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DISCUSSION PAPERS

PAPERS ARISING FROM THE CONFERENCE: RECENT AUSRALIAN ECONOMIC GROWTH

THE ROLE OF RESOURCE DEVELOPMENT IN AUSTRALIA'S ECONOMIC GROWTH

Ben Smith

DISCUSSION PAPER NO. 167

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TABLE OF CONTENTS

SUMMARY

The paper reviews the growth of the minerals sector over the last twenty-five years, arguing that it has contributed significantly to Australia's economic performance, principally in offsetting a decline in the agricultural sector, and led to a substantial re-focusing of Australia's trade interests and concerns. It is probably the case that in the absence of the mineral expansions Australian growth would have been lower than that of similar countries. The paper emphasises the importance of efficient exploitation of the depletable resource base, arguing that policy has not been wholly conducive to this, and raises particular questions about policy influences on the rate of exploitation of crude oil resources.

After a long period of slow decline in its relative importance to the Australian economy, the mining industry accounted for only 1.5 per cent of total GDP in 1962/63. Minerals and metals provided less than 10 per cent of export revenue, out of an overall primary products' share of Australian exports of over 90 per cent.[1]

Some twenty years later, mining accounts for almost 5 per cent of GDP, with minerals and metals providing 40 per cent of Australian exports and more than half of total primary products exports. This rapid turn-around in the relative importance of the minerals sector has been associated with two "booms", the first occurring in the period 1963/64 to 1970/71 and the second in the period 1978/79 to 1981/82, approximately.

The first section of the paper outlines the developments of the first minerals boom, the "inter-boom" period, and the second minerals boom. Section 2 discusses aspects of the effects of minerals growth on the Australian economy, and Section 3 considers the nature of the market for Australian minerals exports and makes some observations about future export prospects. Issues which have specifically to do with the exhaustible nature of mineral and energy resources are addressed in Section 4. The final section provides an overview summary of issues which are important in evaluating the contribution of the minerals sector to the Australian economy, and offers some conclusions on that subject.

1. DEVELOPMENT OF THE MINERALS INDUSTRY

The First Minerals Boom

Although the first minerals boom has often been discussed as if it were the result of sudden, unanticipated discoveries of new minerals wealth, this is not an accurate characterisation. The resources on which the major part of the increase in mining production was based had been known

1. Throughout this paper, the term "mining" refers to extraction of mineral and energy raw materials (including crude oil) and the intermediate processing of those materials, while the term "mineral raw materials" is used to refer to the output of these activities. The term "metals" refers to primary metal and does not include fabricated metal products. The term "minerals", used alone, should be interpreted to include both mineral raw materials and metals.

about for a number of years, even if they had not been very precisely delineated. Before the early 1960s, however, there was no market into which the potential minerals production could profitably be sold. The low costs of extracting mineral raw materials in Australia were more than offset by the high costs of transporting the low-valued output to the distant Atlantic market.[2] In 1960, almost all of Australia's mineral exports were in the form of refined metals, for which transport cost considerations were relatively less important. Copper, lead and zinc (virtually all exported as primary metal) provided 80 per cent of mineral export revenue. The major non-refined exports were titanium dioxide and zircon, produced from mineral sands and with a high value relative to bulk.

The principal cause of growth in the Australian minerals sector after the early 1960s was the emergence of a rapidly growing market for industrial raw materials, and particularly for steel-making raw materials, in Japan. While it is true that some major discoveries of genuinely new mineral resources were made, the bulk of the growth in output did not come from these sources and, in any event, the main stimulus to increased exploration effort was itself the emergence of a market for minerals which might be produced from potential discoveries.

In effect, the first minerals boom was the result of a sharp improvement in the terms of trade for minerals exports within the Western Pacific region. The transport cost resistances which had inhibited the development of Australian minerals for export to the Atlantic market provided a strong advantage to Australian exporters in exploiting the growing regional market for mineral raw materials. Attainable f.o.b. export prices for raw materials like coal, iron ore, and bauxite were effectively doubled, trebled, or quadrupled.

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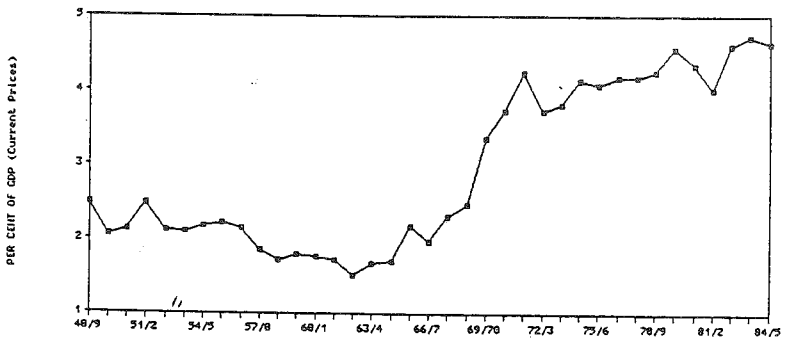
2. An additional restraining factor was the existence of embargoes on the export of iron ore and manganese until 1960. Once a market could be found for these commodities and large reserves had been clearly delineated, the embargoes were lifted quickly. It is doubtful that the embargoes by themselves had as much of a deterrent effect on exploration activity as has sometimes been argued (for example, by Blainey, 1968), or that their removal was the stimulus which resulted in the delineation of large "new" deposits.

This improvement in Australia's terms of trade was not associated with any change in the world prices of mineral commodities, but was simply a function of Australia's now fortunate location.

For most purposes, the characterisation of the first minerals boom as the result of a substantial terms of trade improvement, rather than of large new mineral discoveries, is important only as a matter of factual accuracy. The consequences of the boom, and the nature of the adjustments to the Australian economy which might be required, are independent of which of these two stories one wants to tell about the cause of the boom. However, it is important to note the possibility that Australia's export performance in the minerals area, and particularly in the case of mineral raw materials, can have as much to do with the structure and rate of growth of the regional market for these products as it does with factors influencing global demand and supply levels. The paper returns to this issue in Section 3.

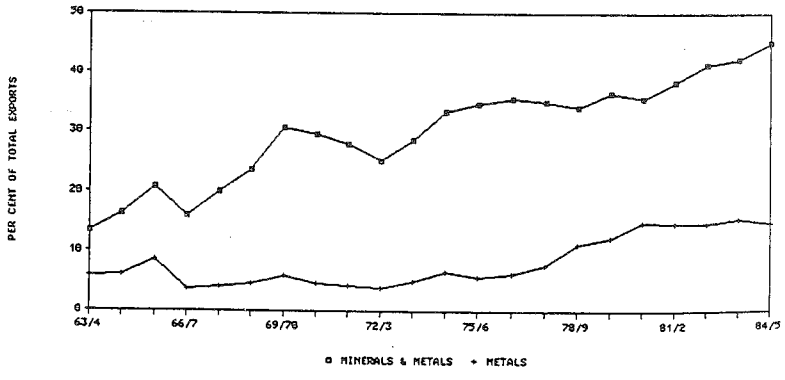
Figure 1: Share of Mining in Gross Domestic Product; 1948/49 to 1984/85.



As is shown in Figure 1, the share of mining in Australia's GDP grew very rapidly between 1963/64 and 1970/71, to reach a level not substantially lower than that which the sector holds currently. Figure 2 shows the

corresponding increase in the export share of mineral and metal commodities. In real values, minerals exports grew at more than 20 per cent per annum for a period of almost ten years. It can be seen from Figure 2 that this expansion was more or less exclusively confined to mineral raw materials, with the share of metals in total exports declining slightly over the period. In fact, the export growth was even more narrowly based than this. More than half of the value of minerals raw materials exported in 1970/71 was made up by coking coal and iron ore, and 80-90 per cent of those exports were directed to the Japanese steel industry. Not only was rapid Japanese economic growth the stimulus to Australia's first minerals boom, but the expansion of the Japanese steel industry alone accounted for a large proportion of the additional demand for Australian minerals.[3]

Figure 2: Shares of Minerals and Metals in Australia's Exports; 1963/64 to 1984/85

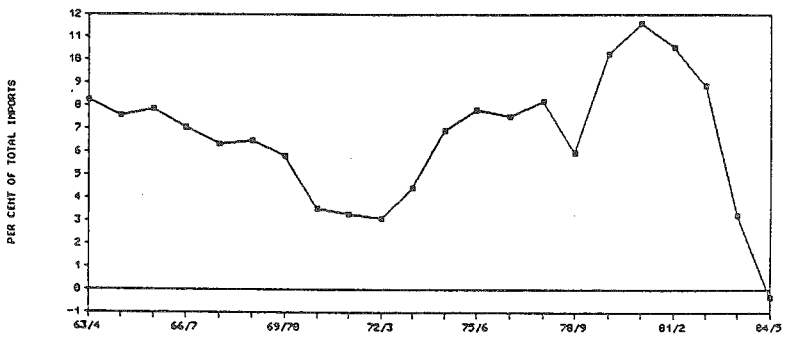


At the same time that the rapid expansion of mineral exports was occurring, Australia had its first major oil discovery in Bass Strait. The new oil production came fully on stream towards the end of the period of rapid minerals

3 Two other major "new" mineral exports, nickel and manganese, were also mainly consumed by the Japanese steel industry in this period.

export growth. Although generally not thought of as part of the minerals boom, the impact of increased oil production on Australia's import demands was proportionately as large as that of coal developments on export receipts. As Figure 3 shows, the share of net oil imports in total imports fell from around 8 per cent in 1963/64 to around 3 per cent in 1970/71. For comparison, in the latter year coal contributed 4.75 per cent of total export revenue.

Figure 3: Share of Net Oil Imports in Total Australian Imports; 1963/64 to 1984/85



Figures 4 and 5 show annual levels of capital investment in mining and in mining plus metals, respectively, as a proportion of GDP. The sequential development of a number of large mining projects during the 1960s led to a sustained, and increasing, high level of mining investment which continued from mid-1965 through to the end of 1971. Over the same period the metals sector went through two smaller investment booms, the first of which peaked in 1965/66 and the second of which peaked coincidentally with mining investment. The combined effect was a massive minerals investment boom which lasted more than six years and which became stronger as it continued.

Figure 4: Investment in Mining as a Proportion of Gross Domestic Product; 1963/64 to 1984/85

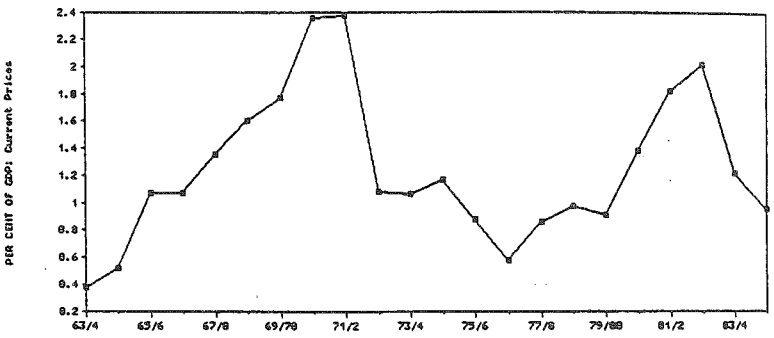
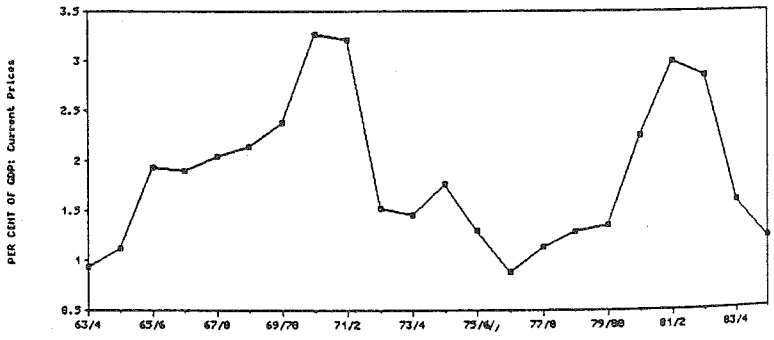


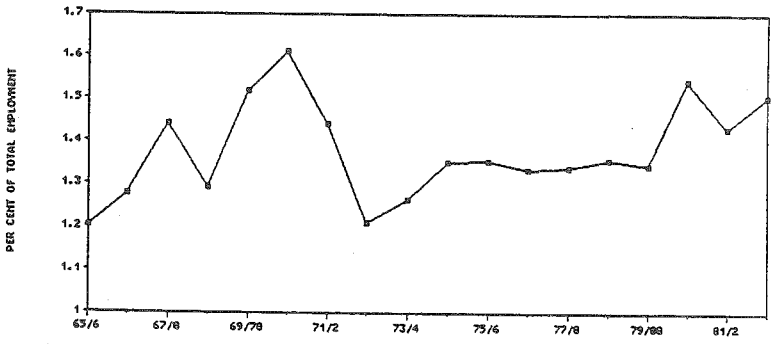
Figure 5: Investment in Mining plus Metals as a Proportion of GDP; 1963/64 to 1984/85



The pattern of investment in the mining industry was matched quite closely by the pattern of direct employment, as Figure 6 shows. During the period of rapid minerals development there was a strong growth in direct employment in the mining industry but, although minerals production and

exports continued to expand through the 1970s, direct employment in the industry fell sharply after 1970/71 when the high investment phase ended.

Figure 6: Direct Mining Industry Employment as a Proportion of Total Employment



A large proportion of the new minerals capacity was financed by direct foreign investment and overseas borrowing. Even if that had not been the case, it is clear that a sustained investment expansion of this magnitude in one sector would have driven other Australian borrowers into overseas markets and resulted in a heavy net capital inflow. By the beginning of the 1970s, the combined effects of increasing mineral export revenues and the continuing strong capital inflow had generated a large balance of payments surplus.

The "Inter-Boom" Period

During the period 1972-1974, the share of minerals and metals in total exports was lower than that reached in 1970/71. This was largely a consequence of the increased value of agricultural exports during the commodity boom of that period and of a lagged adjustment of major mineral export prices to increased world prices because of the contractual arrangements under which minerals were sold.

By 1975, the minerals trade had moved towards more flexible pricing arrangements, and coal prices in particular rose sharply to align with the higher international prices established in the wake of the increase in the world oil price. To a growing extent bauxite was being exported as the much higher valued alumina, while nickel exports were being steadily upgraded from basic ores and concentrates. These changes, combined with a continued expansion in the volume of mineral exports, returned the share of minerals and metals in total exports to the level reached in the early 1970s and placed the industry's export share on a slight growth path. Direct mining industry employment also recovered to a stable 1.35 per cent share of total employment.

The 70 per cent level of oil self-sufficiency established in the early 1970s meant that Australia's trade position was relatively unaffected by the sharp increase in world oil prices of 1973/74. As can be seen from Figure 3, the effect of the quadrupling of the world oil price was simply to return the share of net oil imports in total imports to the sort of level it had been running at in 1963/64.

By 1977 the impetus had gone out of Australia's earlier minerals expansion. The international demand for mineral commodities had weakened considerably and real prices obtained for major export commodities had started to decline.

The Second Minerals Boom

Further minerals expansion was anticipated to lie in the exploitation of Australia's relatively abundant energy raw materials, both through the direct export of these commodities and through the use of low cost energy to expand Australian production and export of energy-intensive commodities. The North-West Shelf LNG project was expected to earn large export revenues by the early 1980s, and a huge expansion of steam coal exports was forecast. The reduced competitiveness of many countries, but particularly of Japan, in the smelting of aluminium was seen as providing Australia with the opportunity for large-scale expansion in that industry, with a similar pattern potentially developing for other mineral processing activities.

Mining investment started to increase during 1977/78, with a sharp jump in the level of investment taking place during 1981/82. Metals investment also increased sharply during 1979/80 and 1980/81, due mainly to the construction of a number of new aluminium smelters. The second minerals investment boom peaked in 1981/82 and 1982/83, as shown in Figure 5. The boom was of substantially shorter duration than that associated with the earlier minerals expansion, although the share of GDP devoted to minerals investment at the peak was not very much smaller.

The important difference between the two cases was that, while the first minerals boom had been underpinned by a strong real growth in demand for Australian minerals products, associated mainly with the real income growth in Japan, the second boom was predicated heavily on substitution effects and structural changes expected to flow from high energy prices. The boom was given considerable added impetus by the sharp increases in the world oil price of 1978/79. In the event, however, a deepening of the international recession led to weaker general demand conditions than had been anticipated and this, combined with the high oil price level, resulted in a much slower growth in energy demand than had been forecast. At the same time, there had been large expansions of production capacity, particularly of coal, in other countries expecting to reap benefits from the "energy boom". Much of the anticipated increase in demand for steaming coal and LNG had been to meet the requirements of planned new electric power developments, the construction of which was postponed.

The result was that the investment boom was not, in this case, followed by the same rapid increase in exports that had accompanied the earlier minerals investment boom. The bringing of new projects on stream was substantially delayed and the large additional capacity which was installed is still gradually being brought into production. Exports of steaming coal, which have recently been expanding at a steady rate, are being sold at substantially lower prices than was anticipated. Nevertheless, the period since 1980 has seen a steady increase in the share of minerals and metals in

Australia's exports and direct employment in the industry has increased. Since 1984/85, the minerals export growth has been reinforced by the emergence of substantial crude oil exports at a level more or less equal in value to iron ore exports. As Figure 3 shows, the initial impact of the jump in the world oil price in 1978/79 was to increase the share of net oil imports in total imports. However, the subsequent sharp fall in oil demand, has led to the development of a net export surplus in the last two years.

2. THE IMPACT OF MINERALS GROWTH

The major discussion among economists about the impact of the large expansion of the minerals sector which has taken place over the last twenty five years, and more particularly of the sharp growth in mineral exports in the late 1960s and early 1970s, has focussed around what became known as the "Gregory Thesis".

Gregory (1976) employed a model in which it was assumed for simplicity that the minerals developments occurred in consequence of unanticipated new discoveries and that these discoveries could be exploited without any need to transfer labour or capital resources from other activities. The exporting of these "free" minerals provided an addition to Australian income not analytically different from that which would be provided if, for example, the United States were to decide to give Australia untied aid of the same foreign currency value on a continuing basis.[4] The simplified analytics of Gregory's story would then run as follows. So long as the income elasticity of demand for non-traded goods is greater than zero, the Australian populace will want to devote part of its additional income to the purchase of non-traded goods and will not want to devote all of its additional income to the purchase of traded goods. This will lead to an excess demand for non-traded goods and an excess supply of (the wherewithal to acquire) traded goods. In order to remove this disequilibrium, an increase in the price

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4 This equivalence holds so long as it is assumed that Australia is a small country. Otherwise it will make some difference (via the terms of trade) whether the additional income accrues in the form of "free" exports or "free" imports.

of non-tradables, relative to tradables, will be required. This change in the "real exchange rate" will provide incentives for consumers to substitute traded for non-traded goods and for resources to be reallocated from traded goods production towards non-traded goods production.

There are two main ways in which the necessary real exchange rate adjustment could be effected. First, if the exchange rate were allowed to float freely, the lack of desire to spend all of the additional income on traded goods would lead to an excess supply of foreign currency and a fall in the value of that currency. Given the assumption that the Australian price of tradables is equal to the world price times the exchange rate, this would reduce the price of tradables in Australia. Alternatively, if the exchange rate were fixed, and the central bank were unwilling (or unable) to sterilise the monetary effects of the payments surplus which emerged, the monetary expansion caused by the central bank's intervention in the foreign exchange market would lead to an inflationary increase in Australian non-traded goods prices.

It was not difficult to point to both of these things having happened in Australia. The exchange rate was not allowed to change initially (in fact, it was moved in the wrong direction at the time of the currency realignments of the Smithsonian Agreement of late 1971). Monetary expansion was allowed to take place at an historically high rate in 1969/70 and 1970/71 and then, after a brief period of restraint, money supply growth increased rapidly in 1972. Subsequently, the nominal exchange rate was appreciated in 1972/73 and again in 1973/74. It seemed a fair story to tell that Australia had adjusted to the rapid mineral export growth with a combination of inflation, nominal exchange rate change and, later, with an across-the-board tariff cut of 25 per cent. An important component of Gregory's story was that the tariff cut effect was relatively small beer by comparison with the quantitative impacts of the inflationary and exchange rate adjustments on other traded goods industries.

It was clear that the simple Gregory analysis needed to be qualified, but the qualifications were principally

concerned with the size and distribution of the impact rather than with its nature or direction.[5]

A more fundamental questioning of the Gregory analysis has revolved around measurement of the real exchange rate movements themselves, in an attempt to ascertain whether any permanent change in the real exchange rate did, in fact, follow the structural shift towards an enlarged minerals sector. Here there is a major difficulty in that there do not exist price indexes which measure exactly the prices which Gregory's model demands. The most common procedures are to adjust movements in the nominal exchange rate for changes in both domestic and foreign price levels, usually differences in the movements of the Consumer Price Indexes (CPI), where the exchange rate adjusted for foreign price changes is supposed to reflect changes in the prices of tradables. Pitchford (1976) has suggested that traded goods prices can be measured more directly by taking a weighted average of the export price index and the implicit GDP deflator for imports.[6] He takes the ratio of the Australian CPI to this traded goods price index as a proxy for the real exchange rate. Shann (1986) has suggested an even more direct means of measuring the prices of tradables and non-tradables. His procedure is to calculate the implicit GDP deflator for manufacturing, mining, and agriculture combined, treating this as an index of traded goods prices; and to use the implicit GDP deflator for the remainder of Australian economic activity as an index of the price of non-tradables.

The Shann measure cannot be estimated with reasonable comparability for periods earlier than 1962/63. In Figure 7 a modified version of the Pitchford measure [P] is presented, spanning the period 1948/49 to 1985/86.[7] It can be seen that

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5 See, for example, the analyses of Snape (1977), Smith (1978), and Cook and Sieper (1984).

6 These indexes receive equal weights in the Pitchford measure.

7 The precise definition of this measure is given in the Appendix. It may be noted, however, that the measure gives the same direction of movement in the real exchange rate as does the Pitchford measure, but that this version tends to make the fluctuations somewhat sharper because it attempts to remove the dampening effect of including traded goods prices in both the denominator and the numerator.

the real exchange rate, as measured in Figure 7, has undergone a trend increase throughout the post-war period, as is argued by Shann to be the common experience of all developed countries. This change in relative prices is consistent with the trend decline in the share of traded commodities in total production which has also occurred. The question whether or not a permanent increase or decrease in the real exchange rate takes place, then, needs to be thought of as whether or not there is evidence of a permanent shift in the trend line. In Figure 7, the effect of the Korean War Boom on the prices of traded goods dominated the domestic inflation which occurred at that time, so that a temporary real exchange rate depreciation occurred at the beginning of the 1950s. The period of the first minerals boom was characterised by a relative appreciation of the real exchange rate, until 1973/74 when the real exchange rate started to decline again. By 1979/80, the real exchange rate was below the level of 1969/70 and it has not subsequently regained the apparent trend value.

Figure 7: Real Exchange Rate [Modified Pitchford Measure]; 1948/49 to 1985/86

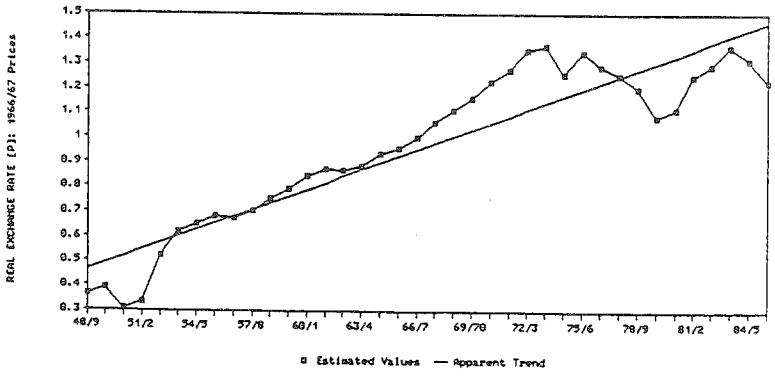


Figure 8 shows the modified Pitchford measure [P] and the Shann measure [S], both set to the base year 1966/67. It is evident that the two measures do not correspond at all

Figure 8: Real Exchange Rate [Modified Pitchford and Shann Measures]; 1962/63 to 1984/85

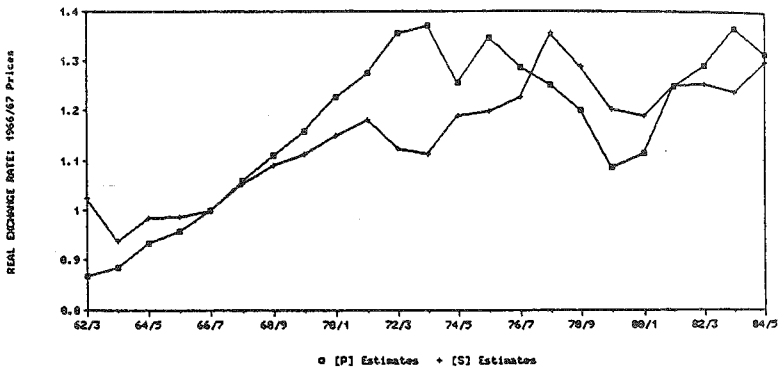
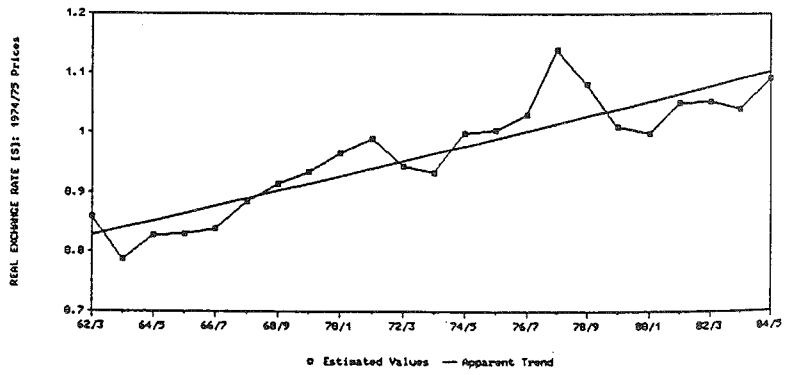


Figure 9: Real Exchange Rate [Shann Measure at 1974/75 Prices]; 1962/63 to 1984/85



closely. In particular, as Shann himself has noted, his measure shows a real exchange rate depreciation in the period 1972/73 to 1973/74 when the other measure is showing its strongest appreciation. It is not clear which of these two measures is to be preferred. The essential difference between

them is that the Shann measure compares an index of the prices of non-traded goods with an index of the prices of traded goods produced in Australia, while the modified Pitchford measure compares an index of the prices of non-traded goods with an index of the prices of traded goods entering or leaving Australia. One can think of reasons for objecting to either measure, and space does not permit any fuller discussion of the issue in this paper.

More important, neither measure reveals any permanent shift in the apparent trend path of the real exchange rate associated with the first, and much more substantial, minerals boom. Shann's (1982,1986) argument is that the thrust of the Gregory model, which assumes a fully employed economy operating at its production frontier, is essentially misconceived. Rather than being reflected in changes in the real exchange rate, he argues that adjustment to favourable or unfavourable international economic circumstances characteristically takes the form of an increasing or slowing-down in the rate of economic growth. That is, when circumstances require a relative increase in the output of non-traded goods, spare capacity in the form of unemployed resources or potential technological improvement can be drawn upon without requiring any relative price change. In the reverse circumstances, reduced demand for non-traded goods is likely to result in the displacement of resources into unemployment. While this could account for the failure of a minerals boom to result in any increase in the real exchange rate, if the economy did not run into a capacity constraint, it is difficult to see how it would explain a purely temporary increase in the real exchange rate.

An alternative story might be advanced as follows. Since the late 1950s, the share of agriculture in Australia's GDP has declined from around 15 per cent to less than 5 per cent. Since the early 1960s, the share of agricultural products in total exports has declined from almost 80 per cent to just over 30 per cent. These changes, which are depicted in Figures 10 and 11, are of as large, or larger, magnitude than the changes in minerals industry activity which have been described. It should be noted that the share of

manufacturing in GDP, which was increasing in the early 1950s, has been falling almost continuously since the late 1950s, so that the sharp decline in the agricultural sector has not reflected any shift towards manufacturing.

Figure 10: Shares of Mining, Manufacturing and Agriculture in GDP; 1948/49 to 1984/85

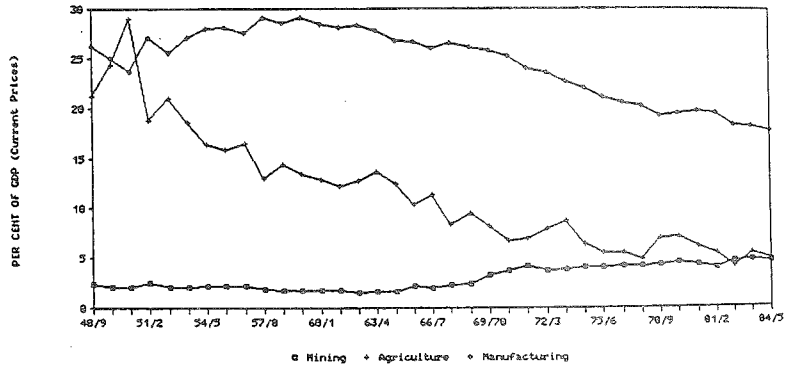
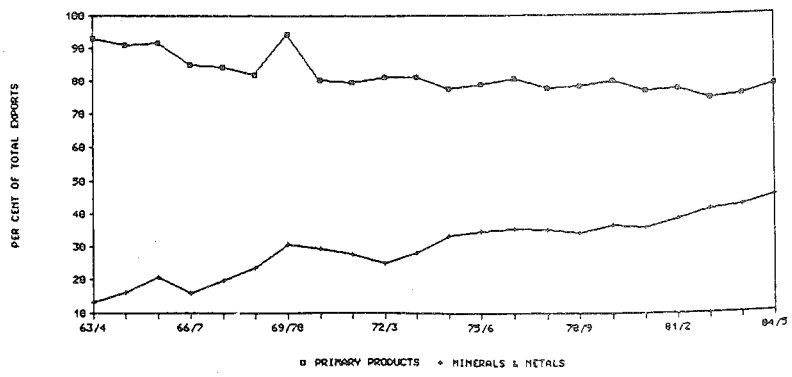


Figure 11: Shares of Total Primary Products and Minerals and Metals in Total Exports; 1963/4 to 1984/5



While it seems certain that some decline in the fortunes of the agricultural sector could have been accomodated without any departure from a stable trend increase in the real exchange rate, it is not at all obvious that changes of the magnitude described could have been so accomodated. Indeed, the literature of the 1950s (see, for example, Lundberg and Hill, 1956) was full of pessimism about the Australian balance of payments outlook, interpretable as suggesting an insufficient rate of growth of traded goods production relative to the growth of the non-traded goods sector. It seems perfectly plausible to argue that, but for the minerals sector developments, Australia would have needed a substantial, permanent real exchange rate depreciation relative to the trend shown in Figure 7.

On that story, there is no reason to expect that the minerals boom should have led to a permanent real exchange rate appreciation. Rather, its long-run effect would have been to prevent, or moderate, the real exchange rate depreciation which otherwise would have been necessary. However, during the period of most rapid minerals growth, 1963/64 to 1970/71, mineral exports would have been expanding much faster than necessary to offset any concurrent decline in the agricultural sector, especially since agricultural exports underwent a minor boom in 1969/70. Thus, one would expect some temporary real exchange rate appreciation to have taken place during that period and in the immediately following years. That is what the modified Pitchford measure of the real exchange rate shows in Figure 7 and, indeed, a trend line fitted to the Shann measure (Figure 9) shows the real exchange rate above trend for the whole of the period 1968/69 to 1978/79, with the slight exception of 1972/73 and the rather more abberrent case of 1973/74.

Given this story, Gregory can be argued to have been essentially correct. His analysis, conducted on *ceteris paribus* assumptions was concerned with the effect of the minerals boom relative to what otherwise might have occurred. Otherwise, according to the above, would have been a real

exchange rate depreciation which would have slowed down the decline of the agricultural sector and provided some greater degree of encouragement to the manufacturing sector.

Boom and Bust

While the first minerals boom provided an immediate, large increase in mineral exports, as indicated earlier the second mineral investment boom was substantially less successful. One of the implications of this was that it had a significantly more destabilising effect on the economy than need have accompanied the first boom, had it had been managed more efficaciously.

The problem with the management of the first minerals boom was that it was allowed to spill over into the beginnings of Australia's rapid inflation of the mid-1970s. Appropriate exchange rate adjustment in 1970 or even 1969 would have dampened the boom and avoided some of the problems which were caused for more marginal investments by the subsequent exchange rate and inflationary adjustments, and it would have allowed Australia potentially to avoid the later inflation and the subsequent costs of reducing inflation.[8] Whether that potential gain would have been realised is, of course, a matter for speculation. In the event, the Country Party resistance to exchange rate appreciation because of the adverse effects on farmers, coupled with a willingness to let the money supply blow out in the lead-up to the 1972 election, determined the outcome.

The second minerals boom took place in a period of greater exchange rate flexibility and the Trade Weighted Index value of the $A appreciated from 84 to 94 during 1980/81, dropping back to the former level over the next twelve months. In that case, the exchange rate change turned out to be very temporary, as the high rate of minerals export growth failed to materialise and Australia's external economic situation continued to deteriorate. With perfect foresight Australia could perhaps have done without the exchange rate appreciation at that time, but with perfect

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8 See Garnaut (1979) for a discussion of the relationship between Australia's inflation experience and the management of the first minerals boom and the later commodities boom.

foresight the capital inflow which brought about the exchange rate change would have been very much more limited.

The perception of the minerals industry as being necessarily associated with periods of boom followed by sharp downturns does not accurately reflect the degree of volatility in prices and quantities traded of Australia's major minerals exports. In general, the minerals trade is less subject to revenue volatility than is the trade in agricultural commodities, and the effective displacement of agricultural exports by minerals exports has probably tended to stabilise export receipts. On the other hand, minerals projects are extremely capital intensive, so that the simultaneous development of a number of large new projects has the potential to generate a substantial investment boom and capital account surplus. As Corden (1981) has noted, the initial capital inflow can be expected to generate an exchange rate change which the subsequent increase in exports will be required to validate. Where that does not occur, the result will be some degree of instability in the exchange rate and the level of economic activity. The problem was exacerbated in the late 1970s and early 1980s by the fact that a number of different sorts of projects were bunched together, all based on the common perception that Australia was on the verge of an "energy boom".

In general, however, there seems to be no reason to suppose that the experience of the second minerals boom will be a frequent phenomenon, or for that matter that there will be a recurrence of the sustained massive expansion of the first minerals boom. The more likely circumstance is that minerals development will in future be spread more evenly over time and that, although variations in market conditions will lead to some bunching of projects, there will rarely be a bunching of the sorts experienced in the 1960s and 1970s.

One qualification to this view is that a contributor to the boom and bust character of the second minerals boom was the apparent tendency of coal producers, in particular, to accept extremely optimistic forecasts of demand and to commit investments to the generation of capacity to meet that expected demand. That tendency is partly endemic in the way

Australian governments allocate mineral exploration and production licences to the people who appear most ready to spend large capital sums, and it is encouraged by the structure of the market into which Australian coal has been sold. Both of these issues are returned to later in the paper.

3. THE MARKET FOR AUSTRALIAN MINERALS AND FUTURE PROSPECTS

As indicated earlier, the principal cause of the first minerals boom was the rapid growth in Japanese raw materials demand. In the earlier post-war period Japanese demand for wool, in particular, had already led to a significant increase in the importance of Japan as a market for Australian exports. In 1962/63, 15 per cent of Australia's exports were directed to Japan. By 1975/76 Japan was taking over one-third of Australia's exports and more than half of all mineral exports. The importance of Japan as a market has declined slightly as the industrialisation of other Asian countries has increased their demands for mineral and energy commodities, but Japan remains by far the most important market for Australian minerals products.

Not only is the Australian minerals industry heavily dependent on export markets which are highly concentrated geographically,[9] but those exports are also heavily concentrated on a few major commodities. In 1984/85 coal, iron ore, bauxite/alumina/aluminium, and oil and gas accounted for more than 75 per cent of Australia's mineral exports (i.e. more than 30 per cent of all exports). In fact, the aggregate share of all other minerals and metals in Australia's exports was smaller in that year than it was in 1963/64, having been roughly constant on average over the twenty year period.

The future prospects for minerals exports therefore depend heavily on the fortunes of a relatively small group of commodities and those, in turn, depend on the nature of the

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9 See Smith (1978) for details of the degree of trade dependence and pattern of trade of Australian minerals.

adjustments which will take place in the industrial structures of Japan and other Asian industrialising countries.

It is evident that the pattern of comparative advantage in minerals processing, and in heavy industry generally is shifting away from Japan. That has been seen clearly in the case of aluminium, where rationalisation of the Japanese industry has provided an important opportunity for expansion of Australian smelting capacity. In the longer term, it can be expected that Japan's competitiveness as a producer of steel will also continue to diminish, so that the rate of growth of Japanese demand for steel-making raw materials will be relatively slow (if not negative) in future. The nature of any rearrangement in competitiveness in the international steel industry is of crucial importance for Australia. Iron ore and coking coal still provide around 40 per cent of Australia's total minerals exports. A shift in steel-making competitiveness outside the Western Pacific region would substantially reduce Australia's own competitiveness as a supplier of these minerals.

The prospects for continued expansion of steam coal exports look rather more certain, especially when the oil market firms up in the 1990s. On the other hand, Australia has relatively short-lived oil reserves, so that the present significant contribution of oil to export revenues and, indeed, the much larger contribution to import-replacement are unlikely to be sustainable in the long-term.

In general, Australia needs to be looking for a greater diversification of mineral export commodities and markets, with a focus on establishing larger markets for processed minerals across the board. The conventional wisdom has become suspicious of this proposition, pointing to the considerable substitution away from metals in advanced industrial countries and anticipating a permanently weak metals market. On that view, Australia needs to look towards diversification away from minerals and metals altogether, and to encourage the development of export-oriented manufacturing industry of the more technologically advanced variety.

That seems to be an incorrect view of the prospects. While the growth in metals demands in the industrialised countries may indeed be slow, the major markets on which Australia should be focussing are the industrialising countries of Asia, and especially China. Potentially, there will be a rapid expansion of raw materials demand in these countries over the next two decades, at a level where the more technologically sophisticated substitutes will be less competitive.[10] As in the 1960s, the terms of trade for Australian producers of mineral products may move somewhat differently from those facing producers in the Atlantic area, and Australia may be one of the last countries for whom it makes economic sense to turn away from minerals and minerals processing activity.

4. THE MANAGEMENT OF AUSTRALIA'S RESOURCE STOCKS

To this point the paper has been concerned with issues which have not had much to do with the distinguishing feature of the resource stocks upon which the minerals industry is based. That central characteristic, of course, is that the resource stocks are depleted by use, so that the industry is necessarily in the business of destroying a capital asset.

The economic significance of this is that there arises an important question as to the optimal time at which to explore for or to extract particular minerals, since any individual instance of these activities can only be conducted once. From the viewpoint of considering Australia's future economic performance, the issue is whether depletion of resource stocks will lead to a reduced resource base and diminished future economic opportunities.

The rule spelled out initially by Hotelling (1930) for the optimal exploitation of exhaustible resource stocks is as follows. Exploration or extraction activities should be conducted up to the point at which the (risk-adjusted, expected) rate of return to be earned from not conducting those activities is equal to the rate of return obtainable

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10 For a review of likely trade prospects for Australia and their relationship to growth patterns in the industrialising countries of the Asian-Pacific region see Anderson, Drysdale, Findlay, Phillips, Smith and Tyers (1985).

from other assets in the economy. Conserving resources for future exploitation is not in principle different from any other kind of investment which may be undertaken to increase future productivity, and the Hotelling rule simply argues for the most efficient allocation of total investment between the various forms which that investment can take. Given this, there need be no particular concern about the rate at which resources are depleted, although such concern might arise as part of a general concern about the level of investment in the economy as a whole.[11]

In an economy in which mineral rights are vested in private individuals who seek to maximise the value of their resource wealth, it is reasonable to suppose that the Hotelling rule will approximately be adhered to. In Australia, however, mineral rights are the property of the States or the Commonwealth, and private companies acquire rights to explore for or mine those resources under licences and agreements which influence the way in which they choose to exploit the resources.

As a broad generalisation, exploitation rights over resources accrue to those who first discover them or who are prepared to develop them first, and provide only limited opportunities for companies to maintain tenure without engaging in significant development work. In the cases of most minerals there are no restrictions which serve to delay the time at which exploration or extraction activity may be commenced,[12] so that companies can apply for exploration permits or mining licences as soon as they feel that it is likely to be worthwhile to do so. By itself, a "first-come, first-served" allocation mechanism of this sort would be expected to cause exploration and development to be conducted earlier, and to involve larger investments, than is

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11 That is, a view that the private sector generally employs a discount rate which is greater than that which society would want to employ, would suggest under-investment across the board, including in the conservation of exhaustible resource deposits.

12 The obvious exceptions to this are where environmental restrictions apply and where Aboriginal communities hold mineral rights.

consistent with the maximisation of resource wealth.[13] In cases where new information or unanticipated market shifts suddenly make particular areas attractive to companies, so that there emerge competing claims for the rights to explore or to mine, the procedure of allocating those rights to the companies which are prepared to spend the largest amounts on exploration or development efforts (Work Program Bidding) has the capacity to ensure that any expected net value of those activities is dissipated in excessive capital expenditures (Willett, 1985).

On the other hand, the fact that distorting taxes, in the form of royalties, excess rail freight charges, and levies, are imposed on production acts as a deterrent to exploration and development activity at the margin. The balance between the encouraging effects of the "first-come, first-served" allocation mechanisms and the discouraging effects of distorting taxes may be to generate greater, or smaller, levels of current investment in exploration and development than is consistent with the maximisation of resource wealth.

For the major mineral commodities produced in Australia, the disincentive effects of the distorting taxes almost certainly outweigh the incentive effects of the lease allocation mechanisms. This is because those minerals are resources whose stocks, in Australia and globally, are large and are expected to be long-lived. Consequently, the resources do not have any significant long-term scarcity value which may be dissipated by premature exploitation. Rather, for limited periods during which they are in particularly strong demand as a result of changes in market structure, Australian resource deposits acquire a value in excess of their long-run scarcity value. For these minerals, the problem is not so much to exploit them optimally along some long-term, smoothly-adjusting price path but, rather, to be able to bring them into production at those times when it is possible to take the greatest advantage of temporary "windows" into the market.

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13 For a fuller discussion of this issue see Fane and Smith (1986).

During the first minerals boom, the rate of growth in demand for the main Australian minerals was large relative to the capacity to increase supply. New projects were developed under long-term contract arrangements with the purchasers which ensured that the additional supplies were taken up as soon as they were able to be delivered. In the second minerals boom, expansion of steaming coal supply capacity was a much more "arm's length" business, with considerable investments in development being required before supplies could be offered for contract sales. The fact that tenure over coal deposits can generally only be acquired or retained by companies prepared to invest in the development of those resources (if such development is commercially feasible), provided a further impetus to undertake capital expenditures in order to secure the rights over potentially valuable resources. These conditions tended naturally to contribute to over-investment in mine development, and therefore to a reduction in the net present value of the coal resources, independently of the fact that the growth in coal demand turned out to be slower than even the more moderate estimates had suggested.

Put simply, the first minerals boom hit Australia so rapidly that it was not possible to dissipate the rent values of the resources being exploited by premature and excessive investments. The second minerals boom would have needed to match the most optimistic of demand forecasts to have had the same result.

Exploitation of Crude Oil Resources

In the case of crude oil, concerns about the rate of exploitation deserve more specific attention. The market for oil is substantially more global in character than that for other minerals, and it is clear that the total world stock of the resource has a relatively short life at current consumption rates. Thus, there is a serious question whether it is sensible to maintain the existing rate of oil production in Australia, or whether some greater degree of conservation of the oil resource would be preferable. As Fane and Smith (1986) have documented, the incentive structures arising from the terms and conditions attaching to (offshore)

oil exploration and production licences have been strongly biased in favour of more rapid exploration and production than a private resource owner might have chosen. On the other hand, the imposition of a crude oil excise levy (if anticipated at the time of exploration) imposes the opposite bias.

The balance of these effects has changed over time. In the 1960s there was no suggestion of any significant special tax on oil production, and oil exploration was explicitly subsidised. In order to allow Australian oil to compete with imports, the crude oil allocation scheme for refineries was introduced in the early 1970s. Under this arrangement each refinery was obliged to take a certain proportion of its supplies from Australian sources at a price greater than the import price. Clearly, the incentives at this time were for greater exploration and production of oil than private resource owners would have chosen and this was explicit in the policies adopted, reflecting the sort of balance of payments preoccupation described earlier. After the first oil "shock", the pricing and allocation arrangements for domestic crudes already in production remained unchanged, with the result that the price of oil to Australian consumers was kept well below the world price. The producer price for "new" oil was set equal to the import price, so that the effect on exploration of the artificially low consumer price was probably not large. In 1978, the government moved to Import Parity Pricing (IPP) for all oil produced in Australia, but simultaneously introduced a crude oil levy for "old" oil which effectively kept the price to producers unchanged. No levy was imposed on "new" oil production. In 1984, the crude oil levy was extended, at a lower rate, to "new" oil and a Resource Rent Tax (RRT) was announced to apply to oil from any resources which might be brought into production in future.

So far as exploration is concerned, there has been no time at which oil from new discoveries (except possibly those closely associated with existing fields) has not been promised to be saleable at the full world price without, until the introduction of RRT, any special tax being applied.

The distorting effects of taxes on exploration activity, then, need to be thought about in terms of the expectations of explorers as to what tax regime they would actually face if successful. Once discoveries were made, however, the conditions under which companies were able to maintain title to resources have been such as to ensure that production took place as soon as possible and at as rapid a rate as was consistent with technically efficient management of the resources. There is some reasonable presumption that the policy approach to oil exploration and production has provided incentives for greater investments in exploration and for more rapid extraction than might have been consistent with maximisation of the value of the resources.

The policy statements of successive governments have emphasised the desirability of maintaining a high degree of oil self-sufficiency. Although there have not since the 1960s been explicit policies to stimulate oil exploration, the general attitude has been one consistent with the maintenance of an exploration and production regime whose test is whether investments are "commercially viable" rather than whether they are likely to lead to the maximisation of resource wealth.

The question whether increased oil self-sufficiency is an objective which ought to be promoted by policy has been discussed by a number of authors (Folie and Ulph, 1979; Gruen and Hillman, 1980; NEAC, 1979). The main issue has been the best way in which to provide a buffer against possible disruption of import supplies, and the common conclusion has been that stockpiling of oil provides a substantially more efficient and effective way of providing such increased security than does increased current oil production. Clearly, policies which increase short-term oil self-sufficiency by providing incentives for greater investment in exploration and crude oil production must have an adverse effect on self-sufficiency at some future date. Common (1986) has used the demand scenarios and indigenous supply projections provided by DRE (1986) to assess possible oil self-sufficiency levels in the year 1999/2000. The Base Case demand scenario and the most probable supply projection

combine to yield a self-sufficiency ratio of around 46 per cent, compared to the current effective level of 100 per cent. The costs of meeting the additional oil import bill are estimated by Common as being equivalent to around 1.5 per cent of GDP.

Given the expectation that oil prices are currently low relative to their long-term trend path, and that the oil market will firm up strongly in the mid-1990s, there is some case for considering whether the level of oil production in Australia is not currently above that which both maximisation of resource wealth and concerns about oil supply security would suggest as being desirable.

There are, however, strong short-term reasons for the government to want to encourage a high level of current oil production and, particularly, of oil exports. Between 1977/78 and 1983/84, the crude oil levy and royalties from offshore oil increased their share of Commonwealth tax receipts from around 1 per cent to almost 10 per cent. With the subsequent decline in the crude oil price, this share has dropped back to just over 6 per cent in 1985/86 and is expected to decline sharply again in 1986/87. The current strategy is to make up for lost crude oil levy receipts on domestic crude oil consumed in Australia by raising the excise on petroleum products. If there were no political difficulty associated with this, the government could afford to be indifferent about the level of production of crude oil for the domestic market. Exports of oil, on the other hand, provide a clear net revenue gain, so that the present strong budgetary pressures faced by the Commonwealth contribute to a significant interest in the level of oil production being such as to generate an export surplus. An export surplus, of course, also confers the advantage of reducing the current account deficit. Given the conditions under which oil production licences are held, and given the short-term advantages of greater crude oil production, one would not be altogether confident that the current level of oil production is wholly motivated by consideration of longer-term issues.

Resource Taxation

A major area of contention surrounding the minerals industry developments has been the appropriate form of tax to apply to mining activity. The argument for <u>any</u> special tax lies in the presumption that economic rents are earned (on average) from mining, reflecting the long-term scarcity of the resources exploited, and that those rents should accrue to the community at large which is the formal owner of the resources.

The debate on appropriate resource taxation has mostly been conducted on the assumption that mining companies would, in the absence of any tax, exploit resources in an optimal manner. Thus, the search has been for a tax which would be as nearly neutral as possible, while collecting a large share of any rents which were earned.

In one important respect, that debate has been misconceived. Given the conditions which attach to exploration and mining licences, it is <u>not</u> reasonable to suppose that mining companies will undertake an optimal pattern of investment in the absence of any tax. Rather, those conditions impart a bias towards premature and excessive investment, and the optimal tax (given this) is one which has an offsetting deterrent effect. As has been argued above, for most minerals the deterrent effects of royalties have probably been substantially larger than this argument would justify, so that the resource taxation debate has not been too wide of the mark. It is somewhat ironical that the area in which the pressures towards over-investment are, in the absence of distorting taxes, likely to be most significant in terms of their efficiency costs (crude oil) is the one area in which an attempt has been made to introduce a more neutral tax.

The Resource Rent Tax to apply to any new offshore crude oil resources is close in its design to the tax suggested originally by Garnaut and Clunies-Ross (1975). The difficulty with this tax is that it seeks to attain neutrality by combining two different sorts of distortions, which will counter-balance one another only in the most unlikely circumstances. In general, the tax will (relative to no tax)

deter exploration, and will deter it increasingly the more risky the particular exploration venture is, and will encourage over-investment (whether in conservation or in capital development) in the exploitation of discoveries.

Given the incentive effects associated with the allocation of exploration and production licences, the distorting effects of RRT are not wholly unwelcome. However, there is no reason in principle why a re-assessment of the procedures for allocating exploitation rights could not be undertaken in conjunction with the design of a genuinely neutral version of RRT, which allowed efficient exploitation without the need for "offsetting" distorting policies and, in the case of crude oil, substantial monitoring and regulation.

5. SOME FURTHER ISSUES AND CONCLUDING OBSERVATIONS

Foreign Investment

An area of major concern in some quarters about the rapid minerals growth of the 1960s and early 1970s was the high level of foreign investment and control in the mining industry. It has never been clear what the main source of that concern was - whether it was motivated by purely nationalistic sentiment, whether it reflected a fear that resource rents which should accrue to Australia would instead accrue to the foreign investors, or whether the concern was that foreign owned companies would engage in a pattern of exploitation of resources which was not in Australia's long-term interests.

One focus of the concern about foreign ownership was the Fitzgerald (1974) Report, which argued that the Australian community had benefitted little from the minerals expansion because of the generous income tax treatment accorded to the industry. While Fitzgerald overstated his case by treating deferred tax receipts as if they were permanently lost, his argument that the industry was too generously treated was correct. However, the argument as stated did not have anything specifically to do with foreign ownership. So long as the sector was under-taxed foreign ownership meant a net loss to Australia, but the tightening of the taxation arrangements was the appropriate way to deal with that

problem and, in fact, the income tax arrangements were amended.

There was some additional concern that foreign enterprises would be able to avoid payment of Australian taxes by the setting of artificial prices at which mineral exports, technology, or loan funds were transferred between themselves and parent companies. In fact, the Australian minerals trade is, relative to the international trade in minerals generally, conducted at "arm's length" to a very large extent, so that transfer pricing problems associated with mineral commodities were not obviously severe. In any event, as the Comalco case showed, it was not only companies with overseas parents that might want to avoid Australian taxes.

The more concrete concern was about the tax treatment of what were perceived to be substantial rents accruing to some foreign-owned mining companies. The company tax could not capture more than half of such rents, and royalty arrangements were not designed to collect substantial revenues. Even after royalties (or rail freight rates) were increased substantially, the problem still remained that the collection of a large share of mineral rents by general application of these taxes would necessarily be at the expense of deterring developments which would otherwise have been worthwhile. It was in this context that the Resource Rent Tax issue came strongly to the fore.

The policy of limiting foreign participation in mining ventures to 50 per cent could be seen, then, as a means of retaining at least half of the rents in Australian hands, while the policy of insisting on 50 per cent Australian control might have contributed to a feeling that adverse tax strategies would be held in check. So far as the first of these is concerned, though, the fact that Australian equity participation was not required during the exploration phase left open the large question of the terms on which an Australian partner would be able to buy into a project flowing from some new discovery. If the foreign explorer were able to obtain a price which reflected the full rent value of

the discovery, the local equity rules would contribute nothing to the retention of rents in Australia.

More efficient than imposing essentially arbitrary foreign investment rules would have been to institute a set of procedures for allocating mineral leases and for taxing mining activity which ensured that a large share of rents earned accrued to the government, independently of the ownership of the company involved.

Given the fact that Australian policy, at both the Commonwealth and State levels, has been designed to ensure a rapid rate of exploitation of mineral and energy resources, the suggestion that foreign companies might exploit those resources in ways inimical to Australia's longer term interests seems faintly absurd. Moreover, it seems likely that the lobbying power of Australian-owned companies for favourable treatment is greater than that of foreign-owned companies so that, so far as influence over the rules is concerned, one might have a preference for foreign ownership.

The application of the foreign investment policy has always been rather flexible, as is implied by the description of it as "Guidelines". In large measure, policy has been tougher when there has been a strong inflow of capital and has been substantially diluted when it has threatened development. Currently, the prospect is for a virtual abolition of foreign investment restraint, while the recent removal of the withholding tax on dividends paid overseas has potentially reduced the flow of tax receipts from foreign companies engaged in mining activity.

Policy towards foreign investment in the mining industry has never been rationalised in concrete terms, but the evidence seems to suggest that it has not been intended to achieve any specific purpose except, perhaps, the satisfaction of some degree of nationalistic sentiment when it was felt that that could be afforded. The real issues of taxation and development incentives have not been effectively addressed, although that may have a great deal to do with the division of powers between the Commonwealth and the States on these issues. It seems quite likely that the foreign investment issue will re-emerge as an important concern at

some future time when economic circumstances are more favourable for the industry and the economy generally than is presently the case.

Export Controls

The heavy concentration of exports of major minerals on the Japanese market, and the the coordinated purchasing stance of Japanese buyers, have given rise to concerns that fragmented Australian exporters would be placed in a weak bargaining position and would obtain lower prices for exports than could otherwise be obtained. Successive Australian governments have maintained the authority to regulate the terms under which mineral exports have been sold, although the extent to which these powers have been used has varied considerably between the high intervention stance of the Whitlam Government and the present decision to not apply export controls.

While it is certainly possible to construct bargaining models in which the sorts of concerns which have been held can be rationalised,[14] the evidence is not clear that Australian exporters have done badly in their dealings with Japanese purchasers compared to the range of bargain outcomes which might have been considered feasible. In general, the quality-adjusted c.i.f. prices for Australian minerals landed in Japan do not seem to have been significantly lower than those from more distant sources. Australian governments have tended to become agitated over any differences in these prices but, given Australia's alternative trading options, f.o.b. prices to Australian exporters have been substantially above those which could have been achieved in other markets.

The area of greatest concern to Australian governments has been the coal trade. It is doubtful whether export controls have allowed Australian exporters to obtain significantly better prices than they otherwise would have obtained, except in the very short-term, and it is very likely that the more excessive instances of the application of export control powers have provided some stimulus to Japanese moves to diversify sources of supply, even to the

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14 See, for example, Smith (1976).

extent of causing significantly higher cost mines to be brought into production.

Currently, the excess capacity in minerals production around the Pacific region renders the attempted exercise of export control powers virtually redundant. Australia's present strategy is to exploit cost advantages and to increase market share, in the hope that some of the higher cost capacity will be shaken out of the market. The delays involved in meeting export control requirements have been argued to impose a disadvantage in negotiating new contracts with no offsetting advantage in terms of prices obtained.

The future development of Pacific minerals markets is likely to involve a decreasing degree of market domination by coordinated Japanese purchasers, as Japan's competitiveness in minerals processing diminishes and industrialisation proceeds in other Asian countries. Consequently, the rationale for the exercise of export control powers is unlikely again to emerge in the way that it did in the early 1970s.

Concluding Remarks

The large growth of the minerals industry over the past two and a half decades has contributed substantially to economic development in Australia. As argued in Section 2, it is probable that, in the absence of the minerals growth, the Australian economy would have been in for a rather tough time as the fortunes of the agricultural sector diminished. This is, in effect, to say no more than that Australia's economic growth performance depends rather heavily on the growth performance of our more immediate neighbours and on the complementarity between the comparative advantage structures of those countries and Australia. If the demand for industrial raw materials in the region had not grown rapidly, Australia would have fared more poorly than it did.

The mining industry does not contribute very strongly to direct employment generation, as Figure 6 shows. In fact, direct employment in mining is one quarter of that in agriculture, even though the two sectors now have the same share of GDP. It has been estimated that employment multipliers are greater for mining than for agriculture and,

to a lesser extent, for manufacturing,[15] but not by a sufficient amount to offset the difference in direct labour intensity. The mining industry has inextricably associated with it the increasing development of manufacturing activities engaged in the processing of minerals, but these activities are also at the labour-intensive end of the spectrum.

This has concerned some people who have felt that the development of the mining industry would reduce employment opportunities and result in a rather strongly concentrated flow of benefits to a limited sector of the community. This depends heavily on the success of the structural adjustment away from manufacturing and agriculture towards the services sector, and on the extent to which the benefits from the depletion of resource assets are distributed widely throughout the community by appropriate taxation arrangements. The structural shift towards the services sector is something which has been continuing since well before the first minerals boom and, though the rapid growth of the minerals sector may have increased the impact on other traded goods sectors in the short-term, it has not created any fundamental change in direction.

The more important questions lie in the macroeconomic and microeconomic management of minerals sector development. The greater exchange rate flexibility which Australia now enjoys means that the sorts of pressures which developed around the first minerals boom, and to some extent also around the second, are less likely to arise in future. Indeed, these sorts of "booms" are themselves less likely to occur. At the micro level, however, there remain issues of management which have not been successfully resolved. These include the questions of appropriate taxation and lease allocation procedures and, although not dealt with in this paper, the appropriate pricing arrangements for domestic consumption of energy resources. As noted above, the question of foreign investment regulation is unlikely to be permanently dead and buried, unless some of these other

15 See Porter (1984), pp.11-15.

issues can be dealt with in ways which make such regulation clearly unnecessary.

Looking to the future, it seems sensible to believe that the importance of the minerals sector in the Australian economy is not going to be reversed. The structure of Australia's pattern of comparative advantage, particularly in the regional context, will not undergo any fundamental change. The most important development is likely to be an enlargement of opportunities to engage in further processing of minerals before export and, potentially, the development of an internationally competititive steel industry in Australia. This will not be promoted usefully by the provision of infrastructure or energy supplies at subsidised prices, as has sometimes been the response in the past, but it probably will require a focus of policy attention on the development of trade links with potential purchasers, most particularly in the case of China, and some attention to supply security concerns which may otherwise lead to more autarkic industrialisation strategies in countries of the region.

There is one major area in which the importance of the minerals sector is certain to diminish in the not too distant future, and that is the domestic production of crude oil. A substantial, sharp reduction in Australia's oil self-sufficiency would have as large an impact on the Australian economy, in the reverse direction, as a major minerals export boom. As indicated in this paper, there are *prima facie* reasons for suspecting that Australia has over-developed its oil resources, and is likely to continue to do so unless more efficient (and less complicated) policies can be put in place.

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APPENDIX: The Modified Pitchford Measure of the Real Exchange Rate

The modified Pitchford measure uses implicit deflators for all price index measures, weighting the index of the price of traded goods to reflect the larger share of manufactures than primary products in Australian production, and making a rough adjustment to remove the influence of changes in traded goods prices from the implicit GDP deflator to obtain an index of the prices of non-traded goods.

The real exchange rate is, then, defined as N/T, where:

$$T = b.I + (1-b).E$$

and;

$$N = (G-a.T)/(1-a)$$

with;

- G = Implicit GDP Deflator
- I = Import Price Deflator
- E = Export Price Deflator
- b = Average share of manufactures in Australian manufacturing, mining, plus agricultural GDP over the period 1948/49 to 1985/86.
- a = Average share of manufacturing, agriculture and mining GDP in total GDP over the period 1948/49 to 1985/86.

These rough adjustments result in larger fluctuations in the real exchange rate than are yielded by the unmodified Pitchford measure, which is what one would expect, but do not alter the direction of change between any pair of years.

THE ROLE OF RESOURCE DEVELOPMENT IN AUSTRALIA'S ECONOMIC GROWTH - COMMENT

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I have always admired Fred Gruen's ability to get to the core of a problem and to cut his way through the webs of mathematical and technical jargon that many younger economists entrap themselves in. I offer therefore the following limerick with apologies to you-know-who.

"You are old, Fred Gruen", the young man said,
"And you hair has become very white;
And yet you continue to offer us pearls
Do you think at your age, it is right?"

"In my youth", Fred Gruen replied to the lad,
"I feared it might injure the brain;
But now that I know I'll always be right
Why, I do it again and again".

Three simplified messages have been drawn by some from the Gregory thesis with which I disagree. Whether these messages are justified by the theory is another matter. These are perhaps straw men constructed by disciples.

(a) Expansion in one sector must result in contraction in other sectors. Growth [sic] seems to become some sort of zero-sum game - in which much of the benefits of mineral sector growth are lost by contractions in other sectors. Whenever we have a winner we have a loser.

(b) Expansion in the mining sector leads to a rise in the real exchange rate - defined in applied work as CPI in Australia compared with our trading partners adjusted by the exchange rate. This led to predictions of Australia having a rising real exchange rate on this measure through the eighties (see Shann, 1982b pp20-21 for a list of predictions). Rapid export growth leads to rising real exchange rates, rather than rising GDP and real incomes.

* The views expressed are my own.

(c) As a result manufacturing was predicted to decline in relative (and possibly absolute) terms, because of mineral sector growth. It was easy to draw the (false) conclusion that we could tax mining heavily and should do little to encourage its development because it had substantial costs for the existing economy.

Now as Ben Smith states in his attempt to rescue the Gregory thesis, the model has strict ceteris paribus assumptions, which mean that some of the more outlandish conclusions were not justified by the underlying theory.

However, it is easy to see how many readers of the literature - including economists - fell into the above traps because of the impression conveyed by the users of the theory.

My own view of how the world works is rather different from that sketched above or in Ben Smith's paper.

(a) Growth in any high productivity sector raises Australian real incomes - we are better off. We can use the same resources to produce higher incomes. This is something to be encouraged, rather than worried about. Mineral sector growth raises our GDP growth rate and our real incomes. Faster export growth is correlated with faster GDP growth - not a message that leaps off the page on reading the Gregory thesis.

(b) Measures of competitiveness based on tradeables prices or nominal unit labour costs (i.e. nominal aggregates) will tend to fluctuate in the short-run around their long-run average but they tell us nothing about our long-run industry structure, or our long-run share in world trade. Graph 1 uses the data in McKenzie (1986) updated and is based on comparing wholesale prices of manufactures in Australia compared with overseas adjusted by the nominal exchange rate. It shows we have repeatedly fluctuated around our long-run average real exchange rate measured in terms of tradeables prices. Yet over the period our industry structure and trade share has changed markedly. This measure of the real exchange rate does not have to rise permanently to restore equilibrium following growth in exports [1]. Ben Smith says on p15 that my view that

mining sector growth may stimulate GDP growth depends on there being unemployed resources in Australia (or starting from current account dis-equilibrium). Both are undoubtedly true at present, but all that is necessary is for factors to be tradeable. As they are, any current account "surplus" can be reduced by faster GDP growth. Resources do not have to be switched out of existing tradeables production to produce non-tradeables. Factors can be imported (labour or capital) to expand non-tradeables production.

(c) What does happen following growth in the mineral sector (or any new tradeable sector) is a change in comparative advantage. Such growth raises real incomes across Australian industry, given that incomes tend to rise equally across industries. This changes the underlying competitive position of other industries. To measure this effect we need a variable which reflects real rather than nominal magnitudes. Correctly measured the relative price of non-tradeables to tradeables does that. I am encouraged that I have at least made enough progress to get people looking at the best method of measuring non-tradeables to tradeable prices.

As shown in the table Pnt/Pt has upward trends in all countries [2]. As Kravis et al (1978) demonstrate Pnt/Pt is correlated with real income levels (a fact which is used in PPP adjusted measures of real incomes between countries). Thus the faster is productivity growth in a country, the faster is real income growth and the larger is the rise in prices of non-tradeables to tradeables. Clearly one would expect countries with rapid productivity growth and rising real incomes (such as Japan) to have rapidly rising Pnt/Pt. They will have rapidly changing industrial structures if their rise in real incomes (i.e. Pnt/Pt) is faster than in other countries.

The rise of a high productivity growth industry in Australia raises Australian real income and via the income elasticity to imports, raises imports. It also raises Pnt/Pt above what it might otherwise have been. Does it necessarily cause a contraction in more labour intensive manufacturing industry in Australia? If it did it would be part of the benefit to Australia from real incomes growing faster than elsewhere in the world. Just as a child leaves behind its toys as it grows up to more interesting and rewarding occupations, so we would leave the candle-stick making to others.

Assume a two country world in which Japan's tradeables industries are clothing and electronics, while Australia's are clothing and mining.

According to Gregory, following an expansion in mining in Australia Pnt/Pt rises and clothing gets wiped out because it can no longer compete at the higher real exchange rate. Any clothing manufacturer in his right mind on hearing this story would go around shooting miners.

In the real world, Japan may have expanded productivity and production in electronics by more than Australia did in the mining sector. As a result Pnt/Pt rises by more in Japan than in Australia.

Clothing in Australia can then actually end up larger than before mining sector growth. Of course it is still true that clothing production in Australia might be even larger if the mining sector had not existed. However, that is not the message everyone drew from Gregory's model. The implications drawn were wrong. The clothing industry should spend its time making sure it is competitive vis-a-vis production overseas and improving its productivity performance to match rising real incomes if it needs to do so. It should not spend its time worrying about mining sector growth.

I suspect on the data in Dowrick and Nguyen [1986] that all the rapid growth in the mineral sector did was to allow Australia's GDP and real income growth to stay level pegging with others, or to avoid losing ground faster. In other words our manufacturing sector faced no faster rise in workers' real incomes than occurred in other developed countries. If the productivity performance of Australian manufacturing industry was worse than overseas that is a problem of our own making (with some help from governments in my view). The mining sector is not to blame.

Of course our comparative advantage has still changed. We will have developed skills upstream and downstream of resources industries so production in these areas will have increased. Industries will exist in Australia only if they can develop productivity, technical skills and market niches that offset the need to pay higher real wages. They should not spend their time worrying about the growth of the mineral

sector, or in elaborating transformed manufactures for that matter, but in ensuring that they are improving their own competitive positioning enough relative to overseas producers to expand production.

The spread of modern technology into low wage countries has of course caused problems for some labour intensive industries in all developed countries - Australia is not unique and our story in these industries is no different from Japan's because our real income growth has come from the mining sector, rather than from electronics.

Let me now turn to my specific disagreements with the paper. Ben Smith's analysis on pp13-14 suggests that we should compare the departures from trend in the rise of Pnt/Pt over time. He starts his story from the argument that both agriculture and manufacturing were declining as a proportion of GDP in Australia and that the growth of mining thus simply saved us from a "real depreciation".

I find this story rather strange. First, in Figure 10 he has not measured shares in production in constant prices, but in current prices. As prices of services have risen relatively this produces contractions in the goods sector in current prices as a proportion of GDP. I suspect he will find in constant prices manufacturing production did rise over the fifties to offset the decline in agriculture.

Certainly over the sixties the mining sector offset the fall in the agricultural sector as a proportion of GDP in constant prices and manufacturing was little changed (see Shann, 1983 p23).

Second, I stress again that the trend in this measure Pnt/Pt shown in Smith's Figures 7, 8 and 9 is correlated with the trend in real income growth. The fact that the rise in Pnt/Pt appears to have slowed in the seventies reflects the fact that our real income growth was lower than previously. Whether it has changed relative to other countries needs analysis of the type conducted by Dowrick and Nguyen [1986] - this measure does not tell us what is going on overseas, as it is an internal relative price. In effect what Gregory is asking is whether real incomes rose faster or slower in Australia than overseas and what does this imply for comparative advantage. While theory would suggest that

more labour intensive industries will get squeezed ceteris paribus if real incomes rise in a country relative to overseas, the actual result depends on the ability of an industry to raise productivity, or develop new designs etc. to offset the need to pay higher real wages.

Third, why does the real exchange rate as measured by Pnt/Pt, or real incomes in Australia relative to overseas for that matter, depend on the sectoral composition of tradeables production? One can have rising or falling trade shares, high or low GDP growth and current account surplus or deficit, with rising or falling shares of any particular tradeables sector in GDP. The analysis seems to me to fall into the "Gregory trap" of assuming everything is determined by the importance of a particular sector in GDP.

Finally, Smith seems to have taken Gregory and the Lucky Country syndrome to their logical - if bizarre - conclusion. On ppl7-18 Smith seems to get close to arguing that without the mining sector we would have had a lower real exchange rate (i.e. had lower real incomes) and as a result have had less of a decline in agriculture and stimulated higher growth in manufacturing. Let us assume that with a minerals boom Australia grew at 3% per annum over the last 15 years. Smith seems to be suggesting that without a minerals boom Australia would have had exactly the same growth rate of 3% per annum, achieved by a lower real exchange rate, but with a different industry structure.

Is it not possible that in the absence of mineral sector growth we would have become a New Zealand, or even an Argentina? We could have been a stagnant, low growth country lacking a dynamic growth sector. Why are we pre-ordained to grow at 3% per annum as Smith's logic suggests regardless of our own efforts? Why does the real exchange rate automatically adjust to achieve this outcome?

Taken to its logical extreme his analysis suggests that any country can boom by cutting real wages - why on earth has Argentina missed out? [3] I have a rather different view of the world. Ultimately our growth performance will be determined by whether we can raise productivity - by more investment, more efficient investment, by developing technical and marketing skills. This allows us to pay higher real wages and results in a higher Pnt/Pt. In short I would revise the direction of causation.

High growth in productivity causes high growth in Pnt/Pt. Growth in productivity will depend on our resource base (widely defined) and the use we make of it.

In any case in Smith's world if higher productivity and real income growth had come from another sector in order to achieve 3% per annum overall growth, would we not have ended up with exactly the same Pnt/Pt as at present, but with a different industry structure?

His conclusion on p34 is in my view more accurate. Without mining sector growth Australia would have been worse off - let us not forget it.

Boom and Bust

Ben Smith argues that trade in minerals is less subject to volatility than trade in agriculture. He concludes on p19, with some qualifications, that the minerals sector is unlikely to cause again the disruption that occurred in the 1960s and 1970s. I disagree.

He described correctly in his first section the gradual growth in the minerals sector over the sixties and notes that by 1970/71 the sector had approximately reached its current size as a proportion of GDP. However, on page 11 he then attributes the rise in the exchange rate in 1973/74 to the growth in minerals production. In my view this is not correct. The size of the 1973/74 disequilibrium and revaluation was primarily due to a massive swing in the terms of trade for both agricultural and mineral products. In the twelve months from September 1972 wool prices rose 61%, cereals 41%, meat 40% and canned fruit 35%. Between 1971 and 1972 the current account balance improved by 2.9% of GDP of which 2.2% was due to the non-mineral sector. It was this which caused the temporary rise in the real exchange rate as measured by competitiveness indices. In constant prices there was actually a sharp decline in mineral export growth in 1971 and 1972 (see Shann 1980, p153).

Equally the 1979-80 experience was due to a massive swing in the terms of trade for resources we possessed, but did not produce in large quantities at the time. Thus calculations of our terms of trade based

on trade flows at the time do not show a large swing, but the sharp rise in energy prices was clearly the proximate cause of the investment boom and revaluation of the $A.

The sharpness of the fall in the $A at present is again due to a sharp fall in the terms of trade.

My own work (Shann, 1984) has looked in detail at volatility in different commodity prices, Australia's export prices, volumes, receipts and terms of trade and the volatility in the nominal and real exchange rate, GDP, CPI, employment and industrial production both over time and compared with other countries.

Raw materials have higher price instability than foods, but I can confirm Ben Smith's conclusion that the diversification of Australia's export trade over the last 3 decades has lowered the instability in Australia's terms of trade. In the fifties we had the highest instability and were five times the average for industrial countries. However, as commodities have greater volatility than manufactures our level of instability in the seventies was still over three times that of industrial countries as a group - we were exceeded only by New Zealand and on one measure by Japan. Despite the fact that commodity trade has low volatility in volumes, the high volatility in prices means that Australia has had slightly higher than average volatility in export proceeds in $US than the average of developed countries.

More importantly the world economy became more unstable in the seventies compared with the sixties due to the OPEC price shocks and the very high level of synchronisation in the world growth cycle. As a result Australian export receipts and prices in $US - along with other countries - show greater instability in the seventies than in the sixties.

This has resulted in high volatility in Australia's real exchange rate because of the correlation between swings in the terms of trade and swings in the real exchange rate (McKenzie, 1986). This correlation means that while in $US Australia's export prices and receipts over 1970-81 were more volatile than the unweighted mean of 20 developed nations, in local currency they were less volatile (Shann, 1986 p228).

However, as I have argued elsewhere (Shann, 1986) this sets up very large swings in the $A price of imports which potentially causes instability in the import-competing and non-resource exporting manufacturing and services sectors. It is hardly surprising in these circumstances that the bulk of tradeable manufactures are therefore resource related or effectively non-tradeables. How more export orientated manufacturing sectors could live with such swings is a subject we need to think much more about. Earning high profits in good years in manufacturing (as at present when commodity prices and the $A are low) does not stop one going bankrupt in bad years (when commodity prices and the $A are high). In the past such industries sought and received quota and tariff protection in bad years. A preferable route is probably companies covering both resources and manufacturing production to stabilise revenue flows. The literature (see Lessard and Lightstone, 1986) also suggests we may see Australian manufacturing companies establishing large scale production overseas as another means of stabilising profit flows.

At the macro-level Australia is decoupled from industrial countries. Our exchange rate swings with commodity prices and the currencies of other primarily commodity producing countries. The result is to damp the swings in competitiveness of the commodity export sector both in terms of $A receipts and in changes in competitiveness vis-a-vis those we compete against in export markets.

In current circumstances low commodity prices are good news for industrial countries. They gain from higher real incomes due to an improvement in their terms of trade, low inflation and low interest rates. This allows relaxation of monetary policy and positively sloped yield curves.

For Australia the situation is reversed. We are the mirror-image. Low commodity prices blow out our current account, cause the $A to devalue, raise inflation and long-term interest rates. Because we must contract domestic demand we must tighten policy via raising short-term interest rates and have an inverse yield curve as a result [4].

If commodity prices rise the situation will be reversed. The only occasions over the last 15 years when Australian interest rates have been at or below US rates has been during commodity booms when the $A was revaluing.

I suggest this situation has become more marked over time because:

- commodity producers are less important in industrial countries. This exaggerates the swings in exchange rates and the terms of trade between industrial and commodity producing countries;
- the world industrial production cycle has become more synchronised;
- floating exchange rates are causing larger fluctuations in real exchange rates.

I agree with Ben Smith that gradual growth in the mineral sector does not need to cause instability in Australia's exchange rate. However, sharp swings in the terms of trade because of our reliance on commodities (both rural and mineral) certainly will cause instability in the manufacturing sector and problems for macro-economic management.

Markets for Australian Minerals

I agree with the thrust of Ben Smith's comments in this section (p20 onwards). Transport costs mean that Australia is well placed on the cost curve to compete with the Pacific Basin in mineral commodities, but much less well be placed in the case of the Atlantic markets. (Selling coal into Europe our shipping costs are $US3.50 per tonne higher than S. Africa, while selling into Japan our shipping costs are $US1.50 per tonne lower).

The key question for Australia is therefore the type of restructuring that occurs in Japan and the nature of the world trading arrangements in manufactures. Japan exports one third of its steel production directly and another sixth is exported indirectly in cars, ships, etc. Thus indirectly our exports of coal, iron ore, nickel and manganese to Japan are dependent on Japan's access to foreign markets.

The present pressures on Japan to restructure should be carefully monitored by Australia. Japan may react by continuing to move heavy industry offshore into surrounding developing countries - South Korea and Taiwan. In that case Australia will continue to benefit from strong demand for its raw materials. Japan may also boost domestic demand by public infrastructure expenditure which is material intensive.

More worrying from our point of view would be a shift of industry by Japan (and also S. Korea/Taiwan) into their markets in Europe and the United States. This trend is already occurring in cars and electronics. The aim is to protect their markets by establishing production within countries in response to the explicit, disguised or threatened protection by their markets in Europe and North America. These plants will be gradually sourced from within the markets and this would threaten Australia's competitive position because of our cost competitive disadvantage in supplying raw materials to Europe and North America. This underlines that Australia is not just interested in GATT for purposes of our own trade in agriculture and minerals. We have a vested interest in ensuring free trade in manufactures and in discouraging the renewed growth in non tariff barriers.

It is worth noting that Japan is now a creditor nation, and its manufacturing companies are household names. Previous major creditor nations - the United Kingdom and the United States - both established production facilities world-wide rather than simply export from their home base. Thus even in a free-trade world we may find Japan restructuring its industrial base to our disadvantage. However, in the case of S. Korea and Taiwan the importance of their access to markets is vital to Australia. On a more pessimistic note than Ben Smith, some potential major new steel producers will have relatively little need for Australian raw materials - because they have their own. India, Brazil, and to a lesser extent China, are in this category.

Further, his optimism on steaming coal (p21) should be tempered. If Japan shifts heavy industry offshore, electricity demand will grow much more slowly than expected. Given that the Japanese are effectively locked into nuclear and LNG fired plants the swing fuels to meet growth will be oil and coal. With low growth in electricity demand (and

certainly if the oil price is low as well) coal is likely to suffer. In addition, while only South Africa is at present below us on the cost curve in steaming coal, we are likely to see major increases in low cost exports from Colombia and China over the next five years.

As well as improving the competitive positioning of things we already do well, we should be aiming to benefit from the restructuring of heavy industry out of Japan by establishing the right environment to encourage first stage processing of minerals in Australia as we have already done in aluminium.

FOOTNOTES

1. Measures of competitiveness based on comparing tradeables prices (e.g. WPI of manufactures) in Australia compared with overseas adjusted by the exchange rate will fluctuate due to departures from the law of one price. They will not show trend shifts. Measures of competitiveness comparing CPI adjusted by the exchange rate will fluctuate due to departures from the law of one price and show trend shifts if Pnt/Pt in Australia rise at a different rate from Pnt/Pt in our competitors. As shifts in Pnt/Pt are correlated with productivity and real income growth this comes down to saying we will have a trend rise in this measure if productivity and real incomes in Australia are rising faster than in our competitors. See Parkin [1977] for a discussion.

2. However, this has not led to a contraction in the share of goods to services in constant prices as Smith implies. See Shann [1983] for a discussion.

3. To avoid misinterpretation, if we are living beyond our means (as at present), a real wage cut is of course appropriate and in fact a necessary part of the solution. However, in the medium term Australia's prosperity depends on raising production and productivity.

4. Again, to avoid misinterpretation, this does not absolve the Australian government from taking appropriate policy action and the implications of the external environment for Australia can be made better or worse by the policy actions taken and the flexibility of the Australian economy in responding to shocks.

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APPENDIX

TABLE 4

RATIO OF PRICE INDEX OF NONTRADABLES TO PRICE INDEX OF TRADABLES ($\hat{PNT}/\hat{PT}$), 1970 = 100

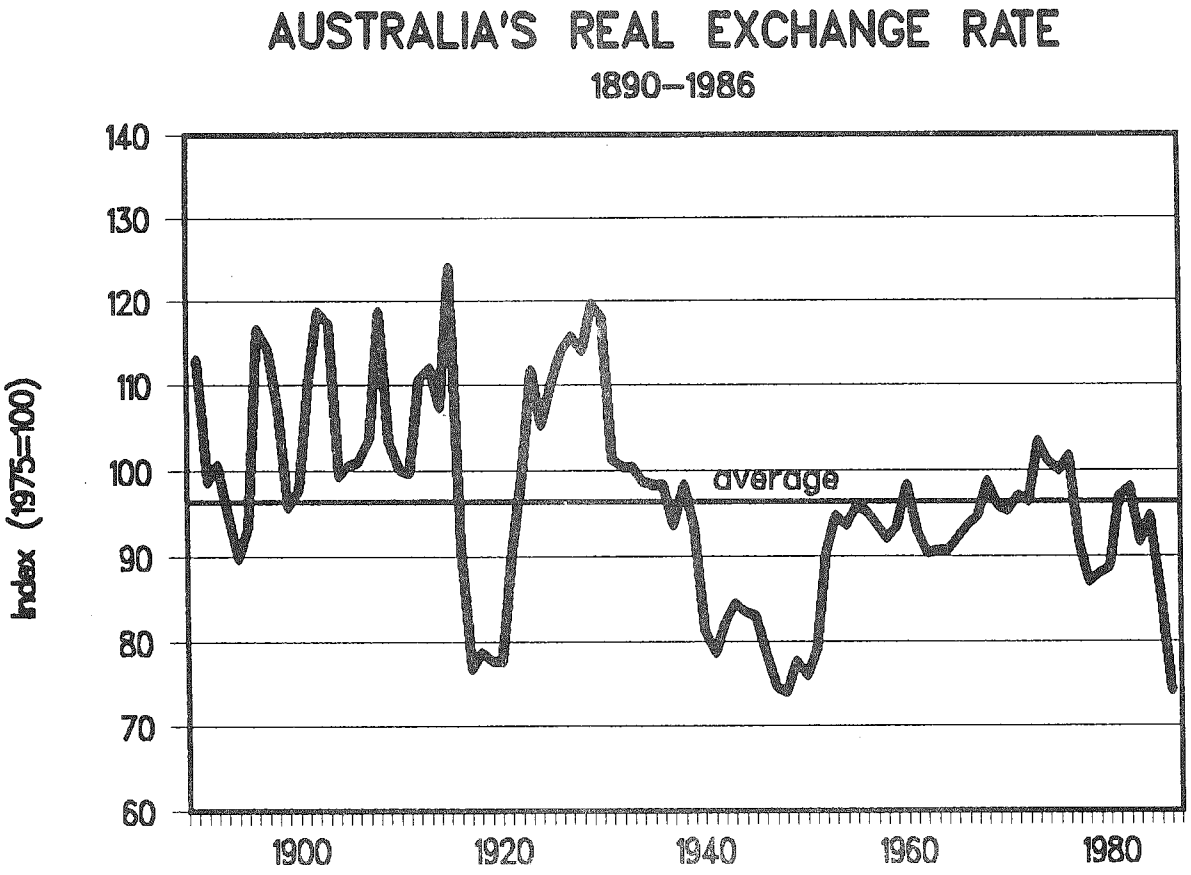
Year	Austria	Belgium	Canada	France	Germany	Italy	Sweden	U.K.	U.S.
1950	60.58	65.43	59.23	61.18	61.27	54.06	53.03	69.74	72.11
1951	62.95	66.29	55.83	59.80	61.17	53.54	47.94	70.67	70.25
1952	66.02	68.56	60.21	65.78	65.34	57.78	51.35	69.29	73.08
1953	68.15	73.83	64.63	70.68	66.13	60.32	55.86	69.19	76.67
1954	68.71	78.17	68.12	73.40	68.30	63.52	54.93	70.74	76.08
1955	70.01	82.35	68.61	74.95	70.54	66.54	55.69	72.95	76.98
1956	73.18	80.90	69.38	74.97	71.81	70.15	55.87	73.48	76.07
1957	75.75	79.26	73.50	76.38	73.61	72.81	59.38	73.49	76.99
1958	78.04	84.51	76.66	76.18	75.63	74.02	60.72	73.71	77.20
1959	80.40	86.76	77.89	80.49	77.68	78.83	61.34	76.11	79.33
1960	79.70	87.05	78.77	81.25	79.96	80.88	63.10	79.08	80.16
1961	82.94	86.56	82.76	82.35	81.17	80.34	64.65	80.59	81.81
1962	84.57	88.13	82.43	83.57	83.32	82.72	66.15	83.46	82.70
1963	87.05	87.24	83.31	85.87	86.25	85.11	79.46	86.56	84.64
1964	87.56	87.83	84.17	88.96	89.06	88.68	80.41	88.88	86.24
1965	89.64	89.72	86.54	91.26	90.19	92.75	82.81	89.68	87.05
1966	91.61	92.03	87.34	92.98	92.34	95.45	88.38	91.85	87.74
1967	96.24	95.46	91.28	95.51	93.34	97.47	93.76	95.52	90.07
1968	98.66	96.47	92.72	99.95	96.49	101.32	97.34	99.61	91.71
1969	100.03	95.81	96.96	98.92	98.54	100.42	100.55	101.80	97.61
1970	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00	100.00
1971	99.73	109.72	104.75	101.45	104.72	102.48	101.83	102.37	104.47
1972	101.77	110.86	105.69		107.65	102.48	102.59	100.31	106.55
1973	103.70	113.76	98.60		111.22	100.40	98.14	95.62	106.01

DELINEATION OF TRADABLE AND NONTRADABLE SECTORS

	Tradables	Nontradables
Current Study: List of Component Industries	Agriculture, hunting, forestry and fishing Mining and quarrying Manufacturing	Electricity, gas and water Construction Wholesale and retail trade Transport, storage and communication Finance, insurance and real estate Consumer services Business services Government
Other Studies: Divergences from Current study		
Aukrust (1970)	Shipping (ocean and coastal transport) Air transport	Agriculture Sheltered manufacturing
Edgren, Faxen and Odhner (1969; 1973)	Foreign transport	Agriculture Sheltered food manufacturing
Maynard and van Ryckeghem (1975)	—	—
Cross and Laidler (1976)	Excludes output not purchased by consumers	Excludes output not purchased by consumers
Murray and Ginman (1976)	—	Excludes government

Source:

Goldstein M. and Officer, L.H. [1979]


AUSTRALIA'S REAL EXCHANGE RATE
1890–1986
Index (1975=100)
140
130
120
110
100
90
80
70
60
average
1900
1920
1940
1960
1980

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