983=1.0) to convert these figures to real values.

Empirical Results

Supply and Demand Results

The empirical results for the supply, demand, and pricing equations are presented in Table 1. In general, most of the critical parameters were significant at the 5% level. The short-run own price elasticities for supply and demand at mean data values are .455 and -.345 (e.g., Gemmill's estimates at .739 and -.286, respectively, and Bautista's estimate of agricultural supply elasticity of .25). The elasticity of demand with respect to income was estimated at 1.205.

Government Behavior Results

Consistent with Nelson's analysis, the empirical results show that producer prices have been strongly influenced by a blend price based on the U.S. and world markets. However, these results show that the producer price changed by approximately 14 cents when the average export price changed by 1 peso. Thus, changes in world market conditions are only partially reflected in the producer prices. The results also show partial rigidity in setting producer pricing and thus a tendency to maintain the status quo ($\gamma_5 = .380$). The result for the standard deviation of the unit value of export (based on the three preceding years) shows that the Philippine government tends to set lower producer prices when experiencing larger world price fluctuations.

The results fail to show any measurable linkage between the government debt and producer prices. The effect on the importance of urban relative to rural employment fulfilled expectations. The larger the employed urban constituency (relative to the rural one), the lower the producer price. The dummy variable for the post-1973 period was not significant, failing to lend support to Nelson's argument of increased taxation under the parastate's organizations that controlled sugar marketing. No statistically significant

association was found between producer prices,and lagged supply. On the other hand, an increase in income resulted in lower producer prices. This variable may, in part, capture the macroeconomic environment.

The results for the consumer prices were generally weaker than those for producer prices.The estimated parameters for the average export value and its standard deviation were insignificant at the 10 percent level. These results may indicate that consumers are more insulated from the world market conditions than producers are. Consumer prices did not show any measurable degree of rigidity. The results for the effects of macroeconomic variables on consumer prices indicate that they are significant in affecting consumer prices. The government debt has a positive effect on consumer prices, indicating that the government has been inclined to raise the consumer price of sugar when its debt has been larger in order to raise revenues. Consistent with the result for producer prices, the larger the urban constituency (employment) relative to the rural one, the lower the consumer prices. The dummy variable for the post-1973 period was insignificant. The result for the dummy variable indicates that the parastate organizations established after 1973 were used to further subsidize consumers by setting even lower prices.

Allocative Efficiency Results

In general, the econometric results appeared reasonable for further analysis. The estimated demand and supply parameters were utilized to compute welfare changes that would result by moving from the *status quo* to an "optimal" pricing system where both producer and consumer face the marginal world sugar price.[4] Results are presented in Table 2.

As expected, the overall change in welfare from instituting marginal pricing is positive for each year. The deadweight loss is greater the higher the

world price or U.S. quota rents. A composite pricing system, such as the one prevailing in the Philippines and in other countries, results in inefficient allocation of resources as producers have an incentive to overproduce when the composite price exceeds the world price or to underproduce when it is below it.

In years of high world prices (indicated by an asterisk in Table 2), marginal pricing would result in a large transfer to producers away from consumers and government treasury. On average, over the 1962-83 period, when compared with optimal pricing, the sugar pricing policies of the Philippines involved taxing of producers (1.65 billion pesos), subsidizing of consumers (.41 billion), and a positive balance of the government treasury. The average deadweight loss was estimated at 947 million pesos per year. An interesting result is that in years of abnormally high world sugar prices, the producers lose, and the consumers and the government treasury gain by maintaining the status quo. In other years, the reverse is true. Thus, one of the goals of the government is clearly to stabilize welfare transfers in the markets and isolate the consitituency from world market fluctuations.

Concluding Comments

This paper empirically analyzed government pricing behavior and its welfare consequences for the Philippine sugar market. The framework rests on the assumption that government authorities react to the welfare of market participants and the macroeconomic environment. Empirical results indicate that the variables determining the economic surpluses of sugar market participants and the macroeconomy are important influences on governmental pricing behavior. The consumers, however, are more insulated from world market conditions than producers are. The allocative efficiency losses from government intervention are greater, the greater the rents resulting from

sugar exports. Judging by the past performance of sugar policies in the Philippines, government intervention has resulted in a transfer of income from producer to domestic consumers and government treasury at an allocative efficiency loss. Thus, producers could potentially compensate both the producers and consumers and still be better off under no government intervention.

Marginal or "efficient" pricing involves the taxing of U.S. quota rents. The problem remains as to whether these rents should be allocated as lump-sum payments to producers or transferred to other sectors of the economy where opportunity costs or political benefits are higher. Nelson points out that an efficient solution would be to auction the U.S. quota to producers and to allocate the quota proceeds to a general revenue fund. However, as the U.S. decreases the quota to exporting countries, including the Philippines, the benefits from an efficient pricing, as well as the quota rents, are diminished. Under the large external debt facing the Philippines and worsening world market conditions for sugar, efficiency and government revenue-raising concerns may predominate in the future.

FOOTNOTES

1. The Philippines sugar market is selected as a case study because of an in both government behavior and sugar policy analysis. In addition, this case study involves a developing nation that is an important sugar supplier to the U.S., who has relied heavily on sugar for employment and economic growth, and for whom data are relatively available.

2. These quotas are classified as AA and A for exports to the U.S. (refined and raw sugar, respectively), B for domestic consumption, C for domestic reserve requirements, and D for world-market exports. The C quota has ceased to exist due to high domestic demand.

3. Following Johnson, the quotas imposed by the Philippine government are treated as a reduction in the effective prices faced by producers. Effects through exchange rates are beyond the scope of this paper.

4. These results should be interpreted with extreme caution as they represent short-term welfare changes and do not take into account the greater price instability that may result under world prices. In addition, the income effect of demand is significant, which results in a divergency between changes in consumer surplus and equivalent or compensating variations (Just et al.). Finally, the exchange rate equilibrium assumption for the world price to represent social marginal cost did not strictly follow in the case of the Philippines in the sample period (Bautista).

Table 1. Parameter Estimates for the Philippine Sugar Market and Government Behavior Equations

Equation	Variable	Parameter	Coefficient	Standard Error
Supply	Intercept	β_0	-560.836	363.168
	P_{st}/D_{1t}	β_1	.502**	.151
	Q^s_{t-1}	β_2	.499**	.155
	Time	β_3	40.533**	13.328
Demand	Intercept	α_0	237.236**	84.192
	P_{dt}/D_{2t}	α_1	-.189**	.068
	GDP/D_{2t}	α_2	6.875**	1.397
	Time	α_4	-2.752	8.878
Producer Price	Intercept	γ_0	22220.085**	1022.568
	Unit Expt. Value	γ_1	.139**	.027
	Std. Dev.Expt.Value	γ_2	-8.309**	1.576
	$Q_{s,t-1}$	γ_3	.019	.297
	GDP_t	γ_4	14.326**	7.029
	Lagged Price	γ_5	.380**	.152
	Time	γ_6	107.163*	64.400
	Gov. Debt	γ_7	.002	.008
	Urban/Rural Employ.	γ_8	-900.931**	434.880
	Dummy (year>73)	γ_9	279.219	162.452
Consumer Price	Intercept	λ_0	1772.420**	607.165
	Unit Expt. Value	λ_1	-.034	.034
	Std. Dev.Expt.Value	λ_2	-5.155	3.104
	$Q_{s,t-1}$	λ_3	.637**	.243
	GDP_t	λ_4	.786	7.515
	Lagged Price	λ_5	-.089	.195
	Time	λ_6	4.118	47.429
	Gov. Debt	λ_7	.023**	.005
	Urban/Rural Employ.	λ_8	-805.051*	516.188
	Dummy (year>73)	λ_9	-590.875**	196.886

NOTES: Sample includes 1962-83 years. D_{1t} denotes the wholesale price index and D_{2t} the consumer price index. All peso figures in the producer and consumer price equations were deflated by the GDP price deflator. One and two asterisks next to the estimated coefficient indicate significance at the 10 and 5% levels.

Table 2. Changes in Welfare: Efficient vis-a-vis Current Pricing

Year	Change in Producer Surplus	Consumer Surplus	Government Treasury	Total Welfare
	-million 1983 pesos-			
62	-1,089.68	225.94	1,013.66	149.92
63*	3,559.609	-925.23	-1,708.00	926.38
64*	1,165.86	-512.53	-504.19	149.14
65	-1,648.19	496.34	-1,440.71	288.86
66	-2,512.09	906.82	2,280.27	674.99
67	-2,265.44	826.25	2,020.65	581.46
68	-2,339.01	887.12	2,014.33	562.44
69	-2,401.95	906.88	1,965.96	470.89
70	-1,569.38	347.03	1,365.41	143.06
71	-1,445.21	-90.87	1,627.95	81.88
72	1,500.61	-672.49	-705.20	122.92
73*	3,417.31	-1,384.94	-1,495.25	537.12
74*	24,701.04	-3,719.57	-10,311.55	10,669.92
75*	9,638.68	-3,117.97	-4,106.69	2,414.02
76*	1,049.74	-1,191.61	255.09	113.23
77	-270.17	96.59	175.50	1.92
78	-649.05	323.66	339.94	14.55
79	-877.89	287.98	612.54	22.64
80*	10,518.92	-3,827.83	-4,232.93	2,458.16
81*	1,971.85	-1,512.16	-300.40	159.26
82	-2,654.40	1,327.13	1,538.80	211.60
83	-1,399.74	1,235.59	248.25	84.09
Average:	1,654.16	-413.08	-293.87	947.20

NOTES: Nominal changes in welfare and government treasury balance were deflated with the GDP price deflator (1983=1.0). An asterisk denotes years of abnormally high world sugar prices.

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