ADJUSTMENT PRESSURES ON THE AGRICULTURAL SECTOR OF AN OPEN ECONOMY: THE AUSTRALIAN SITUATION

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Introduction

The Australian economy has undergone substantial compositional changes since the early 1960s. The relative position of agriculture has declined following the more rapid growth rates of other sectors, especially mining. The uneven growth rate between sectors has led inexorably to adjustment pressures emerging on the slower growing sectors and on the slower growing industries within sectors. The agricultural output mix has changed markedly. Value shares of output and exports represented by wool, fruits, and dairy products have declined, while those represented by beef and wheat have increased. Numerous factors have contributed in recent years to the adjustment pressures facing the agricultural sector and its constituent industries. These include changes in international trading conditions, the mining boom of the late 1960s, real wage increases in excess of productivity gains in the domestic economy, and increased protection from imports afforded key manufacturing industries.

From the late 1960s to the mid-1970s, world prices for textiles, footwear, and other manufactured products fell relative to the prices of agricultural and mineral products and processed and unprocessed energy products. The Australian economy as a whole benefited from these changes, though adjustment pressures emerged in certain sectors (Freebairn). In particular, export and export related industries expanded at the expense of industries competing with imports which experienced the largest relative price declines. On the debit side, restrictions on the access of Australian products to overseas markets, particularly the EC, have severely curtailed a number of rural industries.

Unprocessed mineral export earnings jumped from A$64 million in 1962/63 to A$1,753 million in 1974/75. The effects on the balance of payments and subsequently the exchange rate, standard of living, and industrial structure have been the subject of several recent studies (Dixon, Parmenter, and Sutton; and Gregory). The basic mechanism involves a lowering of the domestic price of traded relative to nontraded goods either by revaluation of the Australian dollar or by a higher local inflation rate.

Real wage costs net of productivity gains increased at an annual rate of over 3 percent for the period 1968 to 1975. In addition, despite a 25 percent across the board tariff cut in 1973, substantial increases in protection, primarily by way of import quotas, have since been granted to key domestic industries. The competitive position of the export oriented agricultural sector is especially vulnerable to increases in domestic production costs.

Our paper investigates the medium term impact on the Australian agricultural sector of two of the previously mentioned adjustment pressures: (1) changes in international demands for and supplies of agricultural and other commodities of importance to Australian trade; and (2) a further expansion of Australian mining activity. It then explores the effectiveness of reducing tariffs on import competing industries as a means of dissipating adjustment pressures on agriculture arising from the combined effect of (1) and (2).

Analytical Framework

Our projections are derived from Australia's multisectoral model of industrial and workforce composition (ORANI) (Dixon, Parmenter, Ryland, and Sutton). ORANI is a predominantly neoclassical model based on a 115 x 113 commodity by industry input-output matrix, and a labour force disaggregated into nine occupations. Computing difficulties associated with size and nonlinearities are

avoided by using the linearization technique of Johansen. The model's main behavioural postulates are that producers minimize the costs of producing their outputs (subject to appropriately specified production functions), and that consumers maximize their utility subject to an aggregate consumption constraint. Competitive pricing behaviour is imposed via zero pure profit constraints. The model contains a number of advances over previous models of its type which make it particularly well suited to analyzing policy issues related to international trade. These advances include: (1) the treatment of domestically produced and imported commodities as imperfect substitutes; (2) downward sloping foreign demand curves for export commodities; and (3) an agricultural sector specification which recognizes both the joint production features of agricultural enterprises and regional differences in their production functions. The agricultural sector consists of a 10 x 8 commodity by industry submatrix. Agricultural industry production functions are of the multiinput-multioutput form, such that:

$$(1) \quad g(Y^r) = f(X^r) = Z^r,$$

where Y^r and X^r are vectors of outputs and inputs respectively in region r, and Z^r is a scalar index defining region r's production capacity. Function f is of the Leontief form among intermediate inputs and between them and primary factors, and of the CRESH form (Hanoch) among the primary factors (labour, land, and capital). Function g takes the CRETH form (Vincent, Dixon, and Powell). The representative farmer is viewed as buying a bundle of nonspecific inputs (labour, fertilizer, and so forth) to combine with the fixed factor, land. The level of nonspecific inputs determines the location of the product transformation curve. The farmer then has a choice of feasible output combinations (wheat, sheep, and so forth) with production possibilities described by transformation frontiers exhibiting less than infinite elasticities.

A feature of the model is that the division between endogenous and exogenous variables is user determined. In a study of the effect of, say, the motor vehicle tariff on the output of wheat, the motor vehicle tariff would be set exogenously and the output of wheat would be endogenous. If, however, we wanted to know the level of protection needed by the tobacco industry to boost its output by 10 percent, then tobacco output is exogenous and its tariff endogenous. Of particular relevance to this study is the switch between industry rates of return and industry capital stocks. With fixed capital stocks and endogenous rates of return, the model is cast in the short run mode. The alternative long run specification employed here involves fixing industry rates of return and allowing capital stocks to adjust. The model then provides a snapshot of a single year, the assumption being that the snapshot year is far enough into the future such that changes in relative rates of return induced by the initial disturbance are eliminated by capital mobility between industries.

Projection Scenarios

Our focus is on prospective developments in the Australian economy to the mid-1980s. We first provide the model with projections of annual changes in world relative prices for imported commodities (the small country assumption is imposed for imports), and annual percentage shifts in the foreign demand schedules for Australian export commodities together with estimates of their foreign price elasticities of demand. These projections are based on an IMPACT study (Freebairn) of likely developments affecting demands, supplies, and prices of internally traded commodities. They refer to average trade opportunities in a nominal year and abstract from seasonality, business cycle, and other transient phenomena. World prices of machinery, equipment, appliances, and motor vehicles are assumed to rise most slowly. These assumptions reflect an

anticipated continuation of technological innovation and more capital intensive production techniques in the production of such commodities. The next slowest to rise group (price increases of 2.6 percent per year faster than the first group) are those products produced by (or anticipated to be soon produced by) developing countries (for example, steel and most metal products not highly fabricated). The fastest rising prices are for wool, meat, and dairy products, and developed country exports (other than machinery). These prices are assumed to inflate from 4-5 percent higher than those of the most slowly increasing group. Prices of wheat and sugar are projected to increase by 2.8 and 2.6 percent, respectively, relative to the most slowly increasing group. Oil prices are projected to increase only at the same rate as prices in general. Annual percentage increases in prices are cumulated for the 5 year period.

Australia's apparent comparative advantage in mineral exports may lead to a further comparatively rapid growth of the mining sector with the restoration of global macroeconomic health. In simulating this, we assert that the direct effects of new mining activity on domestic demands and employment are likely to be small by comparison with the indirect effects arising from the additional foreign exchange earned. We assume that additional mineral exports yield an addition to foreign exchange of A$500 million by the fifth year.

Our third simulation involves a further across the board reduction in ad valorem tariffs of 25 percent.

Since we wish to consider the adjustment forces independently of short run business cycle phenomena, the macro environment is assumed to be one of full employment. Occupational wage relativaties are fixed, but the overall level of real wages adjusts to maintain full employment. The endogenous exchange in real absorption from the exogenous shocks is allocated among its components (aggregate consumption, investment, and government expenditure) according to their initial shares.

Results

TABLE 1 : IMPACT OF CHANGES IN WORLD PRICES, TARIFFS AND A MINING BOOM

Variable Projected	Simulations of Effects of:			
	World Prices	Mining 'Boom'	Tariff Reductions	Total Impact
	(percentage change)			
Real Absolute Wage	1.09	0.81	1.04	2.94
Aggregate real Absorption	1.43	1.93	0.28	3.64
Aggregate real Exports	2.00	-10.91	3.68	-5.23
Aggregate real Imports	1.69	2.18	3.11	6.98
Rural Employment	6.04	-2.86	0.58	3.71
Agricultural Commodity Outputs				
Wool	6.61	-1.78	0.38	5.21
Sheep	9.75	-2.13	0.46	8.08
Wheat	-1.32	-2.19	0.51	-3.00
Barley	0.81	-1.89	0.45	-0.63
Other cereal grains	1.33	-0.99	0.29	0.63
Meat cattle	10.27	-2.23	0.51	8.55
Milk cattle and pigs	3.75	-0.75	0.18	3.18
Other farming exports	-4.38	-2.55	0.73	-6.20
Other farming import competing	1.24	-0.05	0.13	1.32
Poultry	3.33	-0.70	0.16	2.79
Industry Sector Outputs				
Agriculture	3.67	-1.72	0.41	2.36
Mining (Existing Industries)	-2.01	-17.81	6.72	-13.10
Processed foods	1.19	-1.07	0.27	0.39
Other Manufacturing	-3.28	-0.93	-0.61	-4.82
Services	1.18	1.26	0.32	2.76

A summary of results is contained in table 1. We concentrate on some key macroeconomic aggregates and agricultural commodity outputs. Industry outputs have been aggregated to sectors. The figures in the table refer to percentage changes in the variables in a typical year, 5 years hence from the levels they would have reached in the absence of the shocks. Thus, column 1 indicates that, in the fifth year, exports would be 2 percent higher under the world price scenario than they would have been had world prices not changed.

Column 1 shows that the projected world price scenario implies a terms of trade gain to Australia. Exports exceed imports and real wages and real domestic absorption increase. However, the tendency for world price increases for export commodities to exceed those for import competing commodities in itself leads to adjustment pressures. Output contractions occur for export commodities such as minerals whose prices are projected to decline relative to most agricultural commodity prices. Most agricultural commodities and industries (and hence rural employment) gain. Exceptions include wheat and the other farming export groups (mainly sugar) whose price prospects are unfavourable. The processed foods and services sectors, which have substantial linkages to domestic consumption, benefit from the increased aggregate absorption. The growth in domestic absorption is also an important factor in offsetting the output contractions of import competing industries resulting from the decline in the relative prices of most imported commodities.

Column 2 demonstrates the adverse effect on export industries from the additional foreign exchange generated by the mining boom. Note that the simulation captures only the indirect (foreign exchange) effects; the existing mining industries therefore suffer in the same manner as other export industries. Agricultural outputs are considerably less volatile than mining outputs because of the presence of fixed (industry specific) land. While the mining boom also leads to adjustment pressures on the manufacturing sector through stronger import competition, the increased absorption helps cushion these effects. The clear beneficiaries are the nontraded (services sector) industries.

Column 3 indicates that the tariff cut is beneficial to the economy as a whole and to the export oriented sectors in particular. The essentially import competing manufacturing sector contracts. The services sector expands because of its consumption linkages and the increase in domestic absorption, while the processed foods sector expands because of its linkages to exports and domestic consumption.

Concluding Remarks

We have attempted to quantify the medium term effect on the Australian agricultural sector of two pressures for adjustment--changes in world prices of traded goods and an accumulation of foreign exchange (which we attribute to a projected expansion in mining exports). Our analysis overlooks a number of other potential adjustment pressures. These include technological developments and demographic factors, both of which are likely to contribute to changing patterns of industrial demand and occupational employment. Both of these issues are amenable for analysis within the ORANI framework. While we believe that the pressures we have dealt with will operate in the medium term, our projection scenarios remain speculative. Our price scenario implies an extremely favourable outlook for the agricultural sector as a whole but with differential effects within the sector. Our simulations demonstrate the adverse effects on traded (especially export) industries of foreign exchange from an expansion in mineral exports. Unlike the import competing industries, the export oriented agricultural industries gain little from the overall expansion in domestic absorption afforded by the mining boom. The tariff reductions go some of the way to reducing the cost-price squeeze on the agricultural sector arising from the foreign exchange effects of the mining boom. Given, however, the tentative

nature of our scenarios, we would not want to place too much emphasis on the numerical projections. A more fundamental aim has been to illustrate the importance of a multisectoral framework in analyzing policy issues of this type. While our results remain specific to the Australian economy, our quantitative approach is applicable to any market oriented economy.

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OPENER'S REMARKS--George T. Jones

Many would be interested in derived elasticities for agricultural products in general and in detail but doubtless this is too much to ask. How strong are the forces obliging visible trade to balance? Is the projected expansion in mining to be financed by external sources of investment, and are other net inflows of investment into Australia predetermined? Who gets the profits and where do they go? There is a strong analogy with the projections of the impact of North Sea oil on the UK economy.

While not having very severe qualitative disagreements, I did wonder from exactly what date the price assumptions are measured and whether the beef prices start very low. I recognize that any price trend for beef looks sharper in percentage terms from the other side of the world. But I was trying to fit higher real beef prices into the UK framework and was coming up with less than zero growth in demand. At much higher prices, the impact of novel protein food seemed serious, especially for the kind of beef Australia sends us. I know less about the other UK markets for beef, but wonder if the authors are not overguessing the prospects.

Perhaps the most important point of the model itself is that the supply elasticity for production of agricultural products in general is separated from the problem of determining the composition of supply. This makes it rather easier to handle, but does it avoid some kinds of questions that one would like to ask; for example, is it intrinsically more difficult to expand production of less intensive products like wool because of links with land?

Am I right in writing the model like this?

$$(1) \quad 1 = \Sigma d_i (Y_i/Z)^{b_i} \qquad [\text{for g}]$$

$$(2) \quad 1 = \Sigma c_i (X_i/Z)^{a_i} \qquad [\text{for f}]$$

In this formulation, are the short run inputs such as feed, fertilizer, and services tied to the factors X or to the products Y in a Leontief manner, and are they the net outputs or the gross outputs that are described in Y? Are they the gross costs including renovation of capital that are included in X? Was consideration given to any other generalization of the CES function (using no more parameters) such as the two stage CES in which some capital may substitute more closely for land while most of it may be substituted more closely for labour? How does technical progress enter into the projections--through factor saving technologies in f or through specifying more product in g? It would appear that the model allows no supply elasticity for land while allowing unlimited supply elasticity for capital (in spite of difficulties farmers may have in raising it). Is this entirely the right balance in such a big place? How is the labour specified that relates to agriculture, and has it been made too easy to exchange it for other factors, even within the same region?