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Minerals in the Australian Economy

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David Richardson
Senior Fellow
The Australia Institute

TAI

Presentation

Table of Contents

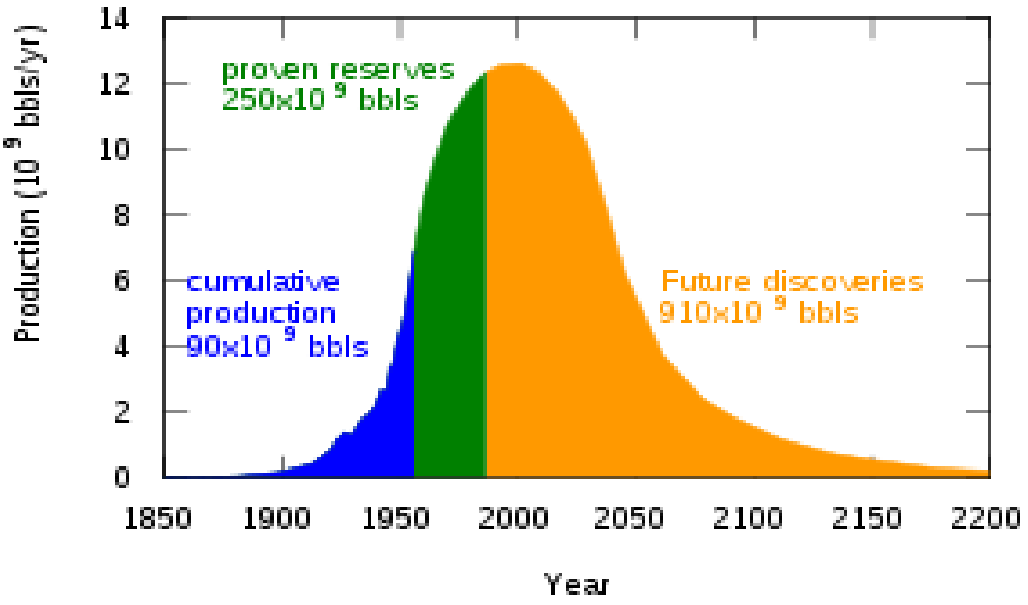
Introduction

'Minerals in the Australian economy' is of course a big topic. On the one hand that means it is inevitable that major issues are not discussed. On the other hand it means that the contributor has a lot of scope to select what to talk about.

The position here is not to question the peak mineral thesis but to explore what that would mean for the Australian economy more widely.

Just to be clear though; much of the discussion below accepts the peak production thesis which suggests production will peak in the near future and decline thereafter. The originator of this idea used a model which suggested oil production would follow a pattern as shown in the following diagram.

Figure 1: World Oil Production



Source: Wikipedia after M K Hubbert.

1 Macroeconomic aspects of the mining industry.

In 2008-09 mining accounted for sales of $132 billion or 11 per cent of GDP. Value added by mining was $81 billion (using 2007-08 prices). That amounts to 6.8 per cent of GDP.

Mining is a very productive industry; output per worker is $497,000 per annum, well above the national average of $111,000.[1] However, productivity in Australia peaked in 2001-02 when output per employee was $845,000 per annum.[2] Since then mining productivity has declined by an average of 7.5 per cent per annum.

The value of mining exports was $119 billion or 9.9 per cent of GDP in 2008-09. Of course, exports are themselves are 20 per cent of GDP implying mining exports are 50 per cent of total exports.[3] Mining exports are a very high 90 per cent of total sales according to the above figures. However, the export figures are likely to include some value added inputs from manufacturing, transport and other sectors.

The changing fortunes of the mining industry have had an impact on the construction industry in particular. For example, in real terms the volume of engineering construction in Australia increased from $9.5 billion in 2000-01 to $47.6 billion in 2008-09.[4]

Along with high output per worker are high incomes per worker. Average weekly full time adult ordinary time earnings in the mining industry were the equivalent of $101,150 in November 2009 compared with the average of $63,794 across all industries in Australia.[5] So the average wage in mining is 59 per cent higher than Australia as a whole.

There is no doubt that mining is a big and important part of the Australian economy. But we can still ask the hypothetical question: What would happen if mining disappeared altogether? This question will be important in our later discussion of the other side of the peak.

Let's look at this through the eyes of many economists. There is a certain number of potential workers and a certain value of capital. Depending on the pattern of demand the firms in Australia hire labour and capital and direct them into the most profitable pursuits. At the moment much of Australia's labour and capital are directed into mining. However, if mining did not exist, more of Australia's labour and capital would be directed into other sectors that would also be useful. So if mining did not exist something would replace it. The question then is whether there are net benefits compared with what the alternative would look like.

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1 ABS (2009) Australian System of National Accounts, 2008-09, cat no 5204.0, 8 December.

2 ABS (2010) Mining Indicators, Australia, Sept 2009, Cat no 8417.0, 11 March and ABS (2010) Labour Force, Australia, Detailed, Quarterly, Feb 2010, Cat no 6291.0.55.003, 17 March.

3 Figures are from ABS (2009) *Australian System of National Accounts, 2008-09*, cat no 5204.0, 8 December and refer to the 2009 calendar year.

4 ABS (2010) Construction Activity: Chain Volume Measures, Australia, December 2009, Cat No 8782.0.65.001, 14 April.

5 ABS (2010) Average Weekly Earnings, Australia, Nov 2009, cat no 6302.0, 25 Feb.

Of course, if a large industry died suddenly it would take some time for the unemployed workers to find alternative employment, especially if they had been concentrated in a region specialising in their industry. The capital would have been tied up in specific pieces of plant and equipment—that would all be lost. A sudden death in any industry would be a very serious issue to be confronted by governments.

However, normally declining industries take time to actually die. Employment tends to dry up slowly. Often no-one is necessarily sacked; normal workforce turnover can be relied upon by employers. They simply do not replace workers who quit.

Equally capital need not be withdrawn; it is simply not replaced when it has worn out. Assuming the original investment decisions were sound then the value of the capital advanced has been replaced. For example the brown coal power stations in Victoria were depreciated long ago. That means that the original owners would have gradually received back their capital in depreciation expenses before they declared a profit. The present value of their plant and equipment is probably no more than its scrap value—if that.

So assuming mining was to disappear gradually would anyone really care? Would it be any different to the decline in the printing industry, blacksmiths, and switchboard operations? The most important consideration seems to be that mining is a high productivity industry and any alternative use for the capital and labour employed in mining would most likely involve a lower contribution to national income and output.

Mining in Australia illustrates the need to carefully distinguish productivity levels from productivity growth rates. Mining is an example of an industry with mediocre productivity performance over the last couple of decades. In the seven years to 2001-02 mining productivity had been growing at 5.6 per cent but in the following seven years mining productivity actually fell by an average of 7.5 per cent per annum.[6] The fall in productivity in recent years has been explained by the Productivity Commission which gives a number of reasons for mining's productivity; for example, mining companies have had to resort to less attractive deposits that are harder to mine. On top of that, the depletion of resources such as oil means that roughly the same numbers are involved trying to lift the oil but the output has fallen.[7] Those and other factors are thought to be behind the fall in mining productivity.

So any shift of resources into mining will still increase Australia's overall productivity. As a simplified example, suppose output per head is 500 in mining and 100 elsewhere. If mining is 5 cent of the economy then the total output per head will be 120. If now mining expands to 10 per cent of GDP, then total output will grow to 140. Hence the shift of resources into mining has resulted in a 17 per cent increase in output per head. Something like this has happened in Australia with the resources boom increasing mining's share of GDP which has more than offset the declining productivity in mining itself.

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6 ABS (2009) Australian System of National Accounts, 2008-09, cat no 5204.0, 8 December

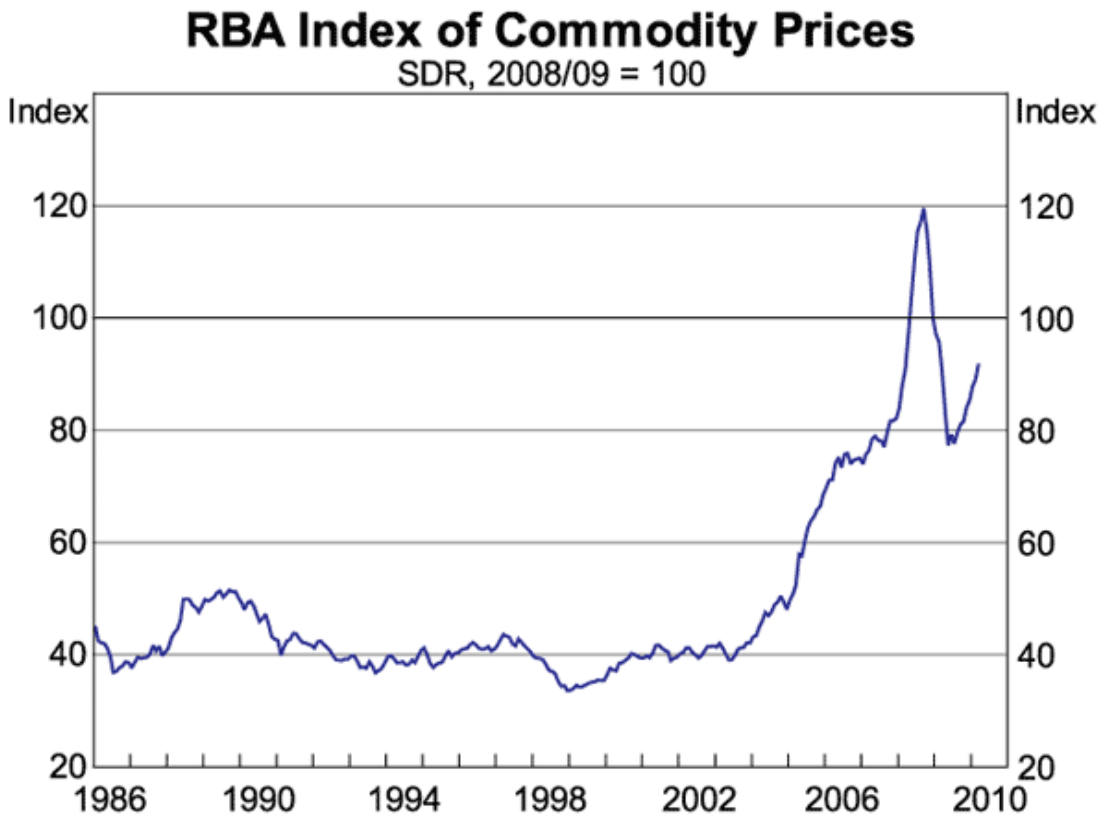
7 Topp V, Bloch H and Parham D (2008) *Productivity in the mining industry: Measurement and interpretation*, Productivity Commission Staff Working Paper, December.

2 Macroeconomic effects of volatile prices.

Price and A$ fluctuations

Minerals and other commodities are subject to massive price changes. The mining boom has been associated with another of those massive increases in prices as can be seen in Graph 1 below. The graph is taken from the Reserve Bank site and gives the index of commodity prices over the last 15 years.[8]

Chart 1: Commodity Prices



Source: RBA (2010) *Index of Commodity Prices*, 1 April at
http://www.rba.gov.au/statistics/frequency/commodity-prices.html

Dramatic price fluctuations such as those in the graph are going to imply major disruptions in the Australian economy. For a start there have been large changes in the value of the Australian dollar. Chart 2 shows the value of the A$ against the US$ between July 2002 to December 2009.

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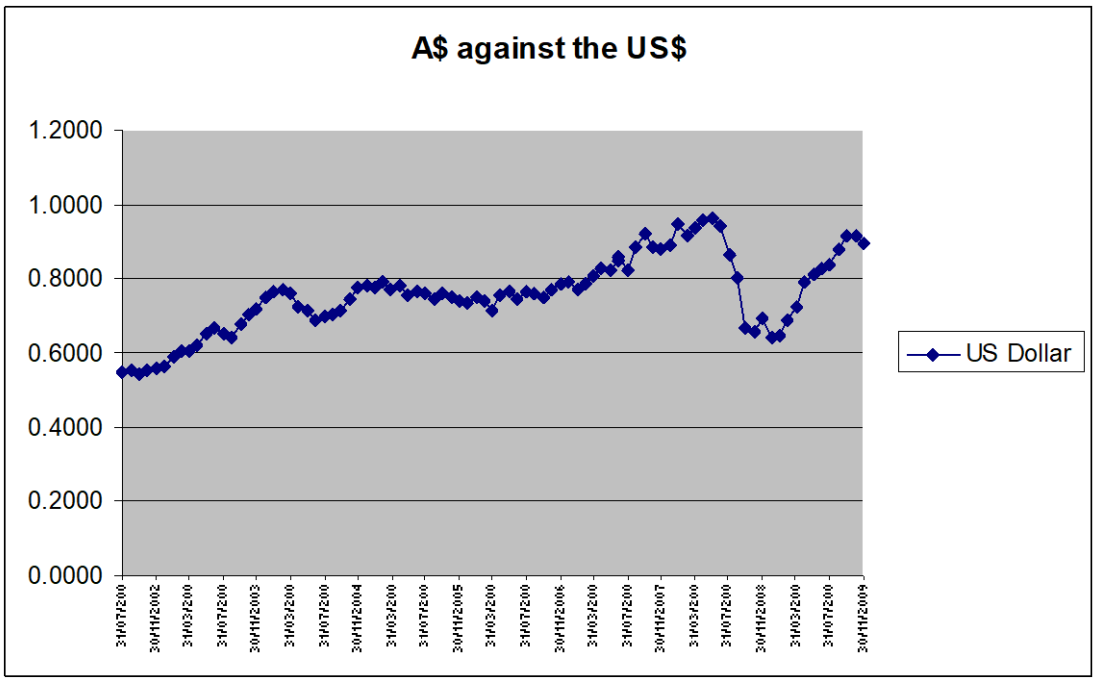
[8] The index is expressed in Special Drawing Rights (SDRs) which are an artificial currency used by the International Monetary Fund. For present purposes the SDR can be taken as an independent measure of the movement in international prices. (If we expressed the same series in A$ the result would be contaminated by movements in the A$ which in turn are influenced by the commodity prices. We don't want to use as the measuring stick a ruler which is contaminated by that which it is measuring.)

Chart 2: Value of the Australian dollar



Source: RBA Statistical Tables at http://www.rba.gov.au/statistics/tables/index.html accessed 16 April 2010.

High prices are one thing but fluctuating prices also pose problems. Even in the mining sector itself it can be assumed that higher volatility in prices are likely to deter investors, even though the average price (or future expected price) might be the same. Even if prices are high, higher volatility increases the risk that a given project will take much longer to pay back the initial outlay or earn the required rate of return.

A problem with the mining industry is that its volatility spreads to other sectors of the economy with one of the chief transmission mechanisms being the currency fluctuations. For companies elsewhere in the economy, fluctuating currencies are going to signal that any project is going to have a more problematic outcome, especially where foreign sales or purchases are involved.

Higher incomes from the mining boom?

The assumption that we have all enjoyed higher incomes as a result of the mining boom is rarely examined properly. The Australia Institute has recently done just that and the results are very interesting.[9]

The main benefits are supposed to come through the terms of trade. The terms of trade essentially measure the purchasing power of our exports by dividing an index of export prices by an index of import prices. From Graph 1 it can be appreciated that commodity prices started to increase towards the end of 2004 and exploded over the next few years. The commodity price index kept by the Reserve Bank of Australia went from around 40

[9] Richardson D R (2009) 'The benefits of the mining boom: Where did they go?' *The Australia Institute Technical Brief No 3*, May.

in 2003 to peak at just under 120 in September 2008. It was these increases in commodity prices that drove Australia's terms of trade; however, there would have been some boost with cheap imported goods from China.

According to the Australian Bureau of Statistics (ABS) the terms of trade effect produced a 9 per cent real increase in national income between the December quarter 2004 and the December quarter 2008.[10] That was over and above all the other things happening at the same time; higher employment, higher wages and other incomes, as well as increases in productivity to name some of the main factors that also affect national income.

If the 9 per cent were shared equally it would have represented additional annual per capita income of almost $4000 per annum. Or if it were distributed pro rata everyone would have received a 9 per cent increase in their incomes. However, the mining boom never worked like that.

The mining boom had its initial impact on the profits of the various mining companies. Shareholders would have received substantial gains, although a lot of the beneficiaries were foreign shareholders and a lot of the paper gains would have been lost since December 2008. After the immediate effects the ripples spread to the mining company suppliers, contractors and workforce through more work and higher incomes. After that the ripples continued with strong local and regional effects in WA and Queensland in particular. However, by the time the ripples reached the rest of us they were so weak as to be imperceptible.

The Secretary of the Treasury, Ken Henry, suggested that Australians would enjoy the benefits of the boom by way of cheaper import prices.[11] However, if your income is indexed to inflation it means you can buy the same bundle of goods and services before and after the boom. Flat panel TVs may have become relatively cheaper but you still couldn't afford one without giving up something else.

For the cheaper import prices to improve anyone's living standards there would have to be a commensurate *real* increase in their incomes. With no more than indexation you are trapped into purchasing the same bundle of goods and services. Groups whose income is adjusted for inflation include those relying on government benefits such as the unemployed.

The main sources of household income are wages and government income support payments. If wage earners were to benefit from the mining boom there would have to be a jump in real wages compared with what they would have been otherwise. That can be tested.

The preferred measure of wages is the wage price index because it tracks what is happening to a fixed composition of jobs. That index was divided by the consumer price index to give a measure of real wages and we looked at how real wages behaved before and after the mining boom.

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[10] ABS (2010) Australian National Accounts: National Income, Expenditure and Product, Dec 2009, Cat no 5206.0, 3 March.

[11] K Henry, 'Revisiting the policy requirements of the terms-of-trade boom', Address to the Australian Business Economists, Sydney, 20 May 2008.

In the four years after the boom real wages increased by slightly more than before the boom. The difference was 0.2 per cent per annum which is only a smidgin above zero.[12] Indeed, if like the Reserve Bank we used an alternative measure of prices that eliminates the volatile components; even that 0.2 per cent disappears. Nevertheless, that 0.2 per cent for four years is well short of the 9 per cent increase in real income supposedly as a result of the mining boom.

While it is hard to identify any improvement in wages using the Australia-wide figures, there is no doubt that wages in some regions and some occupations did increase as a result of the mining boom. For example, average weekly earnings in mining increased by 33 per cent over the four years ending in 2008. On the other hand workers in 'accommodation, cafes and restaurants' received just a12.3 per cent increase. Those people actually experienced a real wage cut of one per cent. State by State figures are less dramatic but WA wages experienced the greatest increase at 22 per cent compared with the national average of 17.6 per cent.[13]

Most pensions are now indexed to wages or the consumer price index, which ever is larger. The age pension is the biggest of those pensions in terms of the numbers of recipients. The indexation arrangements allow the pension to gradually increase over time in line with community standards. However, this group will not have received any benefit from the mining boom if wages themselves have not benefited from the boom. At most it is the 0.2 per cent discussed above. Again, that is nothing like the 9 per cent apparently due to the mining boom.

The rest of government income support payments are indexed and, as already pointed out, there has been no benefit passed on through that mechanism.

Some households would have benefited through their direct and indirect holdings of shares in mining companies such as BHP Billiton and Rio Tinto. For a while there were some large paper gains, up to 170 per cent in the S&P/ASX Resources index, and even at the end of December 2008 mining shares were still 57 per cent above their 2004 levels.[14] However, share ownership is largely confined to higher income households with the top 20 per cent of households owning 86 per cent of shares.[15]

Even so, share ownership is very skewed among those that do own mining shares. For example, Rio Tinto and BHP Billiton account for 51 per cent of the resources index. Looking closely at those, 67 individual share holders or 0.13 of one per cent of shareholders own 68 per cent of Rio Tinto while 78 share holders or 0.01 of one per cent of shareholders own 59 per cent of BHP. Both have a large number of small owners. Around 130,453 people or 87 per cent of Rio Tinto shareholders own just 8 per cent of Rio Tinto while 308,000 people or 59 per cent of BHP shareholders own just 4 per cent of BHP.[16]

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12 The details are set out in Richardson (2009).

13 ABS (2009) Average Weekly Earnings, Australia, November 2008, Cat No 6302.0, 26 February.

14 RBA Statistical Tables at http://www.rba.gov.au/statistics/tables/index.html

15 ABS (2007) 2005–06 household wealth and wealth distribution, Australia, Cat No 6554.0, 9 November.

16 Figures taken from BHP Billiton Limited and Rio Tinto Limited Annual Reports.

All of this points to any gains through share ownership being very concentrated among a small number of wealthy shareowners.

While it is hard to identify any gains that flowed to ordinary people, it is possible to identify some negative impacts. As noted above, the value of the Australian dollar increased dramatically with the mining boom. With the strong increase in commodity prices Australia certainly did experience an appreciation in the Australian dollar. It appreciated by 31 per cent against the US dollar. The impact of that was to reduce Australia's competitiveness in other trade exposed areas with manufacturing being particularly hard hit. Upward pressure on the exchange rate reduced the competitiveness of Australian manufacturing, agriculture and services. For example, tourism in North Queensland suffered from the high $A. Pacific Brands closed down virtually the last of its manufacturing in Australia in 2009. (Pacific Brands makes well known Australian brands from Hush Puppies shoes to Bonds underwear.

In addition to the exchange rate impacts monetary policy was tightened significantly over this period. Most increases in the interest rate were explained at least in part by the increase in commodity prices. The Governor of the Reserve Bank, Glenn Stevens, seemed especially keen to ensure that the mining boom did not spill over into the rest of the economy.

The result was higher interest rates that were spread throughout the Australian economy, and certainly spread more widely than any benefits of the mining boom.

At its peak compared with 2004 higher mortgage interest rates were transferring an additional $24 billion per annum from the household sector. That was equivalent to a 3 per cent reduction in living standards for the household sector as a whole. New home buyers were the worst affected. For a new home mortgage of $300,000 taken out by someone on average weekly earnings, the increase in mortgage interest rates would have taken away 12.9 per cent of their post tax earnings by mid 2008.

Some the additional costs would have been returned in the higher deposit interest rates available on a limited number of deposit types. However, for most of the deposits that households are likely to use, interest is not paid or paid at trivial rates.

The importance of this experience is that the resources boom itself did not necessarily make Australians any richer nor did it seem to be associated with other indicators of material wellbeing.

There is a wealth of international literature that does in fact associate resource dependency on worse economic performance. A lot of that literature merely reports statistical associations and so may just reflect the peculiarities of the present constellation of nations in the world rather than any true causal relationships.[17]

[17] One study looked at 141 countries over the period 1950 to 1990 and found that a one percent increase in resource dependency (measured by the share of mineral exports in total exports) increased the probability of authoritarian government by nearly 8 per cent! See Rosser A (2006) 'The political economy of the resource curse: A literature survey', *Institute of Development Studies Working Paper 268*, April.

3 What will Australia look like on the other side of the peak?

The reduction of oil production is likely to be very disruptive to the world's economies given their present dependence on oil.[18] But there are many other commodities whose demise would not seem to matter all that much. For example, gold is an interesting case. *Peak Minerals in Australia* quotes an assessment suggesting that 80 per cent of mined gold becomes jewellery (p. 72). Slower annual output of gold is unlikely to be much of a concern and the existing holders of gold will be only too happy if the value of the gold increases.

Here I want to focus not on how Australia may be affected as a consumer of increasingly scarce commodities but as a producer.

Singer-Prebisch thesis

Many earlier writers took it for granted that for an economy to be trapped on a resource-dependent growth trajectory was to be trapped in a low growth economy with slow increases in living standards compared with the rest of the world. This is now known as the Singer-Prebisch thesis. Prebisch is particularly interesting; between 1964 and 1969 was secretary-general of the United Nations Conference on Trade and Development (UNCTAD).

The S-P thesis divides the world into the 'centre' based on the advanced economies of North America and Europe and the 'periphery' countries consisting mainly of primary producers. The main point of this thesis is that the periphery produces primary goods to export to the center, and the centre produces secondary goods for export to the periphery. As technology improves the centre is able to retain productivity improvements through higher wages and profits. In the periphery by contrast the results of technical progress are reflected in lower final prices that are passed on to consumers in the centre. Unions are weak in the periphery and companies concerned compete against each other by way of price. In the centre competition among large oligopolies generally avoids price competition. For Prebisch the upshot of all this was that the terms of trade tended to move against periphery countries so that they had to export more in order to get the same volume of industrial exports. All the benefits of technology accrued to the centre, the nations engaged in secondary activities rather than the periphery which was doomed to stagnant living standards.

Whether or not we agree with the mechanism S-P suggest is driving the process, the proximate causal mechanism is the long run deterioration on the terms of trade. Peak production is a mechanism that involves greater scarcity of mineral products and so provides a mechanism to reverse the declining long run terms of trade.

We noted earlier the slump in mining productivity and the implication of the peak minerals report is that productivity is likely to underperform the rest of the economy into

[18] See the Hirsch Report, United States Department of Energy (2005) *Peaking of World Oil Production: Impacts, Mitigation, & Risk Management*, February.

the future.[19] However, the falling productivity hardly mattered in recent years, the commodity price boom more than compensated for the declining productivity.

The Singer-Prebisch thesis in reverse

Now we turn to the rise in commodity prices and how they offset the productivity slowdown. Graph 1 above showed a massive increase in commodity prices since the eve of the mining boom.

The impact of the global financial crisis is clearly evident in the slump in the index from its peak at 119.5 in September 2008 (the month Lehman Brothers collapsed kicking off the global financial crisis). The index then moved to a low of 77.3 in May 2009. Despite the impact of the global financial crisis, at the end of March 2010 the index stood at 91.8 or approximately 130 per cent higher than it stood on the eve of the boom.

It should be intuitively evident that increased prices will offset the slump in productivity in the case of mining exports. Since 2001-02 mining productivity declined by 41 per cent, however, commodity prices increased by around 130 per cent. Assuming international prices for Australian imports remained constant; the value of imports produced by each mining worker would have increased by 33 per cent. Now some of the international prices for Australian imports would also have increased since Australia does import some commodities. Nevertheless, the example shows that even substantial declines in productivity in mining have most likely been more than offset by the increase in commodity prices.

This is a very important feature of the position at the moment. Using the figures reflecting the recent Australian experience it appears that while output per mine worker has fallen in terms of physical quantities produced, the international purchasing power of that physical product has increased significantly. From the economist's perspective the values are much more interesting than the physical product. Rather than the output of minerals per se we are interested in the international purchasing power of the minerals produced.

Of course the discussion so far assumes production is falling in the context of increasing prices. We might expect that to occur in the context where Australia's Hubbert curves roughly match the international Hubbert curves. In other words we should expect increasing international prices so long as we remain on the downward sloping region of the Hubbert curves.

Fluctuations in commodity prices

In addition to the long term trend in commodity prices there remains the question of the volatility in commodity prices. We mentioned earlier that volatile prices are likely to be transmitted to the rest of the economy through exchange rates in particular, but also through other ways; fluctuations in incomes, employment, construction and so on.

In the early 1940s as governments were making plans for the post war economy Keynes argued strongly for some sort of commodity price stabilisation mechanism. However, nothing ever came of those proposals. In the meantime producing countries have tried to

[19] The large gas projects now under consideration may provide an offsetting increase in productivity when they come online—even if the effect is temporary.

manage the fluctuations though cartel arrangements, the best known of which is the Organisation of the Petroleum Exporting Countries or OPEC.

If as seems likely commodity prices are more volatile on the other side of the Hubbert curves then this is a mechanism through which the peak minerals process acts as a negative force on the Australian economy. All sectors will have to accommodate the fluctuations in the currency and other variables brought about by fluctuating commodity prices.

4 Policy responses.

First we note that there are a host of policy responses specific to particular commodities. For example, the peak in oil production in Australia has been associated with interest in subsidising substitutes such as ethanol. Likewise there are specific issues to do with shortages in particular metals etc. However, our interest here is with the macroeconomic problems and policy responses.

Current policy

The policy response to the resources boom has been largely put on hold following the global financial crisis beginning in September 2008. Prior to that the macroeconomic response was to treat the macroeconomic outcome as the government would react to any other episode of 'overheating'—interest rate increases on the part of the Reserve Bank.

The RBA sought to use high interest rates to offset the macroeconomic impact of the mining boom and to confine the booming economy to the mining states. Between May 2006 and March 2008, the RBA steadily increased official interest rates from 5.50 per cent to 7.25 per cent in seven steps of 0.25 per cent. On each occasion, high or rising commodity prices were mentioned specifically:

- as producing 'consequent expansionary effects on incomes and spending'
- as 'adding to the growth in Australia's national income and spending'
- as 'add[ing] to incomes and spending in Australia'
- as 'remain[ing] an important source of stimulus to Australia's national income and spending'.

More recently, it was almost as if the RBA were targeting the terms of trade when it gave its reasons for interest rate hikes as:

- 'Australia's terms of trade are likely to rise further'
- '[they] have further strengthened prospects of Australia's terms of trade'.

The terms of trade were seen by the RBA to be boosting aggregate demand beyond what the Board considered desirable.

To the extent that the RBA was successful in contracting the economy, the spill over from the mining boom on to the rest of Australia would have been offset commensurately. That is, the RBA was using high interest rates to dampen the level of economic activity in the economy to 'make room' for the booming mining industry so that, for example, employment growth in other industries would fall and mortgage holders would reduce their consumption spending. High interest rates also have the effect of encouraging capital inflows, which tend to appreciate the exchange rate and thus reinforce the Gregory effect.

The role of Sovereign Wealth Funds

Australia could implement measures to offset the "resource curse" such as sterilising foreign reserves as Norway does with its Petroleum Fund which invests its overseas earnings in foreign asset markets. These are often referred to as "Sovereign Wealth Funds" or in the discussion below, just 'petroleum funds'.

On the one hand the virtue of a fund to collect windfall receipts from commodity price fluctuations is that it offsets the pro-cyclical pattern in government receipts and the encouragement of pro-cyclical government spending. Pro-cyclical government spending has the effect of amplifying both booms and busts. For example, towards the end of Australia's long boom and prior to the last election the Howard Government wasted the surge in tax revenue on tax cuts mainly going to the rich. In doing so the Howard Government acted so as to amplify the boom to some extent.[20] However, by quarantining the surge in revenue in some fund the spending temptation is removed from governments. The Future Fund presently serves the purpose of earmarking some government revenue and declaring it unavailable for funding present spending.

SWFs such as the Norwegian petroleum fund play an even more important role. To appreciate the way it works we need to go back a step. In discussions about German war reparations following World War One Keynes described the *transfer mechanism* which can be summarised in the proposition that an international flow of money in one direction encourages a flow of goods and services in the same direction.[21] In that context a flow of currency from the defeated Germany to mainly Britain and France encouraged an equal increase in the flow of goods and services from Germany to the rest of the world. The intervening mechanism was the depreciation in the value of the German currency. In Australia's case the massive increase in foreign receipts from mining exports encouraged an increase in the value of the A$ and that in turn encouraged an increase in the net flow of goods and services into Australia. In Britain and France in the 1920s producers were threatened by the competition from cheap German exports. The appreciation of the A$ over the last few years has equally threatened Australian exporters and those that compete against imports.

The resources boom involves an inflow of new money and encourages a flow of goods and services in the same direction. For example, the boom through the appreciation of the A$ had the effect of increasing Australian imports, especially of manufactures and reducing local manufacturing production. Between 2003-4 and 2008-09 manufacturing shrank from 10.2 to 8.6 per cent of GDP. In addition, more Australians holidayed abroad and fewer overseas tourists arrived in Australia.

Those effects could be offset if we could arrange an equal and opposite flow of money which is what the Norwegian *Government Pension Fund* does. The Government Pension Fund used to be the *The Petroleum Fund of Norway* but here we just refer to the petroleum fund. The petroleum fund collects all the petroleum revenue earned by the Norwegian government through its part ownership of Statoil, its taxes on petroleum companies and other petroleum fees and licensing. The important thing about the petroleum fund is that it is mainly invested offshore—international stocks and bonds and other investments. That is the crucial bit. When oil prices go up there is an initial surge in the money going into Norway, but most of that surge is sent back offshore again so that there is no upward pressure on the Kroner. By reversing the flow of money into Norway there is no transfer mechanism.

Some observers suggest Australia should consider setting up an institution similar to the Norwegian petrol fund.

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[20] See Richardson DR (2009) 'Where has all the revenue gone? To tax cuts for the rich!' *The Australia Institute Technical Brief No 2*, May at https://www.tai.org.au/?q=node/9&pubid=2062.

[21] Keynes JM (1919) *The Economic Consequences of the Peace*, London: Macmillan.

The aim of the Norwegian petroleum fund seems to be the accumulation of a sum that will be available when petroleum resources begin to run out. In that way there will be, in theory, a perpetual benefit as a result of the current petroleum reserves. Of course, the Norwegian petroleum revenue is a very large share of government revenue compared with mining revenue in Australia. In a good year the Australian state mining royalties and the Federal resource rent taxes on Australian minerals are unlikely to reach one per cent of GDP.[22] The last year we have for mining royalties Government revenue from petroleum in Norway averaged 18.1 per cent of GDP over the period 2000-06.[23]

Australia is a large order of magnitude different from Norway. Any initiative in Australia that tried to emulate the Norwegian experience would operate on a much smaller scale. Nevertheless if properly managed such a fund could have offset much of the appreciation in the value of the Australian dollar and so could have cushioned the contraction in manufacturing and other trade-exposed industry.

Of course any equal and opposite flow of money would do the same job as a version of the Norwegian petrol fund. For example, on the assumption that Australia will continue to experience resource boom revenues for some time to come perhaps we should be on the look out for some other potential flow of perhaps $20 to 30 billion per annum. One candidate would be reversing the large inflow of foreign funding accounted for by the Australian banks.

There are other options that could be explored such as encouraging mining companies to invest their revenue surges in offshore assets. Equally government revenue surges attributable to mining could be invested in the Future Fund.

There is also a natural reverse flow associated with some of Australia's resources. For example, some of the gas projects may have very little impact on Australia if they

- Involve capital equipment sourced from abroad,
- Involve very little employment or subcontracting with Australians,
- Have profits accruing to foreign owners.

In that case most of the revenue from operations would be sent abroad as payments to foreign suppliers and income for foreign owners. Little more than government taxation revenue would remain in Australia. The Australian figures would show the export income but would also record payments going overseas again. But even those figures would be notional since most of the money would never be seen in Australia. That would solve the transfer mechanism but is likely to be regarded by most people as unacceptable.

Whatever the exact mechanism, there would seem to be a strong case for seriously examining the options for Australia. Anything that can neutralise the transfer mechanism would have the effect of avoiding the disruption to the rest of the economy that Australia periodically experiences as a result of the resources boom.

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[22] Royalties in 2006-07 were $6.6 billion according to ABS (2008) Mining Operations, Australia, 2006-07, Cat no 8415.0, 22 July while the Federal Resource Rent Tax was $1.6 billion for the same year (See Australian Government (2009) Budget Strategy and Outlook, 2009-10 Budget Paper No 1, May). The former would have increased substantially but not the RRT which was expected to raise $1.7 billion in 2009-10.

[23] International Monetary Fund (2007) *Norway: Selected Issues, IMF Country Report No 07/197*, June at http://www.imf.org/external/pubs/ft/scr/2007/cr07197.pdf

5 Conclusions

This has been a fairly wide discussion of the macroeconomic implications of peak minerals in Australia.

In 1951 agriculture accounted for just over 30 per cent of Australia's GDP, much bigger than mining has ever been.[24] Today agriculture is 2.6 per cent of GDP.[25] Sixty years ago it would have been inconceivable to imagine agriculture shrinking to less than a tenth of its size as a share of GDP. Yet it happened. That experience should suggest to us that, with time, Australia is capable of absorbing major changes in the composition of its industry. That experience should also make us think twice before we suggest that there is anything in the current mining industry that is critically important to Australia.

Having said that, mining is a big and important part of the Australian economy. Among other things, the incomes (or value added) produced in the mining industry are much higher than the Australian average, despite the rather large fall in mining productivity over the last seven years.

In recent years the mining industry has also been associated with dramatic price increases. They meant massive increases in incomes earned in the sector but also had a downside in the cities. The appreciation of the Australian dollar and the higher interest rates had the effect of squeezing other parts of the economy thereby creating room for the mining boom. Most Australians would have experienced either no benefit or been worse off as a result of the commodity boom.

The peak minerals thesis is going to have major implications for Australia. There used to be a fairly widely held view that in the long run the terms of trade would move against commodities and that countries locked into commodities faced long term stagnation. However, the commodity price boom means that thinking has to be put on hold.

Australia seems to have been sliding down the right hand side of its Hubbert curve. However, that has coincided with the strong commodity prices which have more than offset the slowdown in mining productivity.

Using figures for recent Australian experience it is apparent that the *value* of the output of Australia's mining industry has increased significantly despite a large fall in mining productivity. If the mining productivity continues to decline or grow slowly we will continue to be protected if prices also continue to increase as a result of being on the wrong side of the Hubbert curve.

Much of the policy response to date has involved action on the part of the Reserve Bank of Australia to slow down the economy. The RBA saw the commodity boom as a direct threat to the stability of the Australian economy. They saw the risk of an overheating economy.

The Henry Tax Review is likely to recommend that the resource rent tax be extended to on-shore mining activities and possibly replace the state based royalty arrangements.

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[24] ABS (2004) 'Feature article—100 years of change in Australian industry', *Australian System of National Accounts, 2003-04*, Cat no 5204.0, 10 November.

[25] ABS (2010) *Australian National Accounts: National Income, Expenditure and Product, Dec 2009*, Cat no 5206.0, 3 March.

That would give the Australian tax system a large tax base that is also very volatile. In that context the establishment of a government fund modelled on the Norwegian petroleum fund begins to look attractive.

On the one hand such a fund could act as a means of stabilising the economy by having the government go into surplus when revenues boom but the fund might be available for use when the economy falls into recession.

The proposed fund could also be used to hide resource incomes from the present government and earmark it for use when the minerals run out. While Hubbert curves alert us to the likelihood that mining production will decline, we cannot rely on rising prices to offset that forever. We are not far from the position where alternative energy sources are competitive with fossil fuels, even without subsidies but especially if carbon is appropriately priced.

Depending on the design, something like the petroleum fund also has the benefit of insulating the economy from commodity price fluctuations. In the Norwegian model most investment is offshore so that as money comes into the economy via oil revenues it is then turned around again through offshore investments. In that way the transfer mechanism is avoided thus protecting manufacturing and other trade-exposed industry from appreciating currency.

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