WESTERN AGRICULTURAL ECONOMICS ASSOCIATION

PAPERS OF THE

1989 ANNUAL MEETING

WESTERN AGRICULTURAL ECONOMICS ASSOCIATION

COEUR D'ALENE, IDAHO

JULY 9-12, 1989

Government Intervention in Agriculture
A Regulatory Approach

David W. Skully

The bias and extent of government intervention in agricultural is not random, it is something to be explained. The bias of net government intervention in agriculture between producers and consumers is analyzed as the price discrimination decision of a publicly regulated monopoly trading agency subject to a budget constraint and political feedback.

The Positive Theory of Regulation

The acknowledged pioneer of the positive analysis of public regulatory agents is George Stigler. Pre-Stiglerian theories of regulation belonged to one of two opposed camps: public agents were cast as either passive servants of the Public Interest or captive lackeys of special interests. The empirical evidence, Stigler argues, suggests that regulation is rarely a corner solution; rather, "The political process, like the economic process, finds intermediate positions which reflect the equilibrium of diverse forces."[1]

Perhaps the most elegant statement of the Stiglerian or positive theory of public regulation is Peltzman's (1976) "Toward a More General Theory of Regulation." The Peltzman/Stigler theory provides a general explanation of the observed pattern of government regulation by viewing regulation as a product traded in the political market-place.

> "The essential commodity being transacted in the political market is a transfer of wealth, with constituents on the demand side and their political representatives on the supply side. Viewed in this way, the market here, as elsewhere, will distribute more of the good to those whose effective demand is highest."[2]

The theory identifies the determinants of effective political demand; it is "ultimately a theory of the optimum size of effective political coalitions". The optimum size of a political coalition seeking a subsidy is 'smaller' than the coalition which will be taxed to finance the transfer. For a given transfer policy, the size of the beneficiary group must balance the inertia of its members against the inertia of the group's potential opponents. The smaller the size of the beneficiary group, the larger its members' per capita gain. A per capita transfer above some threshold will overcome the political inertia of potential beneficiaries. The potential opposition group is the tax base of the transfer, the larger the membership of the tax base, the smaller the per capita loss exacted by the policy. As long as the per capita tax is less than some threshold, political inertia is not likely to be overcome, and active opposition is unlikely. Organizational costs and cheap ridership problems also increase at an increasing rate with group size; this further limits the optimum size of beneficiary groups and promotes targeting large heterogeneous tax bases.

The Majority function clears the political market:

$$M = n * f\left(\frac{T-\alpha T-C(n)}{n}\right) + (N-n) * g\left(\frac{T+C(N-n)}{N-n}\right)$$

---

[1] Stigler (1975:138) -- this is a comment on Posner (1974), which contains a good catalog of pre-Stiglerian theories of regulation.

[2] Peltzman (1976:212)

Where M represents net political support for the incumbent, N is the total population, n is the size of the set of net beneficiaries of intervention, and N-n is the complementary sub-set, the tax base. T represents the Transfer from the tax base, this value may be composed of taxes paid, loss of consumer surplus, public services foregone, etc.: T is best considered the Equivalent Variation of foregoing the transfer and may take either positive or negative values. The value α is the proportion of the transfer retained by the state, this value is negative if the state transfers revenues from other sources to subsidize the transfer to the target group. The function C(.) represents organizational costs: $C_n > 0$ and $C_{nn} < 0$. The arguments of f(.) and g(.), are the net per capita transfer to each group. The functions f(.) and g(.) map the per capita transfer value into the probability of support or opposition, respectively, of group members, with the following derivatives:

$$f_T > 0 \qquad f_{TT} < 0 \qquad g_T > 0 \; g_{TT} < 0$$
$$f_\lambda < 0 \qquad f_{\lambda\lambda} < 0$$
$$f_n < 0 \qquad f_{nn} < 0 \qquad g_{N-n} < 0 \qquad g_{N-n,N-n} < 0$$

In a pure, one agent-one vote democracy, this formula yields the majority value directly; in other systems of preference revelation group political effective demand can be represented in the cost function or in the coefficients of f(.) and g(.).

The public agent regulating agriculture faces a budget constraint, π_o, and a political objective, M(.); and solves the following Lagrangean with respect to t_i: the tax rate on commodity X_i:

$$\Psi = M(.) + \lambda(\Sigma_i^n t_i(\Sigma_h^H X_i^h(t_i)) - \pi_o)$$

Where M(.) is the Majority function. For ease of exposition, one can aggregate the private agents in the economy into two perfectly separable markets, i = 1 net commodity producing households, and 2 net commodity consuming households. The first order conditions are:

$$\partial\Psi/\partial M^h \; \partial M^h/\partial t_i + \lambda \, (t_i \, \partial X_i/\partial p_i + t_j \, \partial X_j/\partial p_i + X_i) = 0$$

Writing the elasticity of demand for X_i, ε_i, as a positive value, this reduces to:[3]

$$1 - \beta^h/\lambda = t_i/p_i * \varepsilon_i$$

Where β^h is the marginal (gain or loss of) political support for the regulator from sector h (via the majority function), and λ is the marginal value of revenue.

If elasticities are held constant, the tax rate (t/p) is a direct function of the ratio, β^h/λ. The larger the value of β^h, the lower tax rate levied on sector h. When $\beta^h > \lambda$, the marginal political value of income to sector h is greater than the marginal political value of income to the regulator, this will result in a subsidy--or negative tax rate.[4] The set of weights imposed by a revenue maximizing public sector would be $\beta^h = 0, \forall \; h \;$ (or $\lambda = \infty$) leading to the monopoly solution; for a perfectly competitive firm $\beta^h = \lambda$, so t/p = 0 (i.e., p = mc). Variations in the elasticity of demand are, as in the monopoly model, inversely related

---

[3]Because of the perfect separability assumption, the cross terms, $\partial X_j/\partial p_i$, equal zero. The term $\partial\Psi/\partial M^h \; \partial M^h/\partial t_i$ can be rewritten as $-\beta^h X_i$ by employing Roy's identity, $\partial M^h/\partial t_i = -\alpha^h X_i$, where α^h represents h's marginal utility of income, and letting $\beta^h = \partial\Psi/\partial V^h \; \alpha^h$.

[4]Peltzman (1976:231) "The substitution of political for economic criteria in the price formation process ... is at the heart of the pervasive tendency of regulation to engage in cross-subsidization."

to the revenue maximizing price or tax rate. If π_0, the budget constraint, is allowed to vary then political support may be gained or lost by running a budget deficit or surplus. Running a deficit by giving higher prices to producers and/or lower prices to consumers increases political support for the incumbent. A surplus will cause political support to diminish.

Development and Trade Biases in Agricultural Policy

The metamorphoses of agricultural production, marketing, and food consumption in the course of economic development result in industrialized economies having interest group sizes and agricultural policies which are the virtual inverse of those of lesser developed economies. In LDCs, urban consumers form a relatively small, geographically compact group, with a large per capita stake in demanding low staple food prices. Rural producers form a large, heterogeneous, and geographically dispersed tax base from which a considerable surplus can be extracted at a relatively low per capita cost. The more difficult it is to organize opposition in the rural sector the higher the per capita tax that can be extracted with out significant opposition. Proposition 1A: Given the urban consumers' higher effective political demand, one expects to find that LDCs will tend to subsidize consumers and tax producers.

In industrial economies, urban households comprise the bulk of the population, and the vast majority have only a small per capita interest in lobbying for lower staple food prices -- or lobbying to prevent higher food prices. Farm households are relatively few in number, and have a very large stake in obtaining higher prices or other forms of public subsidy. Proposition 1B: Consequently, one expects to find that industrialized economies will tend to subsidize producers and tax consumers.

A country's net trade position in a commodity will also influence the bias and extent of intervention. Importing country governments are under pressure from domestic producers to provide protection from competing imports; so, through tariffs and other means, imports are likely to be taxed at higher rates than domestic commodities. The lack of effective opposition of foreign suppliers and the relatively broad consumption tax base leads to Proposition 2A: The greater the excess of domestic consumption over domestic production the greater the likelihood that tax revenues on imported commodities will more than cover subsidies to producers.

Conversely, a net exporter has a surplus of domestic production over consumption. The greater the domestic surplus, the higher the consumption tax rate needed to fully finance producer subsidies. Because higher tax rates increase the likelihood of consumer opposition, Proposition 2B follows: the greater the domestic surplus, the greater the likelihood that producer subsidies will not be fully financed from consumer commodity tax receipts.

The four propositions derived in the four preceding paragraphs can be combined to form three testable hypotheses: 1) that the bias of intervention turns from consumers to producers during the course of economic development; 2) that the net budgetary position of commodity intervention is negatively related to net commodity trade; and 3) that net commodity trade is negatively related to the degree of producer bias. The explanatory variables employed in the testing these hypotheses are: Ag/GDP = the proportion of Gross Domestic Product derived from Agriculture[5]; and NetTrade = (Domestic Production/Domestic Consumption) - 1.

Because intervention in agriculture occurs through many different means--taxes, regulations, marketing boards, tariffs, quota, marketing orders, allotments, subsidies and public goods provision--a broader measure than the nominal or effective rate of protection has been developed. The 'subsidy equivalent' measure was devised by FAO as a means toward making cross-country and cross-commodity comparisons of the incidence of

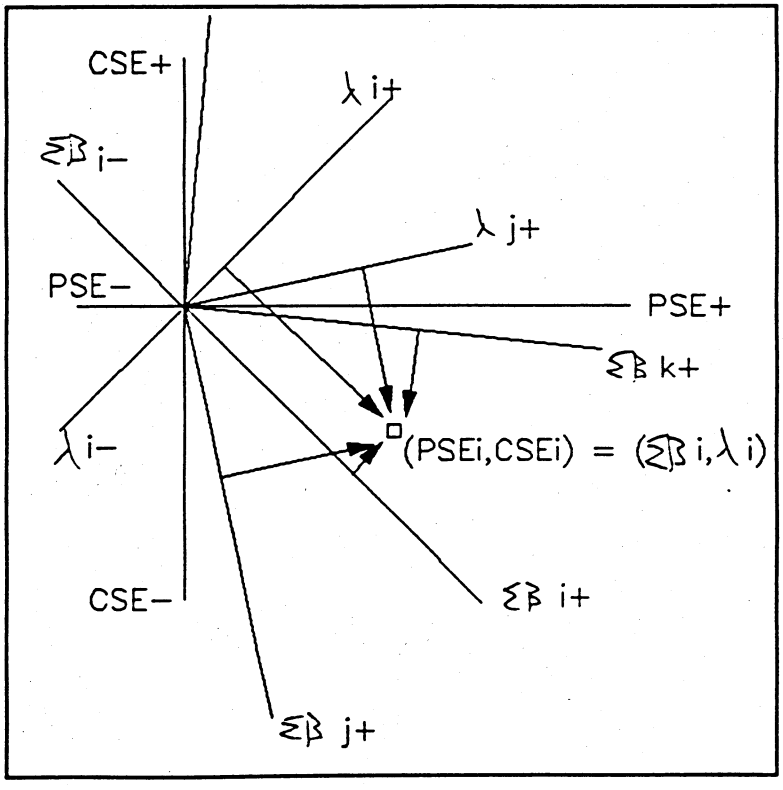
---

[5]This variable available for all countries in the sample (IBRD, 1986) and is highly correlated with: a) the budget share allocated to food and agricultural products--and, indirectly, the elasticity of demand; b) the agricultural proportion of the labor force; c) economic development and the integration of the domestic market.

government agricultural policies. All agriculture specific policies are converted into 'subsidy equivalents,' the lump sum cash payment that would leave producers or consumers indifferent between the subsidy or the existence of the intervention.

When the subsidy equivalent for producers (consumers) of a commodity in a given year is divided by the total value produced (consumed) of the commodity, the result is called the percentage SE. The percentage SE provides a reasonable measure of the tax rate (if negative) or subsidy rate (if positive) on the consumers or producers of a commodity. Producer and consumer subsidy equivalent (PSE and CSE) henceforth refer to their percentage measures.[6]

SEs may be employed as indicators of revealed political weights. The Figure plots a Cartesian product (PSE,CSE); if the quantity produced equals the quantity consumed, the set of tax (SE) rates which balance the budget for a given commodity program is CSE = -PSE, that is, a line through the origin with the slope -1. The budget deficit or surplus for any pair of rates is measured by the length of the perpendicular to the balanced budget diagonal. The set of tax rates which reveal equal political weights is PSE = CSE, that is, a line through the origin with the slope +1. The net political bias for any set of taxes (Σßi = ßp+ßc) can be measured by the length of the perpendicular to the zero bias diagonal.



The Cartesian product (Σßi,λ) is determined by rotating the axes of the (PSE,CSE) coordinate system by, in this case, $\theta = -45°$. The degree of rotation varies with the ratio of production to consumption: if production exceeds consumption, then a higher tax rate must be levied on consumers than on producers if accounts are to balance. The angle of rotation is the cotangent of the slope of the balanced budget axis, as measured in (PSE,CSE) space: $\theta = \tan^{-1}(-Pq/Cq)$.[7] In the figure three possible cases are displayed: i has zero net trade in the commodity; j is a net exporter; and k

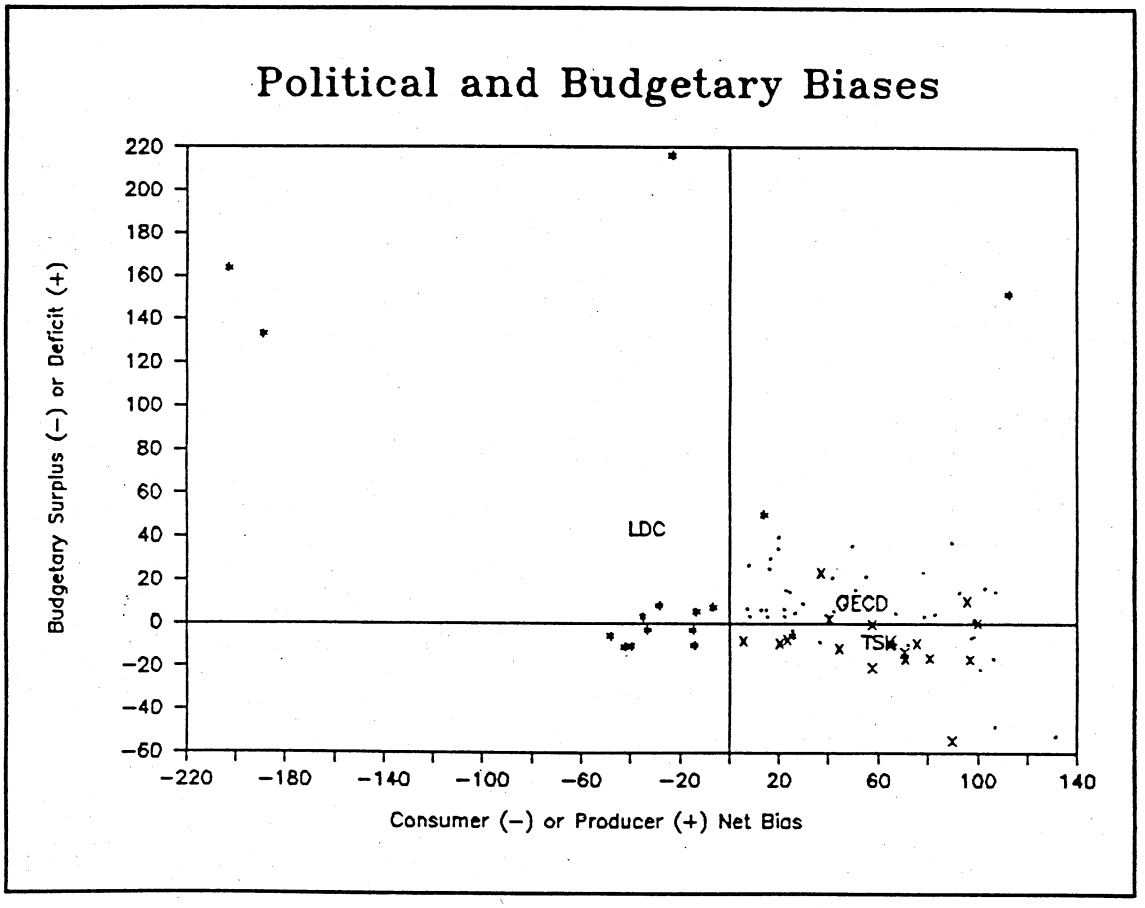
---

[6] The sources of SE data are USDA (1988) and OECD (1987), both organizations estimate SEs for use in the Uruguay round of GATT negotiations. SEs, however, are not particularly appropriate measure for these purposes as they aggregate domestic and trade distorting measures; see Schwartz and Parker (1988) for discussion and references.

[7] $\Sigma\beta i = PSE * \cos\theta + CSE * \sin\theta$;
$\lambda = CSE * \cos\theta - PSE * \sin\theta$.

is a net importer. The different magnitudes of the perpendiculars from the budget and bias diagonals reveal that the same (PSE,CSE) value will have different ($\Sigma\beta,\lambda$) values as net trade differs.

The graph below plots the ($\Sigma\beta,\lambda$) values for 80 observations.[8] The observations are grouped and signified as: LDCs (*), Taiwan and South Korea(x), and OECD countries (.). Group means are plotted, denoted by LDC, TSK, and OECD respectively. Table 1 contains significance tests of the differences between group means in both dimensions.



All differences proved significant except for the political bias measures between Taiwan/S.Korea and OECD. The LDC data points are located in the far NW of the graph, proved to be very significant outliers; these points are observations on Nigeria for which the overvaluation of the Naira was included as an agricultural policy variable in the USDA's calculation of SEs. Such macro-economic instruments were not included for other countries, and we subsequently employed a dummy variable to absorb the effects of the measurement bias in regression analysis.

[8]Country/commodity observations included in the analysis are in an appendix.

Table 1

Difference of Means Tests

	t stat		t-stat	d.f.
$\Sigma\beta_{12}$	5.03**	λ_{12}	2.82**	31
$\Sigma\beta_{13}$	6.43**	λ_{13}	2.88*	61
$\Sigma\beta_{23}$	0.75	λ_{23}	3.57**	62

1 = LDCs 2 = Taiwan & S. Korea 3 = OECD
level of significance: * ≤ .01, ** ≤ .001

The regression results reported in Table 2 clearly do not sustain the null hypothesis that government intervention in agriculture is random; indeed, the number of coefficients signficantly different from zero support the validity of the

Table 2

Regression Results

Dependent Variable		$\Sigma\beta$	$\Sigma\beta$	λ	λ
Constant		70.73	64.79	3.35	9.47
Ag/GDP		-3.54 (5.51)***	-2.09 (3.44)***	0.94 (1.75)**	-0.55 (1.22)
NetTrade		-4.36 (1.33)*	-5.79 (2.07)**	1.35 (0.50)	2.83 (1.36)*
DNigeria			-130 (5.45)***		134.2 (7.59)***
R^2		.284	.485	.038	.452
F		15.29***	23.91***	1.55***	20.97***
N=80	d.f.	77	76	77	76

t statistics in parentheses, levels of significance: * ≤ .10, ** ≤ .05, *** ≤ .005

three propositions. That the bias of intervention turns from consumers ($\Sigma\beta<0$) to producers ($\Sigma\beta>0$) during the course of economic development is supported by the significant negative coefficients for the Ag/GDP variable in the $\Sigma\beta$ equations. That net commodity trade is negatively related to the degree of producer bias (importing governments supply more

protection to producers than exporting governments) is supported by the significant negative coefficients for the NetTrade variable in the $\Sigma\beta$ equations. That the net budgetary position of commodity intervention ($-\lambda$: surplus, $+\lambda$: deficit) is negatively related to net commodity trade is supported by the significant positive coefficient for NetTrade in the λ equations.

Conclusion

This analysis must ultimately be considered as an initial analysis of a larger research program: as data on more countries and commodities becomes available and as a consistent methodology for measuring intervention and identifying the various instruments of intervention develops, the prospects for broadening the scope applying the positive theory of regulation to agricultural policy will be greatly improved. While data has limited the present work to inter-country comparisions, future work should look to explaining instrument choices and inter-commodity differences.

References

IBRD (1986) **World Development Report, 1986.** Oxford Univ Press.

OECD (1987) **National Policies and Agricultural Trade**, OECD Paris.

Peltzman, S. (1976) "Toward a More General Theory of Regulation," **J.Law and Econ.** 19(2): 211-240.

Posner, R. (1974) "Theories of Economic Regulation," **Bell J.Econ.** 5:335-358.

Schwartz, N. and Parker, S. (1988) "Measuring Government Intervention in Agriculture for the GATT Negotiations," **Amer.J.Agr.Econ**, 70(5):1137-1145.

Stigler, G. (1971) The Theory of Economic Regulation, **Bell J.Econ.** 2:3-21.

Stigler, G. (1975) "Free Riders and Collective Action: An Appendix to Theories of Economic Regulation," **Bell J.Econ.** 5:359-365.

USDA, Economic Research Sevice (1988) **Estimates of Producer and Consumer Subsidy Equivalents: Government Intervention in Agriculture, 1982-86.** Staff Report AGES880127.

Data Employed in the Analysis

USDA data

	wheat	rice	corn	barley	sorghum	soybeans
Argentina	x		x		x	x
Canada	x		x	x		
EC	xx[9]	x	x	x		
India	x	x				
Indonesia		x				
Japan	x	x		x		
Nigeria	x	x				
RSA[10]	x		x			
S.Korea		x		x		x
Taiwan	x	x	x		x	x
USA	x			x		

	sugar	cotton	milk	beef	pork	poultry
Argentina						
Canada		x			x	
EC	x		xx[11]	x	x	
India	xx[12]					
Japan		xx[13]	x	x	x	
Nigeria	x	x				
RSA	x					
S.Korea			x	x	x	xx[14]
Taiwan	x		x	x		x
USA	x			x		x

OECD data

	wheat	rice	coarse grains	sugar	eggs
Australia	x	x	x	x	x
Austria	x		x	x	x
Finland	x		x	x	x
Sweden	x		x	x	
USA	x	x		x	

[9]Two observations: soft wheat and durum wheat

[10]Republic of South Africa

[11]Two observations: beef/veal and sheep

[12]Two observations: medium and long staple cotton

[13]Two observations: fresh (or fluid) milk and dairy products

[14]Two observations: chicken meat and eggs