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

by

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REFERENCES

- [1] Dixon, P. B., B. R. Parmenter, G. J. Ryland and J. M. Sutton, (1977) ORANI, A General Equilibrium Model of the Australian Economy : Current Specification and Illustrations of Use for Policy Analysis, First Progress Report of the IMPACT Project, Vol. 2 (Canberra, AGPS), pp. xi + 297.
- [2] Dixon, P. B., B. R. Parmenter and J. Sutton, "Some Causes of Structural Maladjustment in the Australian Economy", Economic Papers, No. 57, January 1978.
- [3] Dixon, P. B., B. R. Parmenter and J. Sutton, "Notes on the Theory of Long-Run Simulations with the ORANI Model", IMPACT Preliminary Working Paper No. OP-20, Industries Assistance Commission, Melbourne, July 1978.
- [4] Dixon, P. B., B. R. Parmenter, A. A. Powell and D. P. Vincent, "The Agricultural Sector of ORANI 78 : Theory, Data and Application", IMPACT Preliminary Working Paper No. OP-25, Industries Assistance Commission, Melbourne, June 1979, pp. 78.
- [5] Dixon, P. B., and A. A. Powell, with a contribution by B. R. Parmenter, Structural Adaptation in an Ailing Macroeconomy, Report to the Crawford Study Group on Structural Adjustment (Melbourne, Melbourne University Press, 1979).
- [6] Freebairn, J. W. "Projections of Australia's World Trade Opportunities : Mid and Late 1980's", IMPACT Working Paper No. I-07, Industries Assistance Commission, Melbourne, December 1978, pp. 88.
- [7] Gregory, R. G., "Some Implications of the Growth of the Mineral Sector", Australian Journal of Agricultural Economics, Vol. 20, No. 2, August 1976, pp. 71-91.
- [8] Hanoch, G., "CRESH Production Functions", Econometrica, Vol. 39, No. 5, September 1971, pp. 695-712.
- [9] Johansen, Leif, (1960) A Multi-Sectoral Study of Economic Growth Amsterdam : North Holland Publishing Co., 2nd edition (1974).
- [10] Vincent, D. P., P. B. Dixon and A. A. Powell, "The Estimation of Supply Response in Australian Agriculture : the CRESH/CRETH Production System", IMPACT General Paper No. G-12, Industries Assistance Commission, Melbourne, May 1978, pp. 33. (Forthcoming in International Economic Review.)

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).¹ While we believe that both these pressures will operate in the medium term, our projection scenarios remain extremely speculative. Our price scenario by itself implies an extremely favourable outlook for the agricultural sector as a whole. Within the sector however, industries producing mainly wheat, sugar and tobacco are projected to fare relatively poorly compared with those producing predominantly wool and meats. Our simulations demonstrate the adverse effects on the traded goods sector (especially the export industries) of the increased foreign exchange likely to flow from a further 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 25 per cent across the board 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 detailed numerical projections. A more fundamental aim of the paper has been to illustrate the importance of a multisectoral framework, such as that provided by the ORANI model, in analysing policy issues of this type. While our results remain specific to the Australian economy, our quantitative approach is applicable to any market-oriented economy.

1. 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 these issues are amenable for analysis within the ORANI framework.

ABSTRACT

This paper uses the Australian multisectoral model (ORANI) to assess the medium term impact on the Australian agricultural sector of two likely pressures,

- (i) changes in international demands for and supplies of agricultural and other commodities of importance to Australian trade; and

- (ii) an accumulation of foreign exchange which would be associated with a further expansion of Australian mining exports.

We then explore the effectiveness of across the board reductions in protection to import competing industries as a means of dissipating adjustment pressures on agricultural industries arising from (i) and (ii).

The world price scenario for traded commodities implies a terms of trade gain to the Australian economy and is especially beneficial to the agricultural sector as a whole. Adjustment pressures emerge, however, on the manufacturing sector and on some agricultural industries (producing commodities whose world prices are projected to increase relatively slowly). The simulations demonstrate the adverse effects on the traded goods sector (especially the export industries) of the increased foreign exchange associated with a projected further expansion in mineral exports. The tariff reductions go some of the way to reducing the cost price squeeze on agriculture arising from the foreign exchange effects of the mining boom.

While our results remain specific to the Australian economy, our quantitative approach is applicable for any market-oriented economy.

most imported commodities.

The results in column 2 demonstrate the adverse effect on export industries from the additional foreign exchange generated by the mining boom. It should be recalled, however, that the simulation captures only the indirect (foreign exchange) effects; the existing mining industries therefore suffer in the same manner as other export industries. Furthermore the direct effects of the mining expansion are not reflected in GDP. Agricultural industry outputs are considerably less volatile than mining industry outputs because of the presence of fixed factors (industry specific land). While the mining boom also leads to adjustment pressures on the manufacturing sector through stronger import competition, the increased domestic absorption helps cushion these effects. The clear beneficiaries are the non-traded industries of the services sector.

Column 3 indicates that a 25 per cent across the board tariff cut is beneficial to the economy as a whole and to the export oriented sectors in particular. As was the case with the mining boom experiment, the existence of fixed land curtails the output response of agricultural compared with mining industries. The essentially import competing manufacturing sector contracts as a result of the tariff cut. 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.

TABLE 1 MEDIUM TERM IMPACT OF CHANGES IN WORLD PRICES, A NEW MINING BOOM AND TARIFF REDUCTIONS

Variable Projected	Simulations of Effects of:				Total Impact	page
	World Prices	Mining 'Boom'	Tariff Reductions	(percentage change)		
Real Absolute Wage	1.09	0.81	1.04		2.94	2.
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	0.53		3.71	3.
<u>Agricultural Commodity Outputs</u>						
Wool	6.61	-1.78	0.38		5.21	4.
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	5.
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	13
<u>Industry Sector Outputs</u>						
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	

Table 1 : Medium Term Impact of Changes in World Prices, A New Mining Boom and Tariff Reductions

A brief summary of results is contained in Table 1. Because of space limitations we concentrate only 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 that they would have reached in the absence of the shocks. Thus the figure for aggregate exports in column 1 indicates that in the fifth year exports would be 2.0 per cent 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 the Australian economy. Exports exceed imports and real GDP, real wages and real domestic absorption all 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 wheat¹, the real price of which is projected to remain constant, and the other farming export group, whose major commodity is sugar (the relative price of which is projected to decline). 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 price of

1. Although not shown in the Table, increases in the prices of wool, sheep and cattle relative to wheat and the high transformation elasticities between these products result in considerable substitution in production against wheat in the model's multiproduct agricultural industries.

general. Annual percentage increases in prices are cumulated for the 5 year period.

Australia's apparent long run comparative advantage in the export of minerals is likely to lead to a further comparatively rapid growth of the mining sector with the restoration of global macroeconomic health.¹ In simulating a future mining boom 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.² We assume that additional mineral exports yield by the fifth year an addition to foreign exchange of \$A 500 million.³ That is, the model is allowed to run a balance of payments deficit in the fifth year which is financed by a free gift of foreign exchange representing the new mining export receipts.

Our third simulation involves a further across the board reduction in ad valorem tariffs of 25 per cent. This proposal is purely hypothetical.

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 relativities are fixed but the overall level of real wages adjusts to maintain full employment. The endogenous change in real absorption from the exogenous shocks is allocated among its components (aggregate consumption, investment and government expenditure) according to their initial shares.

1. A number of potentially large (in terms of foreign exchange earnings) developments are currently underway. These include the North-West Shelf gas project of Western Australia and the uranium mining programme.
2. The direct input-output linkages to new mining activity are becoming increasingly important in Australia. The input-output data base currently used in ORANI 78 refers to the 1968/69 economy. A new set of input-output tables for the year 1974/75 have recently become available in preliminary form. It is to be hoped that the completed version of these tables will soon be released, thus enabling the ORANI data base to be revised.
3. This is equivalent to about 12 per cent of total export earnings in the base year (currently 1968/69).

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1 INTRODUCTION¹

The Australian economy has undergone substantial compositional changes since the early 1960's. The relative position of agriculture has declined following the more rapid growth rates of other sectors, especially mining.² 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 1960's, real wage increases in excess of productivity gains in the domestic economy and increased protection from imports afforded to key manufacturing industries.

From the late 1960's to mid 1970's world prices for textiles, footwear and other manufacturing products fell³ relative to the prices of

1. This paper is a sequel to a previous IMPACT study [5, Ch.4]. Although the focus of that study was long term, the projections were obtained from a short term model. The present study takes advantage of the recent completion of the ORANI model's long term snapshot facility.
2. Between 1962/63 and 1973/74 real gross product increased at an average annual rate of 2.6 per cent for the rural sector compared with 16.0 per cent for mining, 5.3 per cent for manufacturing and 5.7 per cent for the service industries. Over the same period rural sector employment declined by 1 per cent per year compared with increases of 5.4 per cent for mining, 1.9 per cent for manufacturing and 3.6 per cent for services. These relative price decreases reflect the trade and development strategies of their producers - the labour abundant third world countries.
- 3.

agricultural and mineral products and processed and unprocessed energy products. A previous IMPACT study [2] showed that the Australian economy as a whole benefited from these changes, though adjustment pressures emerged in certain sectors. 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 have severely curtailed a number of rural industries. The entry of the United Kingdom into the EEC and the increasingly protectionist stance adopted by the EEC to agricultural imports has contributed to adjustment pressures on fruit growing and dairying industries. More recently, the tight regulation of Japanese beef imports has posed adjustment problems for the beef industry.

Unprocessed mineral export earnings jumped from \$64m in 1962/63 to \$1753m 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 [2 and 7].¹

Real wage costs net of productivity gains increased at an annual rate of over 3 per cent for the period 1968 to 1975. In addition, despite a 25 per cent 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. The basic mechanism involves a lowering of the domestic price of traded goods relative to non-traded goods once the effect of the increase in foreign exchange earnings finds its way into the economy, either by way of revaluation of the \$A or by increased price inflation in Australia relative to other countries.

3 PROJECTION SCENARIOS

Our focus is on prospective developments in the Australian economy to the mid 1980's. For the first simulation we 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. In formulating these projections we have relied heavily on a study [6] of likely developments affecting demands, supplies and prices of internationally traded commodities. The projections refer to 'average' trade opportunities in a nominal year. They abstract from seasonal influences, business cycle and other transient phenomena. General features are as follows; 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 per cent per year faster than the first group) are those products produced by (or anticipated to be soon produced by) less developed countries. We include here steel and most metal products not highly fabricated. The fastest rising prices are for wool, meat and dairy products, fishing exports (largely luxury items - lobsters, prawns, etc.) and advanced country exports (other than machinery and dairy products). These prices are assumed to inflate from 4-5 per cent higher than those of the slowest increasing group. Of the remaining agricultural commodities, the prices of wheat and sugar are projected to increase by 2.8 and 2.6 per cent respectively relative to the slowest increasing group. Oil prices over the 5 year horizon are projected to increase only at the same rate as prices in

tobacco industry to boost its output by 10 per cent 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 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 picture or snapshot of a single year, the underlying 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.¹

- (i) changes in international demands for and supplies of agricultural and other commodities of importance to Australian trade, and
- (ii) 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 (i) and (ii). Section 2 contains an outline of our analytical framework while section 3 discusses the size and nature of the structural forces considered. Results are presented in section 4 and concluding remarks are set out in section 5.

1. See [3] for a discussion of the theory of long run simulations with the ORANI model.

2 ANALYTICAL FRAMEWORK

Our projections are derived from a revised version, ORANI 78 [4], of Australia's multisectoral model of industrial and workforce composition [1]. ORANI 78 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 non-linearities are avoided by using the linearization technique of [9].

The model's main behavioural postulates are that producers minimise the costs of producing their outputs (subject to appropriately specified production functions) and that consumers maximise 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 analysing policy issues related to international trade. These advances include;

- (i) the treatment of domestically produced and imported commodities as imperfect substitutes,
- (ii) downwards sloping foreign demand curves for export commodities, and
- (iii) an agricultural sector specification which recognizes both the joint production features of agricultural enterprises and regional differences in their production functions.¹

1. Most Australian agricultural production occurs on multi-enterprise (cereals-livestock) farms. Furthermore, climatic and biological factors are such that the same product may be produced using different technologies in different regions.

The agricultural sector consists of a 10 x 8 commodity by industry submatrix. Agricultural industry production functions are of the multiinput-multioutput form;

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

where Y^r and X^r are vectors of outputs and inputs respectively in region r , and

Z^r is the 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 [8] among the primary factors (labour, land and capital). Function g takes the CRETH form [10]. The representative farmer is viewed as buying a bundle of non-specific inputs (labour, capital, fertilizer, etc.) to combine with his fixed factor, land. The level of non-specific inputs determines the location of the product transformation curve. The farmer then has a choice of the feasible output combinations (wheat, sheep, wool, cattle, etc.) with the production possibilities described by transformation frontiers exhibiting less than infinite elasticities.¹

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 what level of protection would be required by the

1. The theoretical specification and estimates of the pairwise product transformation elasticities for the multiproduct regions are contained in [10].