SOME CIRCUMSTANCES IN WHICH PRICE STABILIZATION BY THE WOOL COMMISSION REDUCES INCOMES*

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Stabilization of wool prices (which is partially achieved by the Wool Commission) may reduce the average annual net income (surplus) of growers and also of manufacturers of wool. The argument that the surplus of growers may be reduced is based upon Massell's extension of Oi's hypothesis. The possibility of falls in the surplus of manufacturers if wool prices are stabilized has a different basis. If wool prices are stabilized by buffer stocks, manufacturers find that their supplies are more variable than in the absence of controls. Consequently, they experience greater average annual cost if their marginal operating costs are increasing. Unless there are substantial revenue gains to processors, their surplus falls. The argument is also applicable to buffer stock schemes for other primary products.

Introduction

This article suggests that schemes which stabilize the price of a primary product may reduce the average annual income of primary producers of the product as well as the average annual income of processors of that product. For example, schemes to stabilize the price of wool, even if self-supporting, may reduce the incomes of wool-growers as well as the incomes of wool-processors (wool-manufacturers). The reduction in the incomes of primary producers is implied by the analysis of W. Oi [4]. While the impact upon a firm's average level of profit of fluctuations in the price of a firm's product has been well explored [4, 7, 8, 3], it is only recently that implications of variations in the price of factors have been considered [9], and very little attention has been given to cases in which variability of both factor and product price is significant. These latter cases are relevant to assessing the influence on the incomes of manufacturers of schemes which stabilize the prices of primary products. Oi has shown that, under pure competition, certainty and other conditions, a reduction in the variation of the price of a firm's product lowers the firm's average profit if the prices of its inputs are stable. Tisdell has indicated [9] that stabilization of a factor's price can reduce the profit of a firm using that factor if the price of the firm's product is stable. However, cases which involve combined instability of product and factor prices have only been briefly touched upon in the literature [9], and a 'new' case is developed in this paper which might be empirically relevant to wool-processors.

Although the Australian Wool Commission does not officially operate a price stabilization scheme, its reserve price scheme has similar characteristics to such a scheme and could give rise to some of the effects

* I wish particularly to thank Mr A. Chisholm for his useful suggestions on an earlier draft of this paper and to thank the referees for their advice.

which are discussed below. Duloy and Parish have said of the type of scheme which has been adopted by the Commission:

> Although the precise aims and mode of operation of a reserve-price scheme can vary somewhat, depending on the skill, resources and ambitiousness of the reserve-price authority, the authority's basic aim can be stated very simply; it is to buy wool when it is cheap and sell when it is dear. The effects of such a policy, successfully pursued, would be to raise prices when they are low and lower them when they are high, and in this way, the scheme would exert a stabilizing influence on wool prices. If successful, the scheme would also be largely self-supporting, since the authority would earn profits—or, at least, not incur substantial losses on its transactions [1, p. 5].

It will be assumed below that the principal effect of the scheme is to stabilize the price of wool by means of buffer stocks.

The following argument that the income of producers may be reduced by price stabilization does not depend on the costs of storage and of administration of such a scheme, although Duloy and Parish indicate these costs can be considerable [1, p. 5]. Taking into account storage cost, it may be unprofitable to stabilize the price of wool completely even if information happened to be sufficient for this purpose. For simplicity, these factors are ignored in the analysis. They can, of course, only work towards lowering any potential yield from stabilization.

Fluctuations in the price of wool are assumed not to arise from variations of supply, e.g., due to weather changes, but to stem principally from alterations in the level of demand for wool. The relevance of this assumption is given some empirical support by Powell's study [6] which indicated that some ninety per cent of the variability of aggregate income from primary wool production is due to shifts in demand. Clearly, on a farm by farm basis the influence of output variability would be higher but one suspects that price variability due to alterations of demand is of fundamental importance in the industry.

My procedure now is to give a simple model which illustrates how a self-balancing price stabilization scheme for raw wool could cause the average annual surplus of wool-growers to fall. It is then shown how this stabilization scheme for the price of raw wool might cause the annual average surplus of manufacturers of wool to fall. Of course, the argument can in principle be applied to any primary product but in the Australian context it is most relevant at present to take wool as an example.

The Surplus of Wool-Growers

In this section, it is shown that the annual average surplus of wool-growers can fall as a result of price stabilization. The argument relies essentially on Massell's interpretation [3] of the hypothesis and models due to Oi [4].

Assume that wool-growers are price-takers and that variations of market price come about solely as a result of non-ephemeral alterations in the level of demand for wool. Furthermore, imagine that uncertainty about prices is relatively unimportant. This might be so if the average level of prices for a few years ahead is being predicted. If it is not satisfied, the Oi-Massell hypothesis must be qualified [cf. Tisdell, 7, 8, Ch. 5].

The market demand curve (the assumption of Massell) is supposed to shift in a parallel fashion. In the case of wool, take an interval of

years (say 10) and assume that in half of this interval (5 years) demand is at a high level as indicated by the industry demand curve D_2 in Figure 1, but that during the remainder it is at the low level shown by the curve D_1. In the absence of intervention in the market and given the linear (long run) supply curve marked S, the annual aggregate output of wool, X, is X_2 during the period of high demand and price is w_2, whereas in the period of depressed demand the annual output is X_1 and price is w_1.

Suppose now that a commission interferes in the market and sets a reserve price for wool of $\bar{w}$, the average of prices during the boom and depressed periods. The commission operates by buying and storing the commodity X when its price tends to fall below $\bar{w}$ and by releasing supplies to market when the price of X tends to rise above $\bar{w}$. In the example of Figure 1, the commission succeeds in stabilizing the price of wool at $\bar{w}$ by purchasing the quantity TC of wool in each year of depressed demand and releasing CU in each year of high demand. Over the whole interval the commission's net stocks are zero and its undiscounted receipts equal its undiscounted outlays if administration costs are ignored. The scheme is self-balancing in this narrow sense.

As a result of the commission's activities, supplies of wool from the growers are less variable, the prices which they receive are less variable and so too is their surplus. On the other hand, the availability of wool to manufacturers is now much more variable although the price which they pay for their wool input is stabilized. Manufacturers find that

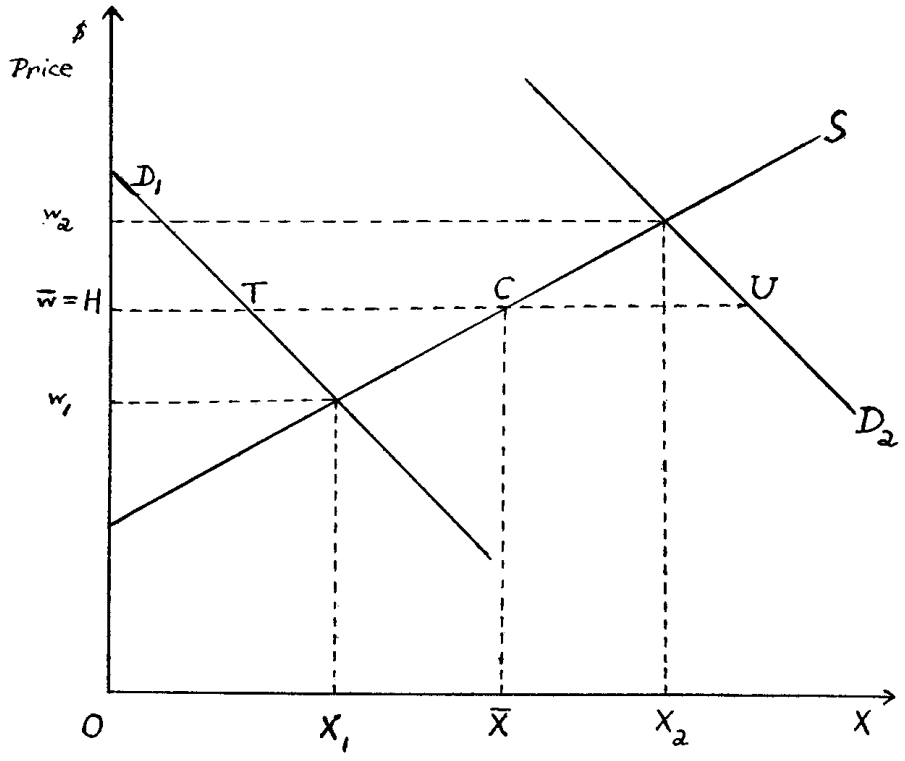

FIG. 1—Quantity of wool per year.

fluctuations in their processing activities are increased. However, let us concentrate on the position of growers at this stage.

The average annual surplus of growers is reduced by the commission's activity. This can be seen from Figure 2 which is a reproduction of Figure 1 without the clutter of the industry demand curves. Also a line segment VC of the same slope as AS but of opposite sign is added to Figure 2. If the price of wool is w_2, the annual surplus of wool-growers is equal to the area of ΔAEJ, and if the price is w_1 the annual surplus equals the area of ΔABG. If w_1 occurs in half the interval of years and w_2 in the remainder, annual producer surplus on average, $E[\Pi]$, is where the expressions refer to the *areas* of the relevant figures,

$$E[\Pi] = 0{\cdot}5\,[\Delta ABG + \Delta AEJ] \quad (1)$$
$$= 0{\cdot}5\,[\Delta ABG + \Delta ABG + GBCH + HCVU + \Delta CEV] \quad (2)$$
$$= \Delta ABG + GBCH + 0{\cdot}5\,\Delta CEV \quad (3)$$
$$= \Delta ACH + 0{\cdot}5\,\Delta CEV. \quad (4)$$

Step (3) follows from (2) because by construction in Figure 2 area *GBCH* equals that of *HCVJ*. In contrast to (4) which indicates the average producer surplus if price is unstable, the average annual producer surplus if the price of wool is stable at $\bar{w}$ equals the area of ΔACH. Consequently, *the stabilization scheme reduces the average annual surplus of growers* by half the area of ΔCEV. The reduction is greater the larger is the initial dispersion of price and the less steep is the supply curve, i.e., the more responsive is supply to price changes or the slower are increasing marginal costs in the industry.

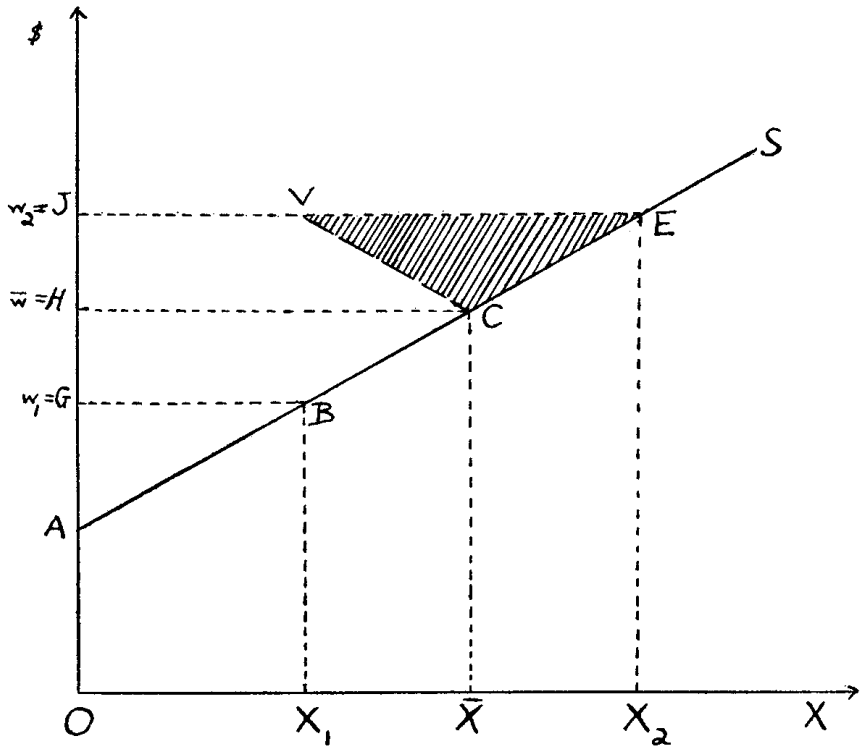

FIG. 2—Quantity of wool per year.

While the percentage reduction in annual average surplus could be substantial, it is less so the more inelastic is supply [7]. Furthermore, if price uncertainty is important the annual average surplus might be increased [7, 8, Ch. 5] by stabilization. Again, the demand curve has been assumed to shift in a parallel fashion so that demand responsiveness to price changes is therefore constant. In this article, I assume that demand responsiveness is measured by the rate of change of the demand curve (the slope of the curve) *not* by the elasticity of the demand curve. This is in accordance with the Gruen-Samuelson view that 'there is no reason to regard elasticities as a more fundamental unit than slopes' [2, 185].

If responsiveness changes as the demand curve shifts, this can also alter the conclusion. For example, if demand is more responsive to changes of price when the demand curve is high and less so when it is lower, stabilization can increase total revenue and the net income of growers. But if the opposite pattern exists, this factor works towards reduced incomes from stabilization [cf. 1, p. 18]. The actual pattern in the wool industry is unknown. On the basis of the speculations by Grubel, and Powell and Campbell, Duloy and Parish indicate [1, p. 18, p. 14] that the price elasticity of demand for wool might be greater during depressed periods and more inelastic during boom periods. If this is so, it is unfavourable to the operation of a stabilization scheme. However, in view of the uncertainty surrounding the pattern, Duloy and Parish prefer to suppose that the elasticity of demand is constant throughout the periods.

However, their assumption of equal elasticities is quite different from the assumption of equal slopes which I have employed in the above model. As Gruen has pointed out [2, p. 185], the Powell-Campbell assertion [5] that hidden losses of a reserve price scheme are likely to exceed hidden gains to growers relies heavily on the use of the elasticity concept. Gruen shows from his model [2] that if the slopes of the demand curves rather than their elasticities do not vary, there is no income loss. However, his result depends upon the assumption of complete inelasticity of the supply of wool. The above analysis indicates that *if* this assumption is relaxed price stabilization reduces the average annual surplus of growers (losses exceed gains) even if the demand curves are of constant slope. Thus the likelihood that a reserve price scheme will reduce the income of growers is greater than it may appear to be at first sight.

The Surplus of Processors

'Proponents of the [floor-price] scheme have argued that wool price fluctuations induce manufacturers to switch to synthetic fibres, so that greater stability in wool prices would tend to raise the demand for wool' [1, p. 15]. But this effect is far from certain to occur. Stabilization of wool prices can reduce the annual average surplus of processors and this may lead to a reduced demand for wool.

At the moment, one can only guess as to what happens in practice since theoretical possibilities are wide and little reliable data is available to limit the worthwhile cases. However, one condition under which the average surplus of processors is reduced is the following: It is reduced if the stabilization scheme leaves the *average* per annum revenue of processors constant and if their marginal cost of processing rises with

their volume of annual throughput of wool. The reduction in surplus is greater the greater is the rate of increase of marginal processing costs.

The scheme which is outlined in the last section increases the variability of supplies of wool to manufacturers. For example, in the case of Figure 1 the range of variability of supply rises from $X_2 - X_1$ to $U - T$. Taking a typical processor, the change in his average annual total cost can be illustrated by the example in Figure 3. Let x be a processor's throughput of wool and $C(x)$ be his annual cost of processing this throughput and assume that his marginal cost is increasing so that $C(x)$ is a strictly convex function. It follows that if the range of x-values about a value $\bar{x}$ is increased that average annual processing costs rise. In Figure 3 if the firm's throughput is x_1 in 50% of the years and x_2 in the other 50%, average per annum cost is ON. [This is equal to the height of the mid-point of the chord joining $C(x_1)$ and $C(x_2)$]. If the variability of throughput is now increased so that x_0 is the throughput in half of the years and x_3 in the other half, average per annum cost rises to OM. The average increase of costs is MN per year. Thus if the average annual revenue of the processor is constant, his average surplus falls as a result of increased variability of throughput because his average annual processing cost rises and his *average* annual costs for wool remain unaltered. The increased variability of throughput arises from the Commission's activity which stabilizes the price of raw wool but increases the variability of its supply. However, this supposes that wool manufacturers do not hold a significant level of stocks so that the volume of their purchases, throughput and sales are approximately equal. If their stocks and the

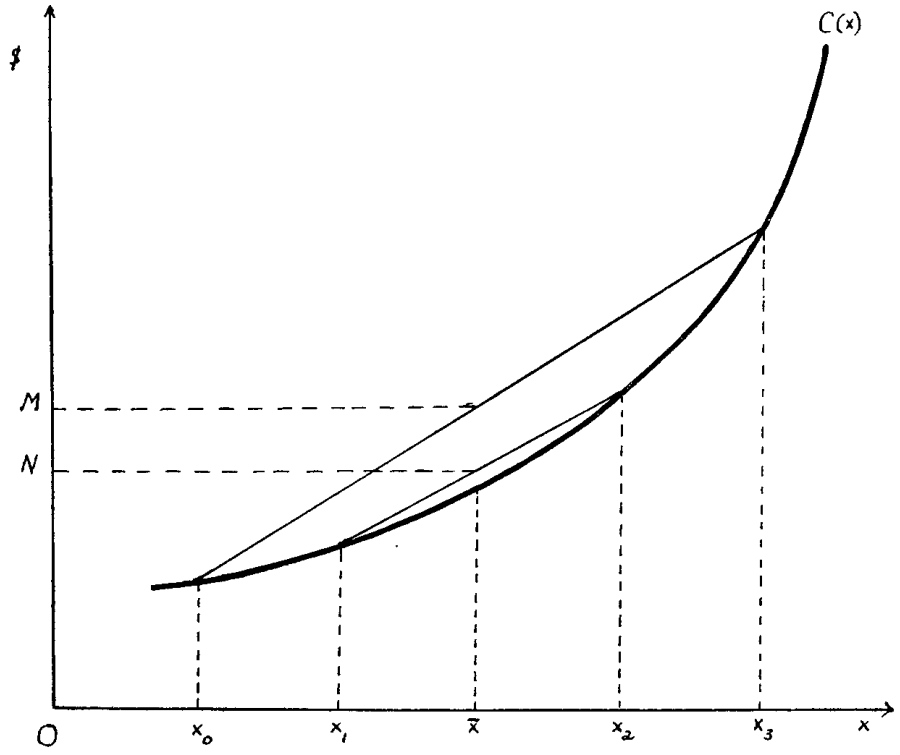

FIG. 3—Throughput of wool per year.

cost of holding stocks vary linearly with sales (equals output) the conclusion is unaffected. On the other hand, if the cost of inventories rises at a decreasing rate with volume of output, or if the propensity to hold stocks changes as a result of a reserve price scheme, the above conclusion requires some modifications.

Nevertheless, under the assumed conditions even if a reserve price scheme causes the average annual revenue of processors to rise slightly, this might be more than neutralized by the cost increase resulting from the increased variability of throughput which causes overutilization of processing facilities at one stage and their considerable underemployment at the next. The cost increase can only be out-weighed if the stabilization scheme leads to a substantial increase in the average annual revenue of manufacturers of wool, and proponents of the reserve price scheme have yet to show that this is so. If this is not the case, the demand for wool may be reduced by the stabilization scheme as manufacturers react to their lower expected returns from wool processing.

Concluding Comments

The influence of price stabilization schemes upon the surplus of primary producers and of manufacturers depends upon the total market situation. Even ignoring storage and administration cost, we cannot conclude *a priori* that self-balancing price stabilization schemes raise or lower such surpluses. Depending upon the nature of the shifts of demand and supply curves and the type of market interdependence, these surpluses can either be raised or lowered.

Circumstances have been indicated above which imply that stabilization of raw wool prices lowers the income of growers and manufacturers of wool. Whether or not these circumstances are approximated in practice is difficult to say. Given the present activities of the Wool Commission, this matter deserves further attention. However, even if it should be found that the incomes of wool-growers are lowered by price stabilization, growers might be prepared to forgo this income for less variability of income. It ought to be recognized, however, that there may be an unavoidable *technical* trade-off between annual average producer surplus and variability of this surplus.[1]

[1] Note that influences of price instability on consumer surplus have not been discussed above. For a discussion of this aspect, see Waugh [10, 11] and Massell [3].

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