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RURAL ASSISTANCE LEVELS: THE INFLUENCE OF POLICIES AND WORLD PRICE CHANGES

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Two aspects of effective rates of assistance for Australian agricultural industries are examined. The long-term rate, rather than the rate for a single year, is determined and a rationale is sought for the pattern of assistance that emerges. Second, the influence of exogenous factors (as represented by changes in world prices) on assistance rates is examined. Assistance elasticities are calculated for the major agricultural commodities and estimates made of the likely change in the pattern of assistance rates from any general world price change. In addition, commodities with assistance rates potentially very different from existing rates are identified. Price transmission elasticities are also derived to indicate the degree of insulation that the various policies provide for each commodity.

Since the pioneering work of Corden (1963, 1966*a*, *b*) in the sixties the concept of the effective rate of assistance has attained wide currency, particularly in Australia. As a conceptually straightforward measure of assistance, though not without complications in estimation and interpretation, it has been adopted by successive official bodies concerned with protection levels, beginning with the Vernon Committee in 1965 through to the Industries Assistance Commission of the present day. The Commission annually presents estimates of the effective rate of assistance for a range of industries, both agricultural and manufacturing. Recent Commission reports (IAC 1982, 1983) indicate that the manufacturing sector (with an assistance rate of about 24 per cent) is more heavily protected than agriculture (with an assistance rate of about 8 per cent). However, there are large variations in these values, both among industries within sectors and between years, particularly in the case of agriculture which has experienced assistance rates up to 13 percentage points higher than the figure quoted above.

In that assistance rates are a guide to the misallocation of resources within an economy (with resources tending to be attracted from industries with low or negative assistance rates to the more highly assisted industries), their usefulness depends on the extent to which they reflect the retention of resources within a sector over and above the freely competitive level. Since resources are more mobile in the long term than the short term, an effective rate of assistance in any one year is not as meaningful as a longer term measure. This is especially so where agriculture is concerned, since many of the factors are activity-specific or of a fixed nature, and not easily convertible to other forms of use. Therefore, when assistance rates vary widely over time, it is more appropriate to regard the longer term rate as a better indicator of resource misallocation.

Assistance rates for agriculture vary widely for a number of reasons: world prices for primary commodities fluctuate considerably; the forms of assistance given in the pursuit of price stability may insulate domestic

prices from world prices; and *ad hoc* assistance is given to meet particular exigencies within the industry. Thus the varying level of rural assistance over time is determined both by conscious political decisions and changing world economic conditions. Because high effective rates of assistance imply some resource misallocation and because these high rates may eventuate as a result of outside factors, it behoves policy makers to be aware of the implications of any measures that may be introduced to meet the needs of one particular set of economic circumstances. Given the variation in world price levels, particularly over the longer term, it is important to know to what extent assistance rates will change with various policy measures determined under different economic circumstances. The shift in recent years toward underwriting and away from other forms of assistance further emphasises the need for an understanding of the potential assistance rates arising from the introduction of different policy measures.

One particular point needs to be stressed here: effective rates of assistance measure the increase in value added as a result of one or more policy measures. Policies such as underwriting which remove some of the risk from an activity may be regarded as assistance, even when no transfers actually occur, since the supply function is altered (Martin and Urban 1984) and greater output may be obtained than under free market conditions. Insofar as a less than optimum amount may be produced without a particular policy in operation, some market failure may be said to exist. The policy in question, far from causing a misallocation of resources, thus ameliorates the pattern of resource use. Omission of any analysis on this risk-reducing assistance and its effect on price expectations will not, therefore, affect any conclusions that may be drawn on the potential levels and directions of resource misallocation.

There are three main objectives in this paper. The first is to determine the long-term effective rate of assistance for a range of agricultural outputs. The period 1970-71 to 1979-80 is used both because it represents a sufficiently long period during which resource adjustment could have taken place and because annual effective rates for these years are available from the annual reports of the Industries Assistance Commission. A subsidiary objective here is to test whether there has been any logical or consistent pattern to the level of assistance given.

The second main objective is to determine the influence of different assistance measures on the level of assistance afforded under changing economic conditions. In this case, changing world economic conditions are represented by changing world prices for agricultural goods. The relationship between assistance rates and changing world prices is estimated for each measure and the sensitivity of the former to the assistance policies is assessed. This also allows some judgment to be made about the changing methods of output assistance and whether they allow potentially more assistance in the eighties than they did at the beginning of the seventies.

The third objective is to use these estimates to assess the relationship between assistance rates and changing world prices for the major agricultural outputs, many of which are assisted, not by one measure, but by a combination thereof. While the direction and the extent of world price changes are impossible to forecast, this analysis does allow much higher assistance rates to be identified. The extent to which the

various outputs are insulated from world markets is also determined from derived price transmission elasticities.

The paper is divided into four main sections. In the first, a mathematical exposition of the derivation of long-term assistance rates and assistance elasticities is provided, and the role of price transmission elasticities in these estimates is discussed. The source of the data for the analysis is then briefly outlined. In the third section, the results are brought together and the limitations of the analysis are discussed. The fourth part consists of concluding remarks and the identification of key features of the paper.

The Model

Long-term effective rates of assistance

Annual effective rates of assistance cannot be averaged to obtain the long-term rate because of the existence of negative assistance rates in some years and the variable quantities of individual commodities produced each year. Instead, the long-term effective assistance rate, $\bar{g}$, has to be calculated from the appropriately deflated individual value-added figures for each year:

$$\bar{g} = \left(\sum_{t=1}^{n} AVA_t I_t - \sum_{t=1}^{n} VA_t I_t \right) \Big/ \sum_{t=1}^{n} VA_t I_t \tag{1}$$

where AVA_t = value added with assistance in year t;
VA_t = value added without assistance in year t; and
I_t = deflating factor in year t (wholesale price index 1980/ wholesale price index year t).

Value added without assistance would normally be difficult to calculate but the existence of published annual effective rates enables it to be determined:

$$VA_t = (YA_t - MA_t)/(1 + g_t) \tag{2}$$

where YA_t = gross output in year t;
MA_t = material inputs in year t; and
g_t = effective rate of assistance in year t.

Policy instruments and the effective assistance rate

The level of assistance afforded a sector at a particular time results from a combination of deliberate political decisions on the types of policy to be pursued and a number of exogenously determined factors, the effects of which are revealed in world price changes. Thus, while a particular policy instrument may be chosen to give a specific level of protection, the actual rate achieved may be rather different. Over time, therefore, with upward or downward drifts in world prices, the level of assistance can change substantially and the extent of this change will depend on how effective the policy instrument is at linking the domestic price to, or insulating it from, the world price. The analysis in this section shows the effect of varying world prices on assistance levels under individual policies.

The standard equation for the effective assistance rate is

$$g = (tY - xtM)/(1 - x) \tag{3}$$

where g = effective rate of assistance;
tY = nominal rate of assistance on output;
tM = nominal rate of assistance on material inputs; and
x = materials-to-output ratio, at free-trade prices.

A change in world prices affects two items in equation (3), namely the nominal rate of assistance on output (tY) and the materials-to-output ratio (x). These changes are shown diagrammatically in Figure 1, where, for simplification, it is assumed that there is no assistance on inputs. This assumption does not alter the results obtained.

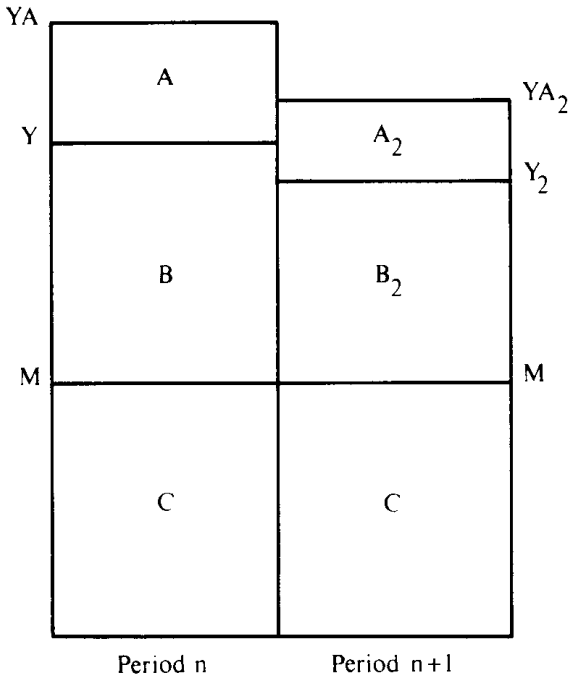

FIGURE 1—Effect of Change in World Price on Assistance Level.

The initial price structure is shown by M, the materials costs, Y, the free-trade value of the output, and YA, the price received in the domestic market by the home producer (the assisted output price). Under these conditions, the materials-to-output ratio is $C/(B+C)$, the nominal rate of assistance on output is $A/(B+C)$ and the effective rate of assistance is A/B. With a change in world prices, shown in the diagram as a decline to Y_2, the producer price may also decline, to YA_2 extent of the decline being dependent on the policy instrument used to provide the assistance. The amounts A and B both decline, to A_2 and B_2, respectively, thus altering the values according to the above definitions. These new values may or may not be very different from the previous ones. This will be determined by the amount of insulation given from world prices changes, as measured by the price transmission elasticity, (E_{PT}). This is defined as the percentage change in producer price divided by the percentage change in

world price. Intuitively, the price transmission elasticities of the most common output price policies are:

(a) specific tariff	<1.0
(b) *ad valorem* tariff	1.0
(c) output quota (no trade)	0.0
(d) market separation and pooled prices	<1.0
(e) output subsidy	<1.0
(f) price underwriting	≤ 1.0
(g) import quota	<1.0

The closer the value of E_{PT} is to zero, the more the effective assistance rate will change when world prices change.

The change in the materials-to-output ratio, to $C/(B_2+C)$, is independent of the method of assistance. Assuming that the physical input-output relationship does not change, the new ratio, x_2, will be

$$x_2 = M/Y\,(P_{w2}/P_{w1}) \tag{4}$$

where P_{w1} = initial price; and
P_{w2} = changed world price.

This can also be expressed as

$$x_2 = x(P_{w1}/P_{w2}) \tag{5}$$

The nominal rate of assistance on output will change from tY to tY_2, the amount of the change depending on the policy instrument. This is shown below for each of the six main policy instruments used in assisting rural sector output.

Specific tariff:

$$ty = (YA - Y)/Y \tag{6}$$

$$tY_2 = tY\,P_{w1}/P_{w2} \tag{7}$$

Ad valorem tariff:

$$tY = tY_2 \text{ (by definition)} \tag{8}$$

Output quota (assuming no trade):

$$tY_2 = [YA/Y\,(P_{w2}/P_{w1})] - 1 \tag{9}$$

$$= [P_{w1}(tY+1)/P_{w2}] - 1 \tag{10}$$

Market separation and pooled prices:

$$tY = K(P_d - P_{w1})/P_{w1}$$

where P_d is the price received on the domestic market and K is the proportion of output sold domestically.

$$tY_2 = K(P_d - P_{w2})/P_{w2} \tag{12}$$

$$= tY\,P_{w1} + K(P_{w1} - P_{w2})/P_{w2} \tag{13}$$

Output subsidy (specific amount):

$$tY = S/P_{w1} \tag{14}$$

where S is the subsidy.

$$\begin{aligned} tY_2 &= S/P_{w2} \\ &= tY\ P_{w1}/P_{w2} \end{aligned} \tag{15}$$

which is the same as in equation (7).

Price underwriting or deficiency payment:

$$\begin{aligned} tY_2 &= (P_p - P_{w2})/P_{w2} \\ &= (P_{w1}/P_{w2})(1 + tY) - 1 \end{aligned} \tag{16}$$

This result, which is the same as in equation (10), is dependent on the producer price, P_p, being independent of P_w. When an automatic adjustment mechanism exists to align P_p with P_w over a period (such as with the present wheat scheme), refinements are necessary. This is discussed later.

These new values, x_2 and tY_2, can be used to calculate the new effective assistance rate, g_2. Comparing the new rate with the old for a given change in world prices gives the assistance elasticity, E_g, for each policy measure.[1] These are shown below.

Ad valorem tariff:

$$E_{g1} = x(tY - tM)/(1 - x)[(P_{w2}/P_{w1}) - x] \tag{17}$$

Specific tariff or output subsidy:

$$E_{g2} = (tY - tM)/(1 - x)[(P_{w2}/P_{w1}) - x] \tag{18}$$

Market separation and pooled prices:

$$E_{g3} = [tY - tM + K(1 - x)]/(1 - x)[(P_{w2}/P_{w1}) - x] \tag{19}$$

Output quota or price underwriting:

$$E_{g4} = [tY - x(tM + 1) + 1]/(1 - x)[(P_{w2}/P_{w1}) - x] \tag{20}$$

The change in the level of assistance afforded by each measure can be compared by substituting into these equations the relevant data (tY, tM, x) for a range of rural commodities and assuming a fall of 1 per cent in the world price.

Changes in assistance rates for individual commodities

Prices of agricultural commodities are supported by a combination of the above-listed measures and others (for example, output quotas, import tariffs and a local-content scheme in the case of tobacco) and it is equally important, if not more important, as far as policy makers are concerned, to know how far the assistance rates of individual commodities may move rather than how they may be influenced by individual

[1] The assistance elasticity, E_g, is defined as

$$E_g = (g_1 - g_2)/[(P_{w1} - P_{w2})/P_{w1}]$$

This definition of elasticity appears not to follow traditional lines because g_1, g_2 are already defined in percentage terms.

measures. The key to this problem lies in the price transmission elasticity, E_{PT}, within which the effects of all the previously discussed measures are embraced. Given this parameter, it is possible to calculate the new nominal rate of assistance on output, tY_2, the new effective rate, g_2, and the assistance elasticity, E_g for all outputs.

The new nominal rate of assistance (tY_2) is a function of the previous assistance rate (tY), the change in world prices (P_{w2}/P_{w1}) and the price transmission elasticity. Thus, since

$$E_{PT} = [(P_p - P_{p2})/P_p]/[(P_w - P_{w2})P_w] \tag{21}$$

then

$$P_{p2}/P_p = 1 - E_{PT}[1 - (P_{w2}/P_w)] \tag{22}$$

and since

$$tY_2 = (YA/Y_2) - 1$$

then

$$tY_2 = (tY + 1)[E_{PT} + (1 - E_{PT})P_w/P_{w2}] - 1 \tag{23}$$

The ratio P_{w2}/P_{w1} is predetermined (a 1 per cent change), tY is derived from data published by the Industries Assistance Commission and a range of possible values is assumed for E_{PT}. Adjusting for the new materials-to-output ratio, x_2, the new assistance rates, g_2, and elasticities, E_g, are determined from the formulae in the previous section. Theoretical assistance elasticities are therefore available for all commodities for the price transmission elasticities chosen. Without some prior knowledge of the values of E_{PT} for each commodity, such information is of limited value. However, an estimate of tY_2 for each commodity can be made from the weighted average of the individual estimates of tY_2 provided by each policy measure. E_g can then be calculated and E_{PT} also determined. The latter figure measures the amount of insulation from the world market afforded each commodity by the sum of the various assistance measures.

Data

The analysis uses data published by the Industries Assistance Commission. The principal data used are the estimates of the annual effective assistance rates and the nominal assistance rates on output, both published annually (for example, IAC 1982). For the calculation of the long-term effective rate of assistance, the values of output and inputs at assisted prices were also essential. The assistance elasticity calculations required estimates of the nominal rate of assistance on inputs. Some of these data have not been available on a regular basis hitherto, but a recent comprehensive source is the Commission's report on assistance to Australian agriculture (IAC 1983).

Results

Long-term effective rates of assistance

The long-term effective assistance rate of the rural sector (that is the average rate, $\bar{g}$, over the period examined) is approximately 12 per cent. This is a net subsidy equivalent of $633m annually at 1980 values. While

this level of assistance may be considered moderate when compared with the level cited earlier for the manufacturing sector, there is substantial variation about this figure for individual rural industries. Table 1 shows these individual assistance rates for commodities in descending order of magnitude. The most heavily assisted commodities are tobacco, eggs, milk for the liquid market, wine grapes, citrus and cotton, all of which have rates of assistance far higher than the manufacturing average. At the other extreme, a number of rural industries have had very low or even negative assistance rates (for example, wheat, sorghum, maize, oilseeds and sugar). The general, if not invariable, pattern is that the extensive forms of production have low or negative rates of assistance and the more intensively produced commodities have higher assistance rates. Thus, while the assistance rates indicate that there has been a tendency for agriculture to lose resources to a less efficient manufacturing sector (or for manufacturing to hold resources at the expense of agriculture), at the same time this effect has been either compounded or compensated for, to a greater or lesser extent, by the existence of different assistance rates within the rural sector. Assistance rates can give only an indication of the extent of resource misallocation. A second consideration must be the absolute size of any transfers between industries. Of the $633m an-

TABLE 1

Long-Term Effective Rates of Assistance for the Rural Sector, 1970-80

Commodity	Effective rate of assistance	Annual net subsidy equivalent (1980 values)
	per cent	$m
Tobacco	1 049	54
Eggs	200	62
Milk for the liquid market	170	141
Wine grapes	59	20
Citrus	49	17
Cotton	41	11
Manufacturing milk	31	67
Rice	30	10
Dried vine fruits	20	8
Pig meat	19	14
Apples and pears	14	9
Chicken meat	14	13
Potatoes	12	8
Wool	8	90
Beef	7	60
Oats	5	4
Mutton and lamb	5	15
Barley	4	8
Sorghum	3	2
Wheat	2	21
Maize	0	(a)
Oilseeds	0	−1
Sugar	−4	−2
Total sector	12	633

(a) Less than $500 000.

nual net subsidy equivalent, three-quarters is accounted for by only five industries. If, as has been suggested by some writers (Edwards and Watson 1978; Lloyd 1978), resources are more mobile within sectors than between them, this represents a substantial cost to those rural industries receiving little or no assistance.

The question of why the disparities in assistance rates should be so great within the rural sector is an interesting one. Sieper (1982) saw the amount of assistance distributed as a reflection of the political power of the various industries, both historically and currently. Similarly, Anderson (1978) hypothesised that the level of assistance is a function of its demand by vested interests and government's incentive to supply assistance. Some industries would stand to gain more from a given rate of assistance than would others, and these were identified as those that relied heavily on farm family labour and those that had relatively low value added. Anderson also put forward the view that the structure of the industry may be important: an industry dominated by a few large firms would have a greater incentive to lobby for assistance since the individual firm's share of the prospective benefits would be larger.

On the supply side, governments would be more inclined to provide assistance the smaller the direct call on government funds. Hence, assistance is more likely to be given to import-competing industries (via tariffs) than to export industries. The latter would tend to be aided by home consumption pricing schemes and these would be effective only under certain conditions. In addition, the location of an assistance-seeking industry would be important. A declining industry would be a more suitable candidate for assistance if it were located in a region with particular economic or political characteristics, such as high unemployment or few alternative occupations. In short, it would be difficult to postulate a simple and consistent theory based on economic considerations to explain the pattern of assistance.

These hypotheses are not inconsistent with the results presented in Table 1; there is certainly no consistent relationship between the assistance rate and a number of economic variables. For example, Spearman rank correlation tests between the assistance rate and the value of exports (-0.40), the level of self-sufficiency (-0.35), and the value of output (-0.19) reveal no uniform assistance pattern.[2] There may be other variables which show a stronger correlation (for example, farm-firm size and labour intensity) but these are difficult to identify for a commodity within an industry characterised by multiproduct firms. The general pattern—with some exceptions—of low or negative assistance rates to the export sector and higher rates to the non-export sector certainly supports Anderson's view and suggests that assistance policy is based as much on political and equity considerations as on anything else.

Assistance elasticities for policy measures

Four different assistance elasticities were calculated for the main agricultural commodities. Each of these elasticities represents the reponsiveness of assistance rates under different policy measures, and each assistance elasticity was calculated on the basis that the existing and

[2] This non-parametric test is used because the rankings of effective rates are more important than the absolute values.

future level of support is determined by a single support method. Thus, for any single commodity, the elasticities indicate the comparable assistance that each support method provides when world prices change.

A number of features can be seen in the results in Table 2. First, the assistance elasticity is positively related to the absolute rate of assistance (commodities are listed in descending order of assistance level), so that a given world price change will have a commensurately greater effect on the assistance rate when that assistance is already high. Second, the elasticities are negative: a fall in world prices leads to an increase in the assistance rate. The exceptions to this are theoretical curiosities occurring only where the elasticities are zero and support is by means of tariffs. Third, the rate of assistance changes considerably more under certain types of measures (market separation, output quotas, price underwriting) than under tariffs or fixed subsidies. For example, the assistance rate for citrus would increase by virtually three percentage points under a quota arrangement (without trade) if world prices fall by one percent. Under an *ad valorem* tariff, the assistance rate would increase by only one half of a percentage point. Clearly, increasing reliance on non-tariff assistance could greatly increase the effective assistance rate under conditions of declining world prices. The trend in recent years toward price underwriting arrangements may therefore indicate a greater propensity

TABLE 2

Assistance Elasticities for Various Policy Measures, by Commodity, Based on Average 1977-80 Data

Commodity	E_{g1}	E_{g2}	E_{g3}	E_{g4}
Eggs	3.98	5.18	9.95	9.95
Tobacco	3.00	5.45	7.78	7.78
Milk for the liquid market	2.24	3.81	6.47	6.47
Pig meat	0.12	0.12	3.14	3.14
Citrus	0.48	1.26	2.91	2.99
Chicken	0.07	0.07	2.49	2.49
Rice	0.10	0.39	1.22	2.04
Beef	0.00	0.11	1.34	2.00
Wine grapes	0.09	0.37	1.95	1.95
Potatoes	0.04	0.17	1.84	1.84
Oats	0.01	0.01	1.61	1.70
Cotton	0.09	0.08	0.89	1.68
Barley	0.00	0.00	0.72	1.61
Apples and pears	0.03	0.03	1.29	1.61
Manufacturing milk	0.07	0.08	0.91	1.58
Wheat	0.03	0.02	0.21	1.55
Maize	0.05	0.05	1.52	1.52
Oilseeds	0.06	0.06	1.34	1.50
Wool	0.02	0.01	0.08	1.42
Mutton and lamb	0.02	0.01	0.93	1.42
Sugar	0.10	0.17	0.22	1.39
Dried vine fruits	0.03	0.02	0.54	1.31

E_{g1}: for *ad valorem* tariff.
E_{g2}: for specific tariff/output subsidy.
E_{g3}: for market separation and pool prices.
E_{g4}: for output quota/price underwriting.

for higher assistance rates. However, all these schemes incorporate prophylactics which base the support price on a percentage of a moving average of realised and expected prices, which reduces substantially the potential level of assistance. Furthermore under these schemes, a given level of protection from a world price change is provided for a limited period only, since the underwritten price follows any downward trend in world prices.

The results in Table 2 are a simplification of the changes that occur in the assistance structure when world prices change. The elasticities in themselves are probably understated because of input substitution possibilities and because, under a market separation policy, the proportion sold domestically, K, is unlikely to remain constant. With a fall in world prices, the proportion sold domestically will increase and this will increase E_{g3}. Since the converse of this also applies, the observation has to be made that the elasticities calculated are not necessarily independent of the direction of world price movements.[3] The change in K will be minor if the supply elasticity is low. Therefore, the estimates of E_{g3} as indicators of short-term changes in assistance levels are not seriously compromised. Only if K changes substantially in the longer term is the estimate of E_{g3} likely to be inaccurate.

A further point which has to be borne in mind is that the data in the table relate to assistance rates, not assistance levels. Where the assistance elasticity is low, an increase in assistance rates is not necessarily accompanied by an increase in the net subsidy equivalent. The extent of resource misallocation needs to be judged in the context of both relative assistance rates and the absolute level of subsidy. Very high assistance elasticities, while indicating a potentially much higher level of support for an industry, may mask relatively small amounts of subsidy which may represent relatively small distortions in the overall resource allocation pattern.

Assistance elasticities for the principal commodities

The assistance elasticity for each commodity under the range of assistance measures available varies directly with the price transmission elasticity. Although the latter is unknown, a range of possible values is assumed and the assistance elasticities derived. In Table 3, the calculated elasticities are broadly similar among products for a given E_{PT}. The few exceptions to this (tobacco, eggs and milk for the liquid market) are commodities already receiving the highest levels of protection in the rural sector.

The range of assistance elasticities within a product grouping shows that a decline in world prices of one per cent increases the effective rate of assistance by between zero and two per cent, again with the few notable exceptions discussed previously. Thus, with complete insulation ($E_{PT}=0$) from further world price changes of, say, 10 per cent downward, the new effective rates of assistance for wheat, beef and wool would be 13 per cent, 22 per cent and 8 per cent, respectively. On the other hand, with perfect price transmission ($E_{PT}=1$), the rates would be only -2 per cent,

[3] There are minor differences in the elasticities if calculated on the basis of a one per cent increase in world prices. This is because the elasticity is calculated on the arc, rather than at the point.

2 per cent and 4 per cent. It is, of course, possible to assess intuitively the appropriate E_{PT} for each commodity, given the form of assistance available. For example, the E_{PT} of barley and other coarse grains which receive no specific protection would be expected to be one, as would the E_{PT} of most of the major export commodities (wool, beef, lamb). Products supplied to the domestic market only and with a natural or artificial monopoly would probably have an E_{PT} approaching zero. However, a more direct method of estimating E_g (and hence E_{PT} if desired) is to estimate the amount of assistance afforded by each type of policy measure. A change in the aggregate nominal rate of assistance can then be calculated.

TABLE 3

Assistance Elasticities under Various Levels of Market Insulation

Commodity	Price transmission elasticity					
	0.0	0.2	0.4	0.6	0.8	1.0
Wheat	−1.55	−1.23	−0.91	−0.60	−0.28	+0.03
Barley	−1.60	−1.28	−0.96	−0.64	−0.31	+0.01
Oats	−1.70	−1.36	−1.02	−0.68	−0.35	−0.01
Maize	−1.52	−1.20	−0.89	−0.58	−0.27	+0.05
Rice	−2.04	−1.65	−1.26	−0.87	−0.48	−0.10
Sorghum	−1.54	−1.22	−0.91	−0.59	−0.27	+0.05
Apples and pears	−1.60	−1.28	−0.95	−0.63	−0.30	+0.02
Citrus	−2.99	−2.49	−1.99	−1.49	−0.98	−0.48
Dried vine fruits	−1.31	−1.04	−0.77	−0.51	−0.24	+0.03
Wine grapes	−1.95	−1.58	−1.21	−0.83	−0.46	−0.09
Potatoes	−1.84	−1.48	−1.12	−0.76	−0.40	−0.04
Sugar	−1.39	−1.09	−0.80	−0.50	−0.20	+0.10
Tobacco	−7.78	−6.82	−5.87	−4.91	−3.95	−3.00
Cotton	−1.68	−1.33	−0.98	−0.62	−0.27	+0.08
Oilseeds	−1.50	−1.18	−0.87	−0.56	−0.25	+0.07
Wool	−0.42	−1.13	−0.84	−0.56	−0.27	+0.02
Mutton and lamb	−1.42	−1.14	−0.85	−0.56	−0.27	+0.02
Beef	−2.00	−1.60	−1.20	−0.80	−0.40	−0.00
Eggs	−9.95	−8.75	−7.56	−6.36	−5.17	−3.98
Chicken	−2.49	−1.98	−1.46	−0.95	−0.44	+0.08
Pig meat	−3.14	−2.48	−1.83	−1.18	−0.53	+0.12
Milk for the liquid milk market	−6.46	−5.62	−4.77	−3.93	−3.08	−2.24
Manufacturing milk	−1.58	−1.25	−0.92	−0.59	−0.26	+0.07

The assistance elasticities for each commodity in Table 4 are based on the mix of assistance measures available over the period 1977-78 to 1979-80. For the most part, assistance rates are relatively unresponsive to world price changes but there are some major exceptions. Milk, eggs, tobacco and potatoes all exhibit the tendency for proportionately higher effective assistance rates from a given world price decline. This reflects the great extent to which policies for these products provide insulation from world markets.

TABLE 4

Assistance Elasticities and Derived Price Transmission Elasticities, Based on Policy Mix 1977-78 to 1979-80

Commodity	Assistance elasticity (E_g)	Price transmission elasticity (E_{PT})
Wheat	−0.20	0.85
Barley	+0.01	1.00
Oats	−0.01	1.00
Maize	+0.05	1.00
Rice	−0.58	0.75
Sorghum	+0.05	1.00
Apples and pears	−0.19	0.87
Citrus	−0.48	1.00
Dried vine fruits	−0.43	0.66
Wine grapes	−0.09	1.00
Potatoes	−1.86	0.00
Sugar	−0.29	0.74
Tobacco	−6.60	0.25
Cotton	+0.09	1.00
Oilseeds	−0.07	1.00
Wool	+0.02	1.00
Mutton and lamb	+0.02	1.00
Beef	−0.07	0.97
Eggs	−7.39	0.09
Chicken	+0.08	1.00
Pig meat	+0.12	1.00
Milk for the liquid market	−6.36	0.62
Manufacturing milk	−1.00	0.35

In general, the assistance elasticities indicate a low propensity for assistance rates to change markedly. As an example, the 17 per cent increase in world prices for wheat between 1981-82 and 1982-83 resulted in a decline in the assistance rate of only three per cent. A price change for barley of almost the same magnitude, but in the opposite direction, barely altered the assistance rate. The increase of almost 12 per cent in world beef prices over this period reduced the assistance rate by just under one per cent. Assistance rates are therefore 'sticky' for all but a minority of products. When world prices fall, this tendency will be reinforced by the form of the existing underwriting schemes, the effects of which cannot be adequately predicted by these assistance elasticities.

A further outcome of these low assistance elasticities is the relatively unchanged rankings in assistance rates when world prices change. As an example, should the general level of world prices change by 5 per cent, the overall ranking of products by assistance rate barely changes at all. Even a larger price change of 10 per cent produces only a slight change in the rankings and affects only three commodities to any degree—manufacturing milk, dried vine fruits and potatoes. Thus, the general pattern of resource misallocation under present policies within the rural sector is unlikely to be altered substantially as a result of general changes in world prices, even though the absolute level can alter marked-

ly. At the extreme, the rural sector could have an effective assistance rate of zero (if world prices rose by just over 13 per cent), while individual commodities would exhibit variations in assistance rates similar to those existing today.

Price transmission elasticities

The price transmission elasticities in Table 4 indicate the extent to which domestic prices reflect changes in world prices; they do not have any necessarily consistent relationship with the level of assistance given, since an assisted domestic price can still change in the same proportion and direction as the world price whilst retaining its protective element. For the most part, the elasticities either equal or approach unity, indicating a high dependence on world prices for the determination of the domestic return. At the other extreme, the very low elasticities for potatoes, tobacco, eggs and milk indicate a high degree of insulation from world price movements. In the case of potatoes, the insulation is complete with an E_{PT} of zero. These derived elasticities are, intuitively, of the right order of magnitude: the major export industries naturally have little or no insulation, while those industries catering only for the domestic market are far more insulated. In the case of products for which no import competition exists (potatoes, milk for the liquid market and eggs), the E_{PT} is close to or equal to zero. The assistance elasticities appear to be reasonable estimates of potential changes in assistance rates. However, there are possible shortcomings in the estimates and these are discussed in the following section.

Limitations of the analysis

The concept of effective assistance depends on a number of assumptions, not all of which may be valid in the context of the present analysis. One assumption is that the industry is a price taker on world markets. While this may be generally true for most commodities examined, it is probably not applicable to wool; estimates of the demand elasticity for wool suggest that the Wool Corporation can influence the price it receives (Campbell, Gardner and Haszler 1980). The estimated rate of assistance for wool may therefore be on the high side. However, since the assistance elasticity measures the change in the assistance rate, this limitation is probably unimportant.

A second criticism may be that the assumption of fixed input-output coefficients, x, cannot be sustained over a long time period: substitution is possible between primary factors (for example, land and labour), between intermediate inputs (for example, fuel and chemicals), and between these two categories, all resulting in misleading estimates of assistance rates, especially since this result can be extremely sensitive to changes in the coefficient used. There are two issues here. First, as Corden (1971) has shown, the calculated protective rate is underestimated by the use of fixed input-output free-trade coefficients because of a firm's ability to switch to less costly inputs. But since not all firms (or, in this case, rural industries) can substitute inputs to the same extent, the error in the calculated protective rate will vary from firm to firm, or industry to industry. The value of these effective rates of assistance may therefore be much reduced since industries may be wrongly ranked in terms of their

assistance rates. While some authors (Balassa, Guisinger and Schydlowsky 1970; Grubel and Lloyd 1971) have concluded that the substitution effect does not appear to be important, Corden (1971) is more cautious. Certainly, where there are serious differences between sectors in factor intensity, substitution may be a major obstacle to the interpretation of assistance rates. The second issue is that, whatever defects there may be with assistance rates because of the possibility of input substitution, these are not necessarily increased because of the longer time period being considered. The long-term estimates presented in Table 1 are calculated from annual figures, one of which is the input-output coefficient. Changes in this figure over the period examined reflect to a great extent the substitution of one input for another. In view of this and the fact that, within most of the rural sector, factor intensities are not dissimilar, it is suggested that the limitation is minor.

The remaining limitation concerns the role of underwriting schemes, the effects of which cannot be adequately predicted by the assistance elasticities. Since underwriting schemes exist for four commodities, some consideration has to be given to the usefulness of the elasticities calculated for these. The elasticities given in Table 4 (for wheat, apples and pears, dried vine fruits and milk) are based on the provision of a guaranteed price which is unaffected by world price changes. A common feature of the underwriting schemes, though, is that the guaranteed price is adjusted annually toward the world price. This inclusion is the prophylactic referred to earlier which reduces the degree of assistance available. It is not possible to be precise about the effects of these schemes on assistance rates because much depends on the extent and frequency of price falls. For example, for the wheat marketing arrangements which existed between 1979 and 1983, on the assumption that the anticipated price reflected the actual price, the pool price had to fall by 7.3 per cent in one year before any underwriting occurred. Underwriting in two consecutive years could be triggered only by an initial fall in pool returns of 13.6 per cent (assuming pool returns did not change in subsequent years). In no case could any single fall in pool returns result in deficiency payments being payable after two seasons. This could occur only when pool prices declined on a more continuous basis. As an example, an annual decline in pool returns of 6 per cent would have resulted in a continual and annual nominal rate of assistance on output of 1.2 per cent from year two onward. Since this particular scheme related to pool prices, and domestic prices were higher, the world price could have fallen rather more than in the above examples before triggering assistance.

While this can lead to the conclusion that these particular assistance rates have been overestimated in the method described in this paper—and the author would subscribe to this opinion—it must also be said that the schemes do allow potentially much higher rates of assistance. Large variations in world prices from year to year may allow the minimum guaranteed price to be pulled up to levels unachievable under tariff or other protection. In addition, the overestimation of the anticipated price can raise the minimum guaranteed price above the actual market price. Nonetheless, the proportion of assistance derived from underwriting schemes (over the commodities affected) has been extremely small in recent years. If this historical evidence is a pointer to the

future, then the estimates of assistance elasticities are unlikely to be very inaccurate.

Conclusion

Effective rates of assistance are useful in indicating areas of the economy where resources may be misallocated. High levels of assistance for certain types of production will attract resources from other forms of production receiving either lower or negative assistance levels. From an efficiency point of view, the important implication of assistance rates is the extent to which an industry retains or attracts resource levels above the freely competitive level. Since resources are relatively immobile in the short term, the resource allocation pattern may not be very different between the assisted and unassisted conditions. However, in the long term, assistance rates are a better guide to resource misallocation.

The results of the analysis indicate that long-term historic rates of assistance to agriculture, while lower than for manufacturing, do exhibit substantial variation between products; in general, it is the export-orientated industries which receive least assistance, while the smaller industries supplying principally the domestic market receive commensurately larger amounts. The pattern of assistance is too irregular to be explained by any economic rationale and is probably the outcome of a hotchpotch of political and social objectives.

A given assistance rate for a commodity results from the implementation of one or more policies of intervention and from changes in world prices. While the type and level of intervention results from a presumed mixture of objectives, and is the result of an explicit political decision, the ultimate rate of assistance given is determined by the change in the level of world prices. Should world prices fall over time, then the effective rate of assistance is increased without even the semblance of a discussion, let alone an Industries Assistance Commission inquiry. The prospective increase in the assistance rate is greatest under an output quota scheme and with price underwriting (with the qualification previously noted), and declines successively under market separation, specific tariffs/bounties and *ad valorem* tariffs. Under the existing policy mix, there would be only small increases in assistance rates for most commodities and these increases would certainly be less than proportionate to any decline in world prices. The notable exceptions to this conclusion are potatoes, tobacco, eggs and milk. The derived price transmission elasticities indicate an extremely high level of market insulation for these products.

A surprising consequence of the differing degrees of market insulation afforded various commodities is the retention of the general pattern of inequalities in assistance rates following a given change in world prices. Thus, even supposing an inflation in world agricultural prices sufficient to reduce the overall effective rate of assistance to the rural sector to zero, the inequalities in rates between industries (and therefore resource misallocations) would still occur.

Disparities in assistance rates depend upon the combination of the policy providing the assistance and world price levels. Since the latter are beyond political control, it appears that policy makers should be more concerned about the potential long-term effects of the policies they pro-

pose. A given level of assistance can be provided in a number of ways, but some of those ways can place a greater long-term cost on the economy than others. For example, from an efficiency viewpoint, specific tariffs are to be preferred to *ad valorem* tariffs, under inflationary conditions.

Finally, it must be emphasised that the results obtained for individual commodities depend on the particular policies in place at the time. However, the model provides a framework for further analysis of assistance rates at any point in time and for a wide range of policies. It is this framework and its implications for future analysis that are probably as important as the results contained in this paper.

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