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EFFECTS OF PAST AUSTRALIAN WHEAT PRICE POLICIES ON KEY INDUSTRY VARIABLES

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Evidence is provided on the extent to which wheat price policies operating over the period 1953-54 to 1983-84 achieved objectives related to the levels and stability of key industry variables. The general findings are that the levels of achievement have been modest and that trade-offs have been involved. This evidence is supplementary to the evidence already available from efficiency-based studies.

Six successive wheat marketing plans were administered by the Australian Wheat Board (AWB) over the crop years 1948-49 to 1978-79. Each was comprised of the same basic policy instruments: a two-price scheme operating between the domestic and export markets, under which costs of production figured prominently in the formula for setting domestic prices; and a government-guaranteed buffer fund on export sales. These plans will be referred to as 'the early plans'. The seventh plan, which was administered over the crop years 1979-80 to 1983-84, differed from the early plans in three important respects. First, the price of wheat for domestic milling was set according to a specified formula designed to follow trends in export prices, but to maintain the domestic price at an average of 20 per cent above pool export prices. Second, domestic stockfeed and industrial wheat was priced at the discretion of the Board. Third, instead of a buffer fund on export sales, growers were provided with a government-guaranteed minimum price, with any deficiency between the grower price and the guaranteed minimum price being met through government contributions. Further details of past wheat price policies are available from several sources (for example, Myers 1982; BAE 1983; IAC 1983).¹

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¹ The eighth wheat marketing plan was introduced for the 1984-85 crop year. In general, it represents a continuation of the arrangements of the seventh plan, although the formula for setting domestic prices for human consumption and the method of determining the guaranteed minimum price were both changed. Under the eighth plan, domestic prices for human consumption are based on export parity prices plus a margin of \$15.00 per tonne (\$16.40 with the Tasmanian freight subsidy). The guaranteed minimum price is 95 per cent of the average of an estimate of the gross pool returns in the subject year and the two lowest pool returns in the previous three seasons less pool costs for the subject year.

The aim here is to supplement existing evaluations of wheat price policies with quantitative evidence on the effects of these policies on the levels and stability of key industry variables. The policies are evaluated in terms of the degree to which stated policy objectives have been achieved.

In the next section of the paper, some interpretations of objectives behind past wheat price policies are presented and the industry variables for analysis are identified. A brief summary of previous evaluations of wheat marketing arrangements is then presented. This is followed by an outline of procedures used in the present study and presentation of results. Some concluding comments are made in the final section.

Objectives Behind Wheat Price Policies

Despite the long history of intervention in wheat marketing, it is difficult to find detailed and unambiguous statements of the objectives behind intervention. As pointed out by Watson (1984, p.8), 'It seems likely that objectives will remain somewhat confused because of the different attitudes of those affected by policy outcomes.'

Miller and White's (1980) interpretation of the objectives was summarised by Ryan (1984, p.3) as: (a) to achieve stability of farm incomes, purchasing power and domestic prices; (b) to achieve greater resource use efficiencies by reducing (or transferring) the price risk and uncertainty associated with wheat production; and (c) to increase production to meet domestic requirements and expand exports.

The Industries Assistance Commission (IAC 1983, p.12) reported that, at its most recent wheat industry inquiry, 'The central theme, whenever the role of the AWB was discussed, was the development of an efficient marketing framework.' Other objectives mentioned by various witnesses included stabilising prices to users; encouraging uniform prices and removing competition between users; ensuring availability of wheat supplies; and ensuring quality and hygiene standards.

According to the Bureau of Agricultural Economics (BAE 1983, p.16), there have been three broad objectives underlying wheat marketing arrangements: equity among growers in the sense that they should receive the same price for equivalent wheat grown in the same season with adjustments for locational differences; stability in the sense of reduced price variability between seasons; and provision of assistance. The Bureau also mentions (p.87) that changes in plans over time have reflected changing emphasis on particular objectives rather than changing objectives and that, in recent plans, there has been more emphasis on reducing downside price risk rather than making the final pool return predictable.

Other accounts of the objectives exist (for example Ryan 1984, p.3 and p.6) and these accounts offer scope for differing interpretations. However, stability of key industry variables as well as the levels of returns to producers seem to loom large. Making free-market outcomes (domestic prices equal to export prices) the base for comparison, we have interpreted the objectives to include:

- (a) more stable domestic prices and quantities traded;
- (b) higher and more stable quantities exported, export prices and export revenues;
- (c) higher and more stable grower prices and revenues; and
- (d) increased production.

In the case of price and revenue variables, it is assumed that the objectives relate to real rather than nominal values.

These objectives clearly have implications for economic efficiency. But the aim in the present paper is to focus on aspects of wheat price policies which have received relatively little attention in the past. Studies dealing with efficiency aspects have been published previously (for example, Longworth and Knopke 1982).

The list of objectives could be criticised on various grounds. First, the objectives are not necessarily consistent with each other. Nevertheless, they each appear in one or more of the accounts of objectives discussed earlier. Second, there is no attempt to weight the objectives on the basis of their relative importance, nor to take account of changes in their relative importance over time. But these would be difficult tasks since outcomes would depend on the interest-group perspective from which the objectives are viewed. Third, no mention is made of the level of domestic prices. Maintaining domestic prices below export parity could hardly have been a general objective behind the early plans. In the seventh plan, the objective of higher domestic prices was quite explicit. However, in the analysis to follow, attention will be given to the effect of the plans on the levels of domestic prices as well as some other variables not mentioned in the above list.

Recent Evaluations of Wheat Marketing

In most previous evaluations of wheat marketing, attention has been focused on efficiency and/or distributive aspects. Some authors have identified improvements in the marketing arrangements over time. For example, shortly after the seventh plan was introduced, Miller and White (1980) argued that it was an improvement on the early plans in that:

- (a) prices would be geared more closely to market forces;
- (b) growers would be faced with less price uncertainty due to a 15 per cent limit on year-to-year changes in the guaranteed minimum price;
- (c) growers would probably receive a higher level of first advance; and
- (d) government payouts would probably be considerably reduced.

Watson (1984, p.8) also identified various improvements, including the demise of cost-of-production pricing and the buffer fund arrangement.

Nevertheless, the general conclusion resulting from recent evaluations has been that there should be some deregulation of marketing. For example, Longworth and Knopke (1982) found, among other things, that the early plans resulted in a gain in consumer surplus of \$668m, a loss in producer surplus of \$1114m and a net social loss (taking account of stabilisation fund transactions and government contributions) of \$667m (1979 dollars). Balderstone, Duthie, Eckersley, Jarrett and McColl (1982), having stated that they favour '... a marketing system for rural commodities which exposes producers and consumers to the prevailing market forces ...' (para. 6.2), went on to consider the pros and cons of Australian Wheat Board monopoly control over domestic marketing. Although they described the home consumption price as '... justifiable because it applies to a lightly protected industry and because it is likely to increase growers' incomes ...' (para. 6.56), they expressed their preference for '... freeing up the domestic market for wheat ...' (para. 6.60). The Bureau of Agricultural Economics (BAE 1983) examined the efficiency of current marketing arrangements and argued before the Industries Assistance Commission that 'Deregulating sales on the domestic market could have a significant number of benefits in terms of the

efficient use of resources as well as increasing returns to some growers significantly.' (p.5)

Finally, the Industries Assistance Commission (IAC 1978, 1983) has been critical of wheat marketing arrangements. In its 1983 report, it criticised the domestic pricing arrangements on several grounds, including the costs imposed on growers and some domestic consumers as well as the administrative costs of controls. Among its recommendations were that 'private traders be permitted to operate freely on the domestic market in competition with the AWB' and that 'the price of wheat sold on the domestic market no longer be administered.' (p.70)

The present study supplements these previous evaluations by focusing on the levels of achievement of specific objectives and trade-offs among objectives in terms of levels of achievement.

Method of Analysis

The analysis is based on the outcomes of simulations with an econometric model of the markets for Australian wheat. Complete details of the model can be found in Myers (1982, pp.21-40) and an overview of the model is provided in the Appendix to this paper. The model was used to simulate three sets of prices, quantities and revenues: (a) those corresponding to 'free-market' pricing, defined as a situation in which domestic prices would, through the operation of market forces, equate with export prices; (b) those resulting from the operation of the early plans; and (c) those resulting from the operation of the seventh plan.

The free-market pricing arrangements and those of the seventh plan were simulated over the period 1953-54 to 1983-84. The pricing arrangements under the early plans were simulated over the period 1953-54 to 1978-79. The period of the initial marketing plan (1948-49 to 1952-53) was omitted from the estimation period for the model and from the simulation experiments. The reason is that, prior to 1953-54, export wheat was offered to signatories of the International Wheat Agreement at a different price to that which prevailed on the open market. Moreover, this period included immediate post-war years. Hence, the inclusion of this period would have led to the problem of trying to model structural change.

The impacts of the various plans on the levels of key market variables were measured by percentage differences in mean values for various periods, with the outcomes under free-market pricing serving as the base. Their impacts on the stability of variables were measured by percentage (not percentage point) differences in the coefficients of variation.

Some limitations of the approach should be recognised. Lucas (1976) and others have argued that the parameters of an economic system change in response to changes in government policies, and the present study could be criticised on the grounds that policy-induced behavioural changes are not reflected in the econometric model. However, general econometric techniques for dealing with this problem are not well developed (Fisher 1982; Lucas and Sargent 1981). Moreover, the significance of the 'Lucas critique' is an empirical question and the traditional approach used here will continue to provide useful estimates of policy impacts in many instances (Klein 1981).

Another general criticism stems from the fact that, even if the underlying parameters are insensitive to different policy scenarios, the results from econometric experiments are subject to errors due to the stochastic nature of the estimated model. The policy analysis reported here is deterministic in the sense that the simulations were carried out using mean values of parameter estimates. However, a partial approach to sensitivity analysis, based on procedures suggested by Anderson (1974), showed that the effects of different policies are not very sensitive to plausible ranges of errors in the parameter estimates (see Myers 1982, pp.90-5 and 120-2 for details of the sensitivity analysis).

At the time the simulations were undertaken, the latest year for which the actual values of all exogenous variables were known was 1980-81. Where it was necessary to predict values of an exogenous variable, these predictions were based on the average annual percentage change in the variable concerned over the estimation period of the model. Further details are available in Myers (1982, pp.122-3).

The above limitations apply to most studies of the present type. Some specific aspects of the present study might also be regarded as limitations. First, choices had to be made as to how to measure the impacts of price policies. The statistical measures chosen (the mean and coefficient of variation) have well-known limitations. But so do other statistics which might have been used. Although the stability effects reported here are based on the coefficient of variation, results were also generated using the standard deviation of percentage changes. With only minor exceptions, the two stability measures led to the same qualitative conclusions. Second, no distinction was made between wheat for domestic milling use and wheat for domestic industrial use in the data used for the study. Hence, in simulating the seventh plan, it was necessary to assume that the formula for determining the price of wheat for milling use also applied to wheat for industrial use. This assumption is the source of a small degree of error since wheat for industrial use (constituting about 20 per cent of the total quantity sold for milling and industrial uses) has been priced at export parity since January 1983 (Ryan 1984, p.15). Third, attention is given to the level and stability of real (1977-78) rather than nominal values of prices and revenues, although the latter are discussed in Myers (1982). Real effects are analysed to facilitate comparisons with Longworth and Knopke's (1982) results and because they have been mentioned in the Bureau of Agricultural Economics' (BAE 1983, p.87) interpretation of broad stabilisation objectives. However, the same qualitative conclusions hold irrespective of whether the analysis is in terms of real or nominal values.

Results

The results of the simulations are discussed under four headings: the early plans, the seventh plan, comparisons between the early and seventh plans and an overview of the results.

The early plans (1953-54 to 1978-79)

The effects of these plans are shown in the first row of each pair of rows in Table 1 (effects on levels of variables) and Table 2 (effects on stability of variables). For comparative purposes, some of the results of Longworth and Knopke's (1982) analysis are shown in Table 3.

TABLE 1
Simulated Changes in Mean Real Levels of Key Industry Variables Resulting from Wheat Price Policies: 1953-54 to 1983-84^a

Period	Plan	Price of human-use wheat		Export price	Price to growers		Quantity for human-use		Quantity for stock-feed	Quantity exported		Production	Revenue from exports		Revenue to growers		Government payments
		per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	\$m 77-78
1953-54 to 1957-58	2	4.7	4.7	-0.1	2.4	-0.6	-7.6	1.9	-0.2	1.7	1.8	0.7	1.7	10.1	15.4	9.6	
	7	32.8	-0.8	-0.8	9.9	-4.7	1.4	11.5	5.7	10.1	14.8	53.5	10.1	5.6	5.8	6.6	
1958-59 to 1962-63	3	14.7	14.7	-1.8	9.0	-1.9	-24.4	12.1	5.9	10.1	14.8	53.5	10.1	5.6	5.8	6.6	
	7	8.5	-1.1	-1.1	1.5	-1.1	1.7	6.8	4.4	5.6	5.8	6.6	1.9	1.1	1.1	2.6	
1963-64 to 1967-68	4	2.1	2.1	-0.6	0.7	-0.3	-3.9	2.6	1.4	1.9	1.8	7.8	1.9	1.1	1.1	2.6	
	7	7.2	€	€	1.3	-1.1	€	0.1	€	€	€	€	€	€	€	€	€
1968-69 to 1973-74	5	9.2	-2.8	-1.3	0.5	-0.8	9.0	6.3	4.7	3.3	6.4	48.3	3.3	2.0	3.5	15.8	
	7	3.3	-0.6	-0.6	0.9	€	0.8	2.9	2.2	2.0	3.5	15.8	2.0	2.0	3.5	15.8	
1974-75 to 1978-79	6	-4.4	-4.4	0.4	-2.9	0.8	9.8	-1.9	-0.4	-2.0	-1.0	0	-2.0	0.5	1.8	0	
	7	14.2	-0.1	-0.1	1.8	-4.3	0.5	0.8	0.6	0.5	1.8	0	0.5	0.5	1.8	0	
1953-54 to 1978-79	2-6	5.5	3.0	-0.7	2.0	-0.6	-1.8	3.3	2.2	2.2	4.2	23.1	2.2	2.2	4.1	7.3	
	7	13.5	-0.5	-0.5	3.2	-2.1	0.8	2.7	1.9	2.2	4.1	7.3	2.2	2.2	4.1	7.3	
1979-80 to 1983-84	7	16.5	-0.1	-0.1	1.6	-5.7	0.3	0.6	0.3	0.5	1.8	3.6	0.5	0.5	1.8	3.6	
	7	13.9	-0.5	-0.5	3.0	-2.7	0.7	2.1	1.5	1.8	3.6	6.7	1.8	1.8	3.6	6.7	

^a Except for the column of government payments, figures are percentage differences between mean (real) values under the plan indicated and mean (real) values under no intervention (equal pricing). Government payments are real (1977-78) mean values rather than percentage differences from no intervention. The Greek letter '€' is used to denote a non-zero percentage value less than |0.1|.

TABLE 2
Simulated Percentage Changes in Coefficients of Variation for Real Values of Key Industry Variables Resulting from Wheat Price Policies: 1953-54 to 1983-84^a

Period	Plan	Price of human-use wheat		Price of stock-feed wheat		Export price		Price to growers		Quantity for human-use		Quantity for stock-feed		Quantity exported		Production		Revenue from exports		Revenue to growers	
		per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent	per cent
1953-54 to 1957-58	2	-1.7	-1.7	-1.7	-1.7	2.3	2.3	-31.1	-1.4	-1.4	-20.5	-4.6	-19.8	-5.8	-21.3	-5.8	-21.3	-5.8	-21.3	-5.8	-21.3
	7	43.5	11.3	11.3	11.3	11.3	11.3	-41.6	-56.2	-56.2	-7.8	-3.9	-13.8	-6.6	-18.4	-6.6	-18.4	-6.6	-18.4	-6.6	-18.4
1958-59 to 1962-63	3	-67.6	-67.6	-67.6	-67.6	-5.6	-5.6	-50.7	15.8	15.8	21.2	3.9	-0.8	3.4	-12.7	-0.8	-12.7	3.4	-12.7	-0.8	-12.7
	7	328.8	19.3	19.3	19.3	19.3	19.3	-34.9	172.7	172.7	3.4	-21.0	-25.6	-23.3	-33.5	-25.6	-23.3	-23.3	-33.5	-25.6	-33.5
1963-64 to 1967-68	4	-87.0	-87.0	-87.0	-87.0	2.5	2.5	-78.6	-50.0	-50.0	-13.9	4.6	9.2	1.6	-3.1	9.2	1.6	-3.1	9.2	1.6	-3.1
	7	-32.2	1.9	1.9	1.9	1.9	1.9	-25.4	-69.2	-69.2	0.6	1.6	2.8	-0.8	-3.6	2.8	-0.8	-3.6	2.8	-0.8	-3.6
1968-69 to 1973-74	5	-76.0	-62.0	-62.0	-62.0	5.2	5.2	-43.8	34.3	34.3	-36.1	-26.1	-7.8	-12.8	-25.6	-7.8	-12.8	-12.8	-25.6	-7.8	-25.6
	7	-65.5	1.4	1.4	1.4	1.4	1.4	-15.6	15.5	15.5	0.1	-8.1	-3.6	-3.1	-9.4	-3.6	-3.1	-3.1	-9.4	-3.6	-9.4
1974-75 to 1978-79	6	-73.1	-73.1	-73.1	-73.1	2.7	2.7	-13.6	-66.2	-66.2	-27.9	5.4	1.9	-5.0	-5.6	1.9	-5.0	-5.0	-5.6	1.9	-5.6
	7	-70.5	0.8	0.8	0.8	0.8	0.8	-15.0	-5.1	-5.1	-0.6	3.2	3.1	-0.8	-5.7	3.1	-0.8	-0.8	-5.7	3.1	-5.7
1953-54 to 1978-79	2-6	-30.2	-15.9	-15.9	-15.9	3.4	3.4	-20.2	4.1	4.1	0.3	-6.2	-2.3	-7.2	-11.7	-2.3	-7.2	-7.2	-11.7	-2.3	-11.7
	7	14.9	1.0	1.0	1.0	1.0	1.0	-4.4	13.3	13.3	-0.5	-4.6	-3.3	-4.8	-10.0	-3.3	-4.8	-4.8	-10.0	-3.3	-10.0
1979-80 to 1983-84	7	9.7	1.4	1.4	1.4	1.4	1.4	-12.2	-23.4	-23.4	0.8	1.3	1.7	-1.4	1.0	1.7	-1.4	-1.4	1.0	1.7	1.0
	7	12.0	0.7	0.7	0.7	0.7	0.7	-2.6	4.7	4.7	-0.6	-3.6	-2.8	-3.9	-8.3	-2.8	-3.9	-3.9	-8.3	-2.8	-8.3

^a Figures are percentage differences between coefficients of variation under the plan indicated and coefficients of variation under no intervention (equal pricing).

TABLE 3

Welfare Changes Resulting from Wheat Price Policy: 1948-49 to 1978-79

Period	Plan	Consumer surplus	Producer surplus	Net social welfare
		'79 \$m	'79 \$m	'79 \$m
1948-49 to 1952-53	1	913	- 1690	- 518
1953-54 to 1957-58	2	- 33	14	51
1958-59 to 1962-63	3	- 169	391	36
1963-64 to 1967-68	4	- 126	368	- 13
1968-69 to 1973-74	5	- 27	90	- 264
1974-75 to 1978-79	6	111	- 318	31
1948-49 to 1978-79	1-6	668	- 1144	- 677
1953-54 to 1978-79	2-6	- 244	545	- 159

Source: Selected from results reported in Table 1 of Longworth and Knopke (1982, p. 652).

An important point to make at the outset is that, while the plan-by-plan results from the present study are consistent with the results of Longworth and Knopke (that is, the directions of changes in consumers' and producers' surpluses reported by Longworth and Knopke are consistent with the directions of changes in domestic and grower prices found in the present analysis), one does obtain a substantially different impression of the overall effects of the early plans depending on whether the initial plan (1948-49 to 1953-54) is included in the analysis. Longworth and Knopke (1982, Table 1, p.652) showed that substantial transfers from producers to consumers occurred during the initial plan. As stated previously, the period of the initial plan was excluded from the present study because of the desire to avoid the difficulty of modelling structural change.

To what extent were the objectives defined earlier met during the course of the early plans? Prices paid by domestic consumers were more stable under each of the individual plans than they would have been under equal pricing, with some of the percentage reductions in the coefficient of variation being substantial. However, while the domestic quantities traded were more stable under some plans, for the period 1953-54 to 1978-79 as a whole, they were slightly less stable than under equal pricing.

With the exception of the sixth plan, the general pattern of effects on the levels of export market variables was one of higher quantities exported and, consistent with this and an elastic export demand, slight reductions in export prices and increases in export revenues. Export prices were generally less stable but export quantities and revenues were more stable, although this was not the case for all plans. Considering the period 1953-54 to 1978-79 as a whole, the effects on export quantities and revenues were consistent with the objectives, although insubstantial. The effects on export prices were inconsistent with the objectives but, again,

insubstantial reflecting Australia's more-or-less price-taking position on the export market.

For all but the sixth plan, the objectives of higher grower prices and revenues were met but the effects were generally slight. In addition, grower prices and revenues were more stable under all of the early plans considered. While it can be concluded that the early plans had positive effects on grower prices and revenues between 1953-54 and 1978-79, the large and negative producers' surplus effects of the initial plan must be kept in mind. Finally, the early plans had modest effects on production between 1953-54 and 1978-79, with the overall effects being in the direction of increased levels and stability.

On balance, the effects of the early plans during the period analysed were consistent with the objectives although many of the effects were slight. Furthermore, they have to be considered against the adverse effects of the initial plan on producers' surplus and net social welfare.

It is relevant to consider the effects of the early plans on other market variables besides those specified in the list of objectives. Here we consider the effects on the levels of domestic prices and quantities traded. Government costs are considered later. Domestic consumers were generally affected adversely in terms of higher prices, although this was not the case during the initial plan (see Longworth and Knopke 1982, Table 1, p.652). Consistent with this, smaller quantities of wheat were traded domestically. In other words, increased domestic price stability was traded off against higher domestic prices and lower quantities consumed.

It should be remembered that the results regarding changes in levels of variables are presented as percentage differences in means computed over the period of each plan. The general patterns of results described above were not true for every individual year. For example, in the 1973-74 boom year, domestic prices were kept below export prices and in some years production levels were less than they would have been in a free-market situation.

The seventh plan (1979-80 to 1983-84)

The effects of this plan were simulated over the period from 1953-54 to 1983-84 and the results are shown in the second row of each pair of rows in Tables 1 and 2. The seventh plan would have had a significant destabilising effect on prices of wheat for human use had it been operating over the 1953-54 to 1978-79 period. During the plan's actual period of operation, and for the whole period from 1953-54 to 1983-84, the impact is again in the direction of decreasing the stability of these prices. It was assumed that the prices for stockfeed wheat were set at export parity throughout the simulation period. This accounts for the insignificant effects of the scheme on the levels and stability of stockfeed wheat prices.

As was the case for the early plans, the seventh plan is shown to have the general effect of increasing quantities exported with slight reductions in export prices and increases in export revenues. However, these effects are particularly small for the actual period of operation of the plan. Again, as in the case for the early plans, the seventh plan would have had a slight destabilising effect on export prices and a slight stabilising effect on export quantities and revenues had it been operating over the 1953-54

to 1978-79 period. The same is true for the whole period from 1953-54 to 1983-84.

The effects of the seventh plan on the level and stability of producer prices and revenues, as well as on the level of production, are generally consistent with the objectives outlined earlier. However, during the actual period of operation of the plan, simulated grower revenues were less stable than under the free-market alternative.

An important effect of the seventh plan is the relatively large increase (compared to both the free-market outcome and the early plans considered) in the price of wheat for human consumption. While the increase is generally less than the planned '20 per cent on average', domestic consumers would hardly regard this as 'fair', especially in view of the increased variability in these prices under the seventh plan. Consistent with the higher prices, the quantities traded on the domestic human-use market are shown to have declined.

Comparisons between the early and seventh plans

Based on the simulation results, the early plans were more effective in stabilising domestic prices than the seventh plan. Indeed, domestic prices would have been more stable under free-market conditions than under the seventh plan. Furthermore, although the results are not reported here, a pronounced cyclical pattern in the prices of wheat for human use is apparent from the year-by-year simulation results (Myers 1982). It is also apparent that the seventh plan had the effect of increasing the prices of wheat for domestic human use to a greater extent than did the early plans considered.

The seventh plan provided a slightly higher level of support for grower prices compared to the early plans, although the overall effects of all plans on the level of grower revenues for the period 1953-54 to 1978-79 were almost identical. There were, however, differences in the sources of support for grower prices. From Table 1 it is evident that government contributions were generally much higher under the early plans (a result consistent with that reported by Miller and White 1980). It was apparent from further simulations (see Myers 1982) that the support for grower prices under the early plans was financed, in about equal proportions, by government contributions under the stabilisation fund arrangements and by higher domestic prices. In the case of the seventh plan, support for grower prices was funded almost entirely through higher prices for wheat for domestic human use.

There are two main reasons for these differences in results. First, the formula for pricing wheat for domestic human use under the seventh plan was designed specifically to raise those prices above export prices (20 per cent on average). Under the early plans, domestic prices were set mainly according to costs of production. Second, the nature of government contributions were markedly different under the early plans compared to the seventh plan. The guaranteed price, which triggered contributions and withdrawals from the stabilisation fund throughout most of the period covered by the early plans, was based mainly on costs of production. However, under the seventh plan the guaranteed minimum price varied according to recent market trends, with the government being called upon to make contributions only following abrupt falls in grower prices.

Overview of the results

In this section the impact of the past three decades of wheat marketing intervention on the levels and stability of key market variables is considered. Have the effects been consistent with the objectives outlined earlier? If so, are they sufficient in magnitude to justify the administrative and other costs of intervention?

Summary results for the impact of intervention over the period 1953-54 to 1983-84 are shown in Table 4. They were obtained by simulating each plan over its actual period of operation and comparing the results with those under a simulated non-intervention situation.

TABLE 4
Summary of Effects of Wheat Market Intervention on Real Levels and Stability of Key Industry Variables: 1953-54 to 1983-84^a

Variable	Percentage change in	
	Mean	Coefficient of variation
Price of human-use wheat	7.1	-32.1
Price of stockfeed wheat	2.5	-11.6
Export price	-0.6	2.7
Price to growers	2.0	-16.7
Quantity for human use	-1.5	-4.5
Quantity for stockfeed	-1.4	1.5
Quantity exported	2.5	-4.7
Production	1.7	-2.5
Revenue from exports	1.7	-1.6
Revenue to growers	3.6	-2.6
Government payments	19.9 ^b	—

^a The effects were generated by simulating plans 2 to 6 over the period 1953-54 to 1978-79 and plan 7 over the period 1979-80 to 1983-84.

^b Simulated (real) mean value of government payments (1977-78\$m) rather than percentage difference from no intervention.

Intervention has generally resulted in increased stability for key industry variables, with the exceptions being export prices and the quantities of wheat traded for stockfeed. However, these effects, as measured by percentage reductions in the coefficients of variation, were slight except, perhaps, in the cases of the price of wheat for domestic human use and grower prices. Intervention has also generally resulted in the desired direction of change in levels of key industry variables, the only exception being lower (rather than higher) export prices. However, the effects, as measured by percentage changes in mean values for the 31 year period, have again been slight (for example, a 2.0 per cent increase in grower prices and a 3.6 per cent increase in grower revenue). On the other hand, the past three decades of intervention have had undesirable effects in terms of higher domestic consumption prices, although domestic prices were lower under the initial marketing plan.

This evidence has to be considered against the various costs of intervention. Longworth and Knopke (1982) and other authors have pointed to some efficiency and distributive effects of intervention. In ad-

dition, there are administrative costs to be considered as well as costs associated with 'rent-seeking'. The latter include the costs of various interest groups in regularly preparing submissions to protect themselves, or to maximise the rents they receive, from government intervention in wheat marketing.

Concluding Comments

Prior to the present study, the case for freeing-up the marketing of Australian wheat rested mainly on the economic inefficiencies associated with intervention. Our findings support the case for freer marketing on the grounds that the levels of achievement of stated objectives have been modest. Moreover, producer gains from higher grower prices must be considered against consumer losses from higher domestic prices.

While the present study has limitations, the evaluative criteria adopted are both meaningful and relevant to industry leaders and policy makers. Further, the conclusions have been reached leaving aside the period of operation of the initial marketing plan in which intervention had a significant negative impact on net social welfare. Even excluding this period, it seems unlikely that the modest levels of achievement of objectives can justify the apparent real resource costs of intervention.

APPENDIX

Overview of the Econometric Model

The model (see Myers 1982, pp.21-40 for complete details) is comprised of 28 behavioural equations, identities and inequalities. The supply side is comprised of a stochastic equation to explain the area sown to wheat (wheat yields were assumed exogenous) and various identities which, taken together, explain the production of wheat. The demand side of the market for Australian wheat is divided into four sub-markets: human use (milling and industrial wheat), stockfeed, seed and exports.

The structure of the model is block-recursive. Ordinary least squares was used to estimate the equations for area sown and the domestic demand for wheat for human use. Two simultaneous systems (the simultaneous domestic demand for stockfeed wheat and other feedgrains, and the simultaneous export allocation and price equations) were estimated separately using two stage least squares. Linear functional forms were assumed for all stochastic equations after examination of data plots and the experience of other researchers.

The signs of all the parameter estimates are consistent with prior expectations and all the equations are acceptable in terms of the usual statistical criteria. The lowest value of the coefficient of determination is 0.77, the Durbin-Watson statistics are satisfactory and most parameter estimates are at least twice as large as their respective estimated standard errors. Partial price elasticities and flexibilities estimated at the points of means are shown in Table A.1 and the results of various validation tests in Table A.2. In short, there is a close correspondence between simulated and actual variable values and the model is dynamically stable.

There are some further important points about the model and parameter estimates worth highlighting here. First, the area response

TABLE A.1
Partial Elasticities and Flexibilities Computed at the Means

Elasticity or flexibility	Estimate
Own-price elasticity of area sown	0.487
Own-price elasticity of domestic demand for human use	-0.168
Cross-price elasticity of domestic demand for human use with respect to the retail price of potatoes	0.049
Own-price elasticity of domestic demand for stockfeed use	-2.374
Cross-price elasticity of domestic demand for stockfeed use with respect to the price of other feedgrains	1.577
Own-price flexibility of the demand for other feedgrains	-0.457 (-2.190) ^a
Cross-price flexibility of the demand for other feedgrains with respect to the quantity of stockfeed wheat	-0.164
Own-price elasticity of export allocation	0.464
Own-price flexibility of export price setting	-0.162 (-6.172) ^a
Cross-price flexibility of export price setting with respect to the quantity of North American exports	0.411 (2.431) ^a

^a Figures in parentheses are the inverses of the corresponding price flexibilities.

equation differs from previous estimates of Australian wheat area response in that the effect of changing price risk on production decisions is accounted for explicitly. Second, the estimate of the partial own-price elasticity of domestic demand for stockfeed wheat (-2.37) is much more elastic than estimates reported in other studies. For example, estimates of -0.73 and -1.03 have been reported by Spriggs (1978) and Fisher (1978), respectively. However, the simultaneous nature of the domestic demand for stockfeeds is not reflected in the models used by those authors. Moreover, both authors specified a ratio of wheat to other feedgrain prices as the price variable, thus constraining the own-price and cross-price elasticities to be equal in absolute value. Third, in many previous studies of the Australian wheat industry, the assumption of a perfectly elastic export demand has been made. However, Alaouze, Watson and Sturgess (1978) have argued that, as a result of an unstable duopoly partnership between the United States and Canada, Australia has enjoyed a degree of export market power at times. Hence, our approach was to specify an export allocation function and an export price-setting function. The former is intended to explain how the Australian Wheat Board allocates a given quantity of wheat between current export and storage while the latter is intended to indicate the factors influencing the level at which the Board sets Australian export prices. Based on the estimated export allocation and price-setting equations, the desire to maintain market share has a direct influence in both these decisions.

The elasticity of export 'demand' facing Australia may, on average, have had an absolute value as low as 6.17 based on the estimate of the own-price flexibility from the export price-setting equation. However, this number should be interpreted cautiously since the export allocation and price equations cannot be viewed as 'supply' and 'demand' functions in the strict sense of these terms. Rather, they should be viewed as 'behavioural' relationships based on more fundamental (but difficult to estimate) supply and demand relationships in the market.

TABLE A.2
Model Validation Statistics

Variable	Gross errors ^a	Root mean square error	Turning points missed ^b	F value ^c	Wilcoxon prob-ability ^d	Theil's U
	per cent	per cent	per cent			
Area sown	12.0	9.6	14.3	1.27	0.14	0.57
Production	12.0	9.6	5.6	0.73	0.15	0.23
Quantity for human use	0.0	2.6	33.3	1.19	0.99	0.60
Quantity for stockfeed use	56.0	21.7	30.8	2.69	0.97	0.65
Price of other feedgrains	4.0	8.6	18.2	2.53	0.82	0.54
Seed use	16.0	12.6	22.2	3.49	0.68	0.79
Quantity available for export	44.0	20.9	0.0	0.71	0.37	0.41
Annual quantity exported	32.0	20.3	15.4	0.39	0.40	0.51
Annual export price	4.0	7.5	0.0	2.02	0.64	0.49
Closing inventories	84.0	99.0	7.1	3.78	0.80	0.73
Pool average export price	8.3	20.7	8.3	1.71	0.55	0.88
Stabilisation revenue payments	58.3	481.6	21.4	0.93	0.99	0.72
Pool AWB costs	8.3	10.1	20.0	2.79	0.09	0.31
Pool grower price	8.3	12.0	33.3	8.08	0.01	0.59
Revenue from human use	0.0	2.6	50.0	0.05	0.92	0.34
Revenue from stockfeed use	56.0	16.5	37.5	2.43	0.92	0.69
Total domestic revenue	4.0	7.0	50.0	1.18	0.86	0.61
Annual revenue from exports	40.0	21.3	23.1	2.10	0.38	0.55
Pool grower revenue	16.7	12.4	5.6	0.74	0.10	0.26
Government contributions	50.0	— ^e	5.9	1.97	0.47	— ^f

^a Number of gross errors (errors greater than 15 per cent) as a percentage of the number of observations.

^b Number of turning points missed as a percentage of the total number of turning points.

^c A test of the joint hypothesis that the intercept and slope of the regression of actual on predicted values are 0 and 1, respectively. The critical F value (below which the hypothesis is accepted) is 3.42 at the 5 per cent significance level.

^d Two tailed probability that the actual and predicted series are the same. A value greater than 0.05 indicates that the two series are the same at the 5 per cent significance level.

^e Infinite percentage errors caused by actual values of zero.

^f Result invalid due to actual value of zero.

Fourth, the annual data used for Australian export prices require an explanation. The Australian Wheat Board publishes export selling quotations but there are no published statistics on annual export prices received for Australian wheat. To overcome this problem, the average annual selling quotations were deflated by seven per cent to obtain an estimate of actual annual export prices. The deflation parameter of seven per cent was obtained as follows: (a) the annual export selling quotations, in conjunction with export quantity and inventory data, were used to estimate the average export selling quotation for each wheat pool from 1953-54 to 1977-78; and (b) this estimate was then compared with the average export price for each pool (which is available from published statistics). On average, the (average) export price for each pool was seven per cent below the corresponding (average) selling quotation.

References

- Alaouze, C. M., Watson, A. S. and Sturgess, N. H. (1978), 'Oligopoly pricing in the world wheat market', *American Journal of Agricultural Economics* 60(2), 173-85.
- Anderson, J. R. (1974), 'Simulation: methodology and application in agricultural economics', *Review of Marketing and Agricultural Economics* 42(1), 3-55.
- Balderstone, J. S., Duthie, L. P., Eckersley, D. P., Jarrett, F. G. and McColl, J. C. (1982), *Agricultural Policy: Issues and Options for the 1980s*, Working Group Report to the Minister for Primary Industry, AGPS, Canberra.
- BAE (1983), *Wheat Marketing in Australia, An Economic Evaluation*, BAE Occasional Paper No. 86, AGPS, Canberra.
- IAC (1978), *Wheat Stabilization*, AGPS, Canberra.
- (1983), *The Wheat Industry*, AGPS, Canberra.
- Fisher, B. S. (1978), *An Analysis of Storage Policies for the Australian Wheat Industry*, Research Report No. 7, Department of Agricultural Economics, University of Sydney.
- Fisher, B. S. (1982), 'Rational expectations in agricultural economics research and policy analysis', *American Journal of Agricultural Economics* 64(2), 260-5.
- Klein, L. R. (1981), 'The value of models in policy analysis', in M. Duncan (ed.), *Modeling Agriculture for Policy Analysis in the 1980s*, a symposium sponsored by the Federal Reserve Bank of Kansas City.
- Longworth, J. W. and Knopke, P. (1982), 'Australian wheat policy 1948-1979: a welfare evaluation', *American Journal of Agricultural Economics* 64(4), 642-63.
- Lucas, R. E. Jr. (1976), 'Economic policy evaluation: a critique', in K. Brunner and A. H. Meltzer (eds.), *The Phillips Curve and Labor Markets*, North-Holland, Amsterdam.
- Lucas, R. E. Jr and Sargent, T. J. (eds) (1981), *Rational Expectations and Econometric Practice*, University of Minnesota Press, Minneapolis.
- Miller, G. and White, G. (1980), The wheat industry stabilisation scheme: evolution and economic effects. Paper presented to the 24th Annual Conference of the Australian Agricultural Economics Society, Adelaide, February.
- Myers, R. J. (1982), *An Econometric Evaluation of Australian Wheat Pricing Policies*, Agricultural Economics Bulletin 27, Department of Agricultural Economics and Business Management, University of New England, Armidale.
- Ryan, T. J. (1984), Wheat marketing. Paper presented to the 28th Annual Conference of the Australian Agricultural Economics Society, Sydney, February.
- Spriggs, J. (1978), *An Econometric Analysis of Export Supply of Grains in Australia*, Foreign Agricultural Economics Report No. 150, USDA, Washington, D.C.
- Watson, A. S. (1984), Wheat in 1984. Paper presented to the 28th Annual Conference of the Australian Agricultural Economics Society, Sydney, February.