Measures of Buyer Concentration in the Australian Wool Market

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The study uses empirical measures of market concentration to examine buyer competition in wool between 1974 and 1992. Three measures of concentration are examined, concentration ratios, Herfindahl indices and Lorenz curves. Data from the Australian Council of Wool Exporters are used to obtain estimates of these measures over the sample period. The results indicate that the buying sector in the Australian wool market is relatively concentrated and calculation of Spearman correlation coefficients indicate that rankings have not altered significantly in recent years.

1. Introduction

The concentration of buyers in the Australian wool market periodically becomes an issue for growers. Before the Reserve Price Scheme (RPS), there was concern about buyer 'pies' at auction and reports such as the Philp Report in 1962, which addressed the issue, were influential in industry policy of the day (Philp, Butterfield and Merry). The RPS was popularly viewed as a countervailing power to buyer power during the seventies and eighties, and with the removal of this scheme in 1990, there was a perception that the market had become unprotected from dominant buying interests. In this paper, an attempt is made to measure the extent of dominance by large buyers in the wool market and assess the justification or otherwise for grower fears about excessive market power.

The purpose of the paper is to examine the main trends in buyer concentration in the Australian wool market and the stability of market shares over time including the period following the removal of the RPS. In section 2, three measures of market concentration are defined and discussed. Data are presented and described in section 3 and measures of concentration for each year from 1973-74 to 1991-92 are presented in section 4. In section 5, the stability of market shares is examined using Spearman Correlation coefficients. A brief discussion and some conclusions are provided in section 6.

2. Measuring Market Concentration

Three measures of market concentration were considered in the study. These were (1) concentration ratios, (2) Herfindahl Indices and (3) Lorenz curves. Each of these measures has strengths and weaknesses and consideration of all three is necessary to understand the levels of market concentration prevailing over the sample period (Hall and Tideman).

2.1 Concentration Ratio

The concentration ratio is perhaps the most widely used measure of market concentration. It is defined as:

$$(1) \qquad CRn = \sum_{i=1}^{n} \frac{X_i}{X}$$

where CRn is the concentration ratio for the n largest buyers, X_i is the volume (or revenue value) of trade by company i and X is the volume (or revenue value) of all trade in the industry. For example, CR4 would measure the market share of the four largest companies in the industry.

The concentration ratio has a number of weaknesses. Its primary weakness is that it does not include information on the size or number of firms in an industry. For example, a CR4 of 0.4 could refer to an industry

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with five or a hundred firms or to an industry with only one dominant player or many dominant players (Curry and George). Despite its shortcomings, the measure is intuitively appealing, widely used and performs reasonably when small changes in the concentration of a particular industry are being measured. It is probably best applied by generating a number of ratios using a range of values for n.

2.2 Herfindahl Index

The Herfindahl Index (H-Index) is bounded between zero and one in a similar manner to the concentration ratio discussed above. However, it has some advantages over that measure. First, all firms are included in the measure and, hence, the number of firms in the industry affects the value of the index. Second, it places a much higher weight on large firms than on small firms so that the representation of industry structure, while still *ad hoc*, is improved. The index is measured as:

$$(2) \qquad \text{H} - \text{Index} = \sum_{i=1}^{n} \left[\frac{X_i}{X}\right]^2$$

where n is the total number of firms in the industry and X and X_i are as before (Scherer and Ross, 1990).

2.3 Lorenz Curves

Traditionally, Lorenz Curves have been used for comparing income distributions. They are drawn with income in dollars on the horizontal axis and the cumulative distribution function (cdf) of income on the vertical axis. An egalitarian distribution corresponds to a Lorenz curve that is a straight line at 45 degrees from the origin. By replacing income with number of buyers and the cdf of income with the cdf for market share, Lorenz curves can be used to provide a graphical overview of the distribution of market shares in an industry. The 45 degree straight line corresponds to equal-sized market shares.

3. Data

Data on the number of bales purchased by each exporter were obtained from the Australian Council of Wool Exporters (ACWE) for the period 1973-74 to 1991-92. The number of firms recorded by the ACWE as buying wool fell over this period (Figure 1) from 101 in 1974-75 to 58 in 1988-89. This trend has reversed in the last two years with the total number of buying firms increasing to 82 by 1991-92.

The reduction in the number of buying firms prior to 1988-89 was partly due to a change in recording practices by the ACWE. From 1976-77 to 1988-89, the ACWE grouped a number of small buyers as 'sundry non-members'. The amount bought by this

Figure 1: Number of Wool Exporters, 1973/74 to 1991/92

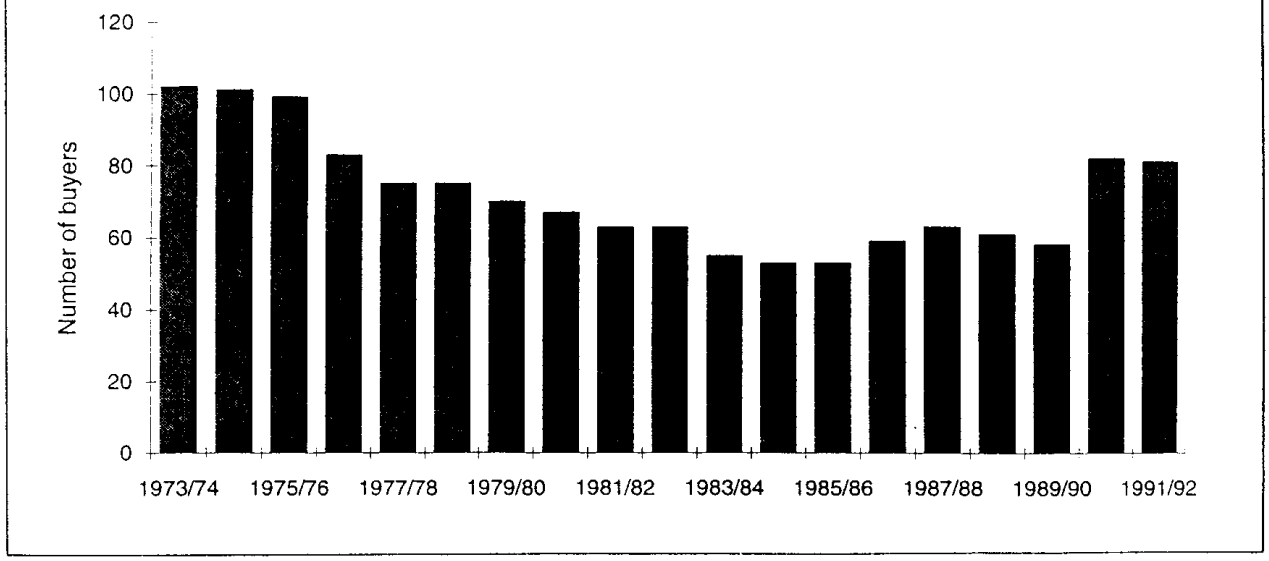
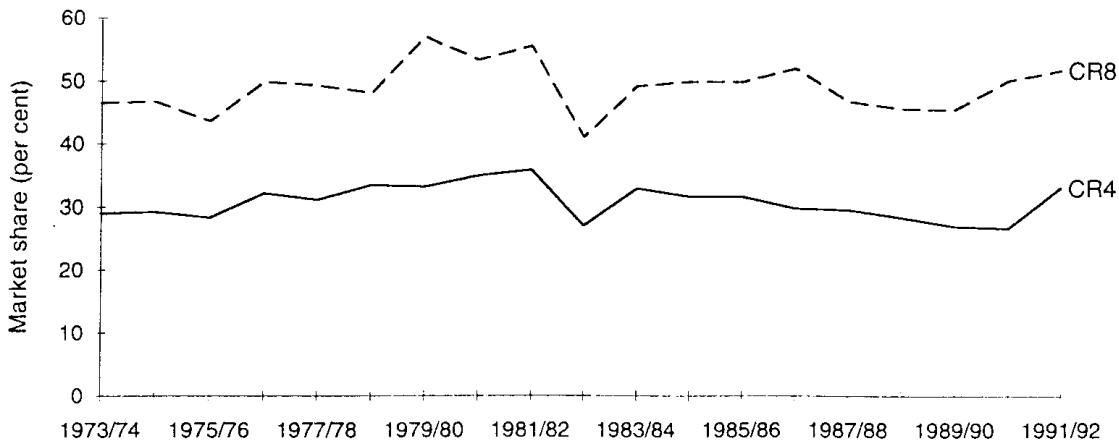


Figure 2: Concentration Ratios of the Australia Wool Buying Sector (excluding AWC purchases)



group was typically very small at one to two per cent of the clip.

4. Results

4.1 Concentration Ratio

The Australian wool market has been dominated by a few major buyers for many years. Over the past 20 years, the largest four buyers, excluding the Australian Wool Corporation (AWC), have bought approximately 30 per cent of the total amount of wool sold. The top eight buyers have consistently bought just under 50 per cent (Figure 2).

During the last decade there has been a slight decrease in the CR4 value, especially when purchases by the AWC increased during 1989-90 and 1990-91. This trend was reversed when the CR4 increased from 26.6 per cent in 1990-91 to 33 per cent in 1991-92. However, the increased concentration was restricted to increased purchases by the four largest buyers as the CR8 only rose from 50 per cent in 1990-91 to 51.6 per cent in 1991-92. The share bought by buyers ranked fifth to eighth actually fell. Between 1990-91 and 1991-92 almost three quarters of the increase in the CR4 value was due to increased purchases by Itoch C & Co who increased their market share from 7.5 per cent in 1990-91 to 12.2 per cent in 1991-92.

Throughout the existence of the RPS the AWC bought significant amounts of wool at auction at floor price levels with the aim of reselling the wool when prices improved. The amount of wool bought each year varied between zero and around 50 per cent of the total amount sold. The AWC has been the largest buyer nine times in the past 19 years and one of the largest three buyers 14 times in the past 19 years.

4.2 Herfindahl Indices

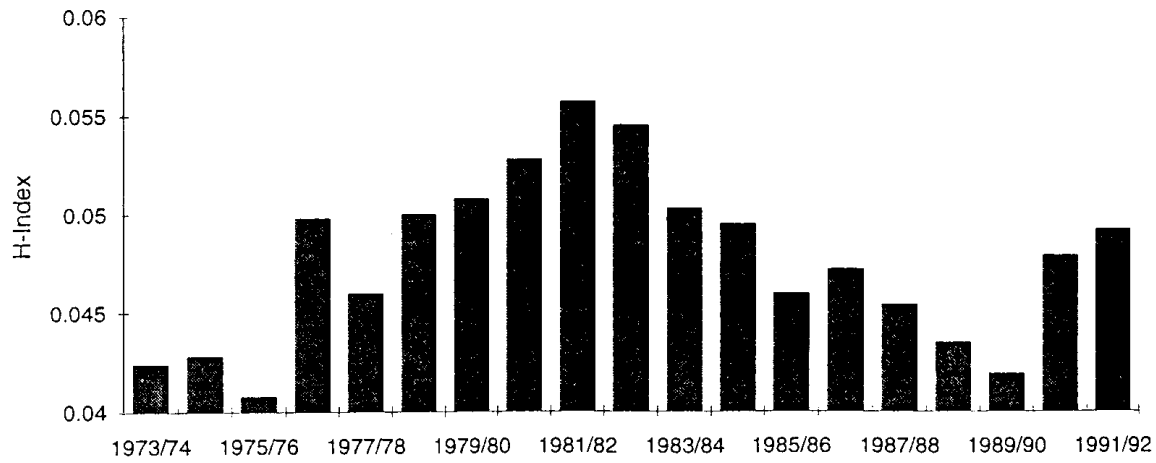
There are a large number of buyers in the Australian wool market with a few large firms buying a significant proportion of the total sold. Thus the value of the H-Index is typically very low, averaging only 0.04 (excluding AWC purchases) over the last 19 years. Although the market share of the largest four buyers has not changed significantly over this period, there have been other changes in the structure of the industry (Figure 3).

During the period 1974-75 to 1981-82, when wool prices were relatively stable, the H-Index rose from 0.043 to 0.056, an increase of 30 per cent. However, in the period 1981-82 to 1989-90 when prices rose steadily, market shares became more equal with the index decreasing by 23 per cent to 0.042. This was despite the total number of buyers falling slightly from 62 in 1981-82 to 58 in 1989-90.

4.3 Lorenz Curves

The distribution of market shares for the whole industry is summarised using Lorenz curves. Figure 4 indicates the distribution of market shares excluding AWC intervention purchases under the RPS.

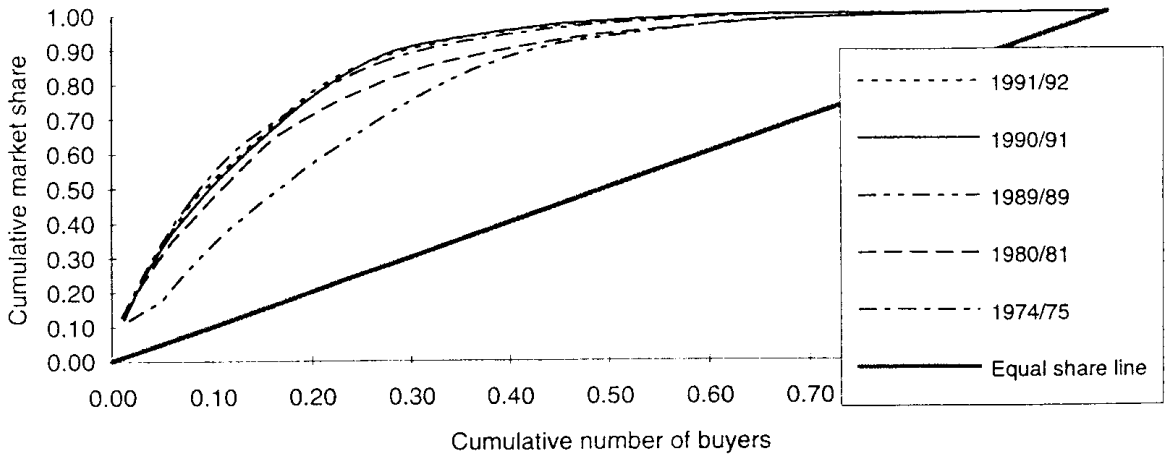
Figure 3: Herfindahl Indices of Australian Wool Buying Sector, 1973/74 to 1991/92



One third of the total bales sold have been bought by around five per cent of buyers over the past 19 years with about 50 per cent of bales bought by 10 per cent of buyers. 90 per cent of bales were bought by less than 30 per cent of buyers. That is, around 70 per cent of buyers purchased 10 per cent of bales sold.

The Australian wool buying sector has become slightly more concentrated in recent years. Over the past 19 years the proportion of bales bought by the smallest 80 per cent of buyers has been slowly decreasing. This is reflected by the small increase in the curvature of the Lorenz curves over time in Figure 4. This change is not apparent from the concentration ratios as the shares of the largest buyers have not varied significantly. However, there has been an increase in individual market shares for firms ranked in the 10 to 40 per cent range and, as a result, the market share of the smallest 60 per cent of buyers has decreased.

Figure 4: Lorenz Market Inequality Curve - Australian Wool Market, 1974/75 to 1991/92 (excluding AWC purchases)



5. Stability of Market Shares

The frequency with which participants enter and exit the industry or, alternatively, the stability of market shares, is also relevant to the discussion. In a competitive market, barriers to industry entry are expected to be minimal and profits are expected to be normal. However, if supernormal profits are possible, there will be incentives for creation of barriers to entry to discourage new firms. Such barriers may be 'natural' resulting from size economies or the reputation of individual firms or, alternatively, barriers may have some legislative or institutional basis. There is no evidence of the latter types of barriers to entry in the Australian wool buying industry.

Measures of changes in wool buyer identity for the period 1981-82 to 1991-92 are presented in Table 1. This data supports the following conclusions. First, entry and exit is dominated by small buyers, ie. firms purchasing less than 10 000 bales per year. Of new firms, 67 per cent bought less that 10 000 bales in their first year. Similarly, 91 per cent of firms which left the industry bought less than 10 000 bales in their last year of operation. Second, there is very little change in the identity and number of relatively large buyers. Third, no buyers that remained in operation throughout the period transferred to a smaller purchase category. Firms that remained in the industry either expanded purchases or remained within the same purchase category. Finally, firms which expanded were generally within the 100 000 to 150 000 bales purchase range (ACWE).

There appears to be frequent entry and exit into wool buying, especially in the purchase category of 10 000 bales and less. However, entry and exit of firms purchasing more than 150 000 bales per year is rare. This presumably reflects both economies to size and the benefits derived from long standing client relationships. It is also possible that larger buyers can draw upon the financial reserves of diversified 'parent' companies during difficult times. While entry and exit of small buyers occurs relatively frequently, there is little evidence of entry and exit with the largest firms.

Spearman coefficients were calculated by ranking a sample of 18 firms for each year between 1973-74 and 1991-92 and obtaining simple correlations between the rankings for each year (Table 2). Rankings from 1973-74 to 1974-75 are not significantly correlated with rankings in 1991-92, but other years are. As might be expected, the rankings have changed from the earlier period. Rankings after 1974-75 are similar to the rankings of firms in 1991-92 with the most noticeable exception being Kanematsu which was ninth during the 1973-74 and had moved to second position by 1991-92. The correlation coefficients between 1975-76 and all other years range from 0.53 to 0.99 and are all significant at the five per cent level.

Table 1: Entry and Exits of Wool Buying Firms, 1980/81 to 1991/92

Purchase Category (bales)	No. of participants 1991/92	1980/81	Net Change (a)	Entry	Exit	Transferred IN	Transferred OUT	Calculated Change (b)
<10,000	41	26	15	36	31	0	5	0
10-50,000	18	19	-1	10	3	5	3	9
50-100,000	6	8	-2	3	0	4	4	3
100-150,000	9	3	6	4	0	4	2	6
150-200,000	1	4	-3	0	0	0	3	-3
200-300,000	4	1	3	0	0	4	1	3
300,000	2	1	1	0	0	1	0	1

Note: The difference between columns (a) and (b) is due to the change in the ACWE recording of small buyers as sundry non-members in 1981/82. In 1991/92 all sundry buyers were listed. This affects the determination of change in the small buying sector, although the overall trends would remain.

Source: ACWE 1992

Table 2: Spearman Correlaton Coefficient of buyer rankings

	1991/92	1990/91	1989/90	1988/89	1987/88	1986/87	1985/86	1984/85	1983/84	1982/83	1981/82	1980/81	1979/80	1978/79	1977/78	1976/77	1975/76	1974/75	1973/74
1991/92	1.000	0.742	0.902	0.891	0.903	0.903	0.736	0.846	0.846	0.811	0.829	0.793	0.762	0.810	0.789	0.719	0.679	0.429	0.429
1990/91			0.860	0.738	0.759	0.753	0.489	0.697	0.692	0.644	0.653	0.631	0.652	0.634	0.635	0.587	0.525	0.314	0.314
1989/90				0.859	0.929	0.909	0.664	0.785	0.820	0.785	0.793	0.758	0.745	0.766	0.749	0.697	0.596	0.363	0.363
1988/89					0.886	0.856	0.700	0.697	0.754	0.727	0.723	0.670	0.637	0.625	0.644	0.587	0.617	0.358	0.358
1987/88						0.976	0.821	0.877	0.925	0.903	0.899	0.851	0.819	0.794	0.842	0.802	0.763	0.521	0.521
1986/87							0.875	0.921	0.943	0.925	0.938	0.907	0.872	0.873	0.899	0.824	0.767	0.516	0.516
1985/86								0.921	0.952	0.960	0.965	0.960	0.938	0.878	0.943	0.912	0.881	0.745	0.745
1984/85									0.956	0.947	0.956	0.934	0.914	0.867	0.943	0.934	0.859	0.719	0.719
1983/84										0.996	0.991	0.974	0.963	0.885	0.969	0.943	0.908	0.723	0.723
1982/83											0.996	0.982	0.969	0.893	0.978	0.956	0.921	0.749	0.749
1981/82												0.991	0.974	0.922	0.987	0.952	0.899	0.723	0.723
1980/81													0.991	0.946	0.996	0.947	0.886	0.723	0.723
1979/80														0.927	0.987	0.943	0.883	0.733	0.733
1978/79															0.951	0.885	0.774	0.631	0.631
1977/78																0.956	0.895	0.736	0.736
1976/77																	0.925	0.864	0.864
1975/76																		0.864	0.864
1974/75																			1.000
1973/74																			

In summary, the buying sector of the Australian wool market is relatively highly concentrated with a few large buyers purchasing a high proportion of wool and competing with a large number of relatively small firms. While the number of small buyers has decreased in the last two decades, their numbers have increased recently and there is no evidence that competition from large buyers will lead to greater market concentration in the future. It appears that small buyers can operate profitably with relatively small turnover and results from Table 2 indicate that the underlying structure of the market has been very stable over the past two decades.

6. Discussion and Conclusions

Two other aspects of the buyer concentration issue warrant comment. The first is the possibility of highly concentrated demand for specific types of wool. This would be important if the buying industry was segmented on the basis of wool type. While this occurs with some smaller buying firms, the larger buying firms purchase across the micron range. Econometric work by Beare and Meshios indicates that buyers are highly responsive to changes in grade price differentials and readily substitute different types of wools. This high substitutability between wool types means that monopsony price premiums for particular lines would be very difficult to establish or maintain. However, this may not be so for the extremes of the micron range where volumes are relatively small and substitution possibilities, for the very coarse wools in particular, are more limited.

The second aspect is the possibility of trade becoming thin at regional markets resulting in monopsony premiums for buyers. Similar arguments to those for thin trading in specialty lines show that this is unlikely. Buyers can substitute selling centres just as they can substitute wool types. While such premiums may occur in the short term, or regional centres may have discounts (or premiums) for reasons unrelated to buyer concentration, any monopsony premiums should be 'traded out' of regional centres over time.

In conclusion, the results indicate that price formation in the wool market is probably best described as one of stable price-leadership. That is, a small number of relatively large firms buy a substantial proportion of the clip while a large number of relatively small firms provide competition from an actively traded 'periphery'. From the perspective of growers, this is likely to be a desirable market structure. Small competitive firms, with their relatively high entry and exit rates, are likely to prevent any under-pricing by large firms. Simultaneously, large firms, with their size-related cost advantages, are likely to keep any inefficient small firms out of the industry. In addition, the large total number of firms would make the occurrence of 'pies' (or other short-term collusive buying practices) unlikely.

The study has been focused on measurement of buyer concentration in the Australian wool market. Future research could broaden this focus to include a theoretical framework to describe interaction between buyers in the market and could provide empirical measures at a more disaggregated level.

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