Politico-Economic Analysis of the US Sugar Programme

Rigoberto A. Lopez and Kay G. Sachtler[1]

Abstract: This paper presents a politico-economic analysis of decision making about the US sugar programme. It analyzes the linkages between the economic surpluses of market participants and the policy response via the level of target prices and import quotas. The legislative decisions of the sugar programme are captured by the target price choices, while the administrative aspects of the programme are captured by the import quota choices. Explanatory variables in the empirical model include domestic sugar producer and consumer surplus, corn sweetener producer surplus, sugar quasi-rents of US quota-holding countries, and US federal budget deficit. Target price decisions were found to be weakly linked to domestic sugar producer surplus but strongly linked to corn sweetener producer surplus. The impact of the federal budget deficit on quota levels is clear. Restrictive quotas reduce Treasury outlays while supporting domestic producers. The influences of various market participants are also examined for both target prices and import quotas.

Introduction

The sugar policies of the US government are one of the best case studies for analyzing politico-economic decision making in agriculture. Since 1789, the US government has involved itself in the sugar industry, setting import and domestic quotas, tariffs, and support prices, singly and in combination. In only four of the last 200 years, 1975-76 and 1980-81, did the government not approve a sugar target price, and, in those years, the abnormally high world sugar prices obviated the need for one. As a result of the US government involvement, the price of sugar has been much higher and more stable domestically than in the world market.

In the late 1980s, the US sugar programme faced challenges on several fronts. Critics contend that high domestic prices have encouraged the development and adoption of sugar substitutes, such as high-fructose corn syrup; that ever more restrictive import quotas increase foreign policy risk (the quota was reduced by 41 percent from 1986 to 1987 alone); and that the programme is highly inefficient. Government officials and all those who make policy and participate in domestic and foreign markets must strive better to understand how policies are formed and what factors affect policy choices. The purpose of this paper is to develop a framework to analyze the determinants of the level of US sugar policy instruments—sugar import quotas and target prices—based on the economic surpluses of market participants. By so doing, the empirical framework incorporates both the economic and political aspects involved in the US sugar case.

Conceptual Framework

Pressure groups and government agencies interact in US sugar policy making. The end product is a sugar programme that consists of policy choices, including price support levels and import quotas. Lobbyists provide a critical input in policy making by representing the special interests of pressure groups trying to influence policies in their favour. The political and economic importance of corn sweeteners cannot be underestimated, especially that of high-fructose corn syrup, which had captured over 35 percent of the US caloric sweetener market by 1986.

As in other public policies, sugar policy involves two strata of decision making: legislating and administering (or implementing) a sugar programme. The first part is done by Congress and the second by executive branches. In the case of sugar policy, the role of Congress has been confined to establishing the price support level for domestic sugar producers. Administering the programme to achieve the price support level starts with an interagency review by a Sugar Working Group composed of representatives of the Departments of Agriculture, State, Treasury, and Commerce; the Office of the US Trade Representative; the National Security Agency; and the Council of Economic Advisers

(Nuttall, 1986). This group develops recommendations on programme administration that then go to the Cabinet and are ultimately approved by the President.

The conceptual framework in this paper follows from the premise that the government authorities form preferences over the welfare of domestic producers and consumers, the Treasury's position (which can be viewed as an income claim to others), and foreign interests. According to Nuttall, administrative decisions in the sugar programme involve four policy areas: domestic farm programmes, domestic budgets, foreign policy ramifications, and implications of trade policy. Modifying the theoretical model presented by Riethmuller and Roe (1986), policy decisions (G_k^*) resulting from the policy-making process can be represented by:

$$(1)\quad G_{kt}^* = G_k(PS_{t-\tau k}, CS_{t-\tau k}, FS_{t-\tau k}, BS_{t-\tau k}),$$

where τk is the institutional lag associated with policy instrument k, *PS* is producer surplus, *CS* is consumer surplus, *FS* is foreign country surplus, and *BS* is the federal budget surplus. The lag is introduced because US sugar policies follow market conditions but lag behind them.

Empirical Framework

Because of the intricacy of the sugar market and the wide variety of policy instrument options, the focus was narrowed to two policy instruments: the government's price-support level (loan rate) and import quota level. The empirical procedures involve the estimation of market parameters, computation of welfare measures based on these parameters, and estimation of policy instruments based on these welfare measures. This paper used the econometric model for the US sugar market presented by Lopez (1989) to estimate *PS*, *CS*, and *FS*.

The levels of policy instruments (G_k^*) chosen by the policy makers are assumed to be effective, and, thus, the observed levels are assumed to correspond to what was chosen. Characterized by a bureaucratic time lag in policy implementation and adjustment, the selected levels of policy instruments are assumed to follow a multiyear distributed lag response. More specifically, an econometric specification of equation *(1)* for government behaviour in setting sugar policy instruments is expressed as:

$$(2)\quad G_{kt}^* = \lambda_0^k + \sum_{\tau=1}^{nk} (\delta_{1\tau}^k PS_{t-\tau} + \delta_{2\tau}^k CS_{t-\tau} + \delta_{3\tau}^k FS_{t-\tau} + \delta_{4\tau}^k BS_{t-\tau}) + U_{kt},$$

where τ represents a lagged period. Let $\delta_{j\tau}^k$ be represented by a polynomial of degree n, which is assumed to be a continuous function of τ so that it can be expressed as $\delta_{j\tau}^k = \Sigma_{i=1}^{n} \lambda_i^k \tau^i$. Substituting this into equation *(2)* yields:

$$(3)\quad G_{kt}^* = \lambda_0^k + \sum_{j=1}^{4} \sum_{i=1}^{nk} \lambda_{ji}^k W_{jit}^k + U_{kt},$$

where $W_{jit}^k = \Sigma_{\tau=1}^{nk} \tau^i X_{jt-\tau} (i=1, \ldots, nk)$, and $X_j = (PS, CS, FS, BS)$. W_{jit}^k represents the "scrambled" terms treated as ordinary regressors that can be unscrambled after estimation to obtain the implied lag coefficients.

Data and Estimation

Most of the data came from various issues of US government publications, including *Sugar and Sweetener Outlook and Situation Report* (US Department of Agriculture, Economic Research Service). The federal budget balance data were obtained from the *Statistical Abstract of the United States* (US Department of Commerce). Annual observations were collected for the 1955-85 period.

The estimated sugar market parameters were used to estimate domestic consumer and producer surpluses in real terms. Following Just, Hueth, and Schmitz (1982), consumer surplus estimation took into account the feedback or multimarket effect of changes in the price of sugar, given that this is a price umbrella for corn sweeteners. Following Just *et al.*, producer surpluses in the production of corn sweeteners (high-fructose corn syrup, glucose, and dextrose) were measured by quasi-rent estimates (returns over variable costs) based on the work of Lopez and on market data. The producer surpluses in the corn sweetener sector were then summed and deflated by the price of maize and entered as an argument of the policy equations.

For the import quota and target price equations, all variables were expressed in logarithms, except for the federal budget surplus. The target price was deflated with the index of prices paid by farmers. Since the aggregate import quota is a policy instrument to implement the target price set by Congress, the real target price (approximated by an instrumental variable estimator) was included as an argument in the quota equation.

The distributed lag models are estimated by assuming a first-degree (import quota) and second-degree (target price) polynomial on the lag coefficients and end-point constraints. Finally, the 1975-76 and 1980-81 observations for the target price and the 1975-81 observations for the import equation equations were excluded from the sample, because these policy instruments were not in effect in those years.

Empirical Results

The empirical results for acreage decisions, corn sweetener prices, and demand parameters are presented in Table 1. In general, the results for the domestic sugar market parameters were reasonable. The results in Table 1 were used along with producer surplus from the corn sweetener market and sample data to compute domestic producer and consumer surpluses.

The polynomial distributed lag results for the target price equation are presented in Table 2. The target price equation was augmented by adding a slope shifter (*D74*). The coefficients associated with sugar producer surplus were the only ones not statistically significant at the 10-percent level. The empirical results fail to show a significant statistical association between sugar producer surpluses (*PS*) and target price level choices. A significant negative statistical association was found between corn sweetener producer surplus (*PSCORN*) and sugar price levels; i.e., Congress tends to set higher sugar target prices when the corn sweetener producers are worse off. Supporting the sugar price partially supports the price of maize to the extent of the corn sweetener share of the maize market.

A statistically significant association was found between consumer surplus (*CS*) and target price levels; i.e., Congress tends to set lower target prices when consumers and sweetener user manufacturers are worse off. Although consumers are not organized to lobby on target prices, sweetener users and manufacturers are. A statistically significant association was found between foreign country surplus (*FS*) and congressional decisions on target price levels; i.e., as sugar export rents of quota-holding countries decline, Congress tends to set lower target prices. Thus, having lower target prices and increased access to the US sugar market coupled with import decisions is in the best interest of foreign countries. The sign associated with the federal budget surplus (*BS*) (deficit if negative) is

Table 1—Estimates of US Sugar Market Parameters

Equation	Parameter	Variable	Coefficient	Standard Error
Cane acreage	α_0	Intercept	1.800**	0.738
	α_1	$ln(P_t^e/D_t)$	0.231*	0.125
	α_2	$ln(S_t^e/D_t)$	-0.204*	0.146
	α_3	$ln(A_{t-1}^c)$	0.601**	0.116
	α_4	Time	0.006*	0.0035
Beet acreage	β_0	Intercept	1.606*	0.874
	β_1	$ln(P_t^e/D_t)$	0.479**	0.150
	β_2	$ln(S_t^e/D_t)$	-0.411**	0.169
	β_3	$ln(A_{t-1}^b)$	0.601**	0.103
	β_4	Time	-0.003	0.002
Corn sweetener prices	π_0	Intercept	-9.282**	2.728
	π_1	P_t	0.671**	0.211
	π_2	$PCORN_t$	0.310	2.166
	π_3	Time	0.628**	0.181
Demand	γ_0	Intercept	58,077.800*	34,650.060
	γ_1	P_t/CPI_t	-1,570.533**	545.661
	γ_2	P_{ot}/CPI_t	1,016.771**	509.463
	γ_3	Q_{t-1}^p	0.814**	0.129
	γ_4	I_t/CPI_t	0.017**	0.062
	γ_5	Time	-1,390.661	2,433.614
Log of likelihood			-304.518	

Notes: D_t is an index of prices paid by farmers (1977=1); S_t^e is an index of expected prices received by farmers (1977=1); CPI_t is the consumers' price index; I_t is consumer disposable personal income; and $PCORN_t$ is the price of maize. All other variables are defined in the text. An asterisk or double asterisks next to the estimated coefficient indicate significance at the 10- and 5-percent levels, respectively.

contrary to expectations. On the other hand, the intercept-shifter coefficient (*D74*) shows that target prices have been generally set lower in real terms after 1974.

The polynomial distributed lag results for the import quota equation are presented in Table 3. The signs of the coefficients associated with sugar producer surplus and consumer surplus are contrary to expectations. A possible explanation of the producer and consumer surplus signs is that the welfare sensitivity by the executive branches in setting import quotas may have been partially captured by the target price. Another possible explanation is that if the amounts of money, time, and effort spent on campaign contributors, lobbying, advertising, and other political activities increase with economic surpluses, then import quota levels may reflect this pressure rather than a pure response to welfare.

The empirical results suggest that the US government has allowed more imports of sugar when quota-holding countries were worse off but has restricted imports when these countries were faring better. This type of response may have changed after 1985 (postsample period), with the implementation of the "no-cost" mandate by which only the

Table 2–Parameter Estimates for the Target Price Equation

Variable	Coefficient (Standard Error) in Lag $\tau = 0$	$\tau = 1$	$\tau = 2$	$\tau = 3$	$\tau = 4$	$\tau = 5$	Sum Lag
$PS_{t-\tau}$	−0.006	−0.009	−0.010	−0.009	−0.006		−0.039
	(0.013)	(0.021)	(0.024)	(0.021)	(0.013)		(0.093)
$PSCORN_{t-\tau}$	−0.020	−0.032	−0.036	−0.032	−0.020		−0.139
	(0.010)	(0.016)	(0.017)	(0.016)	(0.010)		(0.068)
$CS_{t-\tau}$	0.092	0.147	0.166	0.147	0.092		0.645
	(0.020)	(0.032)	(0.036)	(0.032)	(0.020)		(0.139)
$FS_{t-\tau}$	0.019	0.031	0.035	0.031	0.019		0.135
	(0.008)	(0.012)	(0.014)	(0.012)	(0.008)		(0.053)
$BS_{t-\tau}$	−3.079	−4.927	−5.543	−4.927	−3.079		−21.556
	(0.388)	(0.621)	(0.699)	(0.621)	(0.388)		(2.718)
$D74$	−0.315						
	(0.028)						

Notes: $R^2 = 0.948$, $F = 27.132$, and $DW = 2.059$. All variables are expressed in natural logarithms (except $FS_{t-\tau}$ and $D74$) and real terms. The sample includes 1963-85, except 1975-76 and 1980-81, when target prices were not in effect. The parameters were estimated correcting for first-order serial correlation using the Cochrane-Orcutt technique ($\rho = 0.478$).

residual, after unrestricted domestic supply, is imported. Consistent with the conclusions of Leu, Schmitz, and Knutson (1987), Maskus (1987), and the recent no-cost-to-the-Treasury policy, the US government has used import quotas as a substitute for policies requiring Treasury outlays, depending on the federal budget balance. A quota response to the deficit attains two of Nuttall's governmental objectives simultaneously: it protects domestic producer interests and reduces the burden on the Treasury by avoiding the direct use of subsidies.

The results also show that import quotas are effectively used to implement the target price. For an imported commodity, a target price support level can be administered with import quota management as has been true with the implementation of the no-cost-to-the-Treasury mandate. An analogous case is the variable duties imposed by the EC, in which target prices are coordinated with self-adjusting tariffs to support the EC target prices.

Concluding Remarks

An important issue concerns the short-run political horizon of sugar policy makers facing re-election. Although a sugar programme may be effective in attaining the objectives of the policy makers or those of their constituents in the short run, in the long run these policies involve a trade-off because of their inducement of technological and institutional changes. For example, high sugar prices have induced and will continue to induce the

Table 3—Parameter Estimates for the Import Quota Equation

Variable	Coefficient (Standard Error) in Lag $\tau = 0$	$\tau = 1$	$\tau = 2$	$\tau = 3$	Sum Lag
$PS_{t-\tau}$		-0.454	-0.303	-0.151	-0.908
		(0.060)	(0.040)	(0.020)	(0.119)
$PSCORN_{t-\tau}$		0.049	0.033	0.016	0.0982
		(0.040)	(0.027)	(0.013)	(0.084)
$CS_{t-\tau}$		0.501	0.334	0.167	1.002
		(0.076)	(0.051)	(0.025)	(0.152)
$FS_{t-\tau}$		-0.074	-0.049	-0.025	-0.148
		(0.026)	(0.017)	(0.009)	(0.052)
$BS_{t-\tau}$		6.689	4.460	2.230	13.379
		(1.033)	(0.689)	(0.344)	(2.065)
P_t^{IV}	-4.041				
	(1.017)				

Notes: $R^2 = 0.959$, $F = 46.77$, and $DW = 1.540$. All variables are expressed in natural logarithms except $FS_{t-\tau}$. The sample includes 1960-85, except 1975-81, because no quotas were in effect in those years.

development and adoption of sugar substitutes, thus decreasing long-term demand for sugar and reducing imports. If the current trend continues, a zero-import situation may be attained in less than a decade. In that event, political choices would involve a direct trade-off among domestic interest groups as well as Treasury outlays. Finally, this paper finds some evidence to reinforce the widespread view that policy decisions are as much a matter of wider political considerations as they are of economics. Attesting to this view are the weak linkage found between domestic sugar producer surpluses and target prices and the strong linkage between federal budget deficits and import quota choices.

Note

[1]Department of Agricultural Economics and Marketing, Rutgers University.

References

Just, R.E., Hueth, D.L., and Schmitz, A. (1982) *Applied Welfare Economics and Public Policy*. Prentice Hall, Englewood Cliffs, N.J., USA.

Leu, G.M., Schmitz, A., and Knutson, R.D. (1987) "Gains and Losses of Sugar Programme Policy Options," *American Journal of Agricultural Economics*, Vol. 69, No. 3, pp. 591-602.

Lopez, R.A. (1989) "Political Economy of U.S. Sugar Policies," *American Journal of Agricultural Economics*, Vol. 71, No. 1, pp. 20-31.

Maskus, K.E. (1987) *International Political Economy of U.S. Sugar Policy in the 1980s*, Planning and Economic Analysis Working Paper No. WP/87/1, US Department of State, Washington, D.C., USA.

Nuttall, J. (1986) "Operation of the U.S. Sugar Programme," in *California Sugar Beet 1986 Annual Report*, California Growers Association, Stockton, Calif., USA.

Riethmuller, P., and Roe, T. (1986) "Government Behavior in Commodity Markets: Case of Japanese Rice and Wheat Policy," *Journal of Policy Modeling*, Vol. 8, pp. 327-349.

DISCUSSION OPENING—*David R. Lee* (Department of Agricultural Economics, Cornell University)

The paper by Lopez and Sachtler makes several contributions to the growing body of research on the political economy of agricultural policy. First, the use of economic surplus measures to assess expected gains and losses of market participants represents a conceptual improvement over simpler proxy measures (e.g., expected prices) that have previously been used in this type of analysis. Second, the paper's simultaneous attention to the politicoeconomic determinants of two major policy interventions brings an element of realism into the treatment of sugar policy. Third, the integration of foreign economic agent gains and losses into what is, after all, fundamentally an international market for sugar is a useful innovation that broadens the scope of the study beyond simply domestic considerations.

A number of limitations also characterize the analysis, however. The empirical results reported in the paper are less than totally compelling. The presence of perverse signs and lack of statistical significance of regression coefficients associated with key hypothesized determinants of sugar policy is troublesome, notwithstanding the possible explanations for these unexpected results cited by the authors. Perhaps other factors were at work; the paper would benefit from a closer examination of these opposite-from-expected results. A second concern is the issue of continuity in policy formulation. For sugar and many other commodities in the USA, the quadrennial nature of farm legislation imparts a source of discontinuity or stepwise behaviour to policy outcomes through a variety of specific mechanisms. Ignoring this factor in time-series estimation may suggest an unrealistic degree of continuity compared to what actually occurs in commodity policy formulation, such as in the setting of target prices. Lastly, while the paper makes a beginning in attempting to specify the international sources of policy determination, we still have a long way to go, especially for a commodity like sugar for which the market is inherently international and which is driven by noneconomic policies as well, including political and security concerns.

At a more fundamental level, the paper also raises a number of questions pertaining to the broader politicoeconomic literature in agricultural policy. What, for example, are the unique uses and attributes of politicoeconomic analysis? Traditional agricultural policy analysis examines the welfare impacts, distortions, and incidence of past and anticipated policy interventions. Policy makers may not always (or even often) listen to the results, but these studies provide a point of reference for political bargaining and compromise. Are the uses of politicoeconomic analysis any different? To what extent does the introduction of explicitly political elements into economic analysis necessitate greater attention to the policy *process* and the political viability of alternative economic proposals? Questions like these inevitably arise once one goes beyond purely economic considerations.

A related issue concerns the inherent nature of the questions that applied economists ask in politicoeconomic research. Political scientists addressing economic policy issues are generally concerned with questions such as the construction and maintenance of political coalitions, the nature of public support for policy interventions, and the internal dynamics of the policy formulation process. While economists may not have a comparative advantage in addressing these issues, we should not avoid them in our haste to force what are often highly complex and subtle political processes into preconceived boxes that may be quantifiable and estimable.

Finally, a further cautionary note is in order concerning what one might call a political "aggregation problem." Generic use of monolithic terms like "government policy" obscures the number of interest groups active in policy formulation and the wide divergence of their interests. In Bill Browne's recent book on the politics surrounding passage of the 1985 Farm Bill, for example, nearly 20 different interest groups active in the formulation of sugar policy in 1985 are mentioned. Sugar "producers" and sugar "consumers" each comprise many different individual parties, with often opposing views and positions. Aggregating these groups to enable empirical analysis to proceed may be a necessary evil but may also be partly responsible for the difficulty in obtaining powerful and robust empirical results in politicoeconomic studies.

GENERAL DISCUSSION—*Thomas C. Pinckney, Rapporteur* (International Food Policy Research Institute)

In his reply to the discussant, Lopez agreed that the econometric results were less than compelling, perhaps because of the lack of any specification for direct lobbying in the model. During the research, the authors had attempted to model direct lobbying in several ways but had not succeeded in finding an effective method. As for the quadrennial nature of changes in US farm legislation, this affects only the sugar target price. The quota is determined annually. As with direct lobbying, an attempt was made to include a dummy variable for the year of a new farm bill, but the variable was insignificant.