6 The big picture: mining, productivity and prosperity

Key points

- The decline in mining industry productivity after 2000 has been a major drag on national productivity growth. In 2005-06 a decline of nearly 9 per cent in mining industry MFP reduced market sector MFP by close to 1 percentage point.
- After removing the influence of resource depletion effects and capital investment effects in the mining industry, market sector MFP growth between 2000-01 and 2006-07 is estimated to be around 8 per cent higher.
- While conventionally measured multifactor productivity (MFP) growth in mining has been poor in recent years, higher world prices for many mineral and energy commodities generated record profit levels in much of the industry, and record levels of new investment. The mining boom led to a sharp increase in Australia's terms of trade, and an increase in the real exchange rate. The higher terms of trade contributed to an increase in the real incomes of Australians in recent years, even though growth in real output (production) was comparatively poor.
- The broader effects of the mining boom on income and economic activity are regionally concentrated in line with the geographic pattern of mining activity. Mining is more important to the economies of Western Australia and Queensland, and the effects of the boom in terms of income and employment growth are more apparent in these states.
- The expectation has been that mining MFP would begin to improve in 2008-09 as production associated with the surge in labour and capital investment in the sector between 2004-05 and 2006-07 began to come on-stream. However, this projection is now in question due to falling commodity prices, and decisions by many mining companies to cut production and postpone new investment.
- If mineral and energy commodity prices do indeed remain comparatively low over the next few years, then it is likely that mining companies will focus heavily on trying to reduce production costs. To the extent this occurs, it will have a positive effect on mining MFP, and reinforce the expected rebound in MFP (albeit possibly further delayed) as production associated with the recent surge in capital investment comes on-stream.

Following a surge in market sector productivity during the 1990s, Australia's productivity growth has slowed this decade to below the long-term average rate. This chapter reviews the extent to which developments in the mining industry have contributed to slower aggregate productivity growth, and argues that the key productivity measurement issues raised in chapters 3 and 4 — resource depletion effects and capital investment effects — have played an important role.

Notwithstanding the lower aggregate productivity growth outcome this decade, measures of national income and expenditure have been comparatively strong, and this is partly the result of the strength in mining commodity prices leading to higher profitability in the sector, a higher terms of trade, and a stronger Australian dollar. This chapter also reviews the broader relationship between the mining boom and national prosperity so far this decade.

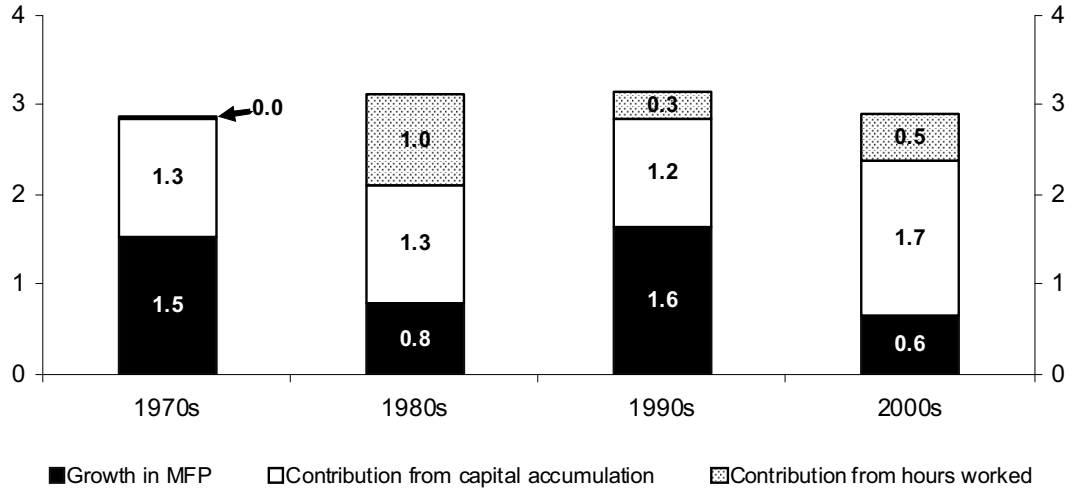
The market outlook for mining changed fundamentally, however, in mid-to-late 2008, as the prices of some mineral and energy commodities fell substantially and as the global financial market crisis unravelled. This chapter also examines the possible consequences for mining productivity of these events.

6.1 The contribution of the mining industry to Australia's productivity growth

Figure 6.1 shows the contributions to growth in the market sector output over the last four decades from growth in hours worked, capital accumulation and growth in productivity. While output growth has varied only slightly over the period — between an annual average rate of 2.9 and 3.2 per cent per year — MFP has varied considerably, with a very noticable decline in productivity growth from 1.6 per cent over the 1990s to 0.6 per cent over the seven years of the current decade for which data are available.

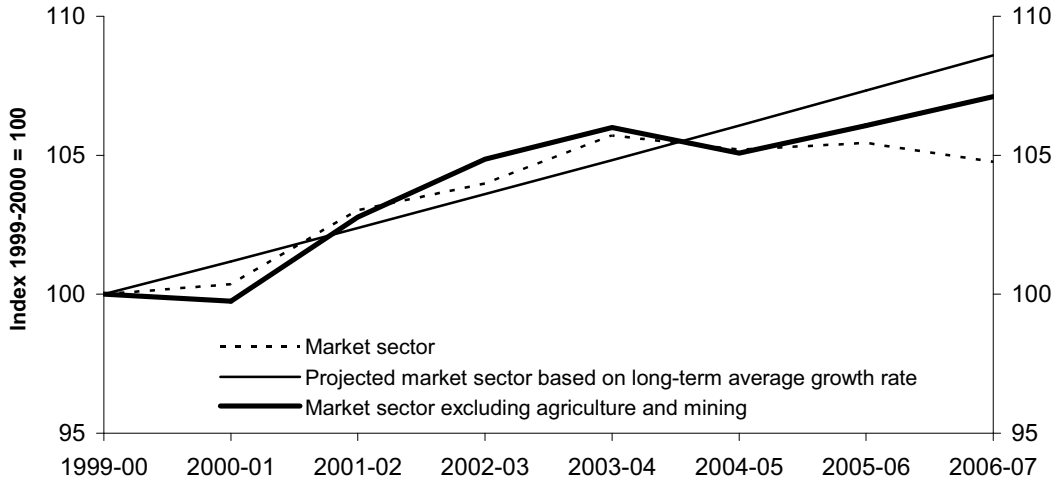
While productivity growth in all sectors has slowed so far this decade, the agricultural and mining industries stand out – recording negative productivity growth over the period since 2000. The developments in agriculture and mining explain more than half of the fall in Australia's productivity growth below the long-term average growth rate (figure 6.2). As noted in chapter 1, the collapse in MFP in the mining industry in 2005-06 reduced market sector MFP by almost 1 percentage point, while in 2006-07 a widespread drought in Australia subtracted 1.3 percentage points from market sector multifactor productivity.

Figure 6.1 **Contributions to market sector output growth**
Annual average change, percentage points



Data source: ABS (*Australian System of National Accounts 2006-07*, Cat. no. 5204.0)

Figure 6.2 **Multifactor productivity**

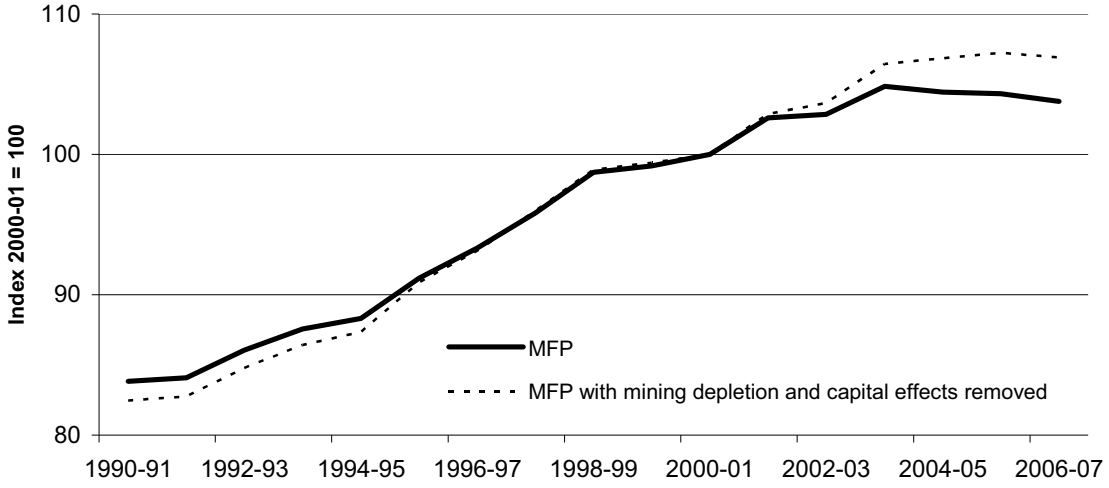


Data sources: Authors' estimates; ABS (*Australian System of National Accounts 2006-07*, Cat. no. 5204.0).

But it is also the case that much of the decline in mining industry productivity between 2000-01 and 2006-07 was the result of the temporary effects of production lags associated with a massive increase in new capital investment, and the effects of ongoing declines in the quality of natural resource inputs used in mining.

After removing the influence of these factors on mining MFP and re-estimating market sector MFP, a significant proportion of the slowdown in MFP growth in recent years can be explained by developments in the mining industry alone (figure 6.3). That is, difficulties associated with the measurement and interpretation of productivity in the mining industry are found to play an important role in explaining the slowdown in overall productivity growth in Australia so far this decade.

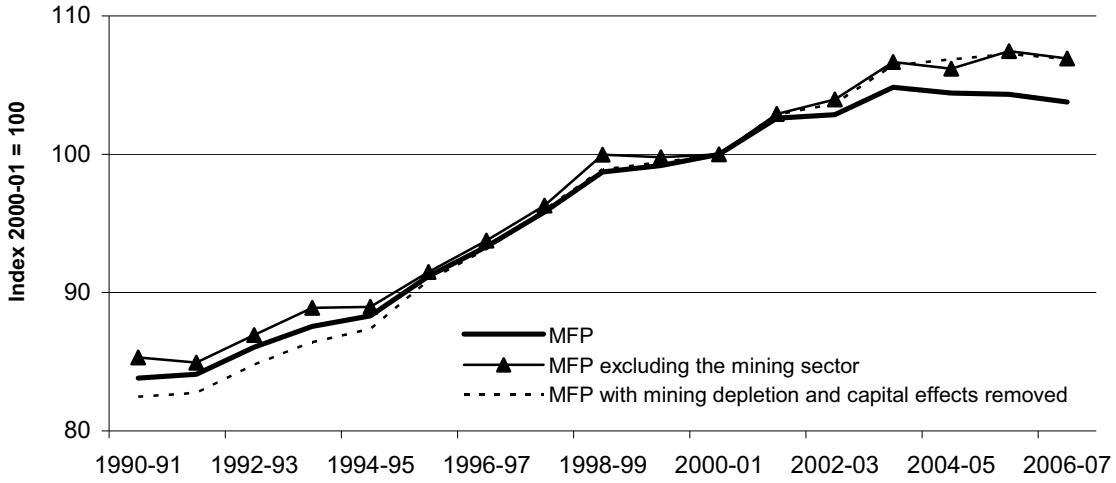
Figure 6.3 **MFP in the market sector: original and adjusted for mining industry developments**



Data sources: Authors estimates; ABS (*Australian System of National Accounts 2006-07*, Cat. no. 5204.0)

The impact on market sector MFP of accounting for the effects of resource depletion and the recent capital investment surge in mining is very similar to the effect of removing mining from the calcuation of market sector MFP in the first place (figure 6.4). That is, after removing the effects on mining MFP of resource depletion and capital effects, mining MFP grew by approximately the same amount as the rest of the market sector between 2000-01 and 2006-07 (approximately 8 per cent).

Figure 6.4 **MFP in the market sector: original, excluding mining, and adjusted for mining industry developments**



Data sources: Authors estimates; ABS (*Australian System of National Accounts 2006-07*, Cat. no. 5204.0).

6.2 The mining boom and national prosperity

The increase in mining industry commodity prices has been a major contributor to an on-going improvement in Australia's overall 'terms of trade' — the ratio of export prices to import prices.[1] By the end of June 2008 the terms of trade had reached a level above that seen during the energy crisis of the mid-1970s, and approaching the level reached during the wool-price boom associated with the Korean War (figure 6.5).

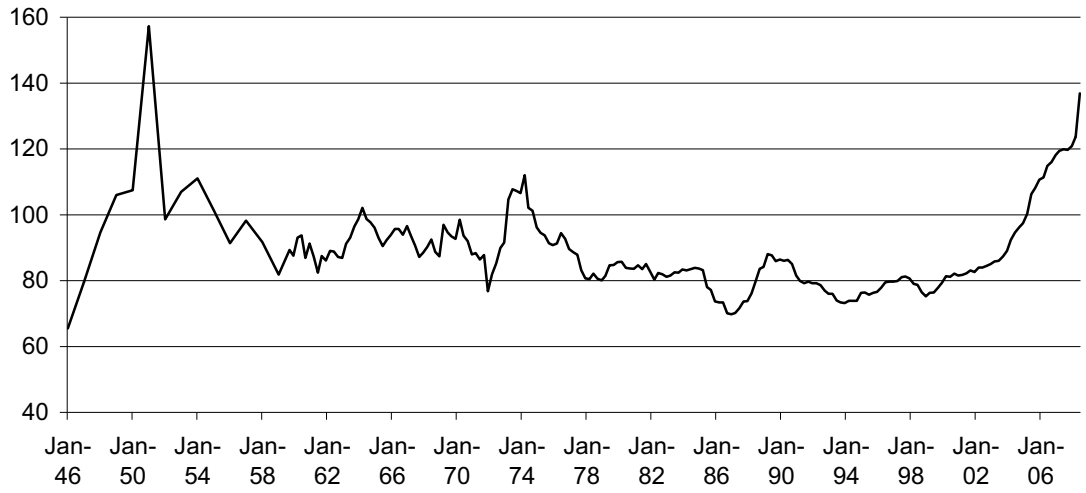
The increase in Australia's terms of trade is important because it has provided a substantial boost to national incomes, spending and activity. In general, an improved terms of trade increases Australia's real income by allowing greater quantities of imports to be purchased for the same quantity of exports.[2] Figure 6.6 shows the extent to which the terms of trade has contributed to the average income growth of Australians over the past four decades, along with the contributions of changes in labour utilisation, and labour productivity. So far this decade, the

[1] Significant declines in the prices of Australian imports, particularly manufactured goods, have also played a part.

[2] The converse, of course, is that a decline in the terms of trade reduces the real income of Australians. What is important for longer-term economic welfare is whether or not an increase in the terms of trade is sustained. Recent declines in the spot market prices of crude oil and a number of metals may be a precursor to the end of the long-running increase in the terms of trade.

improvement in the terms of trade has contributed a substantial increase in real income.

Figure 6.5 **Terms of trade, 1946 to 2006-07**



Data sources: Gruen and Kennedy (2006), ABS (*Australian National Accounts: National Income, Expenditure and Product* 2008 Cat. no. 5206.0, table 1).

Figure 6.6 **Contributions to income growth – the importance of the terms of trade**

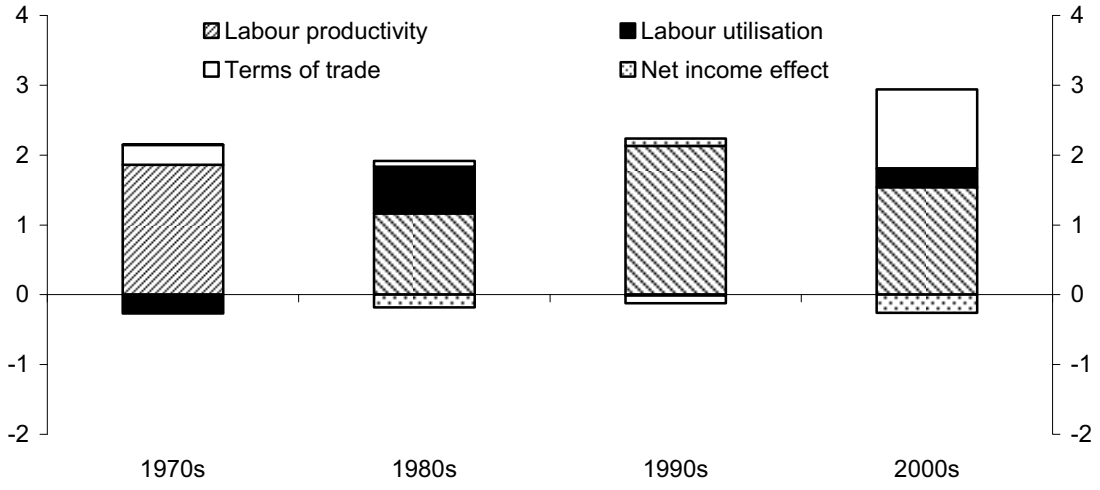
Contributions to annual average growth in real gross domestic income per capita, percentage points per year

Data source: Commission calculations based on ABS (*Australian System of National Accounts 2006-07*, Cat. no. 5204.0) Labour utilisation is hours worked per capita, while Labour productivity is output per hour worked. Changes in labour productivity reflect both MFP growth and capital deepening — increases in outputs due to increases in the stock of capital.

However, some of the profits associated with the resources boom are payable to foreign owners of Australian mining industry assets, and hence not all of the increased income associated with the mining boom necessarily flows through to the rest of the economy (see Reserve Bank 2005). A measure which takes account of income payable to non-residents and income received from overseas is Gross National Income (GNI). Growth in GNI is lower than growth in gross domestic income (GDI) as income payable to non-residents is greater than income received from residents living abroad, nevertheless growth in GNI has been strong with the contribution of the terms of trade effect (net of the net income effect) remaining very strong (figure 6.7).

Figure 6.7 **Contributions to gross national income**

Contributions to annual average growth in real gross national income per capita, percentage points per year



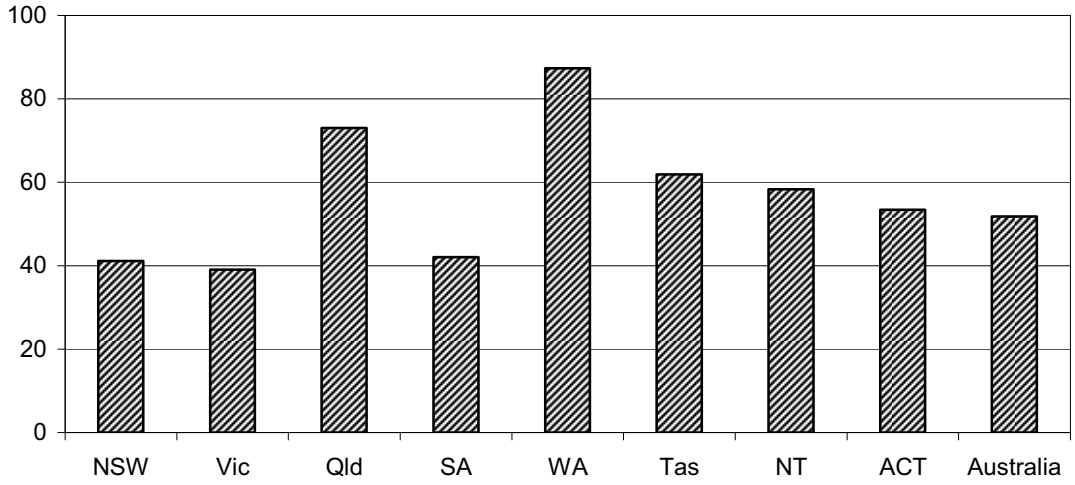
Data source: Commission calculations based on ABS (*Australian System of National Accounts 2006-07*, Cat. no. 5204). Labour utilisation is hours worked per capita, while Labour productivity is output per hour worked. Changes in labour productivity reflect both multifactor productivity growth and capital deepening - increases in outputs due to increases in the stock of capital. The net income effect refers to the contribution made by the change in gross national income due to the difference between primary income flows payable to non-residents and foreign income payable to residents.

Impact of the resources boom on downstream industries

The mining boom has also had significant real effects on economic activity in other areas of the national economy. The direct effects of the boom include stronger demand for inputs, including construction, equipment and infrastructure. As noted in chapter 2 and chapter 4, mining industry spending on new capital equipment has increased dramatically over the last couple of years, and spending on other inputs has also grown strongly (see table 2.1 and figure 4.3).

The impact of the mining boom on downstream industries is particularly important in the states of Western Australia and Queensland. As shown in chapter 2, the mining industry represents a comparatively large proportion of overall economic activity in these regions (see figure 2.1), and the change in gross state product between 2000-01 and 2006-07 is considerably larger in these states (figure 6.8).[3]

Figure 6.8 **Percentage change in gross state product[a] between 2000-01 and 2006-07**



a In current prices.

Data source: ABS (*Australian National Accounts: State Accounts 2006-07*, Cat. no. 5220.0)

A recent paper by Ye (2006) uses a general equilibrium model to simulate the flow-on effects of the iron ore boom on the Western Australian economy. The author finds that the surge in iron ore exports and the development of new iron ore projects is having the greatest stimulatory effects on the industries most closely related to construction activity — that is, energy supply and other services to mining. In relation to employment, more than 80 per cent of the new jobs created as a result of the iron ore boom are expected to be generated *outside* the iron ore sector, particularly in service industries (Ye 2006).

6.3 Impact of global economic developments and falling commodity prices

The expectation was that mining MFP would begin to improve in 2008-09 as production associated with the surge in labour and capital investment in the sector

[3] For a more detailed discussion of the impact of the mining boom on state and regional economic activity (see Garton 2008).

between 2004-05 and 2006-07 began to come on-stream. In September 2008 for example, the Australian Government forecasting agency ABARE was predicting a substantial (7 per cent) increase in mining industry output in 2008-09, after a long period of comparative sluggish output growth (ABARE 2008a).

However, these projections are now in question due to the substantial decline in world prices of a number of mineral and energy commodities. There is anecdotal evidence to suggest that overall output growth in the sector will be revised downwards in 2008-09, due to both the closure of existing mines, and cut-backs to production at others. Mine closures are likely to have a positive effect on MFP as mines with higher average costs of production will generally be closed first. On the other hand, cut-backs in output at existing mines may lead to lower MFP if they lead to temporarily idle capital.

There is a substantial amount of new productive capacity in mining that is expected to come on-stream in 2008-09. The decline in commodity prices may have an impact on the speed and extent to which the new mines and mine expansions reach full capacity. This may delay the anticipated rebound in MFP as production lags associated with the surge in capital investment that started in 2004-05 begin to unwind.

As noted in chapter five, a commodity price boom can lead to lower productivity (albeit occuring at the same time as high profitability) because higher prices render less efficient mines and mining practices economically viable. In boom times the primary focus of mining operations is usually on increasing output, albeit at a higher unit cost of production. The converse tends to hold in downturns, as (in an effort to maintain profitability) less efficient mines and mining practices are wound back in order to reduce unit costs.

If mineral and energy commodity prices do indeed remain comparatively low over the next few years, then it is likely that mining companies will focus heavily on trying to reduce production costs. To the extent this occurs, it will have a positive effect on mining MFP, and reinforce the expected rebound (albeit possibly further delayed) in MFP as production associated with the recent surge in capital investment comes on-stream.