47th AARES Conference

Thursday, 13th February 2003

Implications of Recent Australian Wheat Industry Developments for Domestic and Overseas Prices[φ]

Alexandra Lobb [*] & Rob Fraser [ϕ]

Key words: Privatisation; Australian wheat industry; pricing policies.

Abstract

This study is motivated by the proposition that the objectives of the AWB Ltd have changed since semi-privatisation of the Australian Wheat Board under the Wheat Marketing Act, 1989. Conceptualising this change of objectives as a shift from revenue maximization to profit maximization, this study examines the impact of such a change on the pricing policies of a multi-market price-setting firm. More specifically, this paper investigates, using two hypothetical objective functions, a risk averse AWB's price-setting behaviour in an "overseas" and a "domestic" market in response to recent wheat industry developments. In the analysis these developments manifest themselves as differing price elasticities, differing transport costs and uncertain demand functions, and their implications particularly for the prices paid by domestic consumers are explored.

[φ] This project is funded by GRDC.

[*] PhD Student, University of Western Australia

Contact: aelobb@yahoo.com.au

[ϕ] Professor of Agricultural Economics, Imperial College at Wye, and Adjunct Professor of Agricultural and Resource Economics, University of Western Australia

Contact: r.fraser@ic.ac.uk

Introduction

Historically, the Australian Wheat Industry has been the beneficiary of considerable government-funded support. However, commencing with the cessation of the Guaranteed Minimum Price Scheme in 1989 this support has been in the process of being removed, with the aim of leaving the industry exposed to economic realities. Over this period a central player in the Industry has been the former Australian Wheat Board (AWB), and its activities have been particularly targeted in relation to the removal of government-funded support and the encouragement to adopt fully commercial practices.

In this context the changes imposed on the AWB have been similar to those imposed by governments on former public enterprises in the privatisation process. This process has been the subject of a considerable economics literature, with one of the interests of this literature being the impact of privatisation on the objectives of the firm, and consequently on its behaviour (Fraser, 1989; Vickers & Yarrow, 1989; Bishop et al., 1994; Fraser, 1991; Fraser, 1994(a) and Fraser, 1996). However, one key difference is that whereas the privatisation of public enterprises that retain considerable monopoly power has been associated with post-privatisation regulation of their behaviour, typically of the "price-cap" variety, the AWB Ltd, by virtue of trading across national boundaries, is not subjected to such price regulation.

This observation raises the question of whether an examination of the AWB Ltd's situation using the methods of the privatisation literature might reveal insights regarding how its behaviour is likely to have been modified by the removal of government-funded support to the Industry. The aim of this paper is to undertake such an analysis, focusing in particular on how the government's push of the AWB towards fully commercial practices can be expected to have affected its pricing behaviour.

The structure of this paper is as follows. Section 1 provides a background to the privatisation issues in Australia. In Section 2 the model is developed and a base case scenario is devised with the initial results of the numerical analysis reported. Section 3

outlines several recent Australian wheat industry developments. These developments have occurred over the last decade (1990s), and include: deregulation of the Australian wheat market; changes in domestic and export transport costs; and developments in international stability. These changes are imposed on the hypothetical data used in the original model to determine how pricing behaviour differs from the base case. The results for each scenario are then analysed and conclusions drawn.

Section 1: Background

Microeconomic reform and the process of privatisation has been a Western political phenomenon of the last three decades. Following from the challenge of the classical economist's 'laissez faire' policies rose Keynesianism and the 'mixed economy'. The breakdown of Keynesian economic policy during the 1970s, coupled with the 1979 recession, lead to a push towards microeconomic reform as a means to remove focus from the macroeconomic problems of the day (Quiggin, 1996, p 11).

The US and the UK began to deregulate key industries, such as telecommunications industries, during the early 1980s. The US' reforms were ultimately limited to the airline, road and telecommunications industry, however the UK, under the Thatcher government, began to embrace the concept of privatisation (Quiggin, 1996, p 12). At the same time, international financial deregulation was hastened by the collapse of the Bretton Woods agreement of fixed exchange rates.

Deregulation in Australia began with the Whitlam government's 25% across-the-board tariff slash in 1973. Microeconomic reform continued with the establishment of an Industries Assistance Commission (now the Productivity Commission), and in 1980 a "the first systematic program of microeconomic reform was presented in *Australia at the Crossroads: Our Choices to the Year 2000* by Kasper, Blandy, Freebairn, Hocking and O'Neill" (Quiggin, 1996, p 1). This paper presented a 'libertarian' and a 'mercantilist' path, which differed in their objectives and were supported by proponents for and against microeconomic reform (see table 1.1.1). Kasper et al., suggested the mercantilist

approach to be the most direct of the two, however, it has been the libertarian path that has been chosen - a slightly slower option (Quiggin, 1996, p 2).

Table 1.1.1: Libertarian and mercantilist approaches to microeconomic reform in Australia.

Libertarian	*Mercantilist*
Free international trade;	Protection against import protection;
Acceptance of structural changes wrought by new technologies;	Protection against changes wrought by new technologies;
Elimination of restrictions on international capital flows and competitive domestic capital markets;	Maintenance of restrictions on capital inflows and competitive capital markets;
Variation of wages in response to market forces;	Defense of a rigid system of occupational and real wages;
Reduction in the government's benevolent role in service provision;	Continuation of provisions by a benevolent government (e.g. health, education & welfare);
Application of antimonopoly legislation and market deregulation;	Government by lobbying;
Expansion of the government's role as a provider of income maintenance.	Consumerism and environmentalism supported by bureaucratic regulation.

Source: Kasper et al., 1980, pp 182-211, in Quiggin, 1996, pp 1-2.

The Labour government in Australia embraced microeconomic reform in the late 1980s, against the grain of traditional Labour policies of state ownership, and Australia joined the international bandwagon of deregulation and privatisation.

> From this point on, microeconomic reform proceeded rapidly. The main recommendations of the Campbell Committee were implemented in 1986. By 1988, the government had committed itself to a general reduction in tariffs, and to the privatisation of enterprises such as the Commonwealth Bank. In 1990 the two-airlines agreement came to an end and the basis was laid for competition in telecommunications.
> (Quiggin, 1996, p 28).

In 1995, following the Hilmer Report (1993), the National Competition Policy Act (1995) was ratified by the Council of Australian Governments (COAG). This Act saw the creation of the Australian Competition and Consumer Commission and the National Competition Council (NCC). The aim of the NCC is "to supervise the progress of federal and state governments towards implementation of competitive reform" (Quiggin, 1996, p 29). Since its establishment, the NCC has endorsed many industry reviews, including the 2000 Review of the Wheat Marketing Act.

Section 2: The Model

The model developed in this section is based on that outlined in Fraser (1989) of a size-orientated price-setting firm operating in multiple markets. In that case little was done to specify the firm's alternative markets other than for them to differ in terms of the extent to which demand was uncertain. In this case, in order to characterize more fully the differences between the AWB's domestic and overseas markets, the following market-based assumptions are made:

(a) the product is a homogenous good;
(b) three markets exist: "overseas", "domestic" and residual production ("dump market") in which revenue just covers costs;
(c) costs to supply are greater in the overseas market than the domestic;
(d) demand in the overseas market is more elastic than in the domestic market;
(e) demand in the overseas market is more uncertain than in the domestic market.

Regarding the specification of the firm's objective, based on Fraser (1989), it is assumed that "before" commercialisation the objective of the firm is to maximize the expected utility of sales revenue ($EU(Rev)_T$) subject to an expected profit constraint ($E(\prod)_T$) and a total production constraint ($\overline{Q}$). Note that in what follows consideration of revenue from the sale of residual production is omitted in order to simplify the analysis. In this context

it can be shown that because the firm's pricing behaviour is always constrained, this residual revenue source has a negligible effect on behaviour, even if the firm is very risk averse. In this case the firm's objective is given by:

$$\text{Max} \quad EU(\text{Re}v)_T \qquad \ldots(1)$$

By choice of overseas (p_o) and domestic (p_d) prices.

Subject to:

$$\overline{Q} = E(q_o) + E(q_d) + q_x \qquad \ldots(2)$$

and,

$$E(\prod)_T \geq z \qquad \ldots(3)$$

$$E(\prod)_T = p_o E(q_o) - c_o E(q_o) + p_d E(q_d) - c_d E(q_d) \qquad \ldots(4)$$

where: $E(q_o)$ = expected sales in the overseas market;

$E(q_d)$ = expected sales in the domestic market;

q_x = sales of residual production;

c_o = costs of supply per unit to the overseas market;

c_d = costs of supply per unit to the domestic market;

z = minimum feasible expected profit level.

Demand in both the overseas and domestic markets is assumed to be characterised by constant elasticity (b_i) demand functions subject to additive uncertainty (u_i, where i is either o or d).

$$q_i = a_i p_i^{-b_i} + u_i \qquad \ldots(5)$$

and where price is chosen as an optimal mark-up (λ) on per unit costs of supply:

$$p_i = (1+\lambda_i)c_i \qquad \ldots(6)$$

where:

a_i = scaling factor in each market

$$E(u_i) = 0$$

and demand is assumed to be uncorrelated in the two markets.

As a consequence:

$$E(q_i) = a_i p_i^{-b_i} \qquad \ldots(7)$$

and expected revenue ($E(Rev)_T$) is given by:

$$E(\mathrm{Re}v)_T = p_o E(q_o) + p_d E(q_d) \qquad \ldots(8)$$

While the variance of revenue ($Var(Rev)_T$) is given by:

$$Var(\mathrm{Re}v)_T = p_o^{\,2} Var(u_o) + p_d^{\,2} Var(u_d) \qquad \ldots(9)$$

where:

$Var(u_i)$ = variance of demand in each market.

On this basis, using the mean-variance specification of expected utility, the firm's objective is to maximize[1]:

$$EU(\mathrm{Re}v)_T = U(E(\mathrm{Re}v)_T) + \frac{1}{2}U''(E(\mathrm{Re}v)_T)Var(\mathrm{Re}v)_T \qquad \ldots(10)$$

Subject to:

$$\overline{Q} = E(q_o) + E(q_d) + q_x \qquad \ldots(11)$$

and,

$$E(\prod)_T \geq z$$

[1] See Hanson & Ladd, 1991 for empirical support for this assumption.

$$E(\prod)_T = (p_o E(q_o) - c_o E(q_o)) + (p_d E(q_d) - c_d E(q_d) \quad \ldots(12)$$

The first order conditions for the optimal prices, subject to the expected profit and total production constraints are as follows:

$$foc_i = U'(E(\mathrm{Re}v))_T * E'(\mathrm{Re}v)_i + \frac{1}{2}[U'''(E(\mathrm{Re}v))_T * Var(\mathrm{Re}v_T) * E'(\mathrm{Re}v)_i] + \frac{1}{2}[U''(E(\mathrm{Re}v))_T * Var'(\mathrm{Re}v_i$$

=0

…(13)

where,

$$E'(\mathrm{Re}v)_i = c_i(E(q_i))(1-b_i)$$

…(14)

$$Var'(\mathrm{Re}v_i) = c_i p_i (Var(u_i))$$

…(15)

The "after" commercialisation situation is assumed to be represented by a focus on profit rather than revenue, in which case the firm's objective is to maximize the expected utility of profit, subject only to the total production constraint (Fraser, 1994(a)).

$$\text{Max} \quad EU(\prod)_T \quad \ldots(16)$$

Subject to:

$$\overline{Q} = E(q_o) + E(q_d) + q_x \quad \ldots(17)$$

Using the same specification of the demand functions, expected profit is given by:

$$E(\prod)_T = p_o E(q_o) + p_d E(q_d) - c_o E(q_o) - c_d E(q_d) \quad \ldots(18)$$

and the variance of profit is given by:

$$Var(\prod)_T = (p_o - c_o)^2 Var(u_o) + (p_d - c_d)^2 Var(u_d) \quad \ldots(19)$$

Once again using the mean-variance formulation gives:

$$\text{Max} \quad EU(\prod)_T = U(E(\prod)_T + \frac{1}{2}U''(E(\prod)_T)Var(\prod)_T \quad \ldots(21)$$

Subject to:

$$\overline{Q} = E(q_o) + E(q_d) + q_x \quad \ldots(22)$$

On this basis, the first order conditions for the optimal prices subject to the total production constraint are given by:

$$foc_i = U'(E(\prod))_T * E'(\prod)_i + \frac{1}{2}[U'''(E(\prod))_T * Var(\prod_T) * E'(\prod)_i] + \frac{1}{2}[U''(E(\prod))_T * Var'(\prod_i)] = 0 \quad \ldots(23)$$

where,

$$E'(\prod)_i = c_i E(q_i) - \lambda_i b_i c_i^{\,2} a_i((1+\lambda_i)c_i)^{-b_i-1} \quad \ldots(24)$$

$$Var'(\prod_i) = 2\lambda_i c_i^{\,2} Var(u_i) \quad \ldots(25)$$

In order to undertake a numerical analysis of the model developed it is necessary to specify a functional form for the firm's utility function, and a set of base case parameter values. In what follows, use is made of the constant relative risk aversion utility function (see Fraser 1994a and b). On this basis, total utility for the "before" commercialisation case ($U(\text{Re}v)_T$) is given by:

$$U(\text{Re}v)_T = (\text{Re}v)_T^{\,1-R} \Big/ 1-R \quad \ldots(26)$$

And in the "after" commercialisation case, the firm's utility is given by:

$$U(\Pi)_T = \Pi_T^{1-R} \Big/ 1-R \qquad \ldots(27)$$

The parameter values used for the 'base case' in the numerical analysis (using hypothetical data) are as follows:

Overseas Market	**Domestic Market**	**Residual Market**
$a_o = 10000$	$a_d = 10000$	$\overline{p}_x = c_x = 1$
$b_o = 1.5$	$b_d = 1.3$	$\overline{Q} = 240$
$c_o = 15$	$c_d = 10$	
$u_o = 500$	$u_d = 100$	

Note the relative risk aversion coefficient[2] is set at $R = 0.5$ and the expected profit constraint (z) for the expected utility of revenue maximiser is assumed to be 95% of that achieved by the expected utility of profit maximiser. This is an arbitrary assumption, which is made for simplicity, and in order to keep the two types of pricing behaviour "close" to each other. The role of this constraint is discussed further in what follows.

[2] It might be expected that the AWB Ltd's attitude to risk (R) would also change with commercialisation. However, previous numerical analysis of this model suggests that the pattern of results is insensitive to the assumed value of R (see Lobb and Fraser, 2002, for details).

Table 2.1.1: Full model version*

	Before*	***After****
p_o	$32.90	$41.03
$\boldsymbol{p_d}$	$27.30	$42.49
$\boldsymbol{Q_T}$	188.83	114.48
$\boldsymbol{E(\Pi)_{Total}}$	$3298.32	$3473.42

From the initial numerical analysis of the sensitivity of the relative prices and quantities in Table 2.1.1 (Lobb & Fraser, 2002) three hypotheses were developed[3]:

H1: $p_o(\prod) > p_o(\mathrm{Re}\, v)$

H2: $p_d(\prod) > p_d(\mathrm{Re}\, v)$

H3: $Q_T(\prod) < Q_T(\mathrm{Re}\, v)$

[3] It was also shown in Lobb and Fraser (2002) that: $p_o(\prod_i) \lessgtr p_d(\prod_i)$; depending on the parameter values chosen.

Section 3: Analysis

3.1 Case 1: Domestic Deregulation of the Australian Wheat Market[4]

The Australian Wheat Board (AWB), was originally established as a temporary measure during WWII, "to handle wheat marketing as a war-time emergency" (AWB, 1999). These terms were formalised with the introduction of the Wheat Industry Stabilisation Act (WISA), (1948). The act ensured the former AWB was the sole marketer and seller of Australian wheat on the domestic and export markets. As described by Wait and Ahmadi-Esfahani (1996), prior to deregulation:

> All domestically produced wheat became the property of the AWB once it left the farm gate. The Wheat (*sic*) was then taken to the AWB-appointed receiver in each State – the Bulk Handling Authorities (BHAs), which were statutory monopolies. Growers were charged for the use of the services of the BHAs at the same amount per tonne regardless of the handling facility to which they delivered their wheat and the time of delivery within the season.
> (p 318).

The preliminaries of deregulation followed the IAC's reports[5] and the announcement by the Australian Federal Government (1985), that they were no longer willing or able to provide assistance to wheat producers in order to match the subsidies provided to farmers in other countries (www.prairecentre.org/wheataustralia.htm). The Wheat Marketing Act (WMA), (1984, 1989), was developed to replace WISA (1948). Changes included the removal of the provision of government underwriting of loans and price guarantees for the AWB as well as opening the domestic market to competition to increase internal and allocative efficiency.

The deregulation process culminated with the signing of the WMA on 1st July 1989. The WMA imposed a new structure for the Australian wheat industry and the AWB became

[4] See Lobb, 2002 for a more detailed analysis.

[5] See IAC Reports, 1977, 1978, 1984, 1988(a) & 1988(b).

merely one of several players in the newly competitive domestic market. Multinational companies took this opportunity to enter the Australian market. The companies that began marketing, trading and broking in the domestic market included Cargill, Conagara and Louis Dreyfus (Wait & Ahmadi-Esfahani, 1996, p 320). Farmers were no longer restricted to selling solely to the AWB and now had marketing choices for domestic sales. Buyers also benefited from the increased competition in the marketplace (Wait & Ahamadi-Esfahani, 1996, p 320).

On a theoretical level, domestic market deregulation may have resulted in an increase in the elasticity of the AWB's domestic demand as consumers would not be as constrained to purchasing wheat from the AWB as they had been prior to deregulation. It is important to note that although this is a widely accepted theoretical construct there have been no studies examining the elasticity of demand for the domestic wheat market as the data required is deemed commercially sensitive and has not to date been released by marketing agents (Wait & Ahmadi-Esfahani, 1996, p 321).

For this study, the increase in the elasticity of domestic demand is represented by a 0.1 unit increase in b_d to 1.4, from 1.3 in the base case. Costs and uncertainty are held the same as in the base case. The elasticity of demand for the international market also remains unchanged.

Results

Table 3.1.1A: Comparing sales maximisation results when b_d is increased

	Before* [a]	***Before***
	b_o=1.5 b_d=1.3	b_o=1.5 b_d=1.4
p_o	$32.90	$30.87
$\boldsymbol{p_d}$	$27.30	$24.73
$\boldsymbol{Q_T}$	188.83	170.37
$\boldsymbol{E(\Pi)_{Total}}$	$3298.32	$2576.06

[a] Where 'Before*' indicates the scenario results from the full model version of the base case (as in table 2.1.1).

As expected, the results in Table 3.1.1A indicate that an increase in the AWB's elasticity of domestic demand, by weakening the expected profit constraint, will lead to a decline in both its overseas and domestic prices[6]. Note also that the domestic price has decreased by a greater amount than the overseas price as the revenue maximiser concentrates on using the weaker expected profit constraint to pursue increased sales revenue in the (now more responsive) domestic market.

[6] Note that the expected utility of revenue maximiser will choose to lower prices until it is constrained by the expected profit constraint. Because of this the first order conditions (focs), are not equal to zero for the expected utility of revenue maximiser. However, the focs must equate in order for the best contribution to be made to increasing the expect utility of the revenue maximiser.

Table 3.1.1B: Comparing profit maximisation results when b_d is increased

	After*	***After***
	b_o*=1.5* b_d*=1.3*	b_o*=1.5* b_d*=1.4*
p_o	$41.03	$40.32
$\boldsymbol{p_d}$	$42.49	$34.50
$\boldsymbol{Q_T}$	114.48	109.37
$\boldsymbol{E(\Pi)_{Total}}$	$3473.42	$2711.71

Table 3.1.1B again shows a decline in prices from the base case scenario. The decrease in the domestic price is considerably larger than the decline in the overseas price and this decrease is also significantly greater than that in Table 3.1.1A above. This reflects the greater price flexibility associated with the (unconstrained) profit maximiser. Nevertheless, the results are consistent with the previous findings that overseas and domestic prices of the profit maximiser (after scenario) are still greater than for the revenue maximiser (before scenario), and that the quantity for the profit maximiser is less than for the revenue maximiser (see hypotheses, section 1).

These results suggest that if the effects of deregulation in the domestic wheat market appeared in advance of the commercialisation of the AWB being implemented then domestic consumers would have seen this in terms of a decrease in domestic prices until the implementation of commercialisation brought about a price increase. Alternatively, if the impact of deregulation appeared in conjunction with the impact of commercialisation, then no such price cut would be observed. Rather, the extent of the increase in the domestic price associated with commercialisation would simply have been reduced.

3.2 Case 2: Changes in Transport Costs[7]

The Australian transportation industry (road, rail, and sea), and bulk handling corporations are closely linked with the wheat industry as they provide an integral network between farmers and consumers. Transportation has remained a key cost component post deregulation of the AWB as the majority of wheat (85%) is destined for the export market and requires transportation from receival points to port facilities. Domestic wheat sales account for the remaining 15% where the principal modes of transport are rail and road.

Domestic Costs

There are two main stages of grain transportation. Firstly, grain is transported from the farm to storage facilities (on average 17 kilometres), this cost is usually borne by the farmer (AWB Ltd, 2001a). Secondly, wheat is transported from receival storage facilities to domestic customers or merchants (a national average of 350 kilometres), the costs of which are usually incurred by the marketer, AWB Ltd (AWB Ltd, 2001a).

Road transportation is the largest component of domestic freight transport in Australia, 65% of all freight moved in 1995/96 was by road and this figure has been increasing at 6% per annum over the last few years (Austroads, 2000, p 15 -16). Rail is the next largest mode of freight transportation with 26% of total freight hauled (Austroads, 2000, p 16). Rail is typically used for non-perishable bulk commodities such as minerals or agricultural goods like wheat.

Export Costs

Exported bulk commodities, requiring shipment by sea, are particularly dependent on a low cost structure to ensure a competitive advantage. The majority of Australian wheat is sold 'free on board' (fob) with an increasingly large proportion (30%), of wheat sold as 'costs, insurance and freight' (cif), (PC, 1998, pp 152). Cif requires the AWB Ltd to charter a ship to pick up and deliver wheat for export to a specific buyer. The AWB Ltd

[7] Further details are available from Lobb, 2002

is responsible for all port authority charges including government levies, stevedoring charges, wharfage, tonnage, navigation charges, berthage and all other loading and delivery costs (PC, 1998, pp 36).

Prior to the privatisation of the AWB Ltd, nearly all wheat was sold fob, with the importer accountable for the product after release from Bulk Handling Corporations (BHCs) and prior to loading[8]. As a result of fob sales and operating as a statutory marketing authority, the Australian Wheat Board had no contractual relationship with port authorities. There was little or no incentive for shippers to rally for an increase in efficiency as costs were sustained by the buyer (IC, 1993, pp154). Potentially, post deregulation, the AWB Ltd stood to benefit from waterfront reform by decreasing the cost margin included in the comparative price of Australian wheat. The increase in cif sales also provided an incentive for AWB Ltd to demand highly efficient and low cost services.

Data – domestic costs

Data for the changes in domestic transport costs over the period 1988 till 2000 was calculated solely on rail freight price trends for wheat per tonne 1995-96 to 2000-01. Data for road and BHCs costs was unobtainable. Rail data was compiled from a Productivity Commission (2002) report on "Trends in Australian Infrastructure Prices, 1990-91 to 2000-01". The data represents the average cost of transporting wheat from storage to ports in each state (PC, 2002a, p 225).

[8] This process is often referred to as 'ex spout' (PC, 1993, p 153, footnote 4).

Table 3.2.1: Real rail freight price trends – wheat (per tonne)

(Index 1996-97 = 100)

	NSW	*VIC*	*QLD*	*SA*	*WA*	*National*
1996-97	100	100	100	100	100	100
1997-98	101.3	100.1	100.1	100	98.9	100
1998-99	92.6	99.2	97.0	103.2	96.4	96.2
1999-00	91.4	91.3	93.5	98.4	90.3	92.1
2000-01	78.1	80.1	82.8	93.7	91.3	84.7

Source: PC estimates based on Australian Bureau of Statistics (ABS, *Consumer Price Index, Australia*, Cat no. 6401.0); AWB Ltd, Melbourne, personal communication, 8 April 2002 (PC, 2002a, p 225)[9]

The data in Table 3.2.1, shows a 15.3% decline in national average transport costs of wheat per tonne between the years 1996-97 and 2000-01. If this fall in costs was constant and consistent from 1988-89 one could assume, ceritus paribus, that costs have fallen by 30.6% over the last decade. All elasticities and levels of uncertainty are held per the original base case.

Data – export costs

The data used in this paper for examining the port costs to the AWB Ltd has been taken from these reports and their various public submissions. As a result of the material available it has been possible to estimate the port and related government charges associated with the export of bulk wheat, cif, out of various Australian ports. Table 3.2.2 shows the changes in average per tonne costs in Australian dollars and indicates that during the period 1992 to 2002 there has been a decline in costs of around 9.75%. Costs

[9] Note from PC (2002a): The real price index for each State reflects the average cost of transporting wheat from silos to the port. The average is equal to the cost of transporting the grain from each silo, weighted by the tonnage of Export Pool grain moved from that site as a proportion of aggregate State tonnage of AWB Pool Grain to the port for export.

are in A$ per tonne for 1992 and 2002 for a ship with a gross registered tonnage of 30000 tonnes.

Table 3.2.2: Port authority costs in A$ per tonne for 1992 & 2002

	1992[b] *A$/tn*	*2002*[c] *A$/tn*	*Change $/tn 1992-2002*	*% Change 1992-2002*
PORT				
Brisbane	$2.53	$1.57	$0.96	3.44%
Adelaide	$2.26	$1.79	$0.47	20.08%
Port Lincoln	$2.28	$1.71	$0.57	25.00%
Esperance	$2.48	$2.63	-$0.15	-6.05%
Albany	$2.23	$2.06	$0.17	7.62%
Kwinana	$1.06	$1.80	-$0.74	-69.81%
Geraldton	$2.44	$2.23	$0.21	8.61%
Average	**$2.11**	**$1.97**	**$0.21**	**9.75%**

[b] Source: IC, 1993, Table B8, p 216

[c] Source: Shipping Australia Ltd, 2002, Attachment C, p 7

Reforms are continuously and simultaneously occurring in both the wheat and the waterfront industries. Hence lower port authority costs are due not only to the AWB Ltd's attitude to costs, but also to increased efficiency on the waterfront. It is difficult to distinguish which component of the 9.75% decrease over the period 1992-2002 time periods can be accounted for by changes in the AWB Ltd's corporate structure or by an increase in efficiency in waterfront operations. However, the fact that the AWB Ltd, prior to deregulation, traded in fob contracts suggests that the decline in costs must be accounted for as a result of the AWB Ltd's change in corporate structure.

It is important to note that domestic and overseas costs in the model are representative of total marketing costs and hence a proportion of these total selling costs needs to be

allocated specifically to transport costs. The AWB Ltd, report that their 'Site to Sea' direct costs[10] are approximately 14%, and other marketing costs (pool management fees, insurance and demurrage costs), account for 3% of their National Pool for 2000-01 (AWB, 2001b, p10). Following from this, it can be inferred that transport costs, as a proportion of total costs, are to the order of 82% of total selling costs.

Export costs for the AWB Ltd should also include domestic costs – that is, the transfer of wheat from the receival point to the port. In what follows it is assumed that for exported wheat the internal transport represents 67% of the total transport costs (that is, c_d=10 and c_o=15). Given that domestic costs have declined by 30% over the last decade, the figure used to represent the change in export costs for this time period is 23%.

Modifying these statistics to take into account the proportion of costs allocated to transport (82%), domestic transport costs represent a 25% decline in total domestic selling costs and overseas transport costs represent a 19% decline in total export costs. Note that all elasticities and values of uncertainty are held constant per the base case.

[10] AWB Ltd defines these costs as: "direct costs paid from pool proceeds to service providers involved in the supply chain from up- country receivals sites to bulk wheat shipments, free on board" (AWB, 2001, p 10).

Results – transport costs

Table 3.2.3A: Comparing sales maximisation results when costs are decreased (export costs down by 19%; domestic costs down by 25%)

	Before*	***Before***
	$c_o=15$ $c_d=10$	$c_o=12.15$ $c_d=7.5$
p_o	$32.90	$26.84
$\boldsymbol{p_d}$	$27.30	$20.15
$\boldsymbol{Q_T}$	188.83	268.88
$\boldsymbol{E(\Pi)_{Total}}$	$3298.32	$3619.37

The results in table 3.2.3A show a decrease in domestic and export prices when costs have been decreased in both markets. Moreover, these decreases are proportionately in line with the decreases in costs.

Table 3.2.3B: Comparing profit maximisation results when costs are decreased

	After*	***After***
	$c_o=15$ $c_d=10$	$c_o=12.15$ $c_d=7.5$
p_o	$41.03	$34.43
$\boldsymbol{p_d}$	$42.49	$32.18
$\boldsymbol{Q_T}$	114.48	159.16
$\boldsymbol{E(\Pi)_{Total}}$	$3473.42	$3809.81

In addition, the results in Table 3.2.3B show a decline in the prices for both export and domestic wheat, and again these decreases are proportionately in line with the decreases in costs.

Similar to the case of deregulation, these results suggest that if the effects of transport cost reductions appeared in advance of the commercialisation of the AWB being implemented then domestic consumers would have seen this in terms of a decrease in domestic prices until the implementation of commercialisation brought about a price increase. Alternatively, if the impact of transport cost reductions appeared in conjunction with the impact of commercialisation, then no such price cut would be observed. Instead, the extent of the increase in the domestic price associated with commercialisation would simply have been reduced.

3.3 Case 3: Uncertainty in the International Arena[11]

The international trading arena has become increasingly unstable in light of fluctuating exchange rates and general economic uncertainty following September 11th events in 2001 as well as financial upheaval throughout 2002. However, throughout the 1990s there were two periods of global macroeconomic instability, firstly in 1991-93 and then 1998-99 with an average growth rate of 3% (down from 3.5% in the 1980s and 4.5% in the 1970s (IMF, 1999, p 3). The major reason for this instability was currency crises in Mexico, Brazil, Russia and Asia. Many economies remained surprisingly stable throughout this period, namely the USA, Australia, China, India, Ireland, the Netherlands, Norway and Taiwan (IMF, 1999, p4). As a result, the International Monetary Fund (IMF) (1999), believes that:

> It is unclear whether macroeconomic instability generally has been increasing. However the mere fact that it has been pervasive may be considered surprising given the general improvement in macroeconomic policies in most countries compared with the two preceding decades
> (p4).

For the purposes of this study a measure of the change in the level of international uncertainty from 1988/89 to 1998/99 is taken by examining gold prices. Gold is generally

[11] For further details see Lobb, 2002.

seen as a distinct and relatively stable commodity (less fluctuating than paper currencies), with a "universally acceptable storehouse of value" (Amey, 1998, p 50). Gold is both a commodity and a form of legal tender and it is this dichotomy that enables gold to be used as an indicator for world economic stability – "international political and economic events that may influence the market for gold as a commodity may be outweighed by developments perceived to favor (*sic*) gold as a medium of exchange" (Amey, 1998, p 50).

Results

Following the above analysis[12] and based on fluctuations in the gold price as a proxy for international uncertainty it is assumed that uncertainty in the overseas market has declined over the last decade by 33% (Amey, 1998, p 53). Costs, elasticities, and domestic uncertainty are held the same as in the base case scenario.

Table 3.3.1A: Comparing sales maximisation results when uncertainty in the overseas market decreases (33%)

	Before*	***Before***
	$Var(u_o)=500$ $Var(u_d)=100$	$Var(u_o)=335$ $Var(u_d)=100$
p_o	\$32.90	\$32.84
$\boldsymbol{p_d}$	\$27.30	\$27.44
$\boldsymbol{Q_T}$	188.83	188.07
$\boldsymbol{E(\Pi)_{Total}}$	\$3298.32	\$3301.05

Table 3.3.1A shows a small decline in export prices and a small rise in domestic price as international uncertainty decreases. These results follow from the revenue maximiser feeling less at risk generally and therefore willing to bear the increased risk associated with lowering prices in the more responsive market to increase expected revenue.

[12] For further details see Lobb, 2002.

Table 3.3.1B: Comparing profit maximisation results when uncertainty in the overseas market decrease (33%)

	After*	***After***
	$Var(u_o)=500$ $Var(u_d)=100$	$Var(u_o)=335$ $Var(u_d)=100$
p_o	$41.03	$42.05
$\boldsymbol{p_d}$	$42.49	$42.50
$\boldsymbol{Q_T}$	114.48	113.08
$\boldsymbol{E(\Pi)_{Total}}$	$3473.42	$3475.02

In Table 3.3.1B the firm adjusts its prices upwards to reflect the decreased demand uncertainty in the overseas market. In particular, given the firm's risk aversion, the overseas market is perceived as more attractive, and the price set for that market is raised in the pursuit of increased expected profits even though this also increases the variability of profits.

It follows that as the AWB Ltd has shifted from a revenue maximiser to a profit maximiser changes in the level of international uncertainty can be expected to have had the opposite impact on price setting in the overseas market, with the revenue maximiser avoiding risk with price increases, and the profit maximiser avoiding risk with price decreases.

Section 3.4 Sensitivity Analysis

This section contains an evaluation of the robustness of the hypotheses regarding the impact of commercialisation on the AWB's domestic and export prices to the contemporaneous occurrence of both deregulation and decreased costs of transport. Specifically, although it was found in sections 3.1 and 3.2 that the contemporaneous occurrence of each of these developments is sufficient only to diminish the extent of the

positive impact of commercialisation on domestic and export prices, Tables 3.4.1A and 3.4.1B together show that these hypotheses are not robust to the contemporaneous occurrence of both developments. In particular, although with both developments occurring at the same time as commercialisation there continues to be a small increase in the export price, the Tables show that the domestic price decreases (that is, $27.30 to $26.06).

Moreover Table 3.4.1C evaluates the sensitivity of this finding to the level of the expected profit constraint on the revenue maximiser, which has been set at 95% of maximum expected profits in the previous analysis, but which is weakened to 90% of maximum expected profits in this Table. These results show that a weakening of the expected profit constraint on the revenue maximiser restores the positive impact on prices of commercialisation regardless of the contemporaneous occurrence of deregulation and transport cost decreases (for example, the domestic price increases from $23.61 to $26.06). It follows that the impact of commercialisation on the AWB's prices may have been positive or negative depending both on the associated developments of deregulation and cost decreases, and on the weakness of the expected profit constraint on the AWB's pricing policies prior to commercialisation. In particular, the weaker was this constraint, the more likely it was that both export and domestic prices increased with commercialisation, regardless of the associated developments.

Table 3.4.1A: Comparing revenue maximisation results when b_d is increased and costs have declined in both markets

	Before*	***Before***
	$b_o=1.5$ $b_d=1.3$	
p_o	$32.90	$24.91
$\boldsymbol{p_d}$	$27.30	$18.75
$\boldsymbol{Q_T}$	188.83	245.57
$\boldsymbol{E(\Pi)_{Total}}$	$3298.32	$2883.88

Table 3.4.1B: Comparing profit maximisation results when b_d is increased and costs have declined in both markets.

	After*	***After***
	$b_o=1.5$ $b_d=1.3$	
p_o	$41.03	$34.03
$\boldsymbol{p_d}$	$42.49	$26.06
$\boldsymbol{Q_T}$	114.48	154.54
$\boldsymbol{E(\Pi)_{Total}}$	$3473.42	$3035.11

Table 3.4.1C: Comparing revenue maximisation results with the expected profit constraint set at 90% of maximum expected profits. (Other changes are the same as Table 3.4.1.A)

	Before*	***Before***
	$b_o=1.5$ $b_d=1.3$	
p_o	\$28.85	\$22.02
$\boldsymbol{p_d}$	\$23.61	\$16.48
$\boldsymbol{Q_T}$	228.60	294.66
$\boldsymbol{E(\Pi)_{Total}}$	\$3126.41	\$2731.22

Conclusion

This paper has investigated of the effects of internal deregulation, transport costs and international uncertainty on the AWB Ltd's pricing behaviour in the context of the commercialisation of the AWB Ltd, where this shift is modelled as a change in its objectives from a revenue to a profit maximiser. The results of the above analyses are evaluated in relation to the developed hypotheses and indicate the impact of recent wheat industry developments on hypothetical prices. In particular, it has been shown that the general effect of commercialisation has been an increase in both domestic and overseas prices. However, during the 1990s in association with commercialisation the Australian wheat industry also experienced deregulation of the domestic market, a decline in wheat transport costs and a decrease in world market uncertainty. Based on the simulation results it has been suggested that because both deregulation and lower transport costs have acted to decrease domestic and export prices, their contemporaneous occurrence with commercialisation will have ameliorated to some extent the price increases associated with commercialisation, and may have even dominated this impact depending on the extent to which the AWB's profit constraint was binding on its pricing behaviour prior to commercialisation. In addition, it was found that the commercialisation of the

AWB has resulted in a reversal of the impact of changes in world market uncertainty on the overseas price set by the AWB.

References

Amey, E.B., 1998, "Gold", *Metal Prices in the United States Throughout 1998*, United States Geological Society, July 1998, Gold pp 49-53

Austroads, 2000, "Roadfacts 2000", Austroads Incorporated, Publication Number AP-G18/00.

Australian Wheat Board (AWB) Ltd., 1999, "The Australian Grains Industry – An Introduction", www.awb.com.au

AWB Ltd., 2001a, "Community Education – Transporting Grain", www.awb.com.au

AWB Ltd., 2001b, "AWB National Pool Performance Report 2000-01", www.awb.com.au

Bishop, M., Kay, J. & Mayer, C. (eds.), 1994, Privatisation and Economic Performance, Oxford University Press, Oxford, UK

Fraser, R.W., 1989, "Uncertainty and the Positive Theory of Public Enterprise", *Bulletin of Economic Research*, 41(2), pp147-155

Fraser, R.,1991, "Privatisation in the United Kingdom: Lessons for Australia?", *Economic Papers*, September 1991, 10(3), pp30-37

Fraser, R., 1994a, "Privatisation: Price-capping and Reliability", *Utilities Policy*, April 1994, 4(2), pp121-127

Fraser, R., 1994b, "Price, Quality and Regulation: An Analysis of Price-Capping and the Reliability of Electricity Supply, *Energy Economics*, July 1994, 16(3), pp 175-183

Fraser, R., 1996,"Privatisation in the United Kingdom: Lessons for Australia 2", *Economic Papers*, December 1996, 15(4), pp14-19

Hanson, S.D. and Ladd, G.W., 1991, "Robustness of the Mean-Variance Model with Truncated Probability Distribution", *American Journal of Agricultural Economics*, May 1991, 73(2), pp436-445

Industry Assistance Commission (IAC), 1977, "Wheat Stabilisation", IAC Report, June 1977

IAC, 1978, "Wheat Stabilisation", IAC Report, July 1978

IAC, 1984, “The Wheat Industry”, IAC Report, July 1984

IAC, 1988a, “The Wheat Industry – Conclusions and Recommendations”, IAC Report, February, 1988

IAC, 1988b, “The Wheat Industry”, IAC Report, April 1988

Industries Commission (IC), 1993, “Port Authority Services & Activities”, IC Inquiry Report No. 31, AusInfo, Canberra, May 1993

International Monetary Fund (IMF), 1999, “World Economic Outlook”, October 1999

Lobb, A.E. & Fraser, R.W., 2002, “Pricing Policies under Different Objectives: Implications for the Pricing Behaviour of AWB Ltd.”, Conference Paper, Australian Agricultural and Resource Economics Society 46th Annual Conference, Canberra, 12th-14th February, 2002

Lobb, A.E., 2002, “Policy Developments Relating to the Australian Wheat Industry”, Work in Progress, PhD Thesis

Productivity Commission (PC), 1998, “International Benchmarking of the Australian Waterfront”, International Benchmarking Report, AusInfo, Canberra, April 1998

PC, 2002, “Trends in Australian Infrastructure Prices, 1990-91 to 2000-01”, Performance Monitoring, AusInfo, Canberra, May 2002

Quiggin, J., 1996, Great Expectations: Microeconomic Reform in Australia, Allen and Unwin, Sydney

Shipping Australia Ltd., 2002, *“Submission to the Productivity Commission by Shipping Australia Ltd., Regarding the Inquiry into Economic Regulation of Harbour Towage and Related Services in Australia”, Attachment C*; in PC, 2002b, “Economic Regulation of Harbour Towage and Related Services”, Position Paper, Canberra, June 2002

Vickers, J. & Yarrow, G., 1989, Privatization – An Economic Analysis, The MIT Press, Cambridge, MA, USA

Wait, M & Ahmadi-Esfahani, F., 1996, “How has the Domestic Wheat Market Changed since Deregulation?”, *Review of Marketing and Agricultural Economics*, 64(3), December 19996, pp 319-324