Appendix 1

ALLOCATION OF A SUBSIDY AMONG END-USES

The arguments in the text (pp. 18-19) can be illustrated in greater detail by considering the case of a product in perfectly inelastic supply which is used as an input in two processing industries. The assumption of zero supply elasticity simplifies geometric exposition without detracting from the generality of the argument.

In Figure I, O_1O_2 represents the fixed, inelastic supply of the good: D_1D_1 is the demand for it from processing industry 1, while D_2D_1 - to be read from right to left - is the demand from processing industry 2. Given perfect competition, a common price of the good for both processing activities would be established at P, with industry 1 taking O_1N, and industry 2 taking NO_2, of the good.

Producers of the good could increase their revenues from sales, without changing the total quantity produced or sold, by charging different prices to the two user industries. As is well known, revenue maximisation by this means would be achieved by charging prices such that the marginal revenues from the two markets were equalised. In the case depicted, this involves raising the price to industry 1 and lowering it to industry 2. Revenue maximisation thus requires that prices P_1 and P_2 be charged, and quantities O_1M and MO_2 be sold in the respective markets.

A uniform subsidy of B dollars per unit purchased paid to all users would raise each demand curve by the same amount, leaving unchanged both the equilibrium allocation of the good between the two industries and the total net-of-subsidy revenue. In this case of totally inelastic supply, the whole of the subsidy would be received by producers, and this would represent their total gain from the subsidy.

If, however, the subsidy were applied solely to the use of the good by industry 2, then the D_2D_2 curve would shift upwards (by more than B, since the subsidy expenditure would be concentrated on only part of the total production of the

good) and the division of the supply between the industries would shift from N towards M. As before, the subsidy would accrue solely to producers, but their net-of-subsidy revenue would increase since they would gain more from the expanding, more elastic market 2 than they would lose from the contracting, less elastic, market 1.* This would be true of any increase in sales in market 2 up to NM, but further increases would be counter-productive, since, to the left of M, MR_1 exceeds MR_2. If, then, the funds available for expenditure on the subsidy would, if applied solely to industry 2, result in expansion of that industry's use of the good beyond O_2M, it would be preferable, from the producers' point of view, to apply only as much as achieved the expansion to O_2M, and use any residual funds to subsidise equally the good's use in each industry: this use of the residual funds would simply shift both demand curves upwards by the same amount, leaving the allocation of the product between the industries unaltered.

Thus, differential subsidisation of user industries can extract additional revenue for producers in the same way as could be achieved by the producers forming a marketing cartel and engaging in price discrimination. In addition the producers receive - in this inelastic supply case - all of the government's subsidy payments.

Figure I may also be used to elucidate the case discussed in the text of a coalition between producers and one user group. It was argued that, up to a point, it would pay the coalition to seek the exclusive subsidisation of the good in its own processing activity, regardless of the relative demand elasticities of the two user groups.

To consider the intuitively less obvious case, let us assume that the coalition involves the producers and industry 1.

The value to the **coalition** of an additional unit of the good used in industry 1 is given by the derived demand curve D_1D_1. (The MR_1 curve shows the value to **producers** of an additional unit sold to industry 1: it takes account of the transfer from producers to processors when the price has to be lowered to sell an extra unit; but such transfers net out when we consider the two groups as one coalition).

However, the value to the coalition of the sale of an additional unit to industry 2 is given by the MR_2 curve.

The coalition will maximise its revenue by equating its

* Marginal revenue in market 2 exceeds marginal revenue in market 1, as indicated by the relative heights of the MR_2 and MR_1 curves over the interval MN.

gain from **using** a unit of the good with its gain from **selling** a unit to industry 2. Diagrammatically, the optimal disposition of this good is that shown by the intersection of the D_1D_1 and the MR_2 curves, i.e. by the allocation O_1R to industry 1 and RO_2 to industry 2. Such an allocation could be achieved by a subsidy paid to industry 1 sufficient to raise the D_1D_1 curve so that it intercepted the D_2D_2 curve at point S in the diagram.

As noted in the text, with this market allocation of the product, the price net-of-bounty in market 1, RT, equals the marginal revenue in market 2.

Although it is true that it would pay a coalition to seek, up to a point, the exclusive subsidisation of the good in its own production activity, regardless of the demand elasticities for the two user groups, it is worth noting that the relative elasticities do help determine the point up to which this strategy pays. This can be seen by reference to the diagram. A coalition between producers and industry 2 - with relatively elastic demand - could make use of a much larger exclusive subsidy than could the producer - industry 1 coalition. In the latter case the aggregate amount of subsidy payments required to implement the optimal exclusive subsidy is ST times O_1R, while in the former, it is WV times UO_2.

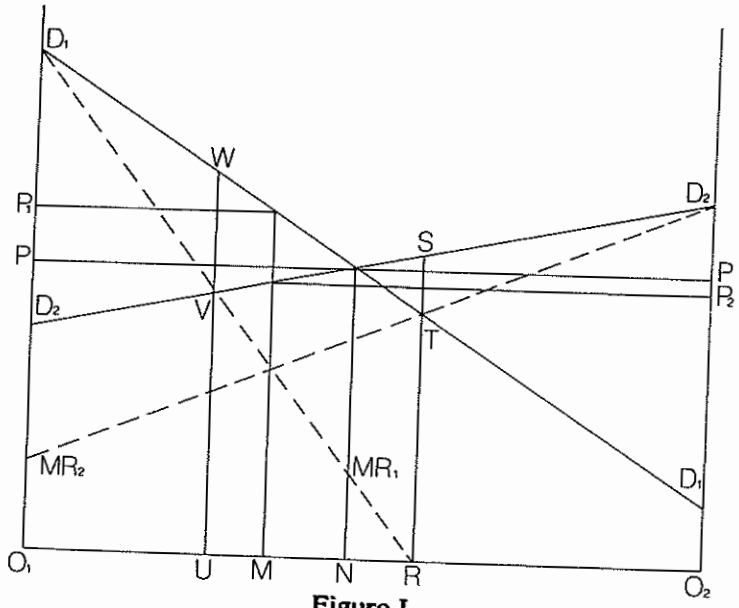

Figure I

Appendix 2

DISCRIMINATION AMONG EXPORT MARKETS

The discussion in the text (pp. 34-38) of exploitation of export markets, in the producer interest, or in the national interest, may be related to the accompanying diagrams (Figure II). Each panel depicts the same underlying supply-demand situation, but different types of intervention. In each case it is assumed that a given fixed supply, OO', of a commodity is apportioned between three markets: the home market, the demand curve of which is D_0, related to the origin 0; and two export markets, 1 and 2, whose demand curves net of transport costs, D_1 and D_2, are drawn in relation to the origin O'. The marginal revenue curves for each market are shown by appropriately labelled dashed lines. The curve labelled ΣD is the horizontal summation of D_1 and D_2, while ΣMR is the horizontal summation of MR_1 and MR_2.

Panel 1 depicts free trade. Competition ensures that supplies are distributed so as to bring about an equality of net returns (prices received by producers) in all three markets. From a national viewpoint this outcome is sub-optimal: too much of the commodity is being exported, as can be seen from the fact that the marginal revenue in each export market is less than the price, whereas the price measures the marginal valuation which home consumers place on the commodity; furthermore, the marginal revenue obtained in market 1 is much less than in market 2, so that a diversion of supply from 1 to 2 (leaving total exports unchanged) would increase export revenue.

Panel 2 illustrates the disposition of supplies among the markets with optimal intervention in the national interest, i.e. intervention designed to remedy the two defects of the free-trade situation just noted. Taxes equal to the amounts indicated by the two braces labelled T_1 and T_2 are levied on each unit of exports to markets 1 and 2 respectively These have the effects of (i) reducing export prices received by producers to the level of the marginal revenue in the export markets; (ii) equalising marginal revenue in the two export markets; (iii) reducing the home price to the new lower

common net-of-tax export price, and hence making the marginal value of a unit consumed at home equal to the marginal value to the nation of a unit exported. These price changes imply a reallocation of supplies from the export markets to the home market, and a reallocation within the export market in favour of 2 at the expense of 1. (Compare Panel 2 with Panel 1 with respect to OH, $O'E_2$ and $O'E_1$ representing the quantities sold on the three markets.)

Panel 3 shows the outcome of optimal intervention from the viewpoint of producers. It is assumed here that producers are able not only to discriminate among export markets, but also between them and the home market. (The case, discussed in the text, where the latter discrimination is not possible, is considered below.) Producers maximise their returns by equating marginal revenue in all three markets. Diagrammatically, this involves finding the point of intersection of the ΣMR and MR_0 curves (which shows the division of supplies between the home and export markets) and then reading off the points on MR_1 and MR_2 corresponding to the common level of ΣMR and MR_0: these points show the quantities ($O'E_1$ and $O'E_2$) sold in markets 1 and 2 respectively. As compared with free trade, supplies are diverted from (and prices raised in) the relative inelastic home market and export market 1 to the relatively elastic export market 2. Total exports expand at the expense of home consumption.

Panel 4 depicts optimal intervention in the producer interest subject to the constraint that producers receive the same price in the home market as they do for exports. Whatever quantity is exported is assumed to be allocated between 1 and 2 so as to equalise marginal revenue from these markets. Corresponding to any quantity so allocated there will be an average revenue received per unit exported. This average revenue is plotted as the curve AER in Panel 4. Producers receive this common price for exports through either a pooling of export returns or a subsidy on exports to 2 financed by a tax on exports to 1. If producers are free to sell on the home or export markets, the home and export prices will tend to equality. Hence the market allocation of supplies is given by the intersection of AER and D_0.

In comparison with free trade we notice that - as with all the types of intervention discussed - there is a reallocation of the relative quantities of exports going to 1 and 2. In addition, there is a diversion of supplies from the home market to the export markets. This is because AER, being based on optimal exploitation of the export markets, must,

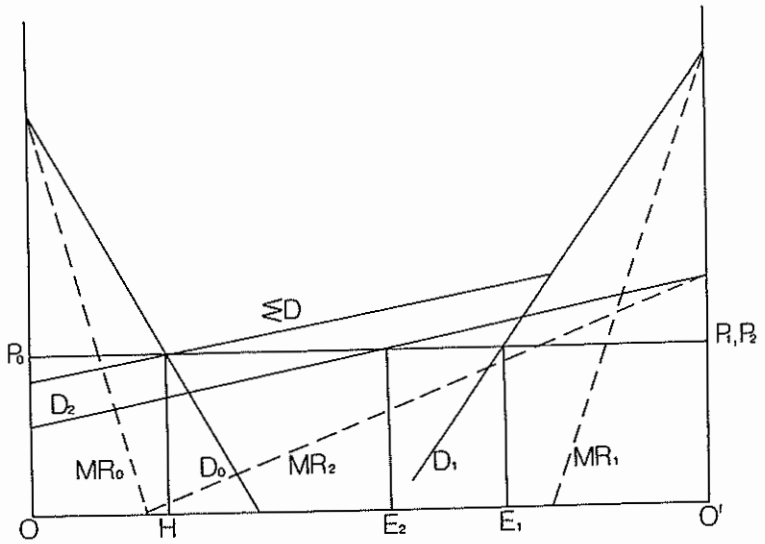

Figure II (1) Free trade

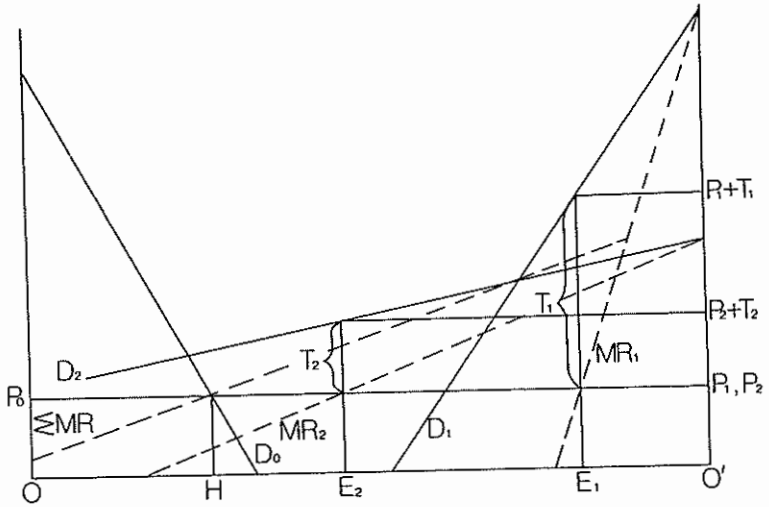

Figure II (2) National intervention

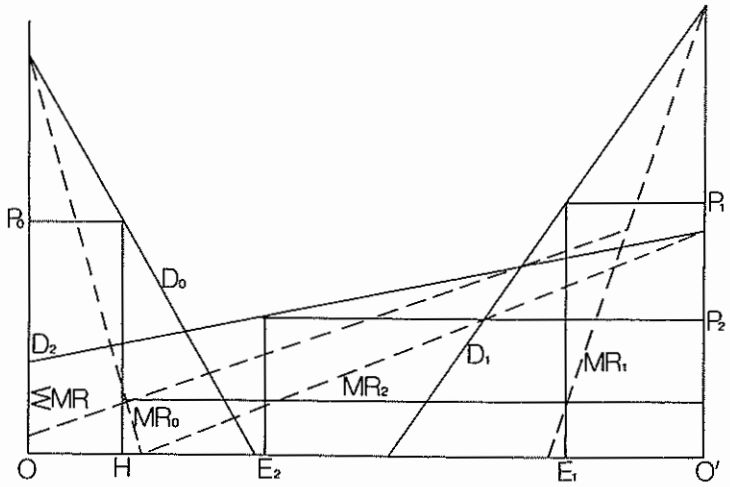

Figure II (3) Producer intervention - unconstrained

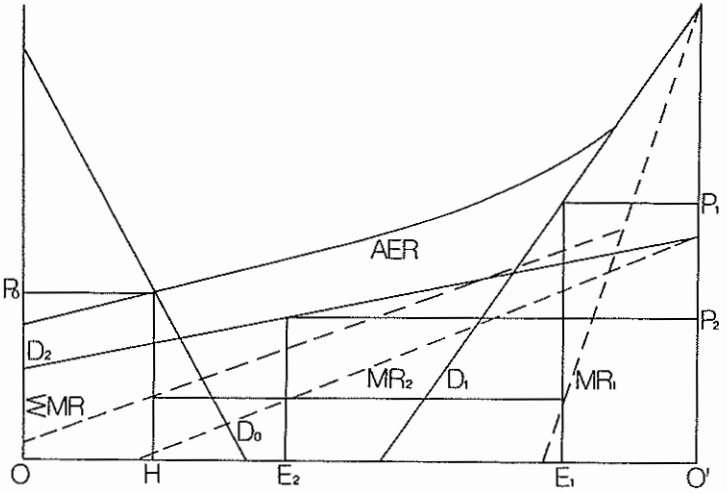

Figure II (4) Producer intervention - constrained

for all quantities, lie above ΣD, which shows the average revenue when exports are allocated so as to equalise the prices received in each export market. The AER-D_0 intersection must therefore lie to the left of the ΣD-D_0 intersection.

The home consumption-export market allocation in Panel 4 is intermediate between that shown in Panel 3 and free trade. This will be the case so long as in equilibrium, with the home price equal to average export returns, marginal revenue in the home market remains below export marginal revenue. If this condition were not met, the Panel 4 policy would result in **excess** diversion from the home market to export markets, as compared with the optimal diversion (from the producers' point of view) shown in Panel 3.

Appendix 3

PATERSON PLAN

Market equilibrium under the Paterson Plan, and the two possible variants discussed in the text, is illustrated in Figure III. DD is the home demand curve, SS the supply curve, and EE the perfectly elastic export demand curve. In the absence of intervention the domestic and export prices are identical (OE), Oq is produced, Oh consumed at home, and hq is exported. By means of various tax-subsidy schemes, the price received by producers may be raised to OF, the price paid by consumers to OC, with resulting expansion of production to OQ, exports to HQ, and contraction of home consumption to OH. As illustrated, these schemes are self-financing, the tax collected being equal to the subsidy disbursed.

The taxes and subsidies are composed of various combinations of the rectangular areas labelled, a, b, c, and d, as follows:

I. (Paterson Plan) export subsidy, b+d; production tax, a+b

II. export subsidy, d; consumption tax, a.

III. production subsidy c+d; consumption tax, a+c.

The logic of these schemes is seen most clearly in II. Since the home price adjusts to the price received for exports, a subsidy paid on exports increases producers' receipts by a multiple of the subsidy payments, the gearing factor being the ratio of total production to exports. A tax is then levied on home consumption at such a rate that it raises sufficient revenue to pay the export subsidy. Hence for this scheme to be self-financing, area a must be equal to area d. Schemes I and III produce the same result but involve additional money transfers of areas b and c respectively.

The diagram also serves to illustrate the fourth variant, a home-price scheme, under which the home-consumption price

is set at OC, and producers receive a price, OF, equal to the average return in the home and export markets. Area a then represents equalisation payments by sellers in the home market and area d equalisation receipts by sellers in the export market.

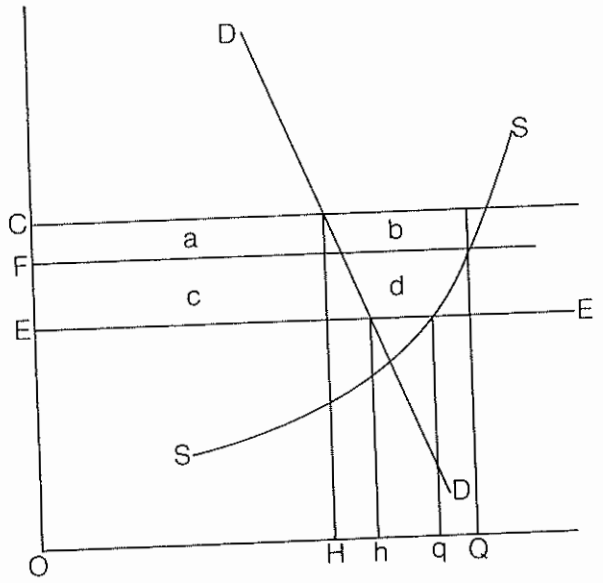

Figure III

LIST OF ABBREVIATIONS

ADFA	Australian Dried Fruits Association
AMB	Australian Meat Board
APC	Apple and Pear Corporation
AWB	Australian Wheat Board
AWC	Australian Wool Corporation
BAE	Bureau of Agricultural Economics
CDPEC	Commonwealth Dairy Produce Equalisation Committee
IAC	Industries Assistance Commission

References

1. Board of Inquiry into the Dairy Industry in Victoria, *First* to *Fifth Reports*, Melbourne, 1975-1977

2. *Brigden, J.B. et al, The Australian Tariff: An Economic Enquiry*, Macmillan, 1929

3. Buchanan, J.M. and Tullock, G., 'Polluters' Profit and Political Response: Direct Controls versus Taxes', *American Economic Review*, March 1975

4. Bureau of Agricultural Economics, *Cotton Growing in Australia*, Canberra, 1963

5. Bureau of Agricultural Economics, *The Australian Cotton Growing Industry*, Canberra, 1970

6. Bureau of Agricultural Economics, *The Australian Dairyfarming Industry*, (1971-72 to 1973-74), Canberra, 1975

7. Bureau of Agricultural Economics, *The Australian Tobacco Growing Industry*, (1970-71 to 1972-73), Canberra, 1976

8. Callaghan, A.R., *The Wheat Industry and Stabilisation*, Department of Primary Industry, Canberra, 1972

9. *Committee of Enquiry into the Dairy Industry*, Commonwealth Government Printer, Canberra, 1960

10. Connors, T., *The Australian Wheat Industry: Its Economics and Politics*, Gill Publisher, Armidale, 1972

11. Copland, D.B. and Janes C.V., *Australian Marketing Problems*, Angus & Robertson, Sydney, 1938

12. Drane, N.T. and Edwards, H.R. (eds), *The Australian Dairy Industry*, Cheshire, Melbourne, 1961

13. Dunsdorfs, E., *The Australian Wheat Growing Industry 1788-1948*, MUP, Melbourne, 1956.

14. Freebairn, J.W. and Gruen, F.H., 'Marketing Australian Beef and Export Diversification Schemes', *Australian Journal of Agricultural Economics*, April 1977

15. Graham, B.D., *The Formation of the Australian Country Parties*, ANU Press, Canberra, 1966

16. Gruen, F.H., 'Crying Over Spilt Milk', *Economic Record*, September 1961

17. Harris, S., Crawford, J.G., Gruen, F.H. and Honan, N.D., *The Principles of Rural Policy in Australia: A Discussion Paper* (Rural Green Paper), AGPS, Canberra, 1974

18. Industries Assistance Commission, *Dairy Industry*, AGPS, Canberra, October 1975

19. Industries Assistance Commission, *Dairy Industry Marketing Arrangments*, AGPS, Canberra, September 1976

20. Industries Assistance Commission, *Fruitgrowing Part B: Apples and Pears*, AGPS, Canberra, January 1976

21. Industries Assistance Commission, *Fruitgrowing Part C: Dried Vine Fruit*, AGPS, Canberra, January 1976

22. Lloyd, A., 'The Marketing of Dairy Produce in Australia', *Review of Marketing and Agricultural* Economics, March 1950

23. Lloyd, A., Quotas: Some General Issues, with Particular Reference to the Dairy Industry. Paper delivered at Australian Agricultural Economics Society Conference, Adelaide, 1971

24. Longworth, J.W., 'The Problem of Meat Marketing: Are Marketing Boards the Answer?', *Australian Quarterly*, March 1972

25. Mauldon, R.G. and Schapper, H.P., *Australian Farmers Under Stress in Prosperity and Recession*, University of Western Australia Press, Nedlands, 1974

26. Morey, J.A., *The Role of the Statutory Marketing Board in the Organised Marketing of Australia's Primary Products*, University of Sydney, Sydney, 1959

27. Parish, R., 'The Costs of Protecting the Dairy Industry', *Economic Record*, June 1962.

28. Peltzman, S., 'Towards a More General Theory of Regulation', *Journal of Law and Economics*, August 1976

29. Pincus, J.J., *Pressure Groups and Politics in Antebellum Tariffs*, Columbia University Press, New York, 1977

30. Posner, R.A., 'Taxation by Regulation', *Bell Journal of Economics and Management Science*, Spring 1971

31. Reeves, W.P., *State Experiments in Australia and New Zealand*, Grant Ritchards, London, 1902 (Republished Macmillan, Melbourne, 1969)

32. *Report of Royal Commission of Inquiry into the Fruit Industry of New South Wales*, Legislative Assembly of N.S.W., March 1939

33. Royal Commission on the Wheat Flour and Bread Industries, *Report*, Government Printer, Canberra, 1932-34.

34. Shann, E., *An Economic History of Australia*, CUP, Cambridge, 1948

35. Smith, W.M., *The Marketing of Australian and New Zealand Primary Products*, Pitman, London, 1936

36. Stigler, G.J., 'The Theory of Regulation', *Bell Journal of Economics and Management Science*, Spring 1971 (Reprinted in [37])

37. Stigler, G.J., *The Citizen and the State; Essays on Regulation*, University of Chicago Press, Chicago, 1975

38. Sugar Inquiry Committee, *Report on the Australian Sugar Industry*, 1952

39. Trade Practices Commission, *Report on Packaging and Labelling Laws in Australia*, AGPS, Canberra, 1977

40. Twohill, R.J.J., *Epitome of Dairying Industry Organisations in Australia*, CDPEC, Sydney, 1956