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Sectoral and Economy Wide Effects of Assistance to Agriculture

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*Robert McDougall
Derek Quirke
Andrew Welsh
John Zeitsch*

Industries Assistance Commission

Not for quotation: Comments welcome

Views expressed in this paper are the sole responsibility of the authors, and do not necessarily reflect the views of the Industries Assistance Commission

1. Introduction

This paper provides estimates of the long-run sectoral and macroeconomic effects of assistance to Australian agriculture. It examines both Commonwealth government assistance and assistance provided by the States through domestic pricing arrangements. Assistance provided by the States by other means is not examined. Estimates of the effects of assistance to manufacturing are also provided.

Estimates of assistance to agriculture and manufacturing are drawn from IAC (1989) and unpublished IAC working papers.

The estimates are obtained using the ORANI model of the Australian economy.¹ ORANI is a multisectoral model incorporating both supply and demand relationships between industries and final users of goods and services, and economy-wide constraints on factor usage and consumption spending. This study uses an extended version of the model, known as FH-ORANI, which incorporates a detailed accounting of government revenue and expenditure, and a stylised accounting of international flows of income and investment.² A special-purpose database is used, incorporating a more detailed representation of agriculture and related processing industries.

Earlier ORANI simulations of reductions or removal of assistance to agriculture have been reported in IAC (1982) and Higgs (1988). The simulations reported below incorporate more recent assistance estimates, an enhanced database, and a more precise representation of the withdrawn assistance. Furthermore, long-run rather than short-run effects are estimated. The greater precision in the scenarios, and the estimation of long-run effects, is greatly aided by the extensions to the model structure in FH-ORANI.

Section 2 below describes briefly assistance to Australian agriculture in 1987-88, and Section 3 the model used in these simulations. Sections 4 and 5 report estimates of the effects of 25 per cent reductions in agricultural and manufacturing assistance. The effects of agricultural and manufacturing assistance reductions are compared and contrasted in Section 6.

1 Dixon et al. (1982).

2 Dec (1989).

2. Assistance to Agriculture

This section describes briefly assistance provided to Australian agriculture in 1987-88. It covers Commonwealth interventions and some interventions by the States which, with varying degrees of Commonwealth compliance, raise prices of agricultural products.³ Substantial assistance provided through other State interventions is not covered.

For this study assistance provided agriculture was decomposed into:

- assistance to value adding factors and other inputs;
- indirect output assistance, ie assistance provided primarily to food processors and assumed to be passed back to farmers; and
- direct output assistance provided to farmers.

A breakdown of assistance by these categories is provided in Table 1. *Assistance to value adding factors* and other inputs is provided mainly in the form of tax concessions and subsidies to research, disease control, wool promotion and subsidised adjustment costs. This assistance amounted to \$520 million in 1987-88 or about 30 per cent of all assistance estimated to have been provided to farmers (see Table 1).

Table 2 identifies the contributions of State and Commonwealth governments in the provision of assistance to the rural sector in 1984-85. State assistance as calculated by the IAC (1988) identifies outlay items in State government budgets that specifically target production, distribution and marketing of agricultural products. Agricultural research and extension accounted for almost 60 per cent of total State budgetary assistance. In total State budgetary outlays accounted for 30 per cent of total assistance provided to the rural sector. State legislation provides for significant assistance in the operation of dairy, sugar and eggs marketing arrangements which are addressed in this study. Assistance mechanisms not quantified included provision of infrastructure, such as roads, irrigation and subsidised communication.

TABLE 1: MEASURED ASSISTANCE PROVIDED TO THE RURAL SECTOR, 1987-88
(\$ Million)

ASSISTANCE TO VALUE-ADDING FACTORS AND OTHER INPUTS		Value
.	Taxation concessions	235.0
.	Rural adjustment	67.0
.	Research assistance	128.0
.	Natural disaster relief	42.0
.	Wool promotion	35.0
.	TB and brucellosis eradication	<u>13.0</u>
	Total	520.0
INDIRECT OUTPUT ASSISTANCE		
Home Consumption Schemes Operating at the Processing Level		
.	Milk products	190.0
.	Rice	14.0
.	Sugar	73.0
.	Cotton	8.0
Export Inspection and Incentives		
.	Beef, sheepmeat, pigmeat	27.0
Tariffs		
.	Citrus juice	13.0
.	Wine	<u>27.0</u>
	Total	352.0
DIRECT OUTPUT ASSISTANCE		
Home Consumption Schemes Operating at the "Farm" Level		
.	Market milk	192.0
.	Wheat	4.0
.	Eggs	23.0
.	Honey	..
.	Dried vine fruits	17.0
Export Inspection and Incentives		
.	Wheat	..
.	Apples and pears	..
Tariffs		
.	Potatoes	7.0
.	Onions	..
.	Other vegetables	<u>1.0</u>
	Total	244.0

.. less than 500,000

TABLE 2: COMMONWEALTH AND STATE ASSISTANCE PROVIDED TO THE RURAL SECTOR, 1984-85
(\$ Million)

Category	State		Commonwealth	Total
	Budgetary outlays	Domestic price arrangements		
Assistance to outputs	45	224	436	705
Assistance to value-adding factors	353	0	304	657
Assistance to inputs	55	0	70	125
Total assistance	453	224	810	1 487

The major tax concession the farm sector receives is the ability to lower tax paid by electing to have tax payable assessed on the average income earned over several years rather than that earned in the current tax year. The facility is not available to Australian industry in general. In 1987-88 it is estimated that this provision of the Income Tax Act saved Australian farmers \$235m or 20 per cent of total assistance estimated to have been provided to the rural sector in 1987-88. This assistance represents a large increase in assistance afforded agriculture through tax concessions. The higher assistance reflects higher wool prices and more favourable weather conditions. For this study it was assumed that a more typical level of \$180m of assistance would be provided through averaging provisions. This represents the average of assistance received through taxation averaging over the last 5 years.

Averaging of incomes enables farmers to lower tax paid. Thus, the removal of these provisions was modelled as an increase in tax rates on agricultural owner operator income and capital income sufficient to recover the typical level of tax avoided through the averaging provisions.

Costs incurred in the eradication of brucellosis and tuberculosis, the conduct of agricultural research, wool promotion natural disaster relief and rural adjustment are not met fully by the farm sector. In this study it was assumed that the level of expenditure on these items was appropriate. In addition, it was assumed that the farm sector would receive, over the longer term, the majority of the benefits from these programs. Under these assumptions there is no reason why the farm sector should not bear the full cost of such expenditure. Accordingly, removal of this assistance was modelled through the introduction of a series of industry levies sufficient to recover the full cost of the various programs.

Indirect output assistance is provided mainly in the form of home consumption price arrangements and under-recovery of costs incurred in inspection of products destined for export markets. Tariffs on processed agricultural products also provide a small amount of assistance to the rural sector. Together this assistance was estimated at \$352m or about 30 per cent of measured agricultural assistance in 1987-88.

Assistance provided through home consumption price arrangements for milk products sugar and rice provide the bulk of indirect output assistance.

Milk

Assistance afforded to market milk is derived from the regulation of market milk sales. Retail fluid milk prices are maintained by insulating fluid milk prices from movements in manufacturing milk prices. Insulation is achieved through various mechanisms, such as quotas, equalisation of returns and inhibitions on interstate trade in market milk. The IAC (1989) calculated that for 1987-88 the price distortion for whole milk for human consumption was 48 per cent, resulting in a producer transfer of approximately \$192 million. This estimate puts great weight on the choice of a benchmark price. In the IAC's report into the Dairy industry, the Australian Dairy Farmers Federation (ADFF) is quoted as claiming that in an unregulated situation the dairy industries in Queensland, New South Wales and South Australia would be likely to contract to the point at which these States would import milk from Victoria to meet market milk demand. The price of market milk in these States would then be roughly equal to the manufacturing milk price in Victoria plus an appropriate freight margin. The Commission has adopted this methodology when calculating consumer to producer transfers.

Assistance afforded to manufacturing milk products was calculated by the IAC (1989) to involve a producer transfer of \$190 million for 1987-88. Assistance provided to cheese production accounted for more than 50 per cent of this assistance.

Assistance provided manufactured milk products are funded by a levy on all milk production which spreads the cost of export subsidisation across the entire industry. The arrangements also involved the phased removal of supplementary product levies which closed in June 1989. However, as the IAC (1989) noted, the new arrangements are not likely to change the long term rate of export subsidy on manufactured milk products of approximately 30 per cent.

In calculating assistance to manufactured dairy products, the Commission has assumed that world prices received for manufactured products represent the appropriate benchmark for assessing assistance. Under the new arrangements, the consumer transfer is simply the difference between the average export fob price and the observed consumer price.

The effects of removal of the dairy arrangements were simulated via exogenous changes in taxes on the sales of unprocessed milk, market milk and manufacturing milk products. The mechanisms captured include the all milk levy, the supplementary support levy on butter and cheese and restrictions on market milk in quota States. Finally, revenue from the Market Support Fund and the Supplementary Support Fund are then pooled to provide export support on prescribed dairy products.

Sugar

The sugar industry also benefited significantly from consumer transfers in 1987-88.

Marketing arrangements for sugar are complex and are characterised by interventions at all levels of growing, milling, refining and sales. The IAC (1989) estimated that assistance afforded to sugar growers was \$73.5 million in 1987-88.

From 1 July 1989 a specific rate tariff of \$115 per tonne applies to imports of raw sugar, while the embargo on raw sugar was abolished. The specific rate of \$70 per tonne for raw sugar (to apply from 1 July 1992) is equal to an ad valorem tariff of just over 20 per cent at current world prices (IAC 1989 page 147).

Domestic price arrangements prior to July 1989, operated by the Queensland Government on behalf of cane-growers, set the domestic prices for raw sugar and refined sugar products. This scheme was made possible by an import embargo on all sugar and sugar products up until June of 1989, under the Sugar Agreement of 1984 between the Commonwealth and Queensland Government.

The IAC calculates producer transfers by comparing the administered domestic price of refined sugar (price per tonne of 1XD refined sugar adjusted to raw sugar ex terminal basis) to the average FOB price of raw sugar exported in bulk.

The effects of removal of home-consumption arrangements for sugar were simulated via an exogenous fall in taxes on all domestic consumption of raw sugar plus an exogenous increase in export taxes. It would be expected that removal of these arrangements would lead to a contraction in marginal sugar growing regions and an expansion in more favourable regions. Given a lack of information on the levels of expansion/contraction of sugar growing in various regions, the neutral assumption was adopted that reducing sugar assistance arrangements would lead to no change in the level of sugar exports. The shocks to export taxes and domestic taxes were set to achieve this result.

Rice

The IAC (1989) have calculated that domestic pricing arrangements resulted in a 49 per cent price distortion and a producer transfer of \$14 million for 1987-88. The NSW Rice Marketing Board is responsible for the receipt, storage and sale of paddy rice, through sole purchasing rights, and the distribution of revenue. The NSW Rice-growers Co-operative mills, processes and sells on behalf of the Marketing Board. A home price

discriminates between domestic and export markets. Estimates of the price distortion have been calculated by comparing domestic and export prices for medium and long grain rice. If these arrangements were to be modelled then the appropriate tax would have to be placed on sales of the ORANI commodity Flour and cereal products of which Milled rice is a part. Removal of this assistance was not simulated. As the data base does not separately identify either rice growing or rice milling, the model cannot adequately represent the effects of economic shocks specific to these industries.

Cotton

IAC (1989) calculated that domestic pricing arrangements resulted in a 18 per cent price distortion and a producer transfer of \$8 million in 1987-88. The arrangements operate through the cotton ginning industry which has maintained the domestic prices of ginned cotton at import parity even though exports account for approximately 60 per cent of total sales. These arrangements were modelled by the removal of a tax on domestic consumption and an export subsidy sufficient to eliminate the calculated price distortion.

The remaining form of *indirect output assistance* is under-recovery of export inspection costs. Full recovery of export inspection costs was modelled via the introduction of a tax on exports of the commodity being inspected sufficient to recover the full cost of existing levels of export inspection. This mainly involved increased costs for the meat processing industry.

Output assistance provided directly to farmers comprises about 20 per cent of measured agricultural assistance. Most of this assistance was provided through State government regulation of market milk which is estimated to have provided dairy farmers \$192 million in 1987-88.

The various forms of assistance were first allocated to particular ORANI commodities and subsequently to ORANI industries. Assistance by ORANI industry is given in Table 3.

TABLE 3: ASSISTANCE PROVIDED TO AUSTRALIAN AGRICULTURE, BY ORANI-AG INDUSTRY, 1987-88
(\$ million)

Industry	Value of output	Assistance
Pastoral zone	1429	50
Wheat-sheep zone	6127	216
High rainfall zone	3200	121
Northern beef	632	46
Dairy farming	1429	214
Pigs	439	4
Sugar cane	630	3
Agriculture nec, export	546	30
Cotton (excluding ginned)	425	14
Agriculture nec, import-competing	763	30
Poultry	883	49
Meat products		31
Milk products		193
Flour mill and cereal products		14
Raw sugar		73
Cotton ginning		8
Total	16374	1096

nec not elsewhere classified.

As can be seen from Table 3, assistance provided directly to broad-acre agriculture is relatively low, accounting for less than 5 per cent of the protected value of production. In contrast, assistance provided dairy farming (including assistance provided manufacturing milk) is very high, accounting for nearly 30 per cent of the protected value of farm milk production.

The following section outlines the version of the ORANI model used to analyse the effects of reducing this assistance.

3. The ORANI Model of the Australian Economy

3.1. Introduction

The model used to simulate of reductions in assistance to agriculture is ORANI, a multisectoral model of the Australian economy. ORANI provides a detailed account of production and demand in the Australian economy, incorporating both direct

links between sectors and economy-wide constraints on factor usage and consumption expenditure.

As used here the model is comparative-static rather than dynamic. The scenarios represent shocks applied to the economy at some point in time, the database represents an equilibrium state of the economy at some later time, and the simulation results represent changes in the equilibrium state at that later time, arising from the shocks.

The model consists of a system of non-linear equations. The simulations reported below are a solution, not of that non-linear system, but of a linear approximation to it. The model results are therefore subject to linearisation error, the severity of which depends upon the magnitude of the shocks. Preliminary simulations of complete removal of agricultural assistance revealed severe linearisation errors; in order to moderate them this paper simulates only a 25 per cent assistance reduction.

The model may be used to simulate either short-run or long-run effects, depending on which variables are treated as predetermined and which are solved for by the model. The selection of predetermined variables is called the model closure. The the long-run closure used in this study is designed to represent effects over a period of the order of ten years.

One property of the model as used here is price homogeneity. A change in the price level not involving any change in relative prices has no effect on real economic activity. Thus, for example, a one per cent rise in world prices (or a one per cent depreciation of the exchange rate) leads to a one per cent rise in all domestic prices, but has no real effects. Conversely, the model cannot determine the domestic price level or the nominal exchange rate (though it does determine the real exchange rate). For this reason, either a domestic price variable or the nominal exchange rate must be determined outside the model. The variable usually chosen is the nominal exchange rate.

The standard ORANI database is constructed using mainly ABS input-output statistics, with special modifications to the agricultural data. The ABS sectoral classification, in which commodities correspond one-to one to industries, is modified to allow for the multi-product nature of Australian broad-acre agriculture. The data are also adjusted so that cost and sales structures in agriculture reflect typical-year conditions, rather than conditions occurring in the single year to which the ABS statistics relate.

The most recent standard ORANI database is constructed from 1980-81 input-output statistics, modified as described above.⁴ For this study that database has been further modified, to provide a more detailed representation of the agricultural sector and related processing industries. The resultant database is called ORANI-AG.

4 Kenderes (1988).

Section 3.2 describes the ORANI-AG database, and Section 3.3 the short-run and long-run closures.

3.2 The ORANI-AG database

The ORANI-AG database is a derivative of the standard ORANI database for 1980-81, specially modified for use in simulations of events directly affecting Australian agriculture. The modifications include disaggregation of agriculture and early-stage processing of agricultural products, aggregation of other sectors of the economy, and other miscellaneous modifications.

The disaggregation is modest in scope, adding only six industries to the 112 industries of the standard database. Three industries are added in the agricultural sector, two in food processing, and one in textiles. A listing of the disaggregated industries is provided in Table 4. The joint production structure for the agricultural sector is shown in Table 5.

TABLE 4: SECTORAL DISAGGREGATION IN ORANI-AG

ORANI SECTOR	ORANI-AG SECTOR
Milk cattle and pigs	Dairy farming Figs
Agriculture nec, export-oriented	Sugar cane Agriculture nec, export
Agriculture nec, import-competing	Cotton growing Agriculture nec, import competing
Milk products	Pasteurised milk Milk products
Food products nec	Raw sugar Food products nec
Cotton ginning, wool scouring and top making	Cotton ginning Wool scouring and top making

nec not elsewhere classified.

TABLE 5: AGRICULTURAL OUTPUT BY COMMODITY AND INDUSTRY, 1988-81.
(\$ million)

Commodity	Industry											All agricultural industries
	Pastoral zone	Wheat-sheep zone	High rainfall zone	Northern beef	Dairy farming	Pigs	Sugar cane	Agriculture n.e.c., export	Cotton	Agriculture n.e.c., import competing	Poultry	
Wool	402	989	718	0	0	0	0	0	0	0	0	2108
Sheep	49	291	208	0	0	0	0	0	0	0	0	547
Wheat	67	1616	36	0	0	0	0	0	0	0	0	1719
Barley	10	284	37	0	0	0	0	0	0	0	0	331
Other cereals	8	243	72	0	0	0	0	0	0	0	0	323
Meat cattle	171	544	560	585	124	0	0	0	0	0	0	1984
Unprocessed milk	1	60	21	0	784	0	0	0	0	0	0	866
Pigs	0	25	9	0	0	324	0	0	0	0	0	358
Sugar cane	0	0	0	0	0	0	895	0	0	0	0	895
Agriculture n.e.c., export	3	0	7	0	0	0	0	346	0	0	0	356
Cotton	0	0	0	0	0	0	0	0	105	0	0	105
Agriculture n.e.c., import competing	14	49	66	0	0	0	0	0	0	943	0	1071
Poultry	0	0	0	0	0	0	0	0	0	0	571	571
All agricultural commodities	724	4100	1734	585	909	324	895	346	105	943	571	11236

SOURCE: ORANI-AG database.

To make the model more manageable, sectors not closely related to agriculture were aggregated. This aggregation reduced the number of sectors by 57. After both disaggregation and aggregation, ORANI-AG contains 61 industries, as against 112 in the standard database.

Other modifications were made to the database for a variety of reasons. The more important of these relate to regulation of the supply of market milk, and to supply of minerals. Fictitious taxes and subsidies were introduced on sales of milk to processors; these taxes and subsidies were designed to represent the effects of State government regulation of market milk, upon both returns to farmers and prices paid for packaged milk by consumers.

Mining industry cost structures were modified to reduce the volatility of output of minerals in long-run simulations. The standard ORANI database recognises no constraint on the expansion of mining industries imposed by the scarcity of suitable deposits; so output of minerals is restricted only by the size of the market. For export-oriented minerals that demand-side constraint is weak, so output is highly volatile. The ORANI-AG database introduces natural resource constraints on mining industry activity, so that minerals output is considerably less volatile.

3.3 Closure of the model

The long-run closure is designed to represent economic responses over a period of time long enough for complete adjustment of capital stocks to changes in profit opportunities in all industries; but not so long that ownership of assets has adjusted fully to changes in saving (which may take many decades). Where parameter settings depend upon the exact length of the adjustment period, that has been taken to be ten years. The principal features of the long-run closure are as follows.

- . Wage rates adjust so as to maintain a fixed rate of employment in each occupation. Employment levels can vary slightly, because of changes in the size and composition of the labour price.
- . Capital stocks adjust so as to maintain a fixed rate of return to capital in each industry.
- . Private consumption expenditure maintains a fixed proportion to national saving.
- . Within each industry, investment maintains a fixed proportion to capital usage.
- . Real aggregate government consumption of goods and services maintains a fixed proportion to real aggregate private consumption.
- . Benefit rates for transfer payments are fixed in real terms.
- . Income tax brackets are indexed to the consumer price index.

- . Direct tax rates on personal and company income vary equiproportionately so as to maintain a fixed real government sector borrowing requirement.
- . The exchange rate is fixed.

4. The Long-Run Effects of Reductions in Assistance to Agriculture

4.1 Preliminary qualifications

Before discussing the results of the agricultural assistance simulation, this section discusses the qualifications which must be borne in mind in considering them. The simulations do not cover all assistance to agriculture; considerable assistance provided by the States is omitted. The simulations represent only the effects of a 25 per cent reduction, not the complete removal, of agricultural assistance. It is not realistic to estimate the effects of complete removal as four times the effects of the 25 per cent reduction. For example, the 25 per cent reduction reduces exports of manufactured milk products by an estimated 40 per cent. Obviously complete removal cannot reduce exports by 160 per cent.

The study is based largely on the IAC's estimates of assistance to agriculture, and adopts the definitions of assistance used in those estimates. Different definitions of assistance would of course lead to different simulation results. In particular, the IAC defines the income tax provisions as assistance to agriculture, by comparing the present provisions (under which income tax averaging is available to agricultural producers) to a tax regime benchmark in which no income is eligible for averaging. Use of a different benchmark, under which all income could be averaged for tax purposes, would reduce the estimated level of assistance to agriculture, and the estimated declines in agricultural income and output resulting from a reduction in agricultural assistance.

While the assistance estimates on which the simulations are based are fairly recent, they have in some respects been already overtaken by events. For example, underwriting of wheat prices has been abolished, and the domestic price arrangements for eggs in New South Wales are being dismantled.

One important class of effects not taken into account in these simulations is changes in economic efficiency internal to agricultural industries. For example, the present assistance regime for the dairy industry imposes not only an external loss of efficiency, by attracting excessive quantities of productive resources into the industry, but also an internal inefficiency, by encouraging dairy farming in higher cost areas at the expense of production in lower cost areas. Contrary to the assumption implicit in this study, distortion of the price of market milk in States operating quota schemes may not raise farm incomes, but instead be dissipated in higher production costs. Estimation of the effects of removing these internal inefficiencies would require much more detailed modelling of the dairy farming industry than is possible in a study of this nature.

Finally, and as always in general equilibrium modelling, the results are sensitive to the theoretical structure and sectoral classification of the model, with their inevitable limitations, and by behavioural parameters for which accurate estimates are unavailable, notably the export demand elasticities and the factor primary substitutions.

4.2 Macroeconomic effects

Estimates of the macroeconomic effects of assistance reductions are reported in Table 6.

Over the long run, reductions in assistance to agriculture lead to a small contraction in the aggregate volume of exports (of 0.2 per cent), with large declines in exports of some processed agricultural products partly offset by rises in exports of other commodities. At the same time the export price index remains virtually unchanged. This seemingly perverse combination of results is explicable by compositional effects. Export prices rise for dairy products and cotton, in which Australia is only a small international trader, with negligible market power; while falling for more important export commodities, over which Australia does have some power. So although export prices do not rise on average, the commodities which do experience price rises have higher export demand elasticities, so that aggregate export volumes decline.

TABLE 6: ESTIMATED MACROECONOMIC EFFECTS OF 25 PER CENT REDUCTIONS IN INDUSTRY ASSISTANCE
(Percentage change)

	Assistance to agriculture	Assistance to manufacturing	Total
GDP (real)	0.07	0.27	0.33
Consumption (real)	0.09	0.12	0.21
Investment (real)	0.09	0.65	0.75
Exports (real)	-0.15	1.94	1.79
Imports (real)	0.00	1.76	1.76
Balance of trade (a)	-0.02	-0.02	-0.05
GDP deflator	-0.26	-0.83	-1.09
Consumer price index	-0.32	-0.78	-1.10
Investment price index	-0.14	-1.15	-1.29
Export price index	0.00	-0.19	-0.19
Employment	-0.01	0.03	0.02
Capital usage	0.09	0.65	0.75
Average wage rate	-0.23	-0.32	-0.55
Average real post-tax wage rate	0.15	-0.04	0.11
Real disposable non-labour income	0.13	0.37	0.50
Shift in direct tax rates	-0.36	-1.39	1.03

(a) Ratio of change in balance of trade to initial GDP (per cent).

The aggregate volume of imports remains virtually unchanged, as the volume-expanding effect of stronger domestic demand is offset by the contractionary effect of falls in domestic prices. The trade deficit increases by an amount equivalent of 0.02 per cent of GDP. The increase in the deficit is driven by a rise in the current account surplus, required to fund the 0.09 per cent increase in real investment, especially as capital goods prices rise relative to consumer goods prices.

Overall the domestic price level declines by 0.3 per cent. As noted above, the export price index is almost unchanged over the long run. That result is predictable, given the high elasticity of demand for exports. Any considerable change in the export price index would lead to very large changes in aggregate export volumes and in the balance of trade; that is, it would lead to external imbalance. Conversely, maintenance of external balance precludes large changes in the export price index.

But the reductions in assistance provided through domestic pricing arrangements lead to changes in relative prices, with domestic consumer prices falling relative to export prices. With export prices virtually fixed, this change in relative prices must result in a fall in consumer prices. Thus the consumer price index falls by 0.3 per cent.

The competitiveness of trade-exposed industries not subject to assistance reductions is enhanced not only by the fall in the domestic price level (as in the short run), but also by the fall in income tax rates, made possible by the reduction in budgetary assistance to agriculture.

Slight growth in real GDP, of 0.07 per cent, is supported by growth in the aggregate capital stock (0.09 per cent) and by an improvement in allocative efficiency, as resources are withdrawn from production of highly subsidised commodities such as dairy products.

In reality, one of the most important mechanisms through which a reduction in interventions in agriculture might lead to expansion in aggregate output is a reallocation of agricultural land use. Current arrangements restricting interstate trade in dairy products encourage dairy farming in high-cost areas. Distortions in the geographical distribution of production within States may also be created by quota systems for milk and sugar cane. The benefits of reducing these distortions are not taken into account in these simulations.

Because of a slight change in the composition of activity from more labour-intensive to more capital-intensive industries, the rise in aggregate output is not accompanied by a rise in demand for labour, and the average real pre-tax wage rate remains unchanged. The average real post-tax wage rate rises slightly (by 0.09 per cent), as income tax rates fall. Real disposable non-labour income also rises slightly (by 0.07 per cent).

4.3 Sectoral results

The estimated effects of assistance reductions on sectoral output levels are reported in Table 7.

Reductions in agricultural assistance lead to contractions in activity both in agriculture and downstream in food and textile fibre processing. Agricultural output declines by 0.5 per cent, while food and textile output decline by 1.2 and 0.3 per cent respectively. Mining sector activity expands relatively strongly, by 1.0 per cent (see Table 5), as minerals exports are assisted by falls in wage rates and input prices. Activity in manufacturing sectors not closely related to agriculture output grows by 0.2 per cent overall, because of improvements in the competitiveness of both export-oriented and import-competing industries. Service sector activity expands very slightly.

TABLE 7: ESTIMATED EFFECTS ON SECTORAL ACTIVITY LEVELS OF 25 PER CENT REDUCTIONS IN INDUSTRY ASSISTANCE
(Percentage change)

	Assistance to agriculture	Assistance to manufacturing	Total
Agriculture	-0.5	0.6	0.1
Agric. services, forestry & fishing	0.1	0.3	0.4
Mining	0.8	2.3	3.1
Food products	-1.0	0.6	-0.4
Textiles	-0.1	-3.9	-4.0
Manufacturing nec	0.2	-0.4	-0.2
Services	0.1	0.3	0.3

nec not elsewhere classified.

More detailed sectoral output results for agriculture and related industries are reported in Tables 8 and 9. Within the agricultural sector the effects of the assistance reductions are very uneven. Dairy farming and cotton growing contract considerably, by 7.1 and 6.1 per cent, and meat producing industries (northern beef, pigs and poultry) contract more moderately (by 0.9, 0.7 and 0.4 per cent respectively). Broad-acre industries not specialised in meat production expand slightly, as they suffer only slight reductions in assistance, and (like other agricultural industries) benefit from a fall of 1.3 per cent in wage rates paid to rural workers.

Reductions in market milk price distortions associated with equalisation pool schemes, and in milk products export subsidies funded by industry levies, lead to falls in exports of milk products, and consequently to falls in milk output; but reductions in market milk price distortions associated with quota schemes have virtually no effect on output.

TABLE 8: ESTIMATED EFFECTS ON ACTIVITY LEVELS IN SELECTED INDUSTRIES OF 25 PER CENT REDUCTIONS IN ASSISTANCE
(Percentage change)

	Assistance to Agriculture	Assistance to Manufacturing	Total
<u>Agriculture</u>			
Pastoral zone	0.2	0.4	0.6
Wheat-sheep zone	-0.3	0.5	0.2
High rainfall zone	0.4	0.1	0.5
Northern beef	-0.9	1.6	0.7
Dairy farming	-7.1	0.8	-6.2
Pigs	-0.7	0.9	0.2
Sugar cane	3.8	1.7	5.5
Agriculture nec, export	-0.6	0.3	-0.3
Cotton growing	-6.1	0.6	-5.5
Agriculture nec, import-competing	-0.3	0.1	-0.2
Poultry	-0.4	0.5	0.1
All agricultural industries	-0.5	0.6	0.1
<u>Food Products</u>			
Meat products	-0.7	0.8	0.2
Pasteurised milk	0.2	0.0	0.2
Milk products	-10.5	1.3	-9.2
Raw sugar	3.8	1.7	5.5
Food products nec	-0.2	0.1	-0.1
All food products	1.0	0.6	-0.4
<u>Textiles</u>			
Cotton ginning	-6.1	0.6	-5.5
Wool scouring and top making	0.2	0.1	0.3
Textiles nec	0.4	-5.3	-4.9
All textiles	-0.1	-3.9	-4.0

nec not elsewhere classified.

TABLE 9 : ESTIMATED EFFECTS ON OUTPUT OF AGRICULTURAL COMMODITIES OF 25 PER CENT REDUCTIONS IN ASSISTANCE (Percentage change)

	Assistance to agriculture	Assistance to manufacturing	Total
Wool	0.1	0.3	0.4
Sheep	0.1	0.4	0.4
Wheat	-0.3	0.5	0.2
Barley	0.0	0.4	0.4
Other cereal grains	-0.3	0.4	0.1
Meat cattle	-0.7	0.8	0.2
Unprocessed milk	-6.4	0.8	-5.6
Pigs	-0.7	0.8	0.2
Sugar cane	3.8	1.7	5.5
Agriculture nec, export	-0.5	0.3	-0.2
Cotton	-6.1	0.6	-5.5
Agriculture nec, import-competing	-0.3	0.1	-0.1
Poultry	-0.4	0.5	0.1
All agricultural commodities	-0.5	0.6	0.1

nec not elsewhere classified

Cane farming is the main expanding industry in agriculture (with output growth of 3.8 per cent). Reduction in assistance to cane farming does not lead to contraction in its activity, as the contractionary effect of reductions in the distorted domestic price are offset by the expansionary effect of relaxation of the quota system. Reductions in assistance to other agricultural industries, such as dairy farming, by lowering the general price level assist cane farming, so that the overall effect is an expansion in its output. This result however depends on an arbitrary assumption about the magnitude of the output-restricting effect of the quota system, as described in Section 2.

Estimated effects of the reduction in agricultural assistance on real farm income are shown in Table 10. Incomes fall especially severely in industries where assistance is associated with quantitative restrictions: dairy farming (a 15 per cent reduction), poultry (9 per cent), and sugar cane (where despite a rise in output of 4 per cent, real income falls by 4 per cent). The severity of the income declines, when compared with the output declines, is to be expected, since the relaxation of quantitative restrictions tends to raise output, but reduces income severely. The other large income decline, in the cotton growing industry (8 per cent), is roughly in line with the decline in output (6 per cent).

TABLE 10: ESTIMATED EFFECTS ON REAL FARM INCOMES OF 25 PER CENT REDUCTIONS IN INDUSTRY ASSISTANCE
(Percentage change)

	Assistance to agriculture	Assistance to manufacturing	Total
Pastoral zone	-0.7	1.2	0.4
Wheat-sheep zone	-1.3	1.3	0.0
High rainfall zone	-0.6	0.9	0.3
Northern beef	-2.5	2.8	0.3
Dairy farming	-15.0	1.8	-13.2
Figs	-1.5	1.5	0.0
Sugar cane	-3.6	2.7	-0.9
Agriculture nec, export	-1.7	1.1	-0.6
Cotton growing	-7.9	1.5	-6.4
Agriculture nec, import-competing	-1.9	-0.9	-1.0
Poultry	-9.5	0.8	-8.7
All agricultural industries	-2.8	1.4	-1.4

nec not elsewhere classified.

Income declines in broad-acre agriculture are moderate, ranging between 0.6 per cent for the high rainfall zone to 2.5 per cent for the northern beef industry. Nevertheless the income declines are again more severe than the output contractions (indeed, for some broad-acre agricultural industries, output expands rather than contracts). A large part of assistance to broad-acre agriculture is provided through income tax concessions, in particular through income tax averaging provisions. Reductions in these concessions tends to lower the rental price of land, and to raise the required pre-tax rate of return on capital. The higher required rate of return on capital leads to substitution of labour for capital. Lower land rentals and substitution of labour for capital both reduce farm incomes, without involving great reductions in output levels.

Overall the long-run sectoral results suggest that assistance to agriculture is critical to the prospects of some agricultural and processing industries, but is of relatively little importance to agriculture as a whole. Activity levels in some of the most important agricultural industries may actually be reduced agricultural assistance, as the slight stimulus they receive directly are outweighed by the cost penalties imposed on them.

5. The Effects of a Reduction in Assistance to Manufacturing

The estimated effects of reductions in manufacturing assistance are discussed here, not as a topic of independent interest, but because in conjunction with the results for agricultural assistance they give some indication of how the total structure of industry assistance in Australia has affected the agricultural sector (although reductions in mining and services industries assistance have not been modelled).

The manufacturing industry assistance considered here comprises tariffs and quantitative restrictions on competing imports. Minor levels of assistance provided through production bounties and export incentives have not been modelled. Estimates of initial levels of assistance are drawn from IAC (1989), and relate to 1988-89.

5.1 Macroeconomic effects

A 25 per cent reduction in assistance to manufacturing would lead to an increase in the volume of imports estimated at 1.8 per cent. External balance is maintained by an expansion of 1.9 per cent in the volume of exports. This expansion in exports is achieved through a fall in the domestic price level, the GDP deflator falling by 0.8 per cent.

Growth in real GDP is 0.3 per cent, achieved partly by improvement in the efficiency of allocation of resources, but mostly by growth of 0.7 per cent in the capital stock. Most of this GDP growth is absorbed by the rise in the level of investment required to maintain the capital stock, but a part remains available to underpin growth of 0.1 per cent in consumption (by both households and government).

The real depreciation required to maintain external balance while reducing tariffs entails a fall in money wage rates, estimated at 0.3 per cent. Since the nominal exchange rate is assumed to be fixed, this represents a decline of 0.3 per cent in wage costs relative to Australia's trading partners and competitors, measured in common currency units. With the cpi falling by 0.8 per cent, real gross wage rates actually rise, by 0.5 per cent. But with income tax rates rising by 1.4 per cent (that is, by 1.4 per cent of their initial value, not by 1.4 percentage points) to offset the effect on the real government borrowing requirement of the reduction of tariff revenue, real after-tax wage rates fall very slightly.

Capital usage is especially encouraged by the relatively large fall (1.1 per cent) in the prices of capital goods, which are more affected by tariffs than consumer commodities (since, although consumer goods such as clothing and motor vehicles are subject to high tariffs, a large share of consumption expenditure is on non-tradable services).

5.2 Sectoral results

The reduction in manufacturing industry assistance leads to an average contraction of 0.4 per cent in output in industries comprising most of the manufacturing sector, and a contraction of 3.9 per cent in the highly-protected textiles industries. The fall in the domestic price level induces expansion in export-oriented sectors including mining (2.3 per cent), agriculture (0.6 per cent) and food processing (0.6 per cent). The mining sector expands proportionately more than agriculture because in the model it is less constrained by the scarcity of natural resources, and because, being more capital-intensive, it benefits more from the large decline in capital goods prices. The services sector expands slightly (by 0.3 per cent) in response to stronger domestic demand.

In general the agricultural industries which expand most are those which provide raw materials to export-oriented processing industries. Thus the cane-growing industry expands by 1.7 per cent, the northern beef industry by 1.6 per cent, and the dairy farming industry by 0.9 per cent. In industries oriented towards the production of commodities exported without processing, such as wool and wheat, growth in exports is constrained by a scarcity of land, which tends to raise land rentals and output prices. Land rentals also rise in the indirectly export-oriented agricultural industries, but there they have less effect on export prices, since farm-gate prices represent a smaller part of export prices.

As in the agricultural assistance simulation, the changes in farm income are large when compared with changes in agricultural output. In the manufacturing assistance simulation, this is largely because of substitution of capital for labour. The manufacturing assistance reduction leads to a fall in capital rentals in agriculture of around 1.1 per cent, while wage rates for rural workers rise by 0.5 per cent. The rise in rural wage rates occurs because of the assumption in the model that the mobility of labour supply between rural and other occupations is rather low. So part of the benefits of the increased competitiveness of agriculture accrue to rural workers in the form of wage rises. At the same time, as the model assumes a moderate degree of substitutability between labour and capital in agricultural production, capital usage in agriculture grows much more rapidly than output, and accordingly farm income grows rapidly also.

6. The Effects on Agriculture of Combined Reductions in Agricultural and Manufacturing Assistance

Assistance to agriculture and manufacturing together comprises a large part of total industry assistance. The effects of combined agricultural and manufacturing industry reductions may therefore give a useful indication of the effects of the total industry assistance regime in Australia.

Combined agricultural and manufacturing assistance reductions are estimated to reduce aggregate agricultural output by 0.1 per cent. This is the small difference between approximately equal but opposite effects of separate agricultural and manufacturing assistance reductions. It comprises growth in output by broad-acre agriculture and cane farming, largely offset by reductions in output by most intensive agricultural activities. This generally reflects differences between agricultural industries in current levels of assistance, although for reasons explained previously the highly assisted cane growing industry experiences the greatest output growth.

Although combined agricultural and manufacturing assistance reductions are estimated to raise agricultural output slightly, their estimated effect on real farm income is negative: a reduction of 1.4 per cent. Again the effects of separate agricultural and manufacturing assistance reductions are opposite, but for this variable the effects of agricultural assistance reductions are about twice as great as those of manufacturing assistance reductions.

As with output, the effects of the combined reductions are generally contractionary in intensive and expansionary in broad-acre agriculture. Dairy farming and cotton growing again experience the most severe declines, and cane growing and poultry, despite output expansion, suffer real income reductions.

The results thus suggest that general assistance reductions would simultaneously raise agricultural output and reduce real farm income. Conversely, the current assistance regime appears both to depress agricultural output and to raise farm income. The apparent paradox arises from the simultaneously output-restricting and income-augmenting effects of quantitative restrictions.

In the light of the severe qualifications described in Section 4.1, how robust are the aggregate results that have just been discussed? Since the overall effect of assistance reductions on agricultural output is a small difference between two relatively large numbers, it may reasonably be suspected that the positive estimate could easily be converted into a negative one, by, for example, taking account of a more comprehensive set of agricultural assistance measures.

The result that balanced reductions in assistance would lead to a fall in real aggregate farm income appears more robust, since here the effect of the agricultural assistance reduction clearly dominates the effect of the manufacturing assistance reduction. Broadening the study to take account of a wider range of agricultural assistance measures could only strengthen this result. On the other hand, changing the benchmark for income taxation, updating the assistance estimates, calculating a true non-linear solution to a simulation of complete assistance removal, and taking account of intra-industry allocative inefficiencies arising from quantitative restrictions, would all tend in the opposite direction. Revision of behavioural parameters could alter the result in either direction. The results presented here may justify some presumption that the current assistance regime is favourable to farm income, but much more work would have to be done before that proposition could be asserted with any confidence.

While the aggregate results may not be so reliable as might be wished, some aspects of the sectoral results appear much more robust. Revision or extension of the study would be unlikely to reverse the conclusions that the current assistance regime is more favourable to intensive than broad-acre agriculture, and that it tends to promote farm income more than farm output. These conclusions follow almost with certainty from undisputed characteristics of agricultural assistance levels and mechanisms.

The results presented in this paper may appear to contradict the widely-held view that agriculture is penalised by the current assistance structure. But those who hold that view probably have in mind mainly broad-acre agriculture, and these results support the view that broad-acre agriculture is penalised (though not greatly penalised). Likewise there is nothing startling in the proposition that the current assistance structure raises incomes in such industries as dairy farming and poultry. While the aggregate outcomes for agriculture may conflict with some preconceptions, they are really less important than the unsurprising disaggregate results. The true conclusion to be drawn from these results is, not that agriculture is (at least by one measure) an assisted rather than a penalised sector, but that the current assistance structure affects agricultural industries so diversely that to characterize agriculture as a whole as assisted or penalised is hardly meaningful.

REFERENCES

- Cooper, R.J. and K.R. McLaren (1983), 'The ORANI-MACRO Interface: An Illustrative Exposition,' Economic Record, Vol 59.
- Dee, Philippa S. (1989), 'FH-ORANI: A Fiscal ORANI with Horridge Extension,' IMPACT Preliminary Working Paper No. OP-66, March.
- Dixon, Peter B., B.R. Parmenter, John Sutton and D.P. Vincent (1982), ORANI: A Multisectoral Model of the Australian Economy, North-Holland, Amsterdam.
- IAC (1982), 'Phosphatic and Nitrogenous Fertilizers', Report No. 299, AGPS, Canberra.
- IAC (1989), Annual Report 1988-89, AGPS, Canberra.
- Kenderes, Mike (1988), 'Notes on the Preparation and Updating of the ORANI Database to 1980-81', IAC Research Memorandum No. 0A-416.