REVIEW OF MARKETING AND AGRICULTURAL ECONOMICS
VOL. 46, NO. 2 (August, 1978)

The Resource Misallocation Costs of Equalisation — Again

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Introduction

In its 1975 report on the dairy industry [1], the Industries Assistance Commission (IAC) devoted considerable effort to demonstrating that resource misallocation losses arising from the equalisation of domestic and export returns for dairy products were relatively insignificant. The IAC's analysis, which used the framework developed by Parish [3], contained estimates of resource misallocation costs of the equalisation system ("Equalisation") between 1% and 3% of the gross value of butter and cheese production for the period 1970–71 to 1973–74. (Interestingly, in its 1976 dairy marketing report [2], the IAC abandoned without further comment its previous commendation of Equalisation and recommended the phased adoption of a two price quota scheme.)

As it appears that some form of a two price quota scheme for manufactured dairy products in Australia will be implemented during 1978,‡ any qualification of the IAC's 1975 analysis of Equalisation has a somewhat historical air. Such qualification can be justified on two grounds. Firstly, it appears that the manner in which a two price quota scheme for manufactured dairy products will be implemented will imply *de facto* Equalisation at least in its initial year. Secondly, equalisation of returns from distinct markets characterises other Australian agricultural industries — *e.g.* wheat and sugar.

> In its 1975 report on the dairy industry, the IAC noted
> "The resource costs [of Equalisation] have been relatively small *and declining* in relation to the dairy industry's value of production. This has been due to a *diminishing proportion of dairy production that has been exported,* and the termination of the bounty" [3, p. 62] (italics added).

It is shown below that a Parish-type analysis does not imply that a diminishing proportion of exports necessarily results in a fall in the resource misallocation costs of Equalisation. It is also shown that, based on current data, the maximum estimates of resource misallocation costs of Equalisation are still "small" with the exception of the case where a declining proportion of exports is brought about by declining export prices.

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‡ Although a reasonable hypothesis at the time of writing, implementation of a two price quota scheme has receded into the indefinite future with the implementation of a Commonwealth scheme of Selective Underwriting for 1978/79 (added 24.7.1978).

Equalization in brief

Figure 1 shows a simplified illustration of the Parish model of Equalization for manufactured dairy products. Linear supply and demand schedules are assumed: D, D_X and E are domestic, export and Equalization demand schedules respectively, and S is supply. Australia is assumed to be a net exporter of manufactured dairy products in the absence of Equalization.

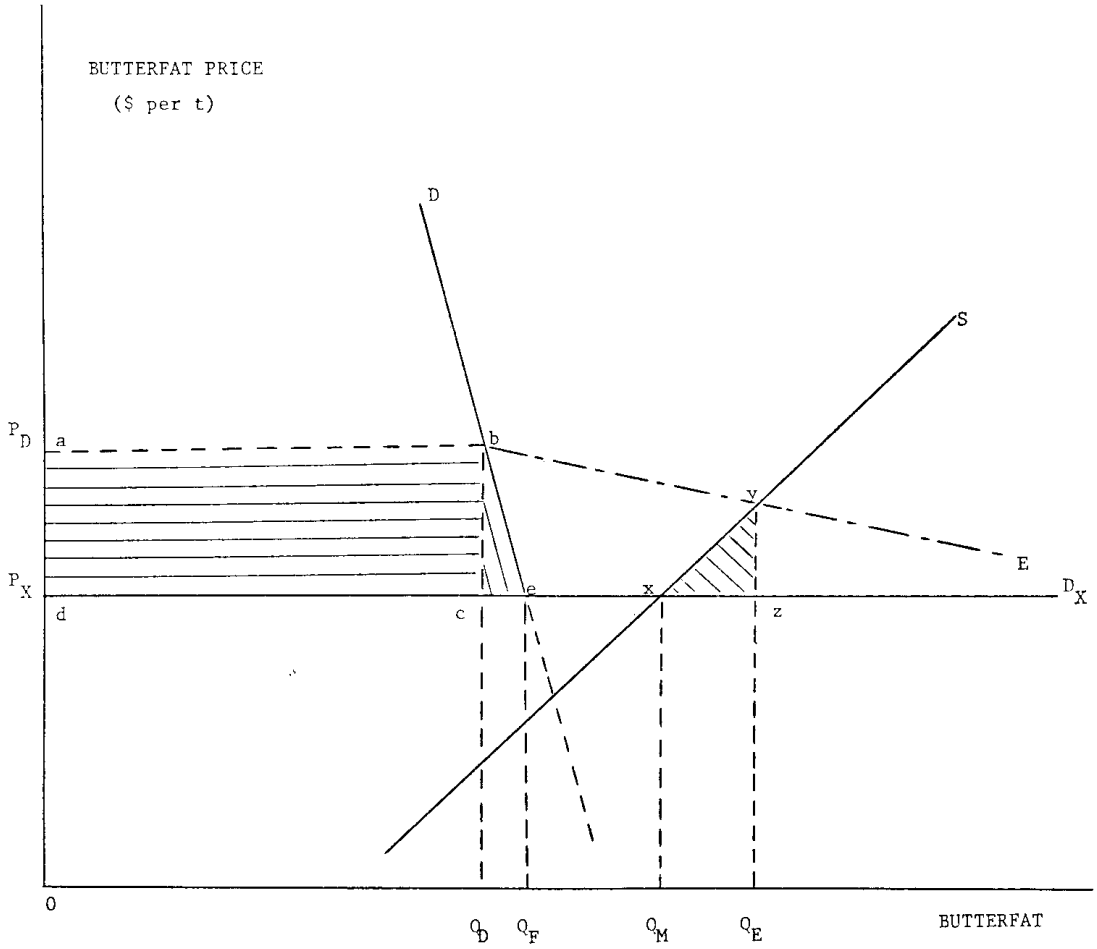

Figure 1: Resource misallocation costs of Equalisation, and transfer payments resulting from domestic price support.

If domestic price is fixed at P_D, Q_D is sold domestically and $(Q_E - Q_D)$ is exported. If exports attracted actual export price, Q_M would be produced. The "resource (misallocation) cost" of Equalization is represented by the triangle *xyz*.

The effect of a diminishing proportion of exports[1]

A diminishing proportion of exports could arise from at least four types of events. These events are treated as mutually exclusive below, but in practice they are likely to operate jointly. It is assumed that, where

1. The framework for analysing the effect of a diminishing proportion of exports was suggested by John Street and Mike Taylor. John Street provided the proofs of cases (i) and (ii), and the methodology for cases (iii) and (iv).

supply or demand shifts occur, they can be represented by parallel shifts in supply or demand schedules.

case (i) : rightwards shift of the domestic demand schedule

In Figure 2(a) the domestic demand schedule shifts from D to D′ with a corresponding shift in the Equalisation demand schedule from E to E′. Resource misallocation is *xyz* with demand schedule D, and is increased by the amount *zyst* with demand schedule D′. (Note that a rightwards shift in domestic demand will only result in a reduction in the proportion of exports for particular configurations of demand shifts and supply elasticities.)

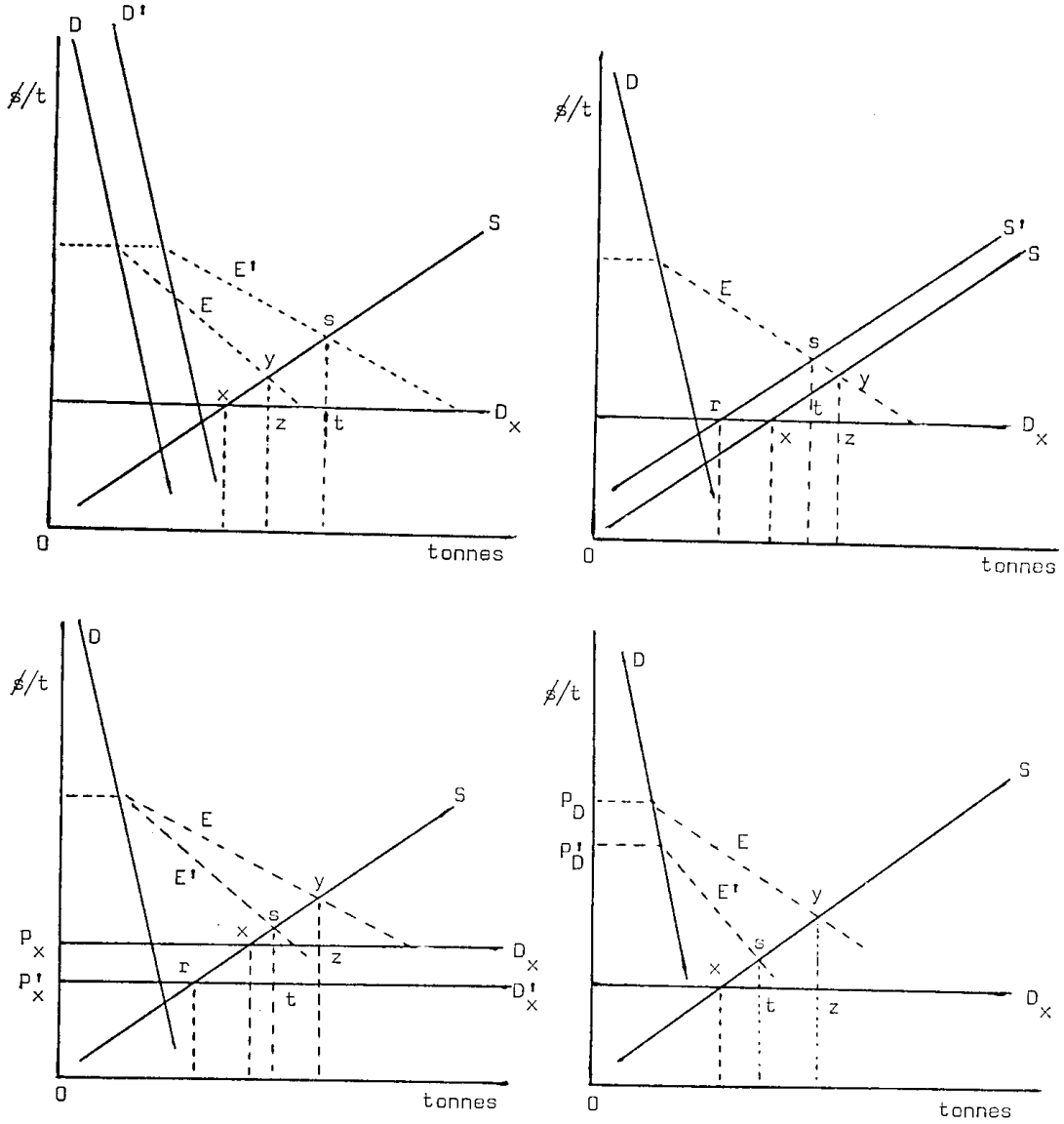

Figure 2: *Changes in resource misallocation costs with various scenarios of a reduced proportion of exports*†

† For simplicity, all schedules are shown as linear. It should be noted that, even if domestic demand and supply, and export demand, schedules are linear, the Equalization demand curves (denoted E, *etc.*) will in fact be *curvilinear* and asympototic to the relevant export demand curve.

case (ii): leftwards shift of the supply schedule

In Figure 2(b), the supply schedule shifts from S (with resource misallocation cost *xyz*) to S′ (with resource misallocation cost *rst*). As S and S′ are parallel, triangles *xyz* and *rst* are similar, but since *st* is greater than *yz* resource misallocation cost *rst* exceeds *xyz*.

case (iii): reduction in export price

In Figure 2(c) the export price falls from P_X to P_X' with a corresponding shift in the Equalization demand curve from E to E′. The corresponding resource misallocation costs are *xyz* for $D_X = P_X$, and *rst* for $D_X' = P_X'$. Since triangles *xyz* and *rst* are similar and *st* is greater than *yz*,[2] *rst* exceeds *xyz*.

case (iv): reduction in domestic price

As shown in Figure 2(d), a fall in domestic price from P_D to P_D' results in a decrease in resource misallocation costs from *xyz* to *xst*.[3]

In summary, in cases (i)-(iii) resource misallocation costs will *increase* as the proportion of production which is exported falls. In case (iv), resource misallocation costs will fall as domestic prices fall.

Of the four events which are separately assumed for the above cases, a leftwards shift of the supply curve (case ii) is probably the most likely, reflecting both a decline in the number of dairy farmers and a diversion of manufacturing milk from traditional products (*e.g.* butter) to dairy products not covered by Equalisation. Real export prices (defined here as average f.o.b. values deflated by the C.P.I.) show marked fluctuations from year to year, although trend values since 1971–72 tend to be negative; thus case (iii) would appear to have been operating at least for the period 1971–72 to 1976–77. It is difficult to determine whether shifts in the *aggregate* domestic demand schedule for manufactured dairy products have occurred since marked reductions in *per capita* consumption of some products (*e.g.* butter) have been offset by marked increases in *per capita* consumption of other products (*e.g.* cheese); thus it is difficult to determine the degree to which case (i) has operated, if at all. Of course, *per capita* domestic consumption trends are an interaction of demand and supply shifts and administered pricing. In terms of the latter, real retail price declines over the period 1970–71 to 1976–77 for butter and cheese with the likely inelasticity of domestic demand for these products (case (iv)), may have countered the trends in cases (i)-(iii) of increasing resource misallocation costs.

Given the interaction of the theoretical outcomes of cases (i)-(iv) discussed above with the actual social environment, it is unlikely that a declining proportion of exports of manufactured dairy products will *reduce* resource misallocation costs. But how important are possible increases in resource misallocation costs likely to be in dollar terms? This issue is examined with relation to the cases of a leftwards-moving supply curve and declining export prices.

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2. $P_E - P_X = ((P_D Q_D + (Q_E - Q_D) P_X)/Q_E) - P_X = Q_D(P_D - P_X)/Q_E$
where Q_E is total production, and similarly
$P_E' - P_X' = Q_D(P_D - P_X')/Q_E'$
But $P_D - P_X < P_D - P_X'$ since $P_X' < P_X$
and $Q_E > Q_E'$ since S is upward sloping
Hence $P_E' - P_X' (= st) > P_E - P_X (= yz)$

3. A perverse result could arise if the Equalisation system were maintained with a highly elastic domestic demand. In this case, a reduction in domestic price would shift the Equalisation demand curve to the right, thus increasing resource misallocation costs. In this situation Equalisation is unlikely to be long maintained as it results in a significant loss in total industry revenue.

Estimated resource misallocation costs

(a) leftwards moving supply curve

In this simplified analysis, the following assumptions are made.

(i) domestic and import parity prices of manufactured dairy products are represented by domestic wholesale matured cheddar cheese prices — P_D = \$5,260/tonne butterfat[4] — and import prices for New Zealand cheddar — P_X = \$4,800/tonne butterfat.[5] (While the magnitude of matured cheese prices may over-estimate the value of manufactured dairy products, it is the *difference* between the values that determines resource misallocation costs.);

(ii) at the assumed prices, total production is Q_E = 148,000 tonnes of butterfat;[6] domestic consumption of manufactured dairy products is Q_D = 100,000 tonnes of butterfat;[7] exports are $(Q_E - Q_D)$ = 48,000 tonnes of butterfat.

(iii) supply elasticity ξ_S is constant and is examined for the cases ξ_S = 1, 2, 4.

Estimates of Resource Misallocation Costs[8] under the above assumptions are presented for a range of production levels representing a range of supply curves (see Table 1).

Table 1: Resource misallocation costs of Equalisation assuming a leftwards movement in the supply curve

Exports ('000 tonnes of butterfat)	Equalized Price (\$/ tonne butterfat)	Effect of Equalization					
		$\xi_S = 1$		$\xi_S = 2$		$\xi_S = 4$	
		Q_M[b] ('000 tonnes of butterfat)	RMC[c] (\$m)	Q_M ('000 tonnes of butterfat)	RMC (\$m)	Q_M ('000 tonnes of butterfat)	RMC (\$m)
4	5242	100.0[d]	1.9[e]	100.0[d]	3.9[e]	100.0[d]	7.8[e]
8	5226	100.0[d]	1.9[e]	100.0[d]	3.7[e]	100.0[d]	7.5[e]
16	5197	107.1	1.8	100.0[d]	3.5[e]	100.0[d]	7.1[e]
24	5171	115.1	1.7	106.2	3.3	100.0[d]	6.6[e]
32	5148	123.1	1.6	114.2	3.1	100.0[d]	6.2[e]
40	5129	131.0	1.5	122.0	3.0	104.1	5.9
48	5111	139.0	1.4	129.0	3.0	112.0	5.6

a assuming Q_D = 100,000; P_D = 5,260; P_X = 4,800
b Q_M = total production when exports attract marginal return
= Equalized production (1 — supply elasticity. (1 — P_X/P_E))
c RMC = resource misallocation cost
d since $Q_M < Q_D$ total production is set equal to Q_D
e RMC is calculated as the area of a triangle; with $Q_M < Q_D$, RMC is in fact represented by the area of a quadrilateral which is smaller than the conventional RMC triangle. Hence these estimates of RMC over-estimate the true RMC, perhaps substantially.

Even over the extreme range of supply elasticities parameterised (the IAC in its 1975 report used a value ξ_S = 0.5 [1, p.184]) the estimated resource misal-

4. Equivalent to \$1,750/tonne of cheese.
5. Equivalent to \$1,600/tonne of cheese.
6. Approximate production of products prescribed under Stage I statutory Equalisation.
7. Approximate current domestic consumption of prescribed products.
8. Resource misallocation cost (RMC) is calculated as

$$RMC = 0.5\,(Q_E - Q_M)\,(P_E - P_X)$$

where P_E is the equalized price corresponding to production Q_E.

*Table 2: Resource misallocation costs of Equalisation with a decline in export prices**[a]

Total Production ('000 tonnes butterfat)	$\xi_s = 0.5$				$\xi_s = 1.0$			
	Export Price ($/tonne butterfat)	Equalised Price ($/tonne butterfat)	Q_M^b ('000 tonnes butterfat)	RMC^c ($m)	Export Price ($/tonne butterfat)	Equalised Price ($/tonne butterfat)	Q_M^b ('000 tonnes butterfat)	RCM^c ($m)
136.4	1700	4310	100.0[d]	49.3[e]	3200	4710	100.0[d]	30.2[e]
138.9	2480	4480	109.9	29.0	3600	4800	104.4	20.6
141.6	3250	4670	121.0	14.6	4000	4890	115.8	11.5
144.6	4020	4880	132.1	5.4	4400	5000	127.3	5.2
148.0	4800	5110	143.5	0.7	4800	5110	139.0	1.4

* Export demand is assumed to be infinitely elastic. For other notes, see corresponding notes to Table 1.

location costs shown in Table 1 are small, and the increases arising from a declining proportion of exports brought about by a leftwards moving supply curve are of miniscule proportions.

Corresponding calculations for cases (i) and (iv) yield similarly negligible changes in resource misallocation costs for changes in the critical parameters.

(b) decline in export price

The increases in resource misallocation costs with a decline in export prices (case (iii) above), show a somewhat different pattern than the other three cases. The assumptions made are similar to example (a) above: $Q_D = 100{,}000$, exports $= 48{,}000$, $P_D = 5{,}260$, $P_X = 4{,}800$, $\xi_S = 0.5{,}1$. Estimated resource misallocation costs are shown in Table 2.

As shown in Table 2, declines in export prices effect marked increases in resource misallocation costs. If a lower supply elasticity is chosen, estimated resource misallocation costs are substantially lower, and the rate of increase with declining export prices is not as great. If Equalisation values for 1977–78 using assessed domestic and export values for green cheese[9] are used in place of matured domestic and import parity cheese prices, the rate of increase in resource misallocation costs is lower but the absolute cost magnitudes are greater.

Clearly, a worsening in export markets for Australian dairy products could significantly increase the resource misallocation costs of Equalisation. For example, a halving of export prices could lead to resource misallocation costs as high as $29m.

All of the preceding analysis has been in terms of infinitely elastic export demand schedules. If export demand schedules are less than infinitely elastic, the theoretical result for case (iv) derived above still holds for parallel shifts in the export demand schedules. However, decreasing elasticity of export demand reduces the resource misallocation costs of Equalization *ceteris paribus*. However, at the domestic supply elasticity assumed in the IAC's 1975 report ($\xi_S = 0.5$), even extremely low export demand elasticities (*e.g.* $\xi_D < 10$.) with moderate falls in export prices (*e.g.* falls of the order of 30%) could result in resource misallocation costs of Equalization increasing from negligible levels to values of the order of $10m, (see Table 3).

Conclusion

Whether a declining proportion of manufactured dairy product exports reduces the resource misallocation costs of Equalisation depends on the cause of the reduction in the proportion of exports. In the cases of shifts in the domestic demand or supply schedules, resource misallocation costs will increase, but the changes are insignificant. With reductions in domestic prices, the most likely result is a decrease in resource misallocation costs, but again the effects are marginal.

In the case of declining export prices, resource misallocation costs may show large increases. Unless the elasticity of export demand is substantially less than infinity and/or the elasticity of domestic supply is greater than has been hitherto assumed, the increase in resource misallocation costs of Equalisation with falling export prices will be substantial.

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9. At 1st July 1977, the domestic and export cheese values used for the Australian Dairy Corporation's operation of statutory equalisation were $1,150/tonne and $850/tonne, respectively.

Table 3: Resource misallocation costs of Equalisation with contracting export demand ($m)[a]

Total Production ('000 tonnes butterfat)	$\xi_s = 0.5$					$\xi_s = 1.0$				
	Export Price ($/tonne butterfat)	Elasticity of export demand				Export Price ($/tonne butterfat)	Elasticity of export demand			
		0.1	1.0	10.0	100.0		0.1	1.0	10.0	100.0
136.4	1700	17.6	41.9	48.6[e]	49.3[e]	3200	4.3	19.7	30.2	30.2
138.9	2480	8.1	23.0	28.3	28.9	3600	2.4	11.7	19.1	20.4
141.6	3250	3.4	11.0	14.2	14.6	4000	1.3	6.3	10.6	11.4
144.6	4020	1.1	3.8	5.2	5.4	4400	0.5	2.8	4.8	5.1
148.0	4800	0.1	0.5	0.7	0.7	4800	0.1	0.7	1.3	1.4

* See corresponding notes in Table 1.

References

[1] INDUSTRIES ASSISTANCE COMMISSION, *Dairy Industry*. (Canberra, Australian Government Publishing Service, 1975.)

[2] INDUSTRIES ASSISTANCE COMMISSION, *Dairy Industry Marketing Arrangements*. (Canberra, Australian Government Publishing Service, 1976.)

[3] PARISH, R. M., "The costs of protecting the dairy industry", *Economic Record*, Vol. 38, No. 85 (June, 1962), pp. 167-182.