A PUBLIC CHOICE PERSPECTIVE ON AGRICULTURAL ADJUSTMENT ASSISTANCE

Jeff Gow and Brian Davidson

November 1994

UNE Working Papers in Economics No. 14

Editor

John Pullen

Department of Economics University of New England Armidale New South Wales 2351 Australia

ISBN 1 86389 220 6

r

*

.

t .

A PUBLIC CHOICE PERSPECTIVE OF THE RURAL ADJUSTMENT SCHEME

by

Jeff Gow^1 and Brian Davidson²

1 Department of Economics

2 Department of Agricultural and Resource Economics

University of New England

Armidale, N.S.W. Australia

June 1994

Abstract

The aim of this paper is to examine the provision of adjustment assistance to the agricultural sector, through the Rural Adjustment Scheme, using an interest group model. This model, draws on public choice theory which posits that self interested, utility maximising, homogenous interest groups will gain from regulation proclaimed in their interests. The method of analysis involves using a comparative static approach to obtain estimates of the impacts of the policy. The indicators used were the output price and quantity changes, the producer and consumer surplus changes and the welfare weights of producers in a political preference function. Five agricultural industries are examined over seven years. The results of the analysis were mixed. Producers, who were the interest group expected to gain from the policy, had their economic surpluses reduced, received a lower output price and their welfare weighting by policy makers was lower than consumers. These results, plus the sensitivity analysis, tend to provide evidence that refutes the public choice view that regulation occurs and continues in response to the benefits that narrowly focused interest groups receive. These findings are also in contrast to previous studies which found that the interest group model provided a good explanation for the observed level of assistance to agriculture.

Introduction

The aim of this study is to examine, from a political economy viewpoint, the provision of adjustment assistance to Australian farmers. A quantitative investigation of the policy impacts will be undertaken using an interest group model. The interest group approach is one of many areas within the public choice field of economics. Public choice theory, the application of economic theory to political behaviour, posits that policy outcomes result from the actions of self interested, utility maximising, homogenous, interest groups. In return for economic benefits, those groups who expect to gain from a particular policy will actively support and lobby for it. A test for the theory is to examine the economic impacts of the policy. In this study a comparative static approach is used to estimate the output price and quantity effects, the producer and consumer surplus changes and the welfare weight of producers in a political preference function.

Background

Agricultural adjustment assistance is provided to Australian farmers to assist them to react to the forces causing structural change in agriculture. The method of assistance is a subsidy on the credit costs of farmers. The policy vehicle for delivering assistance is the Rural Adjustment Scheme.

The primary aim of the provision of the credit subsidy is to increase the efficiency of resources used in agriculture. This is achieved by recombining agricultural resources into more efficient and/or larger units of production. However, within the economics profession there is some criticism of subsidised credit programs generally, and the Scheme specifically. It is claimed by various authors that this policy instrument does not increase efficiency and that it is just another method by which government provides assistance to a clearly defined interest group in society. It could be hypothesised that the provision and continuance of assistance to farmers through the Scheme is the result of the gains that farmers appropriate from government and the market, as a result of the provision of the credit subsidy.

The forces for structural change in agriculture, which result in adjustment by farmers, are many and varied. It is claimed (Musgrave, 1990, 250) that adjustment does not occur quickly enough, as farm incomes are lower on average than the rest of society. The social costs which result from this less than optimal level of adjustment are used to justify the assistance policy.

There are two competing theoretical frameworks which are used to justify government intervention in the economy: the public and private interest theories of regulation. In recent years, the private theory approach, of which public choice theory is a branch, has been increasingly used in assessments of policy intervention. This is the approach used in this study to examine the provision of adjustment assistance to Australian farmers.

This study is justified on three grounds. First, it could be argued that agricultural adjustment assistance, does not increase the efficiency with which agricultural resources are used, despite the efficiency arguments for its provision. Hence, the policy is viewed merely as a means of providing economic transfers to farmers. Second, the interest group approach of public choice theory appears to offer a plausible explanation for the Scheme's continued provision despite reservations expressed about it by various authors: notably Industries Assistance Commission (1984), Wonder (1987), Martin, (1990a), amongst many others. More generally, the economics literature on subsidised credit does not support providing assistance to farmers on efficiency grounds. Third, the proponents of the interest group approach claim good results for the predictive and explanatory power of the model: see Anderson (1978, 1980), MacAulay and Musgrave (1982), MacAulay, Musgrave, Thomas and Burge (1985). Only a few studies in Australia have attempted to empirically examine the interest group aspects of public choice theory by applying it to specific regulatory situations. The test of good theory is in its empirical validation. In all of these studies (except Anderson, 1978) the authors applied the econometric approach, rather than the comparative statics approach. A problem with the econometric approach is that it tends to be highly aggregate, whereas the comparative static approach allows for a more detailed approach. In this study the

comparative static approach is used to test if the theory explains the provision of adjustment assistance to the agricultural sector.

Method

The purpose of the method is to attempt to explain assistance with reference to the political-economic market for regulation. The changes in consumer and producer supluses that result from the policy effects on output price and quantity are estimated. The explanation is based partly on a political preference function which depends on the impacts of the subsidised credit policy. The effect this instrument has on market parameters and on the political welfare weights is estimated. Examination of the price impacts of the policy will enable the producers welfare weight in the political preference function to be estimated. The value the weight takes will assist explanation of the policy in terms of interest group activity to be made. The producer weights are estimated using ex-post observations on the output price parameter to infer the values the weights take.

The method employed involves three stages. First, a factor price model is used to calculate the effects fo the subsidy on the price and quantity of outputs in the industries examined. Second, a welfare economics model is used to calculate the economic transfers that teresult from the policy. Third, a political model of interest group activity is used to estimate producer welfare weights in a political preference function.

A comparative statics approach is used to estimate the policy impacts and the producer welfare weights in the political preference function. The general form of comparative statics analysis of policy instruments consists of changing a policy while holding all other endogenous factors in the model constant, and analysing the consequences of the policy change for variables of interest such as output price and quantity. In policy analysis involving input subsidies, it is necessary to model the output and input markets to estimate the impact of the policy upon the price and quantity of output.

The political economy approach used in this study is outside of the more usual neoclassical approaches to the study of regulation which focus on economic efficiency. In this study the main focus is on the distributional consequences, which is achieved by identifying the winners and losers that result from the regulation and quantifying the magnitudes of these effects. Thus, the validity of the interest group approach can be tested. An analysis will be conducted on the model to determine how sensitive the results are to changes in the variables and parameters used in the model.

The factor price model used to estimate the price and quantity impacts of the policy was developed by Floyd (1965) and Gardner (1987, 89-93). The model characteristics a market for one output which is produce from only two inputs. Consequently, there are six unknown variables; the quantities and prices of the imputs and the output. Six linear equations are specified which determine the prices and quantities of the inputs and output. Appendix A shows the model used.

A welfare economics model is used to estimate the ex-post transfers from the subsidy. The method of estimating the impacts of a subsidy on credit and its distribution, involves measuring the changes in consumer and producer surpluses that result from a shift in an industries supply curve which corresponds to a shift in an industries' production function. It is assumed that demand and supply have the usual slopes and that they are linear. Appendix B shows the model used.

It can be asserted that in most economic assessments, the formulation and implementation of policies are viewed independently from the political process. However, political and economic markets are not independent entities. Economic outcomes result from policy formulation and implementation and political outcomes result from the interaction of economic interests in the political market. Moreover, current policies reflect a political-economic equilibrium which takes into account all the relevant forces which are represented by interest groups.

It is assumed that policy choice in society is governed by a criterion function. This criterion function is a political preference function, which reflects the power and

influence of interest groups in obtaining transfers (Becker, 1983). The function is made up of performance measures for each interest group. The usual representation of an interest group's performance in obtaining regulation are increases in either income and or economic surplus.

According to the political model, government maximises a political preference function whose arguments are the weighted transfers of different interest groups. In its simplest form it is assumed that only two interest groups exist, producers and non-producers, and that their well being can be accurately measured by producer and consumer surpluses, respectively. In the function, the implicit weights placed on producers and consumers surpluses reflect the degree to which those surpluses affect political support. The framework embraces the objectives and decision rules of government and the two interest groups. Policy represents an equilibrium outcome in political economic markets. In other words, the observed policy is the result of the structural framework or, equivalently, is the outcome of maximising the political preference function. This maximisation problem of government results in political efficiency which invariably does not correspond to economic efficiency.

In this study a weighted aggregation of consumers and producers surpluses is used to represent the parameters in the function. The mathematical form of the function is assumed here to be a linear function. Estimates of the surpluses and the associated weights are undertaken using the comparative statics algebra approach.

Political preferences have many goals with differing weights on each goal. Interest groups attempt to change the preference of governments. Hence, the weights attached to goals, or performance measures that relate to their well-being are constantly changing. How these weights change is a direct result of political-economic demand and supply. In an empirical specification of this relationship, political welfare weights associated with transfers taking place will be represented by a parameter, (θ) which can either be determined ex-ante and exogenously, or derived ex-post and assumed to be determined endogenously. In the latter case the weights associated with the various

performance measures will not be constant. The analysis of the interest group theory involves, in part, the measurement and change of these weights.

In this study it is assumed that a political equilibrium exists and that the policy instrument level is determined endogenously. The past actual levels of the policy instrument are assumed to be optimal, and that policy makers maximised their criterion function. Using estimates of the policy effects for the factor price model on output prices and quantities it is inferred what the political welfare weight for producer groups must have been in the political preference function. Using the values from the factor price model, the without subsidy equilibrium quantity and price, can be estimated. The observed output market quantity and price are already known, therefore substituting those values plus the elasticity values into the estimating equation (C.7"), it is possible to calculate the weight for each industry in each year in question. Hence the change in political influence over years and over industries can be calculated. Values of the weight greater than one suggest that interest group pressure by producers results in a preferred welfare weighting toward them by policy makers. Appendix C shows the model used.

This endogenous policy determined approach to discover the political weighting of producers surpluses has been previously applied in an agricultural context by Rausser and Freebairn (1974), Zusman and Amiad (1977) and Oehmke and Yao (1990). In those studies an econometric approach was used to derive estimates of the price and quantity effects which were used to estimate the producer welfare weight, instead of the comparative statics approach that has been used here.

Data

Data are required on the factor shares, and elasticities of input supply, output demand and supply, along with the observed output prices and quantities of a range of agricultural industries over a number of years. The wool, beef, wheat, dairy and sugar industries will be assessed in this study, over the period from 1985-86 to 1991-92. These five industries received approximately two thirds to three quarters of the subsidy

assistance in each year, (see Table 1). The wool, wheat and beef industries were selected because of the size of the level of subsidy received by producers and the gross value of production. Wool, wheat and beef production rank as the first, second and third most valuable agricultural industries in Australia, in terms of the gross value of production. They are also the three largest recipient industries of assistance. The wool industry has received approximately 30 to 40 per cent of total assistance over the past five years. The wheat and beef industries have received 25 to 33 per cent and 12 to 15 per cent respectively during the same time period. The final two industries, dairy and sugar, were selected as they received significant levels of assistance, and second, because, their production systems are intensive and geographically concentrated. These latter characteristics are believed to assist producers in agricultural industries in their lobbying efforts, resulting in increased levels of assistance.

The data on adjustment assistance on an industry by industry basis was not available prior to 1985-86. Consequently, the data used in this study is constrained to the years from 1985-86 to 1991-92. This provides seven observations over five industries, more than enough to apply the comparative static model.

The data on factor shares and output prices and quantities were obtained from ABARE Commodity Statistical Bulletins. The elasticities of input supply, output demand and supply were obtained from the literature. The main endogenous variables of interest from the factor price model are output price (P_x) and quantity (X). The relationship between the price and quantity variables and a change in the policy is determined by six parameters made up of two factor shares and four elasticities, viz.:

- factor share of credit input a in total costs of production (Ka);
- factor share of all other inputs b in total costs of production (Kb);
- elasticity of supply of credit input a, (e_a);
- elasticity of supply of all other inputs b, (e_b);
- elasticity of substitution in production between the credit input and all other inputs, (σ); and elasticity of product demand (η).

	<u>1985-86</u>	<u>1986-87</u>	<u> 1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u> 1991-92</u>
Wool	10.1	6.7	16.2	17.5	18.1	26.2	58.1
Beef	1.9	2.9	5.2	7.0	7.2	8.4	21.0
Wheat	17.2	7.1	14.8	19.6	13.7	15.5	39.0
Dairy	8.6	3.1	2.5	2.6	4.1	3.4	11.8
Sugar	4.8	1.3	0.0	0.4	0.5	0.8	3.6
Others (a)	20.1	12.8	4.2	6.1	9.7	8.2	23.8
Total	62.7	33.9	42.9	53.2	53.3	62.5	157.3

Table 1. Rural Adjustment Scheme Subsidy by Industry (\$ million)

Note: (a) includes administration costs and welfare assistance

Sources: calculated from Rural Adjustment Scheme Annual Reports (1985-86, 32-38) and (1986-87, 20-29) and written and personal communications with individual state managing authorities of the Scheme. In each state and territory:
New South Wales: Rural Assistance Authority of New South Wales Victoria: Rural Finance Corporation of Victoria Queensland: Queensland Industry Development Corporation South Australia: South Australian Department of Agriculture Western Australia: Rural Adjustment and Finance Corporation Tasmania: Tasmanian Development Authority, and Northern Territory: Department of Primary Industries and Fisheries

These factor shares were calculated by dividing the interest paid by total costs incurred by producers. By default, the factor share of all other inputs (K_b) is equal to 1- K_a . Details on the total costs and interest paid were obtained from ABARE Farm Surveys.

As estimates of the elasticities of supply of inputs could not been found these values were assumed. Given the apparent reluctance of farmers to move both labour and land resources out of agriculture, it has been assumed that the elasticities of all other input supplies is inelastic at 0.5. The elasticity for credit is assumed to be relatively more elastic at 2. A sensitivity analysis will be conducted on these values.

Estimates of output demand and supply are outlined in Tables 2 and 3. These estimates were obtained from a number of different published sources. While the techniques and time frames used to estimate these elasticities varied across those studies, the estimates exhibit an almost uniform inelastic response. Given the variability of the estimates, some degree of approximation must be made to obtain the final values which can be used for estimation purposes. These approximated values of the elasticities are presented in Table 4. Sensitivity analysis is conducted on the approximated elasticities.

The elasticity of substitution in production between the credit input and all other inputs, is assumed to be equal to one in all industries as no estimates were available on this parameter. The implication of this assumption is that credit and all other inputs can be substituted for one another equally. Clearly this is an unrealistic assumption, land and labour are less elastic than credit. Sensitivity analysis is conducted on this parameter, to ascertain whether this assumption is valid.

The data needed to estimate the 'without' policy output price and quantity values are now presented. These values are needed to estimate the producer and consumer surplus changes and the producer welfare weights in the political preference function. The 'with' and 'without' policy output price and quantity values are presented in Tables 5, 6, 7 and 8.

Table 2.	Estimates of Elasticities	of Output Demand
	Demand Elasticity	Source:
Wool	-0.85(SR) to -1.0(LR)	ABARE (1990)
Beef	-1.19	Fisher (1979)
Beef	-0.98	Dewbre, Shaw, Corra and Harris (1985)
Wheat	-0.65	Gruen (1967)
Dairy (milk)	-0.28	Davidson, MacAulay and Powell (1989)
Sugar	-0.57	Gruen (1967)
Sugar	-0.076 to -0.024	Wong, Sturgiss and Borrell (1989)

Note: SR is the short run

LR is the long run

 Table 3.
 Estimates of Elasticities of Output Supply

	Supply Elasticity	Source:
Wool	0.25(SR) to 0.36(MR)	Wicks & Dillon (1978)
	0.72	McKay, Lawrence and Vlastuin (1983)
	0.39	Dewbre, Shaw, Corra and Harris (1985)
	0.26(SR)	Johnson, Powell and Dixon (1990)
	0.2(SR) to 0.6 (LR)	ABARE (1990)
Beef	0.69(SR) to 0.90(MR)	Wicks & Dillon (1978)
	0.12	McKay, Lawrence and Vlastuin (1983)
	0.34	Dewbre, Shaw, Corra and Harris (1985)
	0.36(SR)	Johnson, Powell and Dixon (1990)
Wheat	0.5	McKay, Lawrence and Vlastuin (1983)
	0.92	Dewbre, Shaw, Corra and Harris (1985)
	0.3	Lawrence and Zeitsch (1990)
	0.55(SR)	Johnson, Powell and Dixon (1990)
Dairy (milk)	0.2(SR) to 0.43(LR)	Gruen (1967)
Sugar	0.24 to 0.32 (SR)	Wong, Sturgiss and Borrell (1989)
	0.13 to 0.27 (LR)	Wong, Sturgiss and Borrell (1989)
Note: SR	is the short run	
MR	t is the medium run	

LR is the long run

Table 4.	Assumed Elasticitie	s of Output Demand and	Supply
	Demand Elasticity	Supply Elasticity	
Wool	-0.8	0.6	
Beef	-1.0	0.4	
Wheat	-0.8	0.8	
Dairy	-0.3	0.4	
Sugar	-0.6	0.4	

Table 5.	Observed Equilibrium Output World Price (with subsidy)
	<u>(\$/tonne)</u>	

<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
3421	3955	6327	6473	5543	4138	3588
1713	1743	1867	2036	2127	2138	2064
167	147	163	212	195	132	189
196000	221000	239000	268000	286000	266000	291000
223	276	287	333	370	342	307
	1985-86 3421 1713 167 196000 223	1985-861986-873421395517131743167147196000221000223276	1985-861986-871987-88342139556327171317431867167147163196000221000239000223276287	1985-861986-871987-881988-8934213955632764731713174318672036167147163212196000221000239000268000223276287333	1985-861986-871987-881988-891989-903421395563276473554317131743186720362127167147163212195196000221000239000268000286000223276287333370	1985-861986-871987-881988-891989-901990-91342139556327647355434138171317431867203621272138167147163212195132196000221000239000268000286000266000223276287333370342

Source: ABARE Commodity Statistical Bulletin (1992)

- (a) average auction price (greasy) Table 41, p.41
- (b) weighted average saleyard price Table 63, p.61
- (c) Table 98, p.93
- (d) weighted average in \$/Megalitre Table 87, p.83
- (e) average price received by growers Table 161, p.161

Table 6. Estimated Price (without subsidy) (\$/tonne)

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
Wool	3439.62	3967.30	6376.77	6505.33	5570.36	4169.24	3688.30
Beef	1714.99	1745.39	1871.15	2041.23	2131.75	2144.31	2077.32
Wheat	168.50	147.57	164.50	215.19	196.58	133.26	193 .9 6
Dairy	198091	221753	239672	268605	286937	266746	293753
Sugar	225.61	276.81	287.00	333.37	370.47	342.48	308.43

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
Wool (a)	829	890	916	958	1102	1066	875
Beef (b)	1338	1476	1564	1551	1573	1738	1735
Wheat (c)	16167	16778	12369	14060	14214	15066	10688
Dairy (milk)(d)	6038	6176	6127	6291	6262	6403	6732
Sugar (e)	3378	3371	3439	3678	3797	3514	3110

 Table 7.
 Observed Equilibrium Output Quantity (with subsidy) (kilotonnes)

Source: ABARE Commodity Statistical Bulletin (1992)

(a) Table 41, p.41

(b) Table 55, p.53

(c) Table 98, p.93

(d) in ML, Table 82,p.79

(e) Table 160, p.161

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
Wool	825.39	887.79	910.24	954.17	1097.65	1059.56	855.43
Beef	1336.44	1473.98	1560.52	1547.02	1569.49	1732.87	1723.80
Wheat	16050.93	16725.83	12278.11	13890.74	14121.60	14950.56	10463.83
Dairy	6018.68	6169.69	6121.83	6286.74	6255.85	6397.62	6712.89
Sugar	3354.24	3365.05	3439.00	3675.58	3794.12	3511.05	3101.30

To estimate the producer welfare weights in the political preference function it will be necessary to calculate equation C.7". The data required to undertake this task are the output demand and supply estimates, presented in Table 4 and the 'with' policy and 'without' policy prices, reported in Tables 5 and 6.

Results

The main results are the output price and quantity changes, the producer and consumer surplus changes and the producer welfare weights in the political preference function. The purpose in this section is to present and discuss these results. A discussion of the implications of the results for the interest group and the political preference function approaches is undertaken in the next chapter.

The estimated output prices without the policy were shown in Table 6. The estimated output quantity without the policy were shown in Table 8. The estimates of the producer welfare weights in the political preference function are shown in Table 9. The estimated producer and consumer surplus changes are shown in Tables 10 to 14 for all industries.

In summary, the impacts of the policy that subsidise credit, and which is embodied in the Rural Adjustment Scheme, are that:

Producers:

- lose from the output price reduction ;
- gain from total quantity produced increasing;
- lose from the reduction in producer surplus ;
- lose from the welfare weighting of their surpluses ; and
- gain from the subsidy.

Consumers / Taxpayers:

- gain from the output price reduction ;
- gain from total quantity produced increasing;

- lose from the reduction in consumer surplus; and
- lose from the subsidy.

The values obtained from estimating the factor price model parameters for the price and quantity effects would seem to be reasonable, given the structure of the model used. Generally, the output price and quantity changes were below one per cent. As expected, the price and quantity changes were most dramatic in the last year examined, when the subsidy increased to all industries. Significant output price and quantity changes were evidenced in the wool and wheat industries in that year, approximately a two and one half per cent price fall and approximately a two per cent output quantity increase.

The changes in the policy results in a fall in both producer and consumer surpluses over all industries except one. While the impact on beef, is positive, it is not significantly different from zero. The main reason for a reduction in consumer and producer surpluses in all the other industries examined is that the positive impact the policy has on the quantity produced is outweighed by the negative impact it has on the output price.

A value of the political welfare weight for producers equal to one suggests that policy makers are indifferent between producers and consumers in redistributing welfare. Conversely, a weight value below one suggests that policy makers discriminate against producers and above one in favour of producers.

The estimates of the producer political weights for all industries over all years assessed are all below one. Consequently, the implication of this result is that policy makers value producer transfers at a lower level than transfers to consumers. Given the policy could notionally be called a 'pro-producer' policy, as producers receive a subsidy from taxpayers, these results would seem to be counter intuitive.

Table 9.	Value of Producers Welfare Weight in Political Preference							
	Function							
	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>	
Wool	0.9943	0.9967	0.9917	0.9947	0.9948	0.9921	0.9703	
Beef	0.9993	0.9992	0.9988	0.9986	0.9987	0.9983	0.9964	
Wheat	0.9856	0.9938	0.9852	0.9757	0.9869	0.9846	0.9575	
Dairy	0.9900	0.9968	0.9974	0.9979	0.9969	0.9974	0.9911	
Sugar	0.9922	0.9980	1.0000	0.9993	0.9992	0.9991	0.9969	

Table 10. Wool Industry Producer and Consumer Surplus Changes

Producer Surplus

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
With policy (\$m)	2363.34	2933.29	4829.61	5167.61	5090.32	3675.92	2616.25
No policy (\$m)	2365.86	2935.09	4836.97	5172.67	5095.25	3681.31	2629.24
Change (\$m)	-2.52	-1.80	-7.36	-5.06	-4.93	-5.38	-12.99

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
With policy (\$m)	1772.51	2199.97	3622.21	3875.71	3817.74	2756.94	1962.19
No policy (\$m)	1774.39	2201.32	3627.73	3879.5	3821.44	2760.98	1971.93
Change (\$m)	-1.89	-1.35	-5.52	-3.79	-3.69	-4.04	-9.74

Table 11. Beef Industry Producer and Consumer Surplus Changes

Producer Surplus

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
With policy (\$m)	2864.99	3215.84	3649.99	3947.30	4182.21	4644.81	4476.30
No policy (\$m)	2864.99	3215.83	3649.97	3947.27	4182.19	4644.76	4476.11
Change (\$m)	0.00	0.01	0.02	0.03	0.02	0.04	0.19

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
With policy (\$m)	1146.00	1286.33	1459.99	1578.92	1672.89	1857.92	1790.52
No policy (\$m)	1146.00	1286.33	1459.99	1578.91	1672.88	1857.91	1790.45
Change (\$m)	0.00	0.00	0.01	0.01	0.01	0.02	0.07

 Table 12.
 Wheat Industry Producer and Consumer Surplus Changes

Producer Surplus

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
With policy (\$m)	1687.43	1541.48	1260.09	1862.95	1732.33	1242.95	1262.52
No policy (\$m)	1690.35	1542.66	1262.32	1868.22	1735.05	1245.23	1268.45
Change (\$m)	-2.92	-1.18	-2.23	-5.27	-2.72	-2.29	-5.93

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
With policy (\$m)	1687.43	1541.48	1260.09	1862.95	1732.33	1242.95	1262.52
No policy (\$m)	1690.35	1542.66	1262.32	1868.22	1735.05	1245.23	1268.45
Change (\$m)	-2.92	-1.18	-2.23	-5.27	-2.72	-2.29	-5.93

 Table 13.
 Dairy Industry Producer and Consumer Surplus Changes

Producer Surplus

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
With policy (\$m)	1479.31	1706.12	1830.44	2107.49	2238.67	2129	2448.76
No policy (\$m)	1490.31	1710.18	1834.04	2110.81	2243.79	2133.17	2464.92
Change (\$m)	-11.00	-4.06	-3.60	-3.32	-5.13	-4.17	-16.15

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
With policy (\$m)	1972.41	2274.83	2440.59	2809.98	2984.89	2838.66	3265.02
No policy (\$m)	1987.07	2280.24	2445.38	2814.41	2991.72	2844.23	3286.55
Change (\$m)	-14.66	-5.42	-4.80	-4.43	-6.83	-5.56	-21.53

 Table 14.
 Sugar Industry Producer and Consumer Surplus Changes

Producer Surplus

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
With policy (\$m)	941.61	1163.00	1233.74	1530.97	1756.11	1502.24	1193.46
No policy (\$m)	945.95	1164.36	1233.74	1531.64	1757.00	1503.07	1195.67
Change (\$m)	-4.34	-1.36	0.00	-0.67	-0.89	-0.84	-2.21

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
With policy (\$m)	627.74	775.33	822.49	1020.65	1170.74	1001.49	795.64
No policy (\$m)	630.63	776.23	822.49	1021.09	1171.33	1002.05	797.11
Change (\$m)	-2.89	-0.91	0.00	-0.45	-0.59	-0.56	-1.47

	<u>1985-86</u>	<u>1986-87</u>	<u>1987-88</u>	<u>1988-89</u>	<u>1989-90</u>	<u>1990-91</u>	<u>1991-92</u>
Wool	14.51	9.85	29.08	26.35	26.72	35.62	80.83
Beef	1.90	2.91	5.23	7.04	7.23	8.46	21.26
Wheat	23.04	9.46	19.26	30.14	19.14	20.08	5 0.86
Dairy	34.26	12.58	10.90	10.35	16.06	13.13	49.48
Sugar	12.03	3.57	0	1.52	1.98	2.20	7.28
Total (Loss)	85.74	38.37	64.47	75.4	71.13	79.49	209.71

Table 15. O	verall	Welfare	Impact	of the	Rural A	Adjustment	<u>Scheme</u>

Source : Tables 1,10,11,12,13,14.

Note: This is an underestimate of the welfare impact of the policy due to excluding "Others" in Table 1 from the calculations.

Discussion of the Results

The political preference function approach has been used in past studies to infer the existence of bias in policy makers criterion function toward farmers. The studies by Rausser and Freebairn (1974), Zusman and Amiad (1977) and Oehmke and Yao (1990) confirm this result. All of those studies found in differing policy contexts, that the welfare weights of producers were higher than the weights of consumers and taxpayers.

Rausser and Freebairn (1974) reported from their estimates of policy preference functions for United States of America beef import quotas that policy makers over a ten year period weighted a two dollar increase in beef producer returns as approximately equivalent in social value to a one dollar decrease in consumer costs. The measuring stick used in both instances was the impact of the policy on output prices.

Oehmke and Yao (1990) examined government intervention in the United States of America wheat market over an eight year period through government commodity programs, stock accumulations and research expenditures. The policy instruments they examined were target prices, government sales of wheat stocks, and public research expenditure. They found that wheat producers were weighted more highly than taxpayers and consumers by policy makers. They estimated that the weight of producers places an eighty per cent premium on their surpluses relative to wheat consumers and taxpayers surpluses.

In this study however, a reverse result was found. Namely, that policy makers do not favour producers over consumers. The primary reason for this result is the policy instrument examined in this study. Given that the producer welfare weight is a function of the output price impact, a subsidy on an input reduces the output price received by producers. Therefore, the policy impacts negatively on the economic surplus changes, resulting in reduced producer surpluses. The results are reasonable as they are consistent with these other studies and they pass the test of common sense.

Sensitivity Analysis

In the earlier analysis a number of assumptions were made regarding the values of selected parameters. The results that were derived from this analysis are dependent upon all the parameters used in the model. In this section sensitivity analysis is undertaken on all parameters to gauge the effect of changes in them on the results. The impact of changing the values that the elasticity of supply of credit input a, (e_a) , the elasticity of supply of all other inputs b, (e_b) , and the elasticity of substitution in production between the credit input and all other inputs, (σ) , had very little impact on the estimates.

Only two variables have a significant impact on the results discussed in the last section. They are the elasticity of output demand and the elasticity of output supply. The elasticities of input supply for credit (e_a) and the elasticity of supply of all other inputs (e_b) were changed from elastic to inelastic and inelastic to elastic, respectively and with only a minimal impact being observed. The elasticity of substitution in production between the credit input and all other inputs, (σ) was varied from unity elastic to inelastic to inelastic and then to very elastic and only a minor impact on the original results was observed.

Changes in the elasticity of product demand (η) from inelastic to elastic and then very elastic had a discernible effects on the consumer and producer surpluses and the producer welfare weights. The elasticity of output supply (ε) was also changed from inelastic to elastic. The principal effect was to reduce the losses in producer surplus.

The initial change that was undertaken was to double the elasticities of demand for four of the industries and quadruple the dairy industry elasticity. The total percentage change in output price fell by approximately 40 per cent across all industries. The total percentage change in output quantity increased by approximately 30 per cent across all industries, except beef where it increased by 50 per cent.

The effects on producers and consumers surplus and the welfare weights were significant. Producer surplus change estimates for all industries became positive, increasing by approximately 300 per cent in the wool and wheat industries, by 120 per cent in dairy industry and by 130 per cent in the sugar industry. Consumer surplus change estimates for all industries also became positive, increasing by 200 per cent in the wool and wheat industries, by 100 per cent in the dairy industry and by 120 per cent in the sugar industry. The values of the producer welfare weights all moved toward one, implying that the bias of policy makers against producers under this policy is reduced when the elasticity of product demand is more elastic. An explanation of this phenomena is that the resultant output price impact of the policy is negligible, i.e. the output price without the policy becomes closer to the world price, or the with policy price, as the elasticity of product demand increases.

The change in the elasticity of demand from inelastic to very elastic (i.e. to a value of -50) has several effects. The resultant total percentage change in output price is not significantly different from zero, while the total percentage change in quantity increased across all industries. In the wool, beef and wheat industries the output prices changes increased by 60 per cent over the initial estimates. In the dairy and sugar industries the increases were 200 and 100 per cent respectively. The values of the producer welfare weights for all industries increased towards one and almost all equal to one. The changes in producer and consumer surpluses are positive for all industries.

However, the impacts of that change vary to a significant degree between producers and consumers. The change in consumer surplus is not significantly different from zero. Thus, the policy has a very small, but positive, impact on consumers surpluses. Conversely, the producer surplus change in all industries is positive and large when demand is very elastic. The magnitude of the producer surplus changes when compared to the initial change in the elasticity of product demand from slightly elastic to very elastic are that producer surplus in the wool and wheat industries increases by approximately 400 per cent. In the beef industry producer surplus increases by

approximately 150 per cent and in both the dairy and sugar industries increases by approximately 100 per cent.

A sensitive analysis was also conducted on the elasticity of supply which was originally found to be relatively inelastic. It was decided to change this assumption, in order to examine the impacts of an elastic value. Initially the values in all industries were changed to be slightly elastic (at 1.2). The total percentage change in price and quantity values remained unchanged. The effects of this change on the welfare weights are that they decrease. The consumer surpluses are unaltered by the increase in the supply elasticity, yet are still negative. While the producer surplus changes are still negative, the magnitude of the reductions are smaller. In all industries, except beef, the reduction in producer surplus is from one half to two thirds of the original estimates.

From the results it would appear that the subsidy on credit for farmers does not unilaterally benefit producers. Producers gain from receiving the subsidy and also from increased production. However they lose from receiving a lower output price and suffer from a reduction in producer surplus. The estimates of the producer welfare weights in the political preference function are indicative of the fact that producers are not favoured by policy makers through this policy measure. In the sensitivity analysis an examination of the affects differing supply and demand elasticities had on the original estimates were presented. Adjusting output demand to be more elastic than originally specified, resulted in the output price reduction being lessened and the producer surplus change becoming positive. If output supply is more elastic than initially assumed then the producer surplus changes are still negative, although the magnitude of the reductions are smaller. The estimates of the producer welfare weights under all examined scenarios, do not increase above one.

The elasticity of product demand for the industries examined may not be inelastic as most of the commodities produced (with the exception of dairy) are exported. Changing the elasticity of product demand so that the elasticities are greater than one

has a marginal impact on the value of the producer welfare weights, but a more dramatic effect on the producer and consumer surpluses.

The change of the elasticity of product supply from a relatively inelastic value to an elastic, has an effect on the results. The producer welfare weights are marginally affected, whilst the producer and consumer surplus changes are more significant.

Implications of the Results

The aim of the section is to question the validity of the theory to explain the phenomena of agricultural adjustment assistance in Australia. As a consequence, central tenets of the theory are examined in light of the findings presented above. Finally, a discussion of the benefits of using the comparative static approach over the econometric approach is then made.

The Inconsistency of the Results and the Theory

The results of this study tend to refute the public choice view that regulation occurs and continues in response to the benefits that narrowly focused special interest groups receive from regulation. Producers are not the main beneficiaries from the policy. The impacts of the Scheme results in the output price and producer surpluses being reduced. The estimated weights of producers welfare embodied in the political preference function mean that policy makers would appear to favour consumers, rather than producers. However, producers do benefit as they receive the subsidy and they gain as the quantity of output rises. It could have been expected that, if the theory held, the groups that successfully lobby for assistance would receive increases in economic indicators such as, prices, surpluses and the level of subsidy.

The National Farmers Federation (1993, 124), the peak association of Australian farm organisations, supports the provision of adjustment assistance through the Rural Adjustment Scheme. Given that producers appear to lose from the Scheme's provision

a relevant question to ask is: Why do producers lobby for the Scheme when they clearly are not net gainers from its provision?

As the individual producer interest groups are silent on the costs of the Scheme to them, it is possibly safe to assume that they do not perceive themselves to be detrimentally affected by the Scheme. Or, alternatively, is it that they believe that they benefit from the Scheme ? It is probably fair to assume that consumers do not perceive any reduction in their surpluses as a result of the policy. Bureaucrats obtain power and control of the Scheme, individual State governments receive money and power as a result of their administration of the Scheme, whilst the Commonwealth government reduces the political heat upon itself by being seen to be 'doing something'. Perhaps these are some of the reasons why the Scheme continues.

Given that the interest group most affected i.e. producers, lose, it would appear that the theory does not explain the provision of the Rural Adjustment Scheme. The theory implies that interest groups have perfect knowledge and are only motivated by self interest. If this were true, it is unlikely that an interest group like the National Farmers Federation would support and lobby for the Scheme given the outcomes presented here.

Industry Characteristics and Assistance

Anderson (1978) analysed the pattern of assistance to different Australian agricultural industries and found that observed variation in the rates of assistance among them was due to the different characteristics of the industries. These characteristics included political as well as economic factors. The demand and supply for regulation will vary with those characteristics. His general conclusions were that those industries with an export orientation and large numbers of producers, like the wheat and beef industries, will receive relatively low levels of assistance. Conversely, those industries which are primarily import competing and have low numbers of producers, like tobacco and dairying, will receive high levels of assistance.

In justifying the beliefs outlined above, Anderson (1978) presented the following arguments. The export orientation of the relatively unassisted industries makes it difficult for government to assist them. Payment of an export subsidy, for example, is a drain on government revenue, whilst a tariff for import competing industries, which could deliver the same level of assistance, is an addition to revenue. As far as the import competing industries are concerned, they had several other characteristics which made it easier for governments to assist them. For example, the small number of producers generally made formation and on going management of an interest group easier. The associated problems of interest group management which were outlined earlier, such as transactions-cost and free-riders, are minimised in smaller groups. These industries were also assisted in this regard because they commonly had grower dominated organisations in existence that already performed marketing activities. Another feature of these industries generally was their geographical concentration. The interest group model postulates that geographical concentration further assists interest groups in their lobbying efforts.

The wool, beef and wheat industries were lightly assisted because they were relatively capital intensive, not declining, have large numbers of members who were geographically dispersed and had most of their output exported. The dairying, egg, apple and pear and tobacco industries were heavily assisted because they tended to be more labour intensive, they were declining, they had a small number of producers who tended to be geographically concentrated and most of their output was consumed domestically.

MacAulay and Musgrave (1982) and MacAulay, Musgrave, Thomas and Burge (1985) are two further examples of attempts to test the interest group model using agricultural policy examples from Australia. MacAulay and Musgrave (1982) attempted to estimate the supply and demand for assistance in agriculture. They posited variables like concentration of production, lobbying strength, number of farm establishments, effective rates of assistance, degree of organisation of farm lobby groups and others and

obtained estimates of those variables they considered important. Econometric estimation of equations representing the variables was undertaken and the authors claimed that the results were promising. In MacAulay and Musgrave (1982), the variations in budget allocations by the Commonwealth Government to the agricultural industries over the period 1955-56 to 1978-79 were examined. It was found that assistance to agriculture over that period was related positively to the value of agricultural exports, the exchange rate with the U.S. dollar and the size of the Commonwealth Government budget after 1973-74, and negatively to the size of the budget before 1974-75. In their 1985 study MacAulay, Musgrave, Thomas and Burge econometrically tested some of the hypotheses developed by Anderson (1978) about the amount of effective assistance provided to agriculture. They utilised the interest group model to show that demand and supply factors of regulation influenced the level of assistance evidenced over the period 1970-71 to 1980-81.

Anderson (1978), MacAulay and Musgrave (1982) and MacAulay, Musgrave, Thomas and Burge (1985) apparently provide strong evidence for the model. There appears a close relationship between the demand and supply factors first identified by Anderson and the level of assistance received by particular agricultural industries. If these studies are correct, then it would be expected that those industries that have:

- a high geographical concentration of production ;
- a domestic orientation as opposed to export orientation of production;
- a small number of producers ; and
- are in a declining industry.

would receive more assistance than those who do not display these characteristics.

In the three most heavily assisted industries, wool, wheat and beef, the first three conditions are violated. The wool and wheat industries have experienced a price slump over the past three years, which has reduced production in those industries. The dairy and sugar industries meet the first three conditions, yet receive a level of assistance through the Scheme commensurate with their relative size and importance in the

agricultural sector generally. Evaluating the characteristics of each of the five industries examined would suggest that the contentions the theory and Anderson (1978) propose, do not hold in this study.

Government Policies to Moderate Market Instability

Peltzmann (1976) hypothesised that policy makers use intervention to moderate market generated gains or losses. During 'good' times when incomes rise, the extent of policy interventions are reduced and conversely, during 'bad' times when incomes fall, funding will increase. It could be argued that the Scheme has been used to ameliorate the fluctuations and/or reductions in farm industry income which have been witnessed beginning in late 1989 and continuing to the present time. These large increases in funding for the Scheme have occurred during a time of prolonged low output prices and negative farm incomes. If this held, then it is anticipated that a lagged effect would be evidenced, given the policy environment within which the Scheme operates. The response by politicians of increasing funding for the Scheme should occur in the first or second year following an income fall and decreased funding following an income rise.

Martin (1990b, 203) also outlined the argument that adjustment policies like the Rural Adjustment Scheme made explicit the need for continuing adjustment to changing economic circumstances. In his discussion of 'Changes in ideas about industry assistance' he stated that:

> ' expansion of the Rural Adjustment Scheme (during a time of perceived 'rural crisis' in 1986) was that of throwing money at the problem to satisfy private interests which are exerting pressure.'

During 1986-87, funding for the Scheme increased and in subsequent years when the 'crisis' had abated funding was reduced. During the 'boom' years of 1988 to 1990 funding for the Scheme increased marginally. It wasn't until the next 'rural crisis' beginning in early 1990, and corresponding to the collapse of the reserve price scheme for wool, that funding increased in any significant manner. During 1991-92 funding

increased by 150 per cent in one year, and this level of funding was maintained in 1992-93 as commodity prices remained weak and a substantial percentage of farm incomes, approximately 50 per cent, remained negative. Given the continuing 'rural crisis' during 1993, funding for the Scheme during 1993-94 is to remain around the level of the previous two years, approximately \$160 million. It would seem plausible, given the arguments outlined above, that the Peltzmann hypothesis may hold, using the Scheme over the past seven years as a case study. A further test of the Peltzmann hypothesis will be when the present 'crisis' conditions in agriculture abate, to examine if funding for the Scheme falls to its pre 'crisis' levels.

Income Redistribution

Sieper (1982) examined the extent of assistance provided to Australian agriculture in terms of the demand and supply for regulation. Examination of seven policy instruments used to deliver assistance led Sieper to propose that the public interest model did not explain their provision. The conclusions drawn by Sieper are now summarised. The policies were mostly inefficient in achieving their stated goals and in their delivery. However, when examined in the context of the private interest theory, the resultant type of assistance accorded with government having as its primary goal the redistribution of income to producers. The resultant regulation was invariably inefficient and a burden on consumers. The method he used was 'to uncover the market and political conditions that would make the particular form of regulation the one that maximises the benefits to producers in the industry.' (Pincus and Withers, 1983, 54).

Sieper (1982) concluded that if regulation exists then it must be rational for some group and the role of the interest group model is to define the group, and try to estimate by how much they are benefiting from the regulation. Pincus and Withers (1983, 55) criticised the *ex-ante* approach of the model and claimed validation of the model would be complete if groups could be defined on an *ex-post* basis. As it presently stands identification of some or any group who stands to benefit, will validate the model,

however this may lead to erroneous results being obtained, whereby association is ascribed when in fact it may not be the causal factor.

In this instance, the impacts of the Scheme would tend to counter the argument by Sieper that government attempts to redistribute income to producers. The redistribution of income which occurs does not appear to explain the provision of the Scheme.

Other Explanations for the Provision of the Scheme

Interest group theory postulates that changes in policy instruments or the extent of their application is influenced mainly by interest groups. This views government as a passive body to be exploited. In fact, much of the changes to the Scheme evidenced over the past seven years were government responses to perceived ' rural crisis'. This involved outlining the deteriorating economic conditions of farmers in terms of drought or international commodity price falls or internal policy decisions by third party governments (Export Enhancement Program in the United States of America and production subsidies in the European Community) impacting adversely on Australian farmers. The widespread public view in recent years of a ' crisis on the land' has resulted in governments needing to be seen to be 'doing something'. The preferred policy instrument over the past five or so years has increasingly become the Scheme with its efficiency justifications, rather than the other policy instruments like price stabilisation schemes with their mainly equity orientations.

Martin (1990b, 198) stated:

'This development (the provision of agricultural adjustment assistance through the Rural Adjustment Scheme) would then be consistent with the public interest model.....Only if the private interest framework is interpreted in a much broader context than is usually the case would it be possible to reconcile this outcome with the private interest model. However at this level of generality, the private interest model loses the ability to explain why the distorting policies were chosen in the first place.'

The Comparative Static Approach versus the Econometric Approach

In this study the comparative static approach was used. This approach was preferred to the econometric approach because it provides more detailed and relevant information e.g. the producer and consumer surplus changes. More disaggregated results can be obtained from the comparative static approach than the econometric approach. As results were obtained on a year by year and industry by industry basis using this approach, rather than a cross sectional estimate using the econometric approach, then the comparative static approach was judged to be superior.

The other studies examined in this chapter used econometrics to test the interest group model. The occurrence of 'correct' expected signs which corresponded with *a priori* beliefs about the negative or positive influence variables had on the level of assistance evidenced, at a five or ten per cent level of statistical significance, was the justification used to claim acceptance or rejection of the interest group model. The advantages and, more particularly, the disadvantages associated with econometric estimation need to be heeded when interpreting the encouraging results for the interest group model presented in those studies.

Given the findings specified above, it is apparent that the private interest theory does not adequately explain the provision of the Rural Adjustment Scheme. The test of good theory is in its empirical validation. Given the apparent lack of support for the theory, its basis can now be open to (brief) criticism. Other analysts have also criticised the theory. In the next section some of those criticisms are aired.

Conclusions

The aim of this study was to examine from a political economy viewpoint, the provision of agricultural adjustment assistance to Australian farmers. This was done using an interest group model and a quantitative approach was taken to estimating the impacts of the policy. Public choice theory posits that policy outcomes result from the actions of utility maximising, homogenous interest groups. A quantitative approach

was taken to estimate the impacts of the policy. In this study the interest group approach of public choice theory was used to see how adequately the theory explained the policy.

A comparative static approach was used to estimate the interest group model. First, a factor price model was used to estimate the output price and quantity impacts of the policy. Second, these estimates of the price and quantity changes were used to estimate the producer and consumer surplus changes. Finally, estimates of the producer welfare weights in a political preference function were obtained.

The results obtained from estimating the interest group model were mixed. Producers, the interest group who are the most interested in and would be expected to be the main gainers from the policy, had their economic surpluses reduced, the output price of their commodities reduced and their welfare weighting by policy makers was lower than consumers. However, they did benefit from the provision of the subsidy and from production increasing as a result of the policy. Consumers / Taxpayers, the interest group who would have been expected not to benefit from the policy, were found to pay a lower price as a result of output increasing as well as paying the value of the subsidy in taxes. Sensitivity analysis on the model was conducted and only when supply and demand changed from inelastic to elastic were the results significantly altered.

These results, plus the sensitivity analysis, tend to provide evidence that refutes the public choice view that regulation occurs and continues in response to the benefits that narrowly focused interest groups obtain from the regulation. Farmers benefit from the policy, but are also penalised by the policy.

"NOTE

APPENDIX A

Factor Price Model

The factor price model presented here is a static, partial equilibrium one output, two input model. It is based on Floyd (1965) and is taken from Gardner (1987, 89-93).

The prices and quantities in question are:

- 1 output x.
- 2 inputs a, b.
- 6 linear equations in
- 6 mutually determined percentage change variables viz.
- 3 quantities Ex, Ea, Eb
- 3 prices EP_x, EP_a, EP_b.
- 1 exogenous policy instrument T_a.

The policy of interest, the subsidy on credit is modelled as the policy instrument T_a . The relationship among them is determined by 6 parameters made up of 2 factor shares (K_a, K_b) and 4 elasticities (σ, η, e_a, e_b) , where:

- σ is the elasticity of substitution in production between a and b and is assumed to be equal to one.
- η is the elasticity of product demand.
- e_a is the elasticity of supply of input a (credit).
- e_b is the elasticity of supply of input b (all other inputs aggregated).

The regulated input a (credit) receives a subsidy in producing agricultural output x. It is likely that $e_a > e_b$ given that land is included in b and it is a highly inelastic input.

The model consists of the following six equations:

Industry production function:

$$\mathbf{x} = \mathbf{f}(\mathbf{a}, \mathbf{b}) \tag{A.1}$$

Value of Marginal Product = factor price:

$$f_a P_x = P_a \tag{A.2}$$

$$f_b P_x = P_b \tag{A.3}$$

Factor supplies:

$$a = g(P_a) \tag{A.4}$$

$$b = h(P_b) \tag{A.5}$$

Product demand:

$$\mathbf{x} = \mathbf{D}(\mathbf{P}_{\mathbf{X}}) \tag{A.6}$$

In order to justify these equations as the representation of a one-output, two-input industry, we need the following assumptions:

- 1) the output market is competitive,
- 2) the input markets are competitive,
- 3) producers maximise profits, and
- 4) all firms are identical.

The last assumption may be taken as meaning that all units of a and b have the same characteristics and only one least-cost technology is available, which can be represented as a twice differentiable, concave production function that generates an average cost function of the familiar U-shape. These conditions imply that in the long run, all producers will be observed at the minimum of their average cost function so that the industry production function of equation (A.1) is linearly homogeneous and constant returns to scale are assumed. This in turn implies that elasticities of x with respect to a and b are equal to the factor shares and that the sum of factor payments exhausts the value of output ($xP_x = aP_a + bP_b$).

The slopes of supply and demand equations are assumed to have the normal signs, and an internal solution with positive prices and use of both inputs is assumed to exist. The six equations can be solved to find this equilibrium since there are six mutually-

determined (exogenous) variables in the system.

Since we are interested in changes in the system, take the total differentials of equations (4.1) to (4.6):

$$dx = f_a da + f_b db \tag{A.1'}$$

$$dP_a = df_a P_x + dP_x f_a \tag{A.2'}$$

 $df_a = f_{aa}da + f_{ab}db$

 $dP_a = f_{aa}Pxda + f_{ab}P_xdb + f_adP_x$

$$dP_b = f_{bb}Pxdb + f_{ba}P_xdb + f_bdP_x$$
(A.3')

$$da = g_a dP_a \tag{A.4'}$$

$$db = h_b dP_b \tag{A.5'}$$

$$dx = D_{X}dP_{X} \tag{A.6'}$$

Next we convert equations (A.1') to (A.6') to elasticity form and simplify. This requires four kinds of "tricks":

1. Convert differentials to percentage changes by dividing each by the relevant

variable. Percentage changes are denoted by the E operator, e.g., $EP_x = \frac{dP_x}{P_x}$

2. Convert partials to elasticities, e.g.,

$$g_{a} = \frac{\partial a}{\partial P_{a}} \\ = \frac{\partial a}{\partial P_{a}} \frac{P_{a}}{a}$$

Therefore,

$$g_a = e_a \frac{a}{P_a}$$

3. Eliminate all second partials of the production function by means of the

relations

$$f_{aa} = -\frac{bf_a f_b}{ax\sigma},$$

$$f_{bb} = -\frac{af_a f_b}{bx\sigma}, \text{ and }$$

$$f_{ab} = f_{ba} = \frac{f_a f_b}{\sigma x}$$

4. Eliminate f_a and f_b by substituting from equations (A.2) and (A.3):

$$f_a = \frac{P_a}{P_x}$$
, and
 $f_b = \frac{P_b}{P_x}$

The resulting equations are

$$\frac{dx}{xab} = \frac{P_a}{P_x xb} \frac{da}{a} + \frac{P_b}{P_x xa} \frac{db}{b}$$
[divide (A.1') by xab]

$$\frac{dx}{x} = \frac{P_a a}{P_x x} \frac{da}{a} + \frac{P_b b}{P_x x} \frac{db}{b}$$
[multiply by ab]
EX = K_a Ea + K_b Eb (A.1")

where K_a and K_b are the relative shares of a and b in total costs.

Dividing both sides of equation (A.2') by P_a , multiplying the right-hand side terms by a/a, b/b, and P_x/P_x , respectively, and substituting for f_{aa} , f_{ab} , f_a , and f_b as indicated in steps 3 and 4, we obtain

$$\frac{dP_{a}}{P_{a}} = -\frac{bf_{a}f_{b}}{ax\sigma} \frac{P_{x}a}{P_{a}} \frac{da}{a} + \frac{f_{a}f_{b}}{\sigma_{x}} \frac{P_{x}b}{P_{a}} \frac{db}{b} + \frac{f_{a}P_{x}}{P_{a}} \frac{dP_{x}}{P_{x}}$$

$$EP_{a} = -\frac{bP_{a}P_{b}}{ax\sigma P_{x}P_{x}} \frac{P_{x}a}{P_{a}} Ea + \frac{P_{a}P_{b}}{\sigma_{x}P_{x}P_{x}} \frac{P_{x}b}{P_{a}} Eb + \frac{P_{a}}{P_{x}} \frac{P_{x}}{P_{a}} EP_{x}$$

$$EP_{a} = -\frac{bP_{b}}{\sigma_{x}P_{x}} Ea + \frac{P_{b}b}{\sigma_{x}P_{x}} Eb + EP_{x}$$

$$EP_{a} = -\frac{K_{b}}{\sigma} Ea + \frac{K_{b}}{\sigma} Eb + EP_{x}$$
(A.2")

Similarly, from equations (4.3') to (4.6') we obtain

$$EP_{b} = -\frac{K_{a}}{\sigma}Eb + \frac{K_{a}}{\sigma}Ea + EP_{x}$$

$$\frac{da}{aP_{a}} = e_{a}\frac{a}{P_{a}a}\frac{dP_{a}}{P_{a}}$$

$$Ea = e_{a}EP_{a}$$
(A.3")

$$Eb = e_b EP_b \tag{A.5"}$$

$$EX = \eta EP_x \tag{A.6"}$$

We now have six linear equations in six mutually determined percentage change variables, Ex, Ea, Eb, EP_x , EP_a , and EP_b ; three quantities and three prices. The relationships among them are determined by six parameters, the two factor shares and the four elasticity parameters σ , η , e_a , and e_b . Writing these equations in matrix form in preparation for solving via Cramer's rule, the right-hand side is a column of zeros.

There are no constants in the equations. The only solutions are no percentage changes: $E(\bullet) = 0$. The economic meaning of this result is that we have a static system. The prices and quantities are all at given equilibrium levels, which we can obtain from equations (A.1) to (A.6). In percentage change terms, however, while we have a system all set up to analyse changes, we have introduced nothing to cause a change. Changes are introduced by selecting one of the variables and, by regulating it, directly make it a policy instrument. Comparative statics is then conducted by differentiating the system with respect to the policy instrument.

A.2 Exogenous Policy Instruments in the System

In order to analyse shifts in policy parameters, such as a subsidy, we need to add exogenous variables to equations (A.1") to (A.6"). Note that equation (A.6") has been moved to the first row and that the factor supply equations (the last two rows) are specified in price-dependent form. The resulting system of equations is shown in (A.7). In the model, the choice of a policy, for example, a credit subsidy represented by $-T_a$, does not fix any quantities or prices directly, but all must adjust to the change to maintain supply-demand equilibrium. In (A.7') all the variables have been divided by $-ET_a$, so that the percentage changes become cross elasticities, for example, $Ex / -ET_a$.

The preceding systems of equations can be expressed as $B_{6\times 6} X_{6\times 1} = Z_{6\times 1}$. We can solve for the variables $X = B^{-1}Z$. This gives reduced form equations which explain the variables X as a function of the parameters B and exogenous variables Z. The results are shown in Table A.1.

ſ	1	-η	0	0	0	0	Ex		0	
	1	0	-k _a	-k _b	0	0	EPx		0	
	0	1	k _b /σ	-k _b /σ	1	0	Ea	=	0	
	0	1	-k _a /σ	k _a /σ	0	1	Eb		0	
	0	0	-1/e _a	0	1	0	EPa		-ET _a	
L	0	0	0	-1/eb	0	1	EP _b		0	

 $\begin{bmatrix} \frac{1}{-ET_{a}} & \frac{-\eta}{-ET_{a}} & 0 & 0 & 0 & 0 \\ \frac{1}{-ET_{a}} & 0 & \frac{-k_{a}}{-ET_{a}} & \frac{-k_{b}}{-ET_{a}} & 0 & 0 \\ 0 & \frac{1}{-ET_{a}} & \frac{k_{b}/\sigma}{-ET_{a}} & \frac{-k_{b}/\sigma}{-ET_{a}} & \frac{1}{-ET_{a}} & 0 \\ 0 & \frac{1}{-ET_{a}} & \frac{-k_{a}/\sigma}{-ET_{a}} & \frac{k_{a}/\sigma}{-ET_{a}} & 0 & \frac{1}{-ET_{a}} \\ 0 & 0 & \frac{-1/e_{a}}{-ET_{a}} & 0 & \frac{1}{-ET_{a}} & 0 \\ 0 & 0 & 0 & \frac{-1/e_{b}}{-ET_{a}} & 0 & \frac{1}{-ET_{a}} \end{bmatrix}$ $\begin{bmatrix} \frac{Ex}{-ET_{a}} \\ \frac{Ep_{x}}{-ET_{a}} \\ \frac{Eb}{-ET_{a}} \\ \frac{Ep_{a}}{-ET_{a}} \\ \frac{EP_{b}}{-ET_{a}} \end{bmatrix} = \begin{bmatrix} 0 \\ 0 \\ 0 \\ 1 \\ 0 \end{bmatrix}$ (A.7')

45

(A.7)

Endogenous Variables	Effect of Exogenous Policy Variable (Ta)
P _x	$\frac{K_a e_a(e_b + \sigma)}{D}$
Pa	$\frac{e_a(e_b + K_a\sigma - K_b\eta)}{D}$
Pb	$\frac{K_a e_a(\sigma + \eta)}{D}$
Х	$\frac{K_a \eta e_a(e_b + \sigma)}{D}$
a	$\frac{e_a \sigma \eta - e_b (K_b \sigma - K_a \eta)}{D}$
b	$\frac{K_{a}e_{a}e_{b}(\sigma+\eta)}{D}$

Note: The denominator is the same for all parameters and is denoted by D where:

 $D = e_a e_b - \eta(\sigma + K_a e_b + K_b e_a) + \sigma(K_a e_a + K_b e_b), \text{ and}$

D>0 for $\eta < 0$, $e_a > 0$, $e_b > 0$.

Source: Gardner (1987, 107).

APPENDIX B

The Welfare Economics Model

To estimate the producer and consumer surpluses that result from the policy it is necessary to specify the demand and supply functions for the commodity in question. It is assumed that demand and supply have the usual slopes, i.e., D'(Q) < 0 and S'(Q) > 0, and that they are linear. The market demand and supply curves are denoted as:

$$Q_d = D(P) \tag{B.1}$$

$$Q_s = S(P) \tag{B.2}$$

where:

- Qd is the market demand function ;
- Q_s is the market supply function.

Given the assumption that the demand and supply functions are linear (B.1) and (B.2) can be specified as:

$$Q_d = a_0 - a_1 P$$
 (B.3)
 $Q_s = b_0 + b_1 P$ (B.4)

where:

- a₀ is the intercept of the demand function ;
- a₁ is the slope of the demand function ;
- b₀ is the intercept of the supply function ; and
- b₁ is the slope of the supply function.

It is possible to manipulate both functions to estimate the intercepts and slopes of both functions given observations on price and quantity and an estimate of the own-price elasticities of demand and supply respectively. Once the equations are defined, estimates of the consumer and producer surpluses, for both the with and without policy situations, can be made. It may have been possible to estimate the impact of the policy by changing the intercept of the supply function (b₀). However, the effect of a change in the policy is unknown, and was estimated using the factor price model. The difference between the two observations is the impact of the policy on the consumers and producers surpluses.

Consumer and producer surpluses can be estimated using the following equations:

Consumer Surplus =
$$\frac{PQ}{2\eta}$$
 (B.5)
Producer Surplus = $\frac{PQ}{2\varepsilon}$ (B.6)

where:

- P is output price ;
- Q is output quantity;
- η is the elasticity of product demand ; and
- ε is the elasticity of output supply.

Both consumer and producer surplus are estimated with the price and quantity values that exist from the with and without policy scenarios. The policy effect on both measures is the difference between those two values that are derived from the calculation of each measure.

APPENDIX C

Political Preference Function Model

The political preference function model presented here is based in part on Gardner (1987, 200-1).

The public choice (political) considerations are represented by a relevant weighting of consumers surplus, producers surplus and taxation in a social welfare function, which is taken to be the revealed preference function of the government. This social welfare function is represented by:

$$W = CS + \theta PS - T \tag{C.1}$$

where:

- W is welfare ;
- CS is consumer surplus ;
- PS is producer surplus;
- θ is the political welfare weight for producers; and
- T is taxpayer cost;

The consumer surplus, producer surplus and taxpayer costs are equal to:

$$CS = \int_{0}^{\hat{Q}} D(Q) dQ - P_{d}Q$$
(C.2)

$$PS = P_s \hat{Q} - \int_0^{\hat{Q}} S(Q) dQ$$
 (C.3)

$$\Gamma = (P_T - P_d)\hat{Q}$$
(C.4)

where:

- D (Q) is the price dependent demand function ;
- S (Q) is the price dependent supply function ;
- (P_d) is the price dependent demand price ;

- (P_s) is the price dependent supply price ;
- (\hat{Q}) is the observed output with the policy ;
- (P_T) is the with subsidy price ; and
- (P₀) is the without subsidy price.

The first order condition for a maximum is obtained by substituting equations (C.2), (C.3) and (C.4) into (C.1) and setting the derivative with respect to (\hat{Q}) equal to zero. This results in:

$$W = \int_{0}^{\hat{Q}} D(Q) dQ - P_{d} Q$$

+ $\theta \left[P_{s} \hat{Q} - \int_{0}^{\hat{Q}} S(Q) dQ \right] - (P_{T} - P_{d}) \hat{Q}$ (C.1')

and differentiating with respect to observed quantity (\hat{Q}) results in,

$$\frac{\mathrm{dW}}{\mathrm{d\hat{Q}}} = D(Q) - D(Q) - \hat{Q}D'(Q) + \theta \left[S(Q) + \hat{Q}S'(Q) - S(Q)\right]$$
$$- S'(\hat{Q})\hat{Q} - S(Q) + D(\hat{Q}) + \hat{Q}D'\hat{Q} = 0 \qquad (C.5)$$

where:

- P_d = D(Q) is the price dependent demand price as given by the inverse demand curve for output Q[^];
- P_s = S(Q) is the price dependent supply price as given by the inverse supply curve for output Q̂; and
- $P_T = S(\hat{Q})$ which is equivalent to the supply price, P_s , under the policy.

Substituting P_d , P_s , and P_T into (C.5) then dividing through by P_s and converting D(Q) and S(Q) to elasticities, results in:

$$= -\hat{Q}\frac{dP_d}{d\hat{Q}} + \theta P_s + \theta \frac{dP_s}{d\hat{Q}}Q - \theta P_s - \frac{dP_T}{d\hat{Q}}\hat{Q} - P_s + P_d + \hat{Q}\frac{dP_d}{dQ} = 0$$

$$= -\frac{dP_d}{d\hat{Q}}\frac{Q}{P_s} + \theta + \theta \frac{dP_s}{d\hat{Q}}\frac{Q}{P_s} - \theta - \frac{dP_s}{d\hat{Q}}\frac{\hat{Q}}{P_s} - 1 + \frac{P_d}{P_s} + \frac{dP_d}{d\hat{Q}}\frac{\hat{Q}}{P_s} = 0$$

$$= \frac{\theta}{\varepsilon} - 1 - \frac{1}{\varepsilon} + \frac{P_d}{P_T} = 0$$
 (C.5')

Equation (4.19.) can be rearranged to yield the price ratio, in terms of the elasticities and θ .

$$\frac{P_{d}}{P_{T}} = -\frac{\theta}{\varepsilon} + 1 + \frac{1}{\varepsilon}$$
$$= 1 - \frac{1}{\varepsilon} (\theta - 1)$$
(C.6)

Expressing equation (C.6) in terms of P_T as compared to the no-program price P_0 , assumes that the supply and demand functions have a constant-elasticity, which are linear in logarithms, which over small changes is an acceptable assumption. Consequently, equation (C.6) can be rewritten as:

$$\frac{P_{d}}{P_{T}} = \frac{P_{d}}{P_{0}} / \frac{P_{T}}{P_{0}}$$

$$= \frac{A\dot{Q}^{n} / AQ_{0}^{n}}{P_{T} / P_{0}}$$

$$= \frac{\dot{Q} / Q_{0}^{n}}{P_{T} / P_{0}}$$
(C.6')

where:

- AQⁿ is the constant-elasticity demand function ;
- BQ^e is the constant-elasticity supply function.

If e is defined as the inverse elasticity of supply $\frac{1}{\epsilon}$, then equation (C.6') can be

rewritten as:

$$\frac{\hat{Q}}{Q_0} = \left(\frac{P_T}{P_0}\right)^{1/e} \tag{C.6"}$$

If *n* is defined as the inverse elasticity of demand $\frac{1}{\eta}$, then substituting into equation

(C.6"), results in:

$$\frac{P_d}{P_T} = \left(\frac{P_T}{P_0}\right)^{n/(e-1)} \tag{C.6'''}$$

Substituting equation (C.6''') into equation (C.5') and solving for P_T / P_0 , using the fact that $\frac{1}{(n/e - 1)} = \frac{e}{(n - e)}$ then:

$$\frac{P_{\rm T}}{P_0} = \left[1 - e \left(\theta - 1\right)\right]^{e/(n-e)} \tag{C.7}$$

52

To examine the welfare weights of producers, θ in equation (C.7) must be isolated.

Rewriting (C.7), let
$$\lambda = \frac{\Gamma_1}{P_0}$$
 and $\psi = \frac{e}{(n - e)}$, then
 $\lambda = [1 - e(\theta - 1)]^{\psi}$

Taking logs,

$$\ln \lambda = \psi \ln \left[1 - e \left(\theta - 1 \right) \right]$$
$$\frac{1}{\psi} \ln \lambda = \ln \left[1 - e \left(\theta - 1 \right) \right]$$
$$\lambda^{1/\psi} = \left[1 - e \left(\theta - 1 \right) \right]$$
$$\lambda^{1/\psi} - 1 = -e \left(\theta - 1 \right)$$
$$\frac{1 - \lambda^{1/\psi}}{e} = \theta - 1$$

. .

Therefore,

$$\theta = 1 + \frac{1 - \lambda^{1/\Psi}}{e} \tag{C.7'}$$

or

$$\theta = 1 + \frac{1}{e} \left(1 - \left(\frac{P_T}{P_0} \right)^{n - e)/e} \right)$$
(C.7")

Equation (C.7") can be used to derive the political weighting (θ) given to producers by the government in the political preference function. Testable hypotheses can then be derived from the above analytical framework. These can be decomposed across political economic supply versus demand influences reflected in the political preference function. In this section the hypothesis to be tested is whether or not θ is greater than, equal to, or smaller than one.

Gardner assumed that the political weighting θ was exogenously determined, greater than one and constant i.e., producers welfare is given a higher weighting than consumers and taxpayers by policy makers. The producer welfare maximising optimum price and/or quantity is then derived from a given value of θ . Policy makers are assumed to favour redistribution toward producers, away from consumers and taxpayers.

REFERENCES

- Anderson K. (1978), 'On Why Rates of Assistance Differ Between Australia's Rural Industries' Australian Journal of Agricultural Economics 22(2):99-114.
- _____. (1980), 'The Political Market for Government Assistance to Australian Manufacturing Industries' *Economic Record* 56:132-144.
- Australian Bureau of Agricultural and Resource Economics (1990), *Wool: Outlook and* Options for the Future. Australian Government Publishing Service, Canberra.
- _____. (1992), Commodity Statistical Bulletin. Australian Government Publishing Service, Canberra.
- _____. (various issues), Farm Surveys Report. Australian Government Publishing Service, Canberra.
- Becker G.S. (1983), 'A Theory of Competition Among Pressure Groups for Political Influence' The Quarterly Journal of Economics 48(3):1-30.
- Davidson A.B., MacAulay G.T. and Powell R.A. (1989), *The Estimation of the Demand* for Market Milk, Cheese and Butter in New South Wales, Victoria and Queensland. Dairy Economics Research Report No. 2, University of New England, Armidale.
- Department of Primary Industries and Energy. (various issues), Rural Adjustment Scheme Annual Reports. Australian Government Publishing Service, Canberra.
- Dewbre J., Shaw I., Corra G. and Harris D. (1985), *Econometric Model of Australian* Broadacre Agriculture. Australian Government Publishing Service, Canberra.
- Fels A. (1981), 'Theories of Economic Regulation and Their Application to Australia' Paper presented to a Conference of Government Regulation of Industry, University of Newcastle, 19-20 February.
- Fisher B.S. (1979), "The Demand for Meat An Example of an Incomplete Commodity Demand System' Australian Journal of Agricultural Economics 23:220-230.
- Gardner B.L. (1987), The Economics of Agricultural Policies. Macmillan Publishing Company, New York.
- Gruen F.H. (1967), Long Term Projections of Agricultural Supply and Demand: Australia 1965 to 1980. U.S. Department of Agriculture, Economic Research Service, Washington D.C.
- Industries Assistance Commission. (1984), Rural Adjustment. Australian Government Publishing Service, Canberra.

- Johnson D.T., Powell A.A. and Dixon P.B. (1990), 'Changes in Supply of Agricultural Products', Chapter 13 in Agriculture in the Australian Economy 3rd Edition. edited by Williams D.B. Sydney University Press, Sydney.
- Lawrence D. and Zeitsch J. (1990), 'A Disaggregated Model of Agricultural Response' Paper presented to the 34th Annual Conference of the Australian Agricultural Economics Society, Brisbane.
- MacAulay T.G. and Musgrave W.F. (1982), 'Aspects of the Agricultural Policy Process' Paper presented to the 26th Annual Conference of the Australian Agricultural Economics Society, Melbourne.
 - _____, Thomas W.C. and Burge B.T. (1985) 'Factors Relating to Effective Assistance to Australian Agriculture in the Context of an Endogenous Policy Process' Paper presented to the 29th Annual Conference of the Australian Agricultural Economics Society, Armidale.
- Martin W. (1990a), 'Rural Policy' Chapter 8 in *Hawke and Australian Public Policy*. edited by Jennett C. and Stewart R.G. Macmillan, Melbourne.
- . (1990b), 'Public Choice Theory and Australian Agricultural Policy Reform' Australian Journal of Agricultural Economics 34(3):189-211.
- McKay L., Lawrence D. and Vlastuin C. (1983), 'Profit, Output Supply, and Input Demand Functions for Multiproduct Firms: The Case of Australian Agriculture' International Economic Review 24(2):323-339.
- Mueller D.C. (1979), Public choice. Cambridge University Press, Cambridge.

. (1989), *Public choice II A revised edition of Public choice*. Cambridge University Press, Cambridge.

- Musgrave W.F. (1990), 'Rural Adjustment', Chapter 16 in Agriculture in the Australian Economy 3rd Edition. edited by Williams D.B. Sydney University Press, Sydney.
- National Farmers Federation (1993), New Horizons: A Strategy for Australia's Agrifood Industries. National Farmers Federation, Barton.
- Oehmke J.F. and Yao X. (1990), 'A Policy Preference Function for Government Intervention in the U.S. Wheat Market' American Journal of Agricultural Economics 72:631-640.
- Peltzman S. (1976), 'Toward a More General Theory of Regulation' *The Journal of Law and Economics* 19:211-240.
- Pincus J.J. and Withers G.A. (1983), 'Economics of Regulation', Chapter 1 in Surveys of Australian Economics. edited by Gruen F.H. George Allen and Unwin, Sydney.
- Quiggin J. (1987a), 'Egoistic Rationality and Public Choice: A Critical Review of Theory and Evidence' *The Economic Record* 63:10-21.

_____. (1987b), Australian Economic Growth The Role Of Special Interest Groups and Political Factors. Discussion paper No. 161, Centre for Economic Policy Research, Australian National University, Canberra.

Rausser G.C. and Freebairn J.W. (1974), 'Estimation of Policy Preference Functions: An Application to U.S. Beef Import Quotas' *Review of Economics* and Statistics (56):437-449.

- Self P. (1990a), 'What's Wrong With Government? The Problem of Public Choice' *The Political Quarterly* 61(1):23-35.
- . (1990b), 'Market Ideology and Good Government' *Current Affairs* Bulletin 67(4):4-10.
- Sieper E. (1982), *Rationalising Rustic Regulation*. Centre for Independent Studies, Sydney.

Wicks J.A. and Dillon J.L. (1978), 'APMAA Estimates of Supply Elasticities for Australian Wool, Beef and Wheat' *Review of Marketing and Agricultural Economics* 46:48-57.

Wonder B.S. (1987), 'Consistency in Industry Assistance Policy Evaluation: A Case Study of the Bureau of Agricultural Economics' Discussion Paper No. 173, Centre for Economic Policy Research, Australian National University, Canberra.

Wong G., Sturgiss R. and Borrell B. (1989) The Economic Consequences of International Sugar Trade Reform. Discussion Paper 89.7, Australian Bureau of Agricultural and Resource Economics, Australian Government Publishing Service, Canberra.

Zusman P. (1976), 'The Incorporation and Measurement of Social Power in Economic Models' International Economic Review (17):447-462.

. and Amiad A. (1977), 'A Quantitative Investigation of a Political Economy - The Israeli Dairy Program' *American Journal of Agricultural Economics* (59):88-98.