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SOME IMPLICATIONS FOR THE AUSTRALIAN ECONOMY OF TRADE GROWTH WITH NEWLY INDUSTRIALISING ASIA : THE USE AND LIMITATIONS OF THE ORANI FRAMEWORK

by

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APPENDIX : Technical Details of the Simulations

This appendix can be used in conjunction with Dixon (1980 (a)). The exogenous/endogenous variable partition differed from the standard (short run) partition in Dixon (1980 (a)) as follows :

(i) ΔB was exogenous and c_R was endogenous ;

(ii) All elements in $r_j(0)$ were exogenous and all elements in $k_j(0)$ were endogenous ;

(iii) ℓ was exogenous and $f^{(1)}_{(g+1,1)}$ was endogenous ;

(iv) $x^{(0)}_{(15,1)}$ was exogenous and $f^{(1)}_{(g+2,15)}$ was endogenous .

The parameter file differed from the standard file as follows :

(i) The primary factor substitution elasticity was set at 1.276 for all industries (whereas in typical short run experiments, this parameter is assigned a value of 0.5) ;

(ii) The elasticity of substitution between domestically produced and imported crude oil in all end uses was set at 10,000. (This ensured that the price of domestically produced crude oil would reflect the price of imported crude oil).

Exogenous shocks were imposed on the world import price vectors (the p^m_i's) and the export demand shift variables (the p^e_i's) according to the world price scenario in section 3 of this paper.

TABLES :

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SOME IMPLICATIONS FOR THE AUSTRALIAN ECONOMY OF TRADE GROWTH WITH NEWLY INDUSTRIALISING ASIA : THE USE AND LIMITATIONS OF THE ORANI FRAMEWORK

by

D. P. Vincent*

1. Introduction

The industrial structure of the Australian economy has changed markedly over the past two decades. At the sectoral level, the relative position of agriculture has declined following the more rapid growth rates of other sectors, especially mining. The uneven growth between sectors has led to adjustment pressures emerging on the slower growing sectors and on the slower growing industries within sectors. These past pressures for structural change on industries and sectors can be attributed to a number of factors including, for example, changes in Australia's external trading conditions, the mining boom of the late 1960's, real wage increases in excess of productivity gains in the domestic economy, especially in the early 1970's, and selective protection against imports (primarily by way of import quotas) awarded to manufacturing industries. Under the first mentioned heading - changes in Australia's external trading conditions - may be included restrictions on the access of Australian agricultural products to overseas markets, particularly those of the EEC and Japan, the oil pricing policies of the OPEC cartel and the trade and development strategies adopted by many third world countries, especially the so called newly-industrialising economies of South East and East Asia.

* The author wishes to thank Alan Powell and Brian Parmenter for detailed comments on an earlier draft of this paper.

The concern in this paper is with some implications for the Australian economy of an anticipated continuation of the process of industrialisation in Asian countries. In the late 1950's and early 1960's several Asian countries (for example, Taiwan and South Korea) switched from essentially inward looking economic development strategies emphasising import substitution to strategies which recognised export development as being the engine of economic growth. Other Asian countries followed suit, in view of the subsequent success of the export oriented strategies in raising per capita incomes in those countries first making the conversion.[1] Thus, there has been a proliferation of exports of standard technology manufacturing goods that are relatively labour intensive (textiles, clothing and footwear being prime examples) from the labour abundant newly industrialising Asian economies. This in turn has led to a fall in world prices of these goods relative to world prices in general.

Such changes in the terms of trade have affected the Australian economy in a number of ways. On the one hand, import competing manufacturing industries producing these goods have suffered output and employment losses through decreased competitiveness on the local market, despite the substantial additional protection against imports awarded them. On the other hand, higher economic growth rates and foreign exchange earnings in the newly-industrialising Asian countries have resulted

1. Not all Asian economies had to make this switch. In Hong Kong, for example, where industrialisation commenced in the mid-1950's, no protection was afforded against imports. In Singapore, export-oriented manufacturing growth commenced in 1965. Although there was a short period of import substitution policies in the late 1960's, relative to other Asian economies the tariff levels were not high. (See Balassa (1977), p. 4.)

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the rest of the world, is a useful tool for analysing the implications for the domestic economy of such world commodity price changes.

It is appropriate to consider the structural implications of changing world commodity prices within a medium term to long term setting. The version of the model used to provide the medium term projections in this paper is yet to be fully developed. The paper has outlined a number of planned improvements. Progress on the implementation of these improvements will be geared closely to the amount of resources devoted to continued development of the IMPACT framework. In making these improvements it is the availability of data rather than theory or technique that is likely to prove the limiting factor.

Finally, the results of the world price scenario developed in this paper imply a favourable outcome for the economy as a whole and for most industries and commodities in the agricultural sector. The relatively strong performance of the agricultural sector follows from the favourable world price prospects assumed for several important agricultural commodities such as meat products and wool. As noted in section 3, however, the world price projections used in this study represent the expected outcome of a multitude of economic forces operating in the global economy, with Asian industrialisation being only one such force. In order to obtain projections that could be attributed solely to the process of Asian industrialisation, the world price scenario developed in this paper would have to be filtered of all influences other than those pertaining strictly to Asian industrialisation. Furthermore, given the inevitably tenuous nature of world price projections of this type it would be important for policy makers to undertake sensitivity analyses with the model using a range of alternative world price projections.

in increased opportunities for Australian exports to these countries,[1] especially for raw materials and lightly processed mining products (which provide inputs into their rapidly expanding manufacturing sectors), for higher technology manufactured goods and for unprocessed and lightly processed food products (to supplement the outputs of their now relatively smaller agricultural sectors).

In view of its obvious importance as a source of structural change in the Australian economy, it is not surprising that the topic of Asian industrialisation has received considerable recent attention from Australian economists.[2] Much of the work to date has been concerned with assembling and interpreting the data on Asian-Australian trade flows and developing scenarios on future trade growth. In addition, there have been some attempts to explain, using essentially ad hoc procedures, these trade flows in terms of traditional Heckscher-Ohlin ideas about comparative advantage.[3]

The contributions to structural adjustment pressures in the Australian economy from changes in overseas trade prospects have also been addressed in a number of previous IMPACT Project studies. A study by Dixon, Parmenter and Sutton (1978 (a)) showed that the Australian economy as a whole benefitted from the world commodity price changes that took place over the late 1960's to early 1970's,[4] though adjustment pressures emerged

1. These export opportunities are not of course specific to Australian suppliers. The Australian economy appears, however, well suited to producing, at competitive prices, many of the commodities demanded by the newly-industrialising Asian economies.
2. See, for example, the research report by the Bureau of Industry Economics (BIE (1978)) and the contributory papers to the Workshop on Growth, Trade and Structural Change in an Open Australian Economy (Kasper & Parry (1978)).
3. See Kasper and McMahon (1977).
4. These changes involved a fall in the world prices for textiles, footwear and clothing relative to those of agricultural and mineral products and processed and unprocessed energy products.

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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. Several studies (Dixon, Harrower and Powell (1977); Dixon, Powell and Parmenter (1979); Vincent and Ryland (1979)) using different versions of the ORANI model in different use modes, have sought to establish the medium term implications for the Australian economy of likely scenarios on trade prospects. In addition, IMPACT's SNAPSHOT model has recently been used to provide detailed projections of the 1990/91 Australian economy given compatible scenarios on technical change, demographic developments and trade prospects.[1]

The present paper is presented with two aims. The first is to illustrate how the latest version of the ORANI model (ORANI 78) may be used to establish the medium term consequences for industrial structure, workforce composition and living standards in the Australian economy of a particular set of projected changes in Australia's trade opportunities which may in part be attributed to continuing Asian industrialisation. Since the particular set of prospective developments in the overseas prices of traded goods analysed here is but one of many possible future scenarios, the policy analysis should be seen as illustrative of the ORANI model's capabilities rather than as comprehensive or definitive. The second, perhaps more important aim is to document the limitations of the ORANI 78 long term model and to discuss the research currently being undertaken to enhance its modelling capacity.

The paper is structured as follows : Section 2 outlines the long term mode of use of the ORANI model in its present form. Section 3 constructs a medium term trade scenario as an exogenous input into ORANI. Underlying this scenario is an anticipated continuation in the industrialisation of Asian economies. Section 4 reports some ORANI projections based on this

1. See Dixon and Vincent (1979).

the fish population and requiring that at equilibrium, the level of fishing industry output that equates supply and demand for fish products must coincide with a stable fish population. A series of upwards sloping supply curves for fish each associated with a different population of fish and hence fishing cost structure, are postulated. Suppose, for example, the demand curve for fish were to shift outward (as was the case in the section 4 simulation). This would initially result in an increase in the price of fish and the size of the catch. The increased catch is, however, not sustainable since the resulting decline in fish population would increase fishing costs and shift the fish supply function to the left. These ideas can be incorporated into ORANI by the inclusion of a supply shift variable (fish population) in the fishing supply function and the inclusion of an additional equation to explain the rate of growth of the fish population.

6. Concluding Remarks

From the point of view of the Australian economy, the process of Asian industrialisation can be viewed as adding to the foreign supply of one set of commodities (a number of which are currently produced in the import competing sector) and adding to the foreign demand for another set of commodities (a number of which are currently produced in the export sector). Such shifts in the 'rest of the world' commodity supply and demand curves will change the relative world prices of internationally tradeable commodities. This paper has sought to demonstrate that the ORANI model, which places particular emphasis on explaining trade flows between Australia and

final demand.[1] The econometric analysis would hopefully establish substitution prospects between inputs to the mine and transformation prospects among the various minerals produced by the mine.

Before concluding our discussion of supply constraints to mineral production one further issue should be mentioned - changes in mineral extraction techniques. Writing in the context of world supplies, Freebairn (1978) cites a number of studies by Harris (1975), Leontief (1977) and others that contend that mineral requirements over the next decade will be obtained at constant real costs with enhanced technology offsetting the rising costs of mining poorer ore bodies. Changes in mineral extraction techniques have been particularly rapid in the Australian mining industry over the past two decades, with Australia now at the forefront of a number of types of extraction processes. It may therefore prove difficult to unscramble supply shift factors from any tendency for the supply curve to be upward sloping.

5.5.2 Fishing

Our modelling of the fishing industry currently assumes that fish do not become harder (i.e., more expensive) to catch as more are caught, an assumption that fails to recognize the biological characteristics of the self renewable fish population. We are currently revising our treatment of the fishing industry to incorporate both biological and economic factors. The revision essentially involves specifying a biological growth constraint on

1. The present I-O treatment of the mining sector recognizes commodity categories as producing units. Some categories, (e.g., other metallic minerals) contain a variety of minerals produced in mines with considerably different extraction technologies and extraction-cost profiles.

scenario, while section 5 discusses the limitations of the current modelling framework and reports on current research developments. Conclusions are presented in section 6.

2. The ORANI Model in Long Run Mode

ORANI is a multisectoral model of the Australian economy based on the Australian Bureau of Statistics (ABS) 1968/69 Input-Output (I-O) Tables. Salient features of ORANI are its high degree of disaggregation and explicit basis in microeconomic theory. ORANI places particular emphasis on international trade flows and incorporates the capacity to determine endogenously, at the commodity level, both imports and exports. The basic version of ORANI is fully described in Dixon, Parmenter, Ryland and Sutton (hereafter DPRS) (1977). The projections in section 4 are derived from a later version - ORANI 78. This version differs from the version described in DPRS (1977) mainly in the specification of the agricultural sector. In ORANI 78, multi-product enterprises, which are fundamental to Australian agriculture, are modelled explicitly.[1]

ORANI 78 can be used either in short run or long run mode. By short run mode we refer to simulations in which industry specific capital stocks are held fixed. By long run mode we refer to simulations in which capital is freely mobile between industries. The ORANI 78 simulations of the effects of higher energy prices on the Australian economy provide examples of both short and long run modes of use. In a recent simulation we investigated the short term effects of the August 1978 budget decision to raise domestic oil prices to the world parity level existing at that time.[2] The computations showed the

1. Full details are given in Dixon, Parmenter, Powell and Vincent (1979).
2. See Vincent, Dixon, Parmenter and Sams (1979 (a)).

changes in industry and commodity outputs, employment, incomes, etc., which could be expected to take place as a result of the domestic price increase to a fixed world price, over a period of time sufficiently short such that industry capital stocks could be regarded as being unaffected. That is, we allowed the domestic oil price increase to alter investment plans but we did not allow for the impact of the changed investment plans on capital stocks. Since our concern was with establishing the short run adjustment costs associated with the once and for all jump to world parity, the fixed capital stock assumption was adequate. In a later study[1] we focused on the future adjustment problems likely to be imposed on the Australian economy by continued increases in the world prices of crude oil and other energy products relative to the world prices of non-energy products, assuming that import-parity pricing of domestic oil continued. In contrast to the short term focus of the domestic oil price experiment, we considered it more appropriate to take a longer term view when analysing the effects of increases in world oil prices. Our world oil price simulations therefore allowed for capital mobility between industries in response to changes in their profitability.

In both the world crude oil pricing experiment and in the experiment reported later in section 4, we have used the snapshot approach to long term modelling with the ORANI 78 model.[2,3] This approach involves building a picture of the economy in a typical future year. In the ORANI model, where variables are in percentage change form, the solution tells us how outputs,

1. See Vincent, Dixon, Parmenter and Sams (1979 (b)).
2. This and alternative approaches to long run modelling within the ORANI framework, such as, for example, accumulating short run solutions through time and using short run results as an indicator of long run consequences, have been outlined by Dixon, Parmenter and Sutton (1978 (b)).
3. The snapshot approach has been commonly used in programming models. See, for example, Evans (1972), and Dixon and Vincent (1979).

The slope of the long run supply curves for Australian minerals is an empirical question requiring econometric analysis. Clearly the horizontal supply curve assumption is inappropriate for the Crude Oil industry. The opposite assumption of a perfectly inelastic supply curve would seem closer to the mark.[1] In the case of commodities such as iron ore, coal and bauxite, the horizontal supply curve assumption is probably a reasonable one for the medium term. Australia has abundant reserves of these minerals at 'reasonable' grades.[2,3]

Assuming the data were available, a detailed modelling of the Australian mining sector could be undertaken within the CRESH-CRETH production theory of ORANI 78. In terms of the ORANI commodity by industry I-O data base, the existing mining sector would be redefined as a set of column industries (mines) each producing a number of row commodities (minerals). This would allow the incorporation of (i) mine specific production technology, i.e., intermediate inputs, primary factor inputs (returns to mine labour, mine fixed capital, mine working capital and the mine itself) and the bundle of minerals produced by each mine; and (ii) mineral specific sales patterns to intermediate usage and to the various categories of

1. Recall from section 3 that the output of the Crude Oil industry was held fixed in the simulations. One would expect, however, that the supply curve for crude oil would have some price elasticity over the medium term. Higher producer prices for oil are stimulating increased exploration activity (which has some probability of success.)
2. While reserves need to be considered in conjunction with the profile of extraction costs associated with them, such information is not generally in the public domain. Mine owners tend to consider reserves as inventories. Once they have proved reserves sufficient to cover their planning period, they have little reason to extend the reserves figures further - see Harris (1977).
3. Current ratios of reserves to annual production levels are estimated at about 185 for iron ore, 277 for coal and 136 for bauxite (see Harris (1977)).

is the CRESH substitution parameter for the fixed factor in industry j and W_F^{*j} is the 'modified' fixed factor cost share in industry j.[1] Assuming freely mobile capital between industries (the case in the world price simulations) the fixed factor share is zero in all but the land using agricultural industries. Hence, long run supply curves are horizontal (i.e., unit production costs are assumed to be independent of output levels) for all commodities other than those produced in the land using industries. The appropriateness of the horizontal supply curve assumption for the resource based fishing and mining industries is currently under investigation at IMPACT. In section 4 we attributed much of the output volatility of the fishing and mining export industries to the absence of supply constraints on the commodities produced by these industries.[2,3]

5.5.1 Mining industries

The horizontal supply curve assumption implies that Australian mines can meet increased demands for their products at constant unit costs. That is, the increased demands will not lead to the extraction of more marginal deposits (in terms of grade or location) and hence increased production costs. This implies that the mine orebody in itself earns no rental. (In terms of the I-O framework, all of the industry gross operating surplus accrues to the fixed capital stock and the working capital of the mines in that industry.)

1. See Dixon, Vincent and Powell (1976) for a derivation of (5.1).
2. Recall from section 4 that these industries exhibit output responses ranging from - 23 per cent (Basic Iron and Steel) to + 60 per cent (Coal). In the present version of the model, more extreme specialisation in the production of commodities with favourable world price prospects from these industries is prevented by the less than infinite (though still large) foreign price elasticities of demand assumed for such commodities.
3. It is interesting to note that the growth projections for the chief gainer (Coal), which are equivalent to an annual growth rate of about 10 per cent, while large in relation to the economy-wide average, do not appear large when compared with the projections, currently being expressed in the media, about future Australian coal growth prospects.

employment, etc., in a typical year - say five years hence - will differ as a result of the exogenous change from the levels they would have reached in year 5 in the absence of the change. The great advantage of the snapshot approach is that it avoids problems in specifying a fully intertemporal model. However, questions concerning the path by which the economy reaches the snapshot year are left unanswered.

2.1 Salient Features of Short Run Mode

ORANI 78 can be used in either short run or long run mode. Since the vast majority of the applications so far reported have been of the former type, it is opportune to consider them briefly so that the properties of the long run simulations can be brought into sharper focus. A variety of approaches towards short run simulation with ORANI is possible, but the one most often used by the project team involves the concept of the neoclassical short run. Simulations in neoclassical short run mode are based on the assumption that changes over the simulation period in the level of capital stocks in use in each industry may be ignored. The neoclassical short run is assumed to be long enough, however, for the investment plans of industries (as revised in the light of the exogenous changes under scrutiny) to affect the demands faced by industries producing capital goods. In most of these short run simulations the real levels of each of the major components of absorption (viz., consumption, investment and government spending) are treated exogenously. This leaves room in the story for an independent influence of fiscal and monetary instruments on the macroeconomy (such macro instruments not being modelled in ORANI). In many (but by no means all) short run simulations, the level of real wages has been treated exogenously; in all but one of the reported ORANI applications, inter-occupational wage relativities have been regarded as exogenous. This

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exogenous treatment of wages is designed to reflect the assumption of a slack labour market. In such a market any expansion in the employment demand facing any occupation as the result of the exogenous changes under study can be met at the going real wage. Employment is thus endogenous. Given the exogeneity in short run mode of the capital stocks of different industries and of the supply of all types of agricultural land, the endogenization of employment is equivalent to the determination of real GDP. With GDP defined as the sum of absorption and the balance of trade, and the former treated exogenously, the balance of trade is thus endogenous. The many relative prices which are endogenized enable the endogenous determination of the rates of return on fixed factors (capital, land) and the outputs of industries. Important among the relative prices endogenized is the ratio of the domestic cost level to the foreign currency price of traded goods. ORANI does not have anything to say about how the projected movements in this ratio are partitioned into changes in the exchange rate on the one hand, and changes in the domestic rate of inflation, on the other. For convenience we have usually taken the exchange rate as exogenous; the resultant endogenous movements in the Australian price level in response to the exogenous changes under scrutiny could be reinterpreted as a mixture of domestic inflation and exchange rate changes by any user holding firm views about the relative sizes of these components.

2.2 Major Features of Long-Run Mode

Long run projections made with ORANI refer to some nominal future year for which a 'snapshot' of the economy is made. No attempt is made to trace out the time path between the given vantage point (or base year) and this snapshot year. The capital fixity assumption is abandoned, both at the aggregate and at the industry level. The response period

leading to an overstatement of the profitability of the domestic economy and the relative growth potential of capital intensive industries.

Dixon (1980 (b)) has recently outlined an alternative specification of the long run model which would endogenise capital flows in the snapshot year and make explicit allowance for their servicing costs. This procedure involves calculating net capital inflow in the snapshot year as the difference between gross domestic product and domestic absorption.[1]

5.5 Long Run Supply Constraints

Under the CRESH-CRETH production technology of ORANI 78,[2] the own price elasticity of output of the i^{th} commodity produced in the j^{th} industry (ξ_{ii}^{j}) is given by :

$$\xi_{ii}^{j} = S_{i}^{j}\left(\frac{1 - W_F^{*j}}{W_F^{j}}\right)\left(\frac{1}{h_F - 1}\right) \quad , \qquad (5.1)$$

where S_{i}^{j} is the product share of commodity i in industry j's output, W_F^j is the share of fixed factor costs in industry j's total costs, h_F

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1. See Dixon (1980 (b)) for details. Several additional equations are required. An equation is needed to explain snapshot year investment (in terms of the growth in the capital stock over the snapshot period). A second equation is needed to explain snapshot year domestic savings (in terms of income accruing to wages and to domestic capitalist income). The latter variable is formulated as the total return to capital (already determined) multiplied by the share accruing to domestic residents. The change in this share from its base value is assumed to depend on the increase in domestic savings relative to the increase in capital stock for the snapshot period.

2. Note that while the theory allows for CRESH technology on the input side and CRETH technology on the product side, in the present version of the model only the first three industries in the list of Table 3 are modelled as having CRETH product transformation prospects.

with these changes. One way of assessing the significance of these omissions is by (a) comparing the projected changes in occupational labour demands with the historical evidence on inter-occupational labour mobility (which has taken place largely independently of formal retraining schemes), and (b) comparing projections of the changes in industry capital stocks with 'natural' wastage rates that could be expected through, say, depreciation over the five year period. While we have not done this in any formal way for the present simulation[1] a quick glance at the results suggests that the changes in industry capital stocks and workforce composition implied by the world price projections would not involve significant adjustment costs.

5.4 Endogenising Capital Flows in the Snapshot Year

The results in section 4 indicated that, given fixed rates of return to capital, the aggregate capital stock in year five would be 4.4 per cent greater as a result of the compounded changes in world commodity prices than its level in year five had world commodity prices remained constant. Recall that in generating these results, the balance of trade in the snapshot year was assumed constant. The constant balance of trade assumption is less than ideal for two reasons. Firstly, it implies that the increase in the economy's aggregate capital stock takes place by capital flows over the snapshot period but not in the snapshot year. Secondly, it does not account for the costs of servicing the accumulated capital, thus

1. Such an exercise was undertaken, at least with respect to occupational labour changes, in a previous IMPACT study - see Dixon, Powell and Parmenter (1979). In that study, the authors concluded that the extent of required occupational mobility arising via the ORANI projections (from prospective changes in Australia's international trading pattern, and from additional mineral exports) was well within the range of historical precedent.

envisaged must be long enough to accommodate any reconfiguration of the capital stock occasioned by the exogenous changes under study (in this paper, the foreign prices of traded goods). That is, no industry should be required to contract over the projection period at a rate faster than is consistent with depreciation of the base period capital stock plus such inter-industry transfers of second-hand equipment as may be possible. One does not always know a priori whether a particular projection horizon (5, 7 or 10 years, say) will turn out to be consistent with this aspect of the neoclassical long run; the matter can always be checked ex post. If one believes in upper limits to feasible rates of capital formation, analogous considerations would apply in the case of industry expansions.

In ORANI the natural dual variables of industries' capital stocks are their rates of return on new investment. These rates of return are set exogenously in long run simulations. The paradigm justifying this takes the supply prices of capital for investment in different types of activity as given on world markets. Any exogenous input into ORANI which causes the Australian rates of return to deviate from these global long term yields is assumed to cause the corresponding domestic industries to grow, or to decline, at speeds ensuring that the domestic rates of return are once again in balance with world rates in the last year of the projection horizons (i.e., in the 'snapshot year'). The mechanism assumed to make this possible, but not currently modelled in ORANI, is the international flow of capital.

In long run mode, it would be sensible in most simulations to treat one (but only one) of either real wages or levels of labour demand as endogenous. Shocks such as the overseas price changes assessed in this paper do not, we believe, have any necessary implications for the long run

real wage/employment mix chosen by the Australian economy. In most applications (including the current one) we have chosen to exogenize aggregate employment demand. For the time being at least, however, we continue (as in short run mode) to treat occupational wage relativities as exogenous. This means, of course, that the occupational composition of labour demand is endogenous. Whether or not the overall level of labour demand in the snapshot year corresponds to full employment is another matter. This depends on the success of macroeconomic policies in achieving a real wage level consistent with full employment given the productivity of the economy. However, the relevant macroeconomic instruments are not modelled in ORANI.

It is important to realise that, once the assumption of the exogeneity of the total level of labour demand in the snapshot year is accepted, the actual value assigned to this variable is a side issue so far as the projection of the effects of other exogenous shocks is concerned. This is because ORANI is linear in percentage changes of its variables. For each assignment of the variables to exogenous and endogenous sets a unique matrix of the elasticities of endogenous with respect to exogenous variables is defined. Results are then generated by multiplication of the relevant rows of the elasticities matrix by the values assigned to the exogenous variables of interest. In this paper, the exogenous variables of interest are world prices. Readers who have a firm view about changes in employment over our projection period could, in principle, supply a corresponding value for the exogenous aggregate employment variable and compute, from the elasticities matrix, the effects of the assumed employment change on the endogenous variables. These results could then be added to our own projections. But one should keep in mind that the actual value of the total labour demand variable has no effect on the projected consequences of the change in the foreign prices of traded goods.

A decrease in A_i is an input i augmenting technical change. If, as a result of the introduction of a new production technique, A_i declines by 10 per cent, then an input of 100 units of i becomes equivalent to an input of 110 units of i under the old technology. In the ORANI 78 theory, provision is made for a technical change variable (an A) to be attached to all commodity and factor flows to industry production processes.[1] Because the ORANI production functions do not allow for price induced substitution between different intermediate inputs or between intermediate inputs and primary factors, the set of A's appended to intermediate input flows should reflect any anticipated relative price induced changes in input structure as well as autonomous changes in production techniques.

5.3 Supply Side Adjustment Costs

In section 4 we noted how the world price scenario caused changes in the occupational composition of the workforce, the industrial structure of the economy and hence the distribution of the economy's capital stock across industries.[2] However, because it abstracts from events over the snapshot period, the ORANI 78 long term model does not account for any adjustment costs (such as labour retraining costs necessary to ensure flows between occupations and capital relocation costs between industries) associated

1. Because of the model's high degree of disaggregation and its detailed treatment of commodity flows (from both domestic and imported sources) for use as inputs in both current production and capital formation together with its detailed treatment of margins on these flows, the data requirements (the set of A's) required to specify a complete scenario on technical change are immense.

2. Projections of percentage changes in industry capital stocks, although not given in section 4, are available on request.

a 1980/81 I-O table in the model's data base, we would expect that under the shock of higher world energy prices, outputs of the three multi-product agricultural zones (industries 1, 2, 3) would contract on average by more than the six per cent indicated in Table 3.

A preliminary version of the 1974/75 I-O table has recently become available. Work is currently under way to ensure the speedy adoption of the soon to be released final version of this table. The Australian Bureau of Statistics has undertaken to produce updates of the 1974/75 I-O table on an annual basis, commencing with the 1977/78 financial year.

5.2 The Incorporation of Scenarios on Technical Change

Underlying the world commodity price projections in section 3 are assumptions about technical change in overseas industries producing these commodities. While the ORANI 78 theory[1] incorporates a comprehensive treatment of technical change, the necessary software developments required to incorporate the user's exogenous scenario on technical change are not yet complete.

Technical change in ORANI is of the factor augmenting type. Industry production functions are written as follows :

$$Z = f\left(\frac{X_1}{A_1}, \frac{X_2}{A_2}, \ldots, \frac{X_n}{A_n}\right) , \qquad (5.1)$$

where f is a non-decreasing function of each of its arguments, Z is the industry activity level, the X's are input levels and the A's are technical change variables.

1. See Dixon (1980 (a)).

Finally, in the current long run configuration of ORANI, we assume that in the snapshot year the external trade account is approximately in balance. This assumption is imposed by setting the change in ORANI's balance of trade variable (ΔB) to zero in the snapshot year.[1] The ORANI model in its present form does not include variables to represent capital inflow and capital outflow. However, although these two variables do not appear explicitly in the model, their net value must implicitly be influenced by the exogenous setting of ΔB. Recall, however, that the economy's aggregate capital stock in the snapshot year is endogenous. Clearly our assumptions of (a) an effectively exogenous net capital inflow, and (b) an endogenous aggregate capital stock, are potentially in conflict.[2]

With ΔB set exogenously in the long term mode, the GDP identity requires that real domestic absorption be determined endogenously. The model therefore determines the change in the level of domestic absorption which must accompany the exogenous shocks given a constant balance of trade. ORANI does not explain the distribution of the change in absorption, which is allocated amongst its components (aggregate consumption, investment and government expenditure) according to their initial shares.

2.3 Setting Up the Long Run Simulations

As we have seen above, the transition from short to long run mode essentially involves making changes to the exogenous/endogenous variable partition. The replacement on the endogenous list of the trade balance by absorption is a case in point. But perhaps the most important swap among

1. The balance of trade deficit in ORANI's base year was 1.4 per cent of GDP.

2. This potential conflict is an obvious current shortcoming of the long run use of ORANI. In sections 5.4 we discuss plans for endogenising capital flows in the snapshot year.

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variables is the relocation of the rates of return in the exogenous list, where they replace industries' capital stocks, which themselves now appear on the endogenous list.[1] For the reasons alluded to in section 2.2, total labour demand is placed on the exogenous list, where it displaces the real wage, which now moves to the endogenous list.

In the case of one important parameter, namely the elasticity of substitution between capital and labour (σ_{KL}), the available evidence indicates that the relevant value varies between the short and the long run.[2] For the long run simulations reported here σ_{KL} has been set at 1.28, whereas the value in the parameter file supporting simulations in short run mode is 0.5. For the current simulations, the parameter file was also set in such a way as to cause the market to treat domestic and imported crude oil as perfect substitutes (which may not be true in the short run).

In the results presented below, a five year snapshot period is assumed. That is, five years is hypothesized to be sufficiently long for the economy to absorb the changes in industry specific capital stocks projected to take place as a result of the world commodity price changes. In section 5.3 we consider the plausibility of this assumption in the light of the endogenous capital stock changes.

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1. Further technical details are given in the Appendix.

2. Caddy (1976), (1977). For the length of the neoclassical short run in ORANI, the empirical evidence so far available suggests 6 - 8 quarters (Cooper and McLaren (1980)).

overseas technology. The endogenous responses of the ORANI model which are documented here, however, do not incorporate matching changes in the Australian technology to reflect the implicit assumptions made about the overseas technology in the construction of the overseas price scenarios.

5.1 The Model's Base Year

The ORANI model has as its main data source a commodity by industry input-output (I-O) table which establishes the I-O linkages in the domestic economy and those between the domestic economy and international trade in the base year. For example, production techniques for domestic industries in producing their commodity bundles are reflected in the shares in industry production costs accounted for by the costs of domestically produced and imported intermediate inputs and the various mark-up and primary factor inputs. Similarly, the disposition of domestically produced and imported commodities is reflected in the sales shares of these commodities to intermediate usage and to the various categories of final demand (one of which is exports). The data base supporting this analysis in section 4 refers to the 1968/69 economy, 1968/69 being the year of the latest completed I-O table. While there is a good deal of information to suggest that I-O cost and sales shares exhibit some stability over time, the increasing antiquity of the data base is a cause for concern. Consider, for example, the results in column 2 of Tables 2 and 3. The 1980 economy is considerably more energy rich than was the case in 1968/69. In particular, the reliance on imported crude oil has fallen while the coal export industry and the energy intensive aluminium export industry, have both expanded substantially. Thus, if the simulations were repeated using, say,

The most obvious shortcomings of the section 4 experiment are :

(i) The model's base year (1968-69) is considerably outdated.

(ii) No allowance has been made for technical progress in the domestic economy between the base year and the snapshot year.

(iii) No account has been taken of the costs of retraining labour and shifting capital between industries to achieve the new industrial and workforce composition implied by the solution.

(iv) Questions relating to the financing and ownership of the aggregate capital stock are left unanswered (that is, the model does not, at present, endogenise capital flows between Australia and the rest of the world in the snapshot year).

(v) The long run supply curves for the products of all non-land-using industries (except that of the crude oil industry) are assumed to be horizontal (while the long run supply curve for crude oil is assumed to be vertical).

Each of these issues is considered in the following sections. Suffice it to remark here that each of the above factors has the potential to effect the quality of the partial projections given in section 4. The reason that point (ii) is relevant to the quality of the partial projections (in addition to the generation of forecasts) is that the exogenous scenarios on the world prices of traded commodities necessarily imply some view about the state of overseas technology. These price scenarios, therefore, encapsulate not only a view about overseas cost and trading conditions, but also about

3. An International Trade Scenario

ORANI is a model of Australia, not of the world economy. It does not contain equations to describe the foreign supply conditions for commodities that Australia imports. Nor does it attempt to explain foreign demand conditions for Australian export commodities. In order to use the model to analyse questions related to international trade, the user must construct a scenario of Australia's world trade opportunities, essentially in terms of world price projections of internationally traded goods. While Australia is assumed to be a 'small country' with respect to import markets, i.e., the world prices of goods imported by Australia are assumed to be independent of Australian import demands, provision is made for the foreign demand curves facing Australian exporters to be downwards sloping.

In the present exercise, the task is to establish the consequences for world commodity prices in the mid-1980's of an anticipated continuation of industrialisation in Asia. However, it is somewhat unrealistic to envisage a set of changes in future world commodity prices which can be attributed solely to Asian industrialisation. The pace of Asian industrialisation, and hence the consequences for certain world commodity prices will be linked to numerous other world events, such as, for example, developments in the world energy market. The scenario developed here therefore attempts to take into account the influence

of numerous other factors, in addition to Asian industrialisation, in shaping future world commodity prices.

3.1 The World Price Scenario

This scenario is expressed in terms of annual shifts in world import prices for the commodities distinguished in the model, together with annual shifts in the foreign demand curves for exports (projections of world price changes in the absence of changes in Australian export levels) and estimates of the foreign price elasticities of demand for export commodities. In preparing the scenario we have drawn on a number of studies. One such study specially commissioned by the IMPACT Project (Freebairn (1978)) investigated likely developments affecting demands, supplies and prices of internationally traded commodities in the medium term. Underlying Freebairn's work are assumptions about long term rates of growth of income and population (on the demand side) and rates of technical change and investment (on the supply side) together with estimates of world price elasticities of supply and demand and Australia's share of world markets.[1]

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1. Projections for these items are combined to yield world price projections within the context of a simple competitive world trade model which assumes the rest of the world (world minus Australia) supply and demand functions for each commodity to be of the form :

$$D^W = F_1 P^{-\eta} \quad (3.1) \qquad \text{and} \qquad S^W = F_2 P^{\varepsilon} \quad (3.2) \ ,$$

where D^W is the rest of the world demand, S^W is the rest of the world supply, P the world price, F_1 and F_2 are indexes of demand and supply shift factors respectively, and η and ε are price elasticities of demand and supply. Australia's net trade (export or import) function is $X = D^W - S^W$. This may be written as

$$p = \left[\frac{f_1 - f_2 \frac{S^W}{D^W}}{\eta + \varepsilon \frac{S^W}{D^W}}\right] - \left[\frac{X}{D^W \left(\varepsilon \frac{S^W}{D^W} + \eta\right)}\right] x \qquad (3.3) \ ,$$

where the lower case symbols represent logarithmic differentials of corresponding upper case variables. Suppose, for example, that x in (3.3) refers to exports. Then the first term in (3.3) contains the components of the export demand shift variable while the coefficient of x contains the components of the reciprocal of the foreign demand elasticity.

5. An Outline of Future Developments Planned for the ORANI Long Term Model

The section 4 experiment sought to illustrate the usefulness of the ORANI framework in providing detailed projections of the consequences for the domestic economy of changes in Australia's international trading environment. These projections are of course conditional on the numerous assumptions underlying the model, some of which are currently being revised. It is appropriate here to list the major limitations of the long run projections made with the ORANI model in its present form and to outline the work in progress to improve the long run projection facility.

In compiling such a list it is useful to distinguish between (i) those shortcomings of the current framework likely to affect the validity of the projected effects on the Australian economy of the given world price scenarios in the absence of other exogenous changes, and (ii) the partial nature of the projections themselves. Since the actual position of the Australian economy during a snapshot year some five or ten years hence is the consequence of the interaction of a myriad of exogenous forces on the structural relations pertaining in the economy, a forecast (as distinct from the partial projections given in this paper) would require as well the development of scenarios for all of these exogenous variables. The current versions of the ORANI model cope with many, but by no means all, of the relevant exogenous factors. Thus at the present time the ORANI model is not used for forecasting.[1]

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1. See Powell (1980) for a more detailed discussion.

Table 4 : Projected Impact on Farm Industry Incomes of Complete World Price Scenario

Industry	Real Income per cent	Industry	Real Income per cent
1. Pastoral Zone	16.1	5. Milk Cattle	5.7
2. Wheat/Sheep Zone	- 6.4	6. Other Farming Export	- 22.3
3. High Rainfall Zone	14.1	7. Other Farming Import Competing	0.3
4. Northern Beef	14.7	8. Poultry	2.4

These results for the strongly export and export related industries (1 - 4, 6) follow closely from the world price scenario. They indicate strong income gains for the industries producing commodities with favourable world price prospects and vice versa. Industry 5 (Milk Cattle) in the model produces in fixed proportions both meat cattle and milk cattle and pigs. The former is sold to the Meat Products industry and hence to exports, while the latter is sold to the Milk Products industry for processing. It is the favourable world price scenario for the meat products commodity that explains the moderate income performance of industry 6. Industry 7 (Other farming import competing) produces commodities which are essentially non-traded or not subject to effective import competition.[1] Its output and income performance is therefore due largely to factors in the domestic economy.[2] In our data base, industry 8 (Poultry) sells to the Meat Products industry (32 per cent of sales) and to consumption (62 per cent of sales). The output and hence the income boost of the Poultry industry is mainly attributable to the increase in world demand for meat products.

1. Although this industry produces tobacco leaf, for institutional reasons the tobacco processing industry does not vary its mix of inputs between domestic and foreign sources in response to relative prices.
2. Consumption of both the other farming import competing and the tobacco products commodities increase by less than the aggregate consumption growth, principally because of the low income elasticities of demand assumed for these products. This leads to the poor income performance of industry 7.

Freebairn's study is in turn partly based on overseas work in this area, including the recent United Nations study entitled The Future of the World Economy by Leontief and others.[1] We have also drawn on historic data of world commodity price changes over the late 1960's to mid-1970's to supplement information obtained from the more forward looking studies.

The world price scenario is summarised in Table 1. The scenario refers to 'average' trade opportunities in a 'typical' year. In keeping with the snapshot concept, the scenario abstracts from seasonal influences, business cycles and other transient phenomena. The projections in the table are reported as price movements relative to the slowest increasing group.[2]

Broad features of the scenario are as follows. The prices assumed to rise slowest are those of the machinery, equipment and appliance group. This group also includes motor vehicles. We anticipate that continued scope for capital intensive production techniques and technical innovation will lead to falling relative prices for commodities in this group. The next slowest to rise prices are those of products exported by or soon to be exported by the newly-industrialising Asian economies. Note that included in this group are basic iron and steel and most metal products not highly fabricated. We anticipate that as Asian industrialisation proceeds, real wage increases in the more advanced Asian economies (e.g., South Korea) will shift the comparative advantage of such economies away from the traditionally labour intensive products into the more complex manufacturing processes such as steel production. Lower technology manufactured

1. See Leontief et al. (1977).
2. Only relative price movements are relevant for the ORANI model. The absolute rate of inflation in the rest of the world will have no effect on ORANI results.

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Table 1 : Assumptions Concerning Annual Rates of Growth in World Commodity Prices to the Mid-1980's

Commodity Description[a,b]	Price Group Number	Projected Additional Inflation in Commodity Price Relative to Slowest Growing Group (Group 9)
		(% per year)
ENERGY AND ENERGY RELATED		
Crude oil	1	6.8
Coal		5.8
Oil and coal products		5.8
Other basic metals		4.8
MAINLY AGRICULTURAL EXPORTS		
Meat products	2	5.2
Leather products		4.9
Fishing; Wool		4.8
MAINLY ADVANCED COUNTRY EXPORTS (OTHER THAN MACHINERY)		
Forestry; Prepared fibres; Man-made fibres and yarn; Wool and worsted yarns; Pulp and paper; Fibreboard; Paper products n.e.c.; Newspapers and books; Commercial printing; Chemical fertilisers; Industrial chemicals; Paints and varnishes; Pharmaceuticals; Soap and detergents; Cosmetics and toiletry; Chemical products n.e.c.; Signs and writing equipment	3	4.1
CERTAIN FOODS, DRINKS		
Milk products; Milk cattle and pigs;	4	4.0
Fruit and vegetable products; Bread, cakes and biscuits; Margarine, oil and fats; Other farming import competing; Tobacco products		3.8
NON-ENERGY MINERALS		
Iron; Non-metallic n.e.c.; Other metallic minerals	5	3.4
MISCELLANEOUS GROUP[c]		
Wheat; Barley; Other cereal grains; Poultry (eggs); Flour and cereal products; Soft drinks and cordials; Beer and malt; Concrete products	6	2.8

continued ..

(import share of 53 per cent and import substitution elasticity of 2.4) and Electronic Equipment (import share of 35 per cent and import substitution elasticity of 2.0). The eighth largest loser is the Wheat/Sheep Zone. Over 50 per cent of the base year output of this zone consists of wheat, barley and other cereal grains, all of which are assumed to face relatively unfavourable world demand prospects and highly elastic foreign demand curves. The Wheat/Sheep Zone is therefore caught severely in a domestic cost/world price squeeze.[1]

Changes in employment demand for most workforce categories are modest. Rural employment demand shows a slight fall. Employment losses in the Other Farming Export and Wheat/Sheep Zone industries are sufficient to offset gains in employment demand elsewhere in the agricultural sector. As already noted, the weakness in employment demand for occupations 4 and 7 reflects their heavy use in the import competing machinery and textile sectors, both of which produce commodities assumed to face relatively poor world price prospects.

4.2 Farm Industry Incomes

Table 4 contains farm industry income projections. These are computed as appropriately weighted sums of percentage changes in real returns to land, labour (both owner-operator and hired) and capital in each industry.

1. The Wheat/Sheep Zone produces wool, sheep and cattle in insufficient amounts to avoid the squeeze.

The largest gainers are the three export industries Coal, Fishing and Other Basic Metals, all of which are projected to have extremely favourable world price prospects and are assumed, in the present version of the model, to exhibit perfectly elastic supply curves over the medium term. The next three industries all produce export oriented commodities with favourable world price prospects.[1] The strong output performance of the Meat Products industry is attributable to the very favourable world price prospects for the meat products export commodity. The moderate output performance of Forestry follows from the strong output performance of the Coal industry. In our data base, nine per cent of the total sales of forestry products are absorbed by the Coal industry.

The four largest losers are all export and export related industries with particularly unfavourable world price prospects for their products. In addition, all such products are assumed to face highly elastic foreign demand curves. The next largest loser, Motor Vehicles and Parts is an import competing industry particularly vulnerable to import competition.[2] Given the unfavourable world price prospects assumed for motor vehicles, a strong substitution towards the imported product occurs. Relatively poor world price prospects and vulnerability to import competition are the major reasons for the poor output performance of Cotton, Silk and Flax

1. Northern Beef produces only meat cattle which is exported as meat products, while 88 per cent of the base year output of the Pastoral Zone and 82 per cent for the High Rainfall Zone consists of wool, sheep and cattle.

2. The vulnerability of an industry to import competition is, according to ORANI, an increasing function of the base period import penetration by the commodities of that industry and the elasticity of import substitution. The base year import share for Motor vehicles and parts is 31 per cent and the import substitution elasticity is 5.0. (Both are relatively large numbers - see DPRS (1977), pages 160 and 210.)

Table 1 continued ....

Commodity Description[a,b]	Price Group Number	Projected Additional Inflation in Commodity Price Relative to Slowest Growing Group (Group 9)
		(% per year)
SUGAR AND RELATED PRODUCTS		
Other farming export; Confectionery; Food products n.e.c.	7	2.7
MAINLY EXPORTS AND PROSPECTIVE EXPORTS OF INDUSTRIALISING ASIA		
Cotton, silk and flax; Textile finishing; Textile floorcovers; Textile products n.e.c.; Knitting mills; Clothing; Footwear; Sawmill products; Plywood and veneers; Joinery and wood products; Furniture and mattresses; Glass; Clay products; Cement; Non-metallic mineral products; Basic iron and steel; Structural metal; Sheet metal products; Metal products n.e.c.; Rubber products; Plastic products; Other manufacturing	8	2.6
MACHINERY, EQUIPMENT AND APPLIANCES		
Motor vehicles and parts; Ship and boat building; Locomotives; Aircraft building; Scientific equipment; Electronic equipment; Household appliances; Electrical machinery; Agricultural machinery; Construction equipment; Other machinery	9	0.0

a. The composition of most commodity categories can be inferred from the commodity description. Details are in Australian Bureau of Statistics (ABS) (1978). The commodity categories, Other farming export, and Other farming import competing, are not used in the ABS I-O classification. Other farming export consists mainly of sugar cane. Other commodities included in this category are various fruits and dried vine fruits. Other farming import competing includes tobacco leaf as well as vegetables and flowers.

b. Commodities which are essentially non-traded do not appear on this list.

c. The overall world commodity price level is assumed to inflate at the same rate as for this group.

goods such as textiles and footwear will be manufactured increasingly in the least industrialised of the Asian economies. The relocation of iron and steel and metal products production from traditional Western producers to the more advanced of the industrialising Asian economies should ensure a downward pressure on relative prices for these commodities.

The next group contains sugar and commodities which are heavy users of sugar in the manufacturing process. We anticipate a combination of favourable supply side factors in semi tropical regions (better fertilisers and management techniques and more efficient harvesting and processing machinery) and less favourable demand side factors (reduced consumption of refined sugar products for nutritional reasons) to lead to a relatively unattractive sugar price outlook. We would expect that the current international sugar agreement will not persist into the 1980's, thus ensuring quasi-free trade in conjunction with a relatively inelastic EEC import requirement.

Group 6 is dominated by agricultural commodities - various cereal grains and their products. The assumed outlook for these products is relatively unfavourable. In the case of grains, further large gains in productivity are anticipated through advances in mechanisation at production, harvesting and transportation levels. Demand shift factors such as population, income and trade policy changes are not likely to be prominent.[1]

Group 5 contains the non-energy mineral commodities. The world price outlook for these commodities is assumed to be only fair.[2]

1. Projections by FAO, OECD, USDA and others anticipate only small increases in world import demand for wheat, for example. (See Freebairn (1978)).

2. See Freebairn (1978) for details.

rather than absolute output performance that is the important factor. Hence the absolute results of column 5 should be considered in conjunction with the average growth performance of the economy which can be approximated by the gain in real absorption of 2.4 per cent. Industries with projected output growth below 2.4 per cent can be expected to face adjustment pressures in the absence of favourable offsetting factors not explicitly modelled in this exercise (such as improvements in production techniques). These pressures are most severe on those traded industries which are particularly susceptible to domestic cost increases and which are expected to face particularly unfavourable world price prospects. These include (i) several export oriented agricultural and processed food industries, (ii) non-energy mineral and mineral processing industries, and (to a lesser extent) textile, clothing and footwear industries whose commodities are classified to the newly-industrialising Asian category, and (iii) industries producing commodities classified to group 9 in Table 1, i.e., those whose world price prospects are particularly unfavourable.

Rather than attempting a detailed exposition of the output response of all industries in column 5, we will restrict the remaining discussion of industry output responses to the eight industries projected to gain most from the world price scenario and the eight industries projected to gain least. These main gainers and losers, together with their percentage output responses are as follows :

Gainers : Coal (59.8), Fishing (43.0), Other Basic Metals (32.0), Pastoral Zone (9.7), Northern Beef (8.7), High Rainfall Zone (8.1), Meat Products (7.3), and Forestry (6.2).

Losers : Iron Ore (-34), Food Products n.e.c. (-30), Basic Iron and Steel (-23), Other Farming Export (-15), Motor Vehicles, Parts (-13), Cotton, Silk & Flax (-6.6), Electronic Equipment (-5.5), and Wheat/Sheep Zone (-3.7).

change their product mix towards wool, sheep and cattle.[1] Note that industry 2 (Wheat/Sheep Zone), which is the industry most heavily involved in producing wheat, barley and other grains, experiences only a small output gain relative to the other multi-product industries 1 and 3.

As a result of the world price changes whose consequences are projected in column 3, employment demand for rural workers increases substantially in line with the favourable prospects for the agricultural sector as a whole. The sectoral composition of the economy is strongly biased towards the land using agricultural industries. These experience large increases in their return to land. This explains the fact that, although real national income has increased, the share accruing to labour, and hence the average real wage, has actually declined slightly.[2]

The column 4 results are included essentially for completeness. Because the price scenario for this column includes a large group of commodities with varying world price projections, the results in themselves are of little interest. Note, however, that the outcome of the column 4 scenario is a very large terms of trade gain to the Australian economy.

The column 5 results represent the outcome of the complete world price scenario, that is the sum of the effects in columns 1 - 4. As noted earlier, this scenario is favourable to the economy as a whole, resulting in higher domestic absorption and a higher real wage level. In establishing the extent to which individual industries will face adjustment pressures from the anticipated world price scenario, it is their relative

1. For a detailed discussion of the operation of the CRETH supply system in determining agricultural commodity output performance across the three multi-product industries, see Dixon, Parmenter, Powell and Vincent (1979).

2. This reallocation of returns between factors can be thought of in terms of the well known theorem of Stolper and Samuelson (see Stolper and Samuelson (1941)). The terms of trade change in column 3 causes an expansion in the outputs of agricultural industries. Thus the real reward of the factor employed relatively intensively in these industries (land) increases at the expense of the real rewards earned by other factors (such as labour).

Group 4 contains several agricultural commodities - milk products, and fruit and vegetable products. Because of barriers to world trade in milk products, future movements in the rest of the world demand function for Australian dairy products are particularly uncertain. Income and population growth in the developing countries, especially those of Asia, will have a beneficial effect but this will be offset by increased productivity. Slight gains in real prices for both commodities are anticipated.

Of the remaining agricultural commodities, wool and meat products are located in group 2. That is, their relative world price prospects are considered to be extremely favourable. For wool, the influence of demand shift factors such as income and population growth and higher prices for petroleum based competing fibres are projected to outweigh shifts on the supply side. Genetic and animal husbandry and harvesting gains in wool growing have been fairly small in recent times. While important productivity gains in Australian wool production have come from pasture improvement, the scope for large production gains on a world scale from this and other sources does not seem high. For meat products the outlook is complicated by the trade policies of major meat importers such as the USA, Japan and to a lesser extent the EEC. Population and income growth in the newly industrialising Asian countries, where the income elasticity of demand for beef is quite high, are likely to be important components of the rest of the world demand for Australian beef. While there are potential opportunities for substantial increases in beef production in South American exporting countries, our judgment is that supply shift factors will be overshadowed by demand shift factors. The fishing commodity category is also included in this group. Australian fishing

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exports are dominated by crustacea (lobsters and prawns), the world demand for which is highly income elastic. Furthermore, there would appear to be biological limits to rest of the world (and Australian) production of these commodities.

The fastest rising group contains the energy commodities crude oil, coal, and oil and coal products. Also included in this group is the other basic metals category which contains the energy intensive aluminium commodity. World prices for commodities in this group are assumed to inflate at from 4.8 to 6.8 per cent annually relative to the slowest increasing group. Events in the world oil market over the past decade indicate that future world price projections for energy commodities will be highly speculative. It is unclear to what extent future crude oil prices for example will reflect 'artificial' prices set by the OPEC producing cartel or genuine scarcity factors. While moderately large increases in the real price of crude oil have been assumed in this exercise it seems unlikely that OPEC could sustain such rises indefinitely given the move, now well under way, towards substitute fuels, the development of recently discovered oil fields and improvements in crude oil extraction technology. Increases in crude oil prices will, of course, have implications for the world prices of other energy and energy related commodities, especially those that may substitute closely with oil, such as coal, and those, such as aluminium, that are intensive in their use of energy inputs. In a previous paper[1] we described a formal procedure for calculating the effects of projected increases in world energy prices on the world prices of non-energy commodities. In this paper our approach is

1. See Vincent, Dixon, Parmenter and Sams (1979 (b)).

price shifts. The weakness of demand for these occupations reflects their heavy usage in the textile sector which is assumed to face unfavourable world prices. Demand for rural workers increases in line with the export led expansion in rural industries.

The column 3 scenario (agricultural commodities and processed foods) is again favourable to the economy as a whole but has somewhat different implications for industrial composition than the scenarios in columns 1 and 2. Non-agricultural export or export related industries and import competing industries contract in the face of a deteriorating domestic cost/world price situation. The explanation of commodity and industry output performance within the agricultural sector is of interest. Because of the relatively unfavourable world price prospects for refined sugar, the output of the sugar refining industry (Food Products n.e.c.) declines, causing a contraction in the output of the single product agricultural industry supplying it (Other Farming Export). All other agricultural industries and commodities expand output even though world prices for the export commodities wheat, barley and other cereal grains fall relative to both world prices in general and the domestic price level. Wheat, barley and other cereal grains are produced in industries 1 - 3 in competition with other agricultural commodities such as wool, sheep and cattle, all of which have relatively favourable world price prospects.[1] The net effect is an expansion in the outputs of the three multi-product industries sufficient to ensure increased output of the grains, although the relative importance of the grains in the output mix declines in each industry as producers

1. In the case of sheep and cattle, the relevant world price change is for the processed product (meat products).

reflected in comparatively low values of the elasticities of substitution between imported and domestic commodities.[1] Industries with sales patterns oriented towards the domestic economy, and which are relatively insulated from international trade, expand in line with the higher domestic absorption. The rural worker category of the workforce (which is employed only in agricultural industries) suffers the largest decline in employment demand.

The column 2 results (which refer to the effects of a decrease in the world prices of commodities exported by or soon to be exported by newly-industrialising Asian countries, relative to other world prices) also imply a terms of trade gain to the Australian economy leading to increased domestic absorption and higher real wages. The initial tendency for the balance of trade to move towards surplus (because of a reduction in the foreign currency value of imports exceeding a reduction in the foreign currency value of exports) is eliminated by the price adjustment mechanism previously outlined. However, although the domestic price level has increased relative to world commodity prices on average, it has fallen relative to the world prices of all export commodities other than basic iron and steel (which is the only ORANI export commodity in the group of commodities assumed to be produced by newly-industrialising Asian countries). The resultant expansion in export commodities other than basic iron and steel explains the output growth of the agricultural export and export related commodities and the industries producing them. Import competing industries producing commodities in the group 8 category of Table 1 face a domestic cost/world price squeeze and contract in the face of increased import competition, while service industries expand because of increased domestic absorption. Occupations 4 and 7 are the main losers from the column 2

1. See DPRS (1977), p. 160, for the values of these elasticities.

less formal. The prices of non-energy commodities have been adjusted in an ad hoc fashion to be consistent with the oil price scenario. Of crucial importance to the future of the Australian economy is the extent to which higher world oil prices are reflected in higher world coal prices.[1] Here we have assumed that the world price of coal will closely follow the world price of oil. This implies that the long run world supply curve for coal is upwards sloping. (Substitution of coal for crude oil in key end uses causes increased coal production costs and hence prices.) The evidence suggests that there are immense reserves of coal. However, it is unclear what the implications will be for coal extraction costs should massive substitution of coal for oil occur.

3.2 Export Demand Elasticities

In typical ORANI simulations, exports are allowed to be determined endogenously for 13 commodities. These commodities accounted for about 70 per cent of Australian exports in the model's data base. For the remaining minor export commodities, changes in exports are set exogenously.[2] Values for the export demand elasticities used in the section 4 projections are as follows : Wool (- 1.30), Wheat (- 12.5), Meat products (- 16.7), Prepared fibres (- 2.63), Barley, Other cereal grains,

1. Vincent, Dixon, Parmenter and Sams (1979(b)) investigated the polar cases where (i) higher crude oil prices left coal prices unchanged, and (ii) increases in crude oil prices led to coal price increases of the same magnitude. Under (i) the agricultural and other export sectors expanded relative to the more domestic oriented manufacturing and service sectors in order to meet the higher oil import bill. Under (ii) because Australia is a net exporter of energy, the restoration of external balance involved a contraction in non-energy export industries at the expense of the domestically oriented sectors.

2. In the present exercise, scenarios on export quantity prospects for the minor export commodities have not been developed.

Fishing, Iron, Other metallic minerals, Coal, Food products n.e.c., Basic iron and steel, Other basic metals (all - 20.0). As is evident from the second term in equation (3.3), these estimates are in turn based on estimates of Australia's share in world commodity markets together with demand elasticities in importing countries and supply elasticities in competing export countries.

4. Some ORANI Projections : World Price Scenario

The prospective annual rates of change in world prices in a 'typical' year, summarised in Table 1, were compounded for five years. That is, the world price changes were assumed to persist for the period 1979/80 to 1984/85. The resultant vectors, which are interpreted as price shifts in the case of imports and foreign demand curve shifts in the case of exports, constitute the exogenous shocks generating the projections reported below.

These projections[1] are conditional on the set of macroeconomic assumptions listed earlier.[2] In addition to those assumptions about (i) rates of return and capital mobility, (ii) wages and employment, and (iii) absorption and the balance of trade, several additional assumptions

1. It is important to note that the results are in fact projections and not forecasts. They refer to the effects of the exogenously specified world price changes on selected variables, given the specified macroeconomic environment and assuming that all other exogenous variables are held constant. In order to use the model to obtain forecasts, the exogenous scenario would have to encompass all exogenous variables, not just world commodity prices. See Powell (1980), pp. 17-21.
2. The technical specifications for the simulations reported here are given in the Appendix.

The results in column 1 of Tables 2 and 3 reflect the fact that Australia is a net exporter of energy (oil, coal, energy based export commodities, energy based import commodities). Higher world prices for energy based exports (coal and other basic metals for example) generate foreign exchange earnings in excess of those required to pay for the higher priced energy imports (crude oil, for example).

The favourable terms of trade change implies an increase in the productivity of the economy and allows higher domestic absorption and higher real wages at the exogenous employment level. The increase in the domestic price level relative to world prices which results imposes a domestic cost/world price squeeze on export industries other than those producing the energy commodities coal and other basic metals. Hence, all the agricultural export industries and commodities contract, as do the 'non-energy' mining industries.[1] Because of the presence of the fixed factor, land, the agricultural export industries show considerably less output volatility than do their non-agricultural counterparts. The Coal and Other Basic Metals industries, both of which produce commodities assumed to face perfectly elastic supply curves,[2] expand rapidly in response to the exceedingly favourable world demand conditions for their products (as do industries such as Forestry which are prominent suppliers of inputs to these industries).

Most import competing manufacturing industries also contract in the face of the domestic cost world price squeeze. In many cases, however, their output contractions are cushioned by significant sales to an expanding domestic market and their 'natural' protection afforded against imports as

1. Industries heavily involved in supplying inputs to these industries, such as Chemical Fertilisers and Services to Agriculture in the case of agricultural industries, also contract.
2. The appropriateness of this assumption is discussed in section 5.

Table 3 continued ....

		1	2	3	4	5	6
5	Other Cereal Grains	-4.9	0.2	4.1	-1.1	-1.8	(c)
6	Meat Cattle	-6.7	0.2	15.5	-1.8	7.2	(d)
7	Milk Cattle	-2.4	0.1	5.6	-0.6	2.7	(e)
8	Other Farming Export	-6.9	0.3	-4.5	-1.9	-13.0	(f)
9	Other Farming Import Competing	-1.8	0.1	1.6	0.1	0.0	(g)

(a) Industries are classified as import competing (IC), exporting (E), export related (ER), or non-traded (NT). The categories are judgmental. Export industries are those for which a major share (generally greater than 20 per cent) of domestic output is exported. Export related industries supply large proportions of their outputs to export industries. Import competing industries sell in markets where the level of import penetration is significant and where imports and domestic outputs are close substitutes. Remaining industries are designated as non-traded.

(b) Figures in columns 1 - 4 may not total those in column 5 because of rounding errors.

(c) Produced in industries 1 - 3.

(d) Produced in industries 1 - 5.

(e) Produced mainly in industry 5.

(f) Produced mainly in industry 6.

(g) Produced mainly in industry 7.

have been adopted; namely (iv) that import parity pricing for domestically produced crude oil is maintained over the snapshot period and in the snapshot year, but that domestic oil producers are unable to expand their production over the snapshot horizon in response to increased prices;[1] and (v) that technology is fixed so that industries are not allowed to substitute between alternative forms of energy, for example, or between energy and other intermediate inputs as relative input prices change.[2]

The results are presented in three tables. Table 2 contains projections for selected macro and employment variables, Table 3 for industry and agricultural commodity outputs and Table 4 for farm industry incomes. The figures in the tables refer to percentage changes in the variables in a typical year, five years hence, from the levels they would have reached in year five in the absence of the shocks.

Note that Tables 2 and 3 each contain five columns of results. Columns 1 - 4 divide the world price scenario into broadly defined components; energy and energy related products only in the case of column 1, products exported by or likely to be exported by newly-industrialising Asian countries in the case of column 2, selected agricultural and processed food commodities in the case of column 3, and all remaining products (mainly machinery, equipment, appliances and advanced country exports) in the case of column 4. The results in column 5 refer to the complete world

1. The appropriateness of this assumption about the medium term supply constraints on domestic oil production is discussed in section 5.

2. Note that industry production functions in ORANI do not allow for relative price induced substitution between intermediate inputs or between intermediate inputs and primary factors. However, the model is currently being revised to enable it to accept scenarios on changes in production techniques (see section 5.2). Changes in production techniques can be envisaged as having both an autonomous component and a component attributable to anticipated relative input price changes. The technical change facility will therefore allow the user some scope for exogenously accounting for relative price induced substitution between inputs.

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Table 2 : Projections of the Medium Term Effects of Price Changes on Macro and Employment Variables

(per cent)

Variable	Price Scenario Components				
	1	2	3	4	5
	Energy & Energy Related Products (Group 1, Table 1)	Mainly Exports & Prospective Exports of Industrialising Asia (Group 8, Table 1)	Selected Agricultural Products and Processed Foods (c)	Mainly Machinery and Equipment, Appliances and Advanced Country Exports(d)	Complete Scenario
Macro					
Aggregate Real Absorption	0.46	0.02	0.11	1.80	2.40
Absolute Real Wage	0.84	0.01	-0.05	1.20	2.01
Aggregate Capital Stock	0.24	0.04	0.46	3.68	4.43
Aggregate Real Exports(a)	4.30	-0.14	1.13	1.71	7.00
Aggregate Real Imports(a)	3.94	-0.13	1.03	1.56	6.40
Consumer Price Index	3.24	-0.14	2.10	0.95	6.14
Simple Average of World Price Changes	0.53	-0.19	0.72	0.13	1.26
Employment by Occupation(e)					
1. Professional White Collar	0.49	0.01	-0.58	0.89	0.81
2. Skilled White Collar	0.30	-0.01	-0.44	0.39	0.24
3. Semi & Unskilled White Collar	0.21	-0.01	-0.32	0.36	0.24
4. Skilled Blue Collar (metal & electrical)	0.86	-0.07	-1.32	-0.76	-1.28
5. Skilled Blue Collar (building)	0.17	0.02	-0.03	0.58	0.75
6. Skilled Blue Collar (other)	-1.44	0.01	2.31	-0.25	0.62
7. Semi & Unskilled Blue Collar	1.20	-0.04	-1.07	-0.30	-1.99
8. Rural Workers (b)	-8.35	0.28	8.70	-1.01	-0.38
9. Armed Services	0.45	0.02	0.11	1.74	2.32

[Please see p. 25 for (a), (b), (c), (d) and (e).]

Table 3 continued ....

	Industry	1	2	3	4	5	6
76	Agricultural Machinery	-5.6	0.2	6.5	-2.2	-1.1	ER
77	Construction Equipment	-0.2	0.0	-4.0	2.7	-1.4	IC
78	Other Machinery	0.9	-0.1	-1.3	-0.8	-1.2	IC
79	Leather Products	-1.0	-0.1	-1.4	2.3	-0.1	IC
80	Rubber Products	-0.7	-0.1	-1.0	1.0	-0.7	IC
81	Plastic Products	-0.9	-0.2	-0.6	0.5	-1.1	IC
82	Signs, Writing Equipment	-0.1	0.0	-0.5	2.5	1.9	IC
83	Other Manufacturing	-0.4	-0.1	-0.2	2.3	1.5	IC
84	Electricity	2.1	-0.0	-1.0	1.3	2.4	NT
85	Gas	0.4	-0.0	-0.2	1.5	1.7	NT
86	Water, Sewerage	0.3	0.1	0.3	2.4	3.0	NT
87	Residential Building	0.5	0.0	0.1	1.8	2.4	NT
88	Building nec	0.3	0.1	0.7	1.3	2.4	NT
89	Wholesale Trade	0.0	-0.0	0.4	1.4	1.8	NT
90	Retail Trade	0.4	0.0	0.2	1.5	2.0	NT
91	Motor Vehicle Repairs	0.2	0.0	0.5	2.3	3.1	NT
92	Other Repairs	0.4	0.0	0.7	1.5	2.6	NT
93	Road Transport	2.7	0.0	-0.2	0.9	3.5	ER
94	Railway Transport	6.6	0.1	-2.6	0.9	5.0	ER
95	Water Transport	0.3	-0.2	-1.0	-0.2	-1.2	NT
96	Air Transport	-0.0	0.0	-0.0	2.4	2.4	IC
97	Communication	0.5	-0.0	-0.1	1.5	1.9	NT
98	Banking	0.3	0.0	-0.0	1.3	1.6	NT
99	Finance & Life Insurance	0.3	0.0	0.1	1.6	2.0	NT
100	Other Insurance	0.3	0.0	-0.0	1.4	1.7	NT
101	Investment, Real Estate	0.2	0.0	-0.0	1.0	1.2	NT
102	Other Business Services	0.2	0.0	0.0	1.3	1.5	NT
103	Ownership of Dwellings	0.7	0.1	0.3	3.3	4.4	NT
104	Public Administration	0.4	0.0	0.1	1.8	2.4	NT
105	Defence	0.4	0.0	0.1	1.7	2.3	NT
106	Health	0.3	0.0	0.1	1.7	2.1	NT
107	Education, Libraries	0.4	0.0	0.1	1.8	2.3	NT
108	Welfare Services	0.4	0.0	0.1	1.6	2.1	NT
109	Entertainment	0.3	0.0	-0.0	2.0	2.3	NT
110	Restaurants, Hotels	0.3	0.0	0.1	1.5	1.9	NT
111	Personal Services	0.3	0.0	0.1	1.8	2.3	NT
112	Business Expenses	0.3	0.0	-0.0	1.2	1.5	NT
113	Non-Competing Imports	0.5	0.0	0.1	1.8	2.4	NT
	Agricultural Commodity Outputs :						
1	Wool	-5.4	0.2	11.1	-1.5	4.4	(c)
2	Sheep	-6.5	0.2	14.8	-1.7	6.8	
3	Wheat	-7.2	0.2	1.8	-1.8	-7.0	
4	Barley	-6.4	0.2	3.8	-1.6	-4.1	

continued ...

Table 3 continued ....

	Industry	1	2	3	4	5	6
29	Tobacco	0.1	0.0	0.1	0.9	1.2	IC
30	Prepared Fibres	-6.3	0.1	8.4	-1.6	0.5	E
31	Man-Made Fibres, Yarn	-3.6	-0.0	-2.0	6.2	0.7	IC
32	Cotton, Silk, Flax	-2.9	-0.8	-1.8	-1.0	-6.6	IC
33	Wool & Worsted Yarns	-0.4	-0.1	-0.2	0.6	-0.1	IC
34	Textile Finishing	-0.3	-0.1	-0.2	0.5	-0.2	IC
35	Textile Floor Covers	-0.4	-0.2	-0.3	0.5	-0.5	IC
36	Textile Products nec	-0.8	-0.4	-0.9	0.9	-1.2	IC
37	Knitting Mills	-0.3	-0.1	-0.2	0.2	-0.4	IC
38	Clothing	-0.3	-0.1	-0.2	0.2	-0.3	IC
39	Footwear	-1.3	-0.4	-0.9	-0.3	-2.9	IC
40	Sawmill Products	-0.5	-0.2	-0.7	1.3	-0.1	IC
41	Plywood, Veneers	-0.5	-0.2	-0.3	1.5	0.4	IC
42	Joinery & Wood Products	0.2	-0.0	-0.1	1.8	1.9	NT
43	Furniture, Mattresses	0.5	0.0	0.1	2.0	2.6	NT
44	Pulp, Paper	-1.1	0.1	-0.6	3.2	1.5	IC
45	Fibreboard	-0.7	0.0	-0.0	1.0	0.3	NT
46	Paper Products nec	-0.4	0.0	0.0	1.6	1.2	IC
47	Newspapers & Books	-0.0	0.0	-0.2	2.1	1.9	IC
48	Commercial Printing	0.1	0.0	-0.1	1.6	1.6	NT
49	Chemical Fertilisers	-5.0	0.2	6.3	-0.5	1.0	ER
50	Industrial Chemicals	-1.1	-0.1	-1.7	3.9	1.0	IC
51	Paints, Varnishes	-0.2	0.0	-0.1	0.2	-0.1	NT
52	Pharmaceuticals	-1.6	0.1	1.0	2.7	2.2	IC
53	Soap and Detergent	0.3	0.0	-0.0	1.8	2.0	NT
54	Cosmetics, Toiletry	0.1	0.0	0.1	2.1	2.5	IC
55	Chemical Products nec	0.2	0.1	-2.0	4.0	2.4	IC
56	Oil & Coal Products	-0.9	0.0	0.4	1.8	1.4	IC
57	Glass	-0.9	-0.2	-0.4	0.4	-1.2	IC
58	Clay Products	1.3	-0.2	-0.8	1.0	1.3	NT
59	Cement	2.4	0.2	-1.7	2.2	3.1	NT
60	Ready-Mixed Concrete	0.9	0.1	0.5	1.4	2.8	NT
61	Concrete Products	1.9	0.1	0.1	1.4	3.5	NT
62	Non-Metal Mineral Products	-0.2	-0.1	-0.2	1.3	0.7	IC
63	Basic Iron & Steel	-11.0	-2.8	-6.3	-2.8	-23.0	E
64	Other Basic Metals	51.4	0.9	-14.0	-6.3	32.0	E
65	Structural Metal	0.6	-0.1	-0.1	0.9	1.4	NT
66	Sheet Metal Products	-0.4	0.0	0.6	0.6	0.8	NT
67	Metal Products nec	-0.5	-0.2	-0.9	0.3	-1.4	IC
68	Motor Vehicles, Parts	-2.3	0.2	-0.8	-10.0	-13.0	IC
69	Ship & Boat Building	-2.7	0.0	-2.5	9.4	4.2	NT
70	Locomotives	4.0	0.1	-4.5	2.7	2.3	NT
71	Aircraft Building	-0.4	0.1	-0.2	-0.3	-0.8	IC
72	Scientific Equipment	0.1	0.0	-0.4	0.2	-0.1	IC
73	Electronic Equipment	-0.9	0.1	-1.0	-3.7	-5.5	IC
74	Household Appliances	0.1	0.1	-0.1	0.8	0.8	IC
75	Electrical Machinery	0.4	0.0	-0.9	-2.2	-2.7	IC

continued ...

Table 2 continued ....

(a) Because the model's base year data indicates a small deficit in the balance of trade, the percentage change in exports exceeds the percentage change in imports to achieve a constant balance of trade.

(b) This category includes both hired agricultural labour and the labour inputs of owner-operators.

(c) This column contains wool, sheep, wheat, barley, other cereal grains, meat cattle, milk cattle, other farming import competing, poultry, meat products, milk products, fruit and vegetable products, food products n.e.c., tobacco and prepared fibres.

(d) This column contains all commodities not included in columns 1 - 3.

(e) Employment is assumed to be determined by labour demand : bottlenecks on the supply side are assumed not to exist.

price scenario. It should be emphasised that this partitioning of the world price scenario is valid only to the extent that prices for a particular group of commodities can be regarded as moving independently of the prices of commodities outside that group. In reality, all commodity prices are inter-related. (A change in the world price of oil, for example, would lead to a change in the world price of, say, iron ore.) Hence while the partitioning of the scenario is of some assistance in illustrating the mechanisms underlying the results, it is only a set of projections based on a complete scenario projection such as that shown in column 5 that is strictly relevant.

4.1 Macro, Employment, Industry and Commodity Output Projections

In rationalising the projections in each column, the crucial factor is the extent to which the exogenous world price changes constitute a terms of trade gain or loss to the Australian economy. Given the medium term macroeconomic assumptions of a constant balance of trade and exogenous

employment, any tendency for the world price changes to alter the net foreign exchange position of the economy must be eliminated by an adjustment of the domestic price level relative to world prices sufficient to bring about the required redirection of resources between the traded and non-traded sectors. This reconfiguration of the industrial structure of the economy in turn leads to changes in the occupational composition of the workforce. In fact, because both occupational wage relativities and domestic production techniques are assumed fixed, the changes in workforce composition can be directly attributed to changes in industry activity levels.

The projections of aggregate real absorption in Table 2 indicate that the world price scenario as a whole represents a terms of trade gain to the Australian economy (as do each of the component columns of the scenario). This permits increased domestic absorption at the constant balance of trade, and given the assumption of exogenous rates of return set in the world capital market, results in an increase in the economy's total capital stock. The improvement in the economy's terms of trade is reflected in an increase in the productivity of domestic labour which is translated into higher real wages. While the economy's domestic price level (as reflected in the model's consumer price index) increases relative to the general level of world prices in each column, the changing world price scenarios across columns ensure changing domestic cost/world price differentials for various commodities and hence differenc patterns of industrial structure and workforce composition. The discussion of these changes in industrial structure concentrates on broad categories of industries (see footnote (a) to Table 3) which respond in similar ways to the exogenous shocks rather than on individual industries. Furthermore, since the focus of this Workshop is on industrial structure rather than on workforce composition, the latter will be largely ignored in the discussion.

Table 3 : Projected Impact of the World Price Scenario on Industry and Commodity Outputs

(per cent)

Industry	1 Energy & Energy Related Products	2 Mainly Exports & Prospective Exports of Industrialising Asia	3 Selected Agricultural Products & Processed Foods	4 Mainly Machinery, Equipment, Appliances & Advanced Country Exports	5 Complete Scenario (b)	6 Category (a)
1 Pastoral Zone	-5.8	0.2	16.4	-1.2	9.7	E
2 Wheat/Sheep Zone	-6.5	0.2	4.1	-1.6	-3.7	E
3 High Rainfall Zone	-5.5	0.2	15.6	-2.1	8.1	E
4 Northern Beef	-11.0	0.4	22.2	-2.7	8.7	ER
5 Milk Cattle	-2.0	0.1	5.6	-0.4	3.2	ER
6 Other Farming Export	-7.2	0.3	-6.2	-1.9	-15.0	ER
7 Other Farming Import Competing	-1.6	0.1	1.6	0.2	0.3	NT
8 Poultry	-2.2	0.1	5.0	-0.6	2.4	ER
9 Services to Agriculture	-5.5	0.2	6.8	-1.4	0.1	ER
10 Forestry	7.0	-0.0	-2.5	1.8	6.2	NT
11 Fishing	-40.0	1.4	-17.0	98.7	43.0	E
12 Iron Ore	-47.0	0.6	-24.0	36.3	-34.0	E
13 Other Metallic Minerals	7.3	1.4	-21.0	12.1	-0.1	E
14 Coal	79.0	0.5	-13.0	-6.3	60.0	E
15 Crude Oil	-0.0	-0.0	-0.0	-0.0	-0.0	IC
16 Non-Metallic Minerals nec	-0.0	-0.0	-0.7	1.5	0.7	NT
17 Services to Mining	3.6	0.1	-1.7	2.2	4.2	ER
18 Meat Products	-6.9	0.2	15.8	-1.9	7.3	E
19 Milk Products	-0.1	0.0	0.1	0.1	0.2	NT
20 Fruit & Vegetable Products	0.0	0.0	0.2	0.6	0.9	NT
21 Marge, Oils & Fats	-1.6	-0.2	-1.4	1.2	-1.9	IC
22 Flour & Cereal Products	-1.0	0.0	0.3	0.4	-0.3	NT
23 Bread, Cakes	0.0	0.0	-0.0	0.3	0.3	NT
24 Confectionery	-0.1	0.0	-0.1	0.4	0.2	IC
25 Food Products nec	-15.0	0.6	-10.0	-5.0	-30.0	E
26 Soft Drinks, Cordials	0.2	0.0	0.1	0.8	1.1	NT
27 Beer and Malt	0.1	0.0	0.1	1.0	1.2	NT
28 Alcoholic Drinks nec	-0.6	0.0	-0.2	2.0	1.2	IC

continued ...