The Effect of the Mining Boom on the Australian Economy

Peter Tulip*

This article presents estimates of the effects of the mining boom using a macroeconometric model of the Australian economy. The mining boom is estimated to have boosted real per capita household disposable income by 13 per cent over the decade to 2013. The boom contributed to a large appreciation of the Australian dollar that has weighed on other industries exposed to trade, such as manufacturing and agriculture.

Introduction

The world price of Australia's mining exports more than tripled over the 10 years to 2012, while investment spending by the mining sector increased from 2 per cent of GDP to 8 per cent. This 'mining boom' represents one of the largest shocks to the Australian economy in generations. This article presents estimates of its effects, using a macroeconometric model of the Australian economy. It summarises a longer research paper, which contains further details and discussion of the results (see Downes, Hanslow and Tulip (2014)).

The model estimates suggest that the mining boom increased Australian living standards substantially. By 2013, the boom is estimated to have raised real per capita household disposable income by 13 per cent, raised real wages by 6 per cent and lowered the unemployment rate by about 1¼ percentage points. However, not all parts of the economy have benefited. The mining boom has also led to a large appreciation of the Australian dollar that has weighed on other industries exposed to trade, such as manufacturing and agriculture. However, because manufacturing benefits from higher demand for inputs to mining, the deindustrialisation that sometimes accompanies resource booms – the so-called 'Dutch disease' – has not been strong.

Model estimates suggest that manufacturing output in 2013 was about 5 per cent below what it would have been without the mining boom.

Modelling the Mining Boom

To estimate the impact of the mining boom, this article uses AUS-M, which is a large structural model of the Australian economy. The model assumes that most output is determined by demand in the short run, with some important exceptions. The major expenditure components of real GDP are estimated by separate time series regressions. The model is designed to fit the data closely, with a relatively loose connection to economic theory.

Quantifying the effects of the mining boom involves a comparison of two scenarios:

- how the Australian economy evolved throughout the mining boom (the baseline scenario)

- how the Australian economy might have evolved without the mining boom (the counterfactual scenario).

Differences between the baseline and counterfactual scenarios are interpreted as the effects of the mining boom. The baseline scenario reflects the actual behaviour of the economy to 2013 and then uses AUS-M to project economic conditions to 2030. The extension to 2030 is used to capture the transition of

*   The author is from Economic Research Department.

the mining industry from the investment phase to the production phase of the boom and to measure lagged responses. This extension differs significantly from RBA forecasts. It is not intended to be precisely realistic and is already out of date in some respects. It is simply intended to provide a plausible baseline from which deviations can be measured.

The counterfactual scenario, in which the mining boom does not occur, is based on simulations of AUS-M under the following three assumptions:

• The trend growth of world industrial production is held constant at its 2002 rate and not allowed to accelerate.

• World mineral commodity prices are reduced (beyond what arises from the previous assumption) to their average level from 1985 to 2000.

• Remaining unexplained strength in mining investment (beyond its normal response to economic conditions) is removed so that it remains about 2 per cent of GDP.

These assumptions lead to significantly lower mineral commodity prices and mining investment in the counterfactual scenario (Graph 1 and Graph 2).

Graph 1
Mineral Commodity Prices
November 2010 = 1

Source: Downes, Hanslow and Tulip (2014)
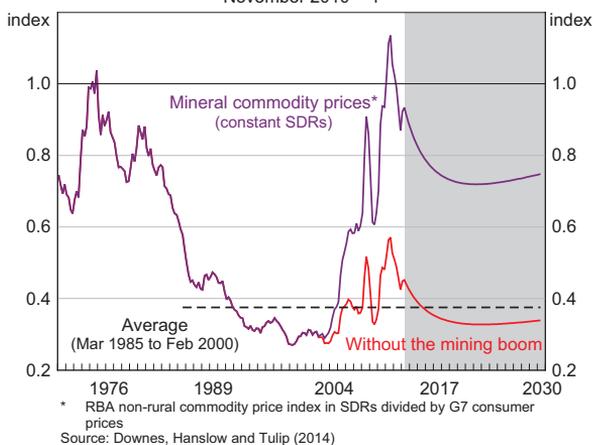
Graph 2
Mining Investment
Per cent of trend GDP

Source: Downes, Hanslow and Tulip (2014)
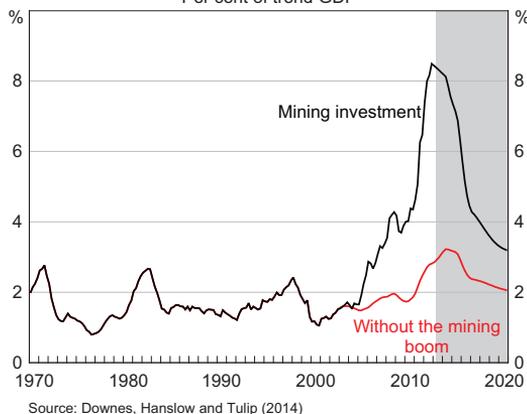
Aggregate Effects

The effect of the mining boom on overall living standards can be gauged by the difference in real household disposable income per capita, which is estimated to have been about 13 per cent higher in 2013 than it would have been without the boom (Graph 3).

This effect can largely be decomposed into increases in the purchasing power and volume of output. Higher commodity prices translate into higher terms of trade, which directly boost the purchasing power of domestic income. This boosted real gross domestic income (GDI)[1] by about 6 per cent in 2013 (Graph 3). The contribution to real GDI overstates the increase in real national income due to the mining boom, because some of the benefit accrues to foreign investors.

Graph 3 also shows an estimate of the increase in the volume of goods and services produced arising from the boom. Higher mining investment directly contributes to higher aggregate demand. Furthermore, higher national purchasing power boosts consumption and other spending components. Higher mining investment also increases the national capital stock and hence aggregate supply. There are many further

---

1   Real GDI is a standard measure for assessing purchasing power effects. It differs from GDP in that nominal exports are deflated by import prices, rather than export prices.

Graph 3
Effects of the Mining Boom on Income*
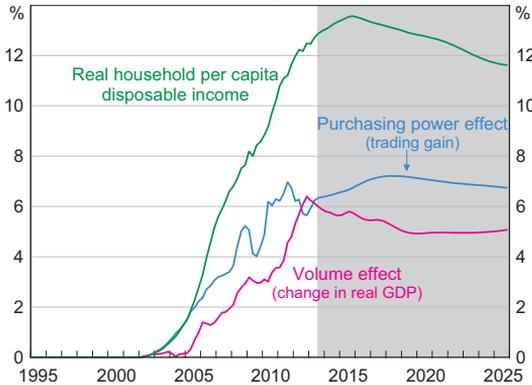
* Percentage deviation of baseline estimates from the no-mining-boom
counterfactual
Source: Downes, Hanslow and Tulip (2014)

Graph 4
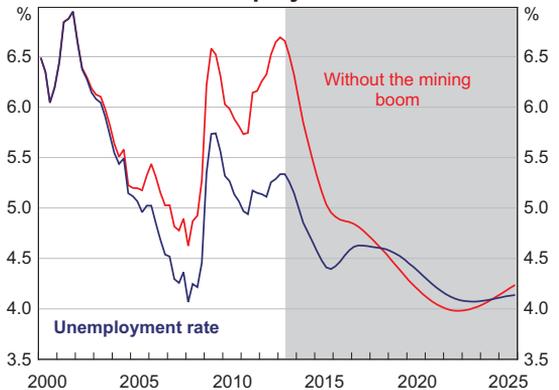**Real Exchange Rate**
November 2010 = 1

* Trade-weighted exchange rate adjusted for movements in relative
consumer prices
Source: Downes, Hanslow and Tulip (2014)

Graph 5
Unemployment*

* Estimates are based on published data up to mid 2013, then model
simulations thereafter
Source: Downes, Hanslow and Tulip (2014)

compounding and offsetting effects, discussed below. The estimated net effect is to increase real GDP by 6 per cent.

The increase in both the purchasing power and volume of domestic production accounts for most of the increase in household disposable income. There are also minor contributions from changes in taxes, foreign income, population and so on.

Many of the effects of the mining boom estimated by AUS-M reflect changes in the exchange rate. As a result of the mining boom, the real exchange rate is estimated to have been 44 per cent higher in 2013, relative to its level in the absence of the boom (Graph 4). That is, the exchange rate would not have appreciated but would have remained around the same levels as the previous 20 years.[2]

The stronger activity arising from the mining boom results in stronger employment, reducing the unemployment rate by 1¼ percentage points in 2013 (Graph 5).[3]

---

2 While estimating exchange rate behaviour is difficult, the elasticity of the exchange rate to the terms of trade is similar in AUS-M to other models of the Australian economy, such as the Monash Multi-Regional Forecasting model, or Stone, Wheatley and Wilkinson (2005).

3 As in all the graphs, estimates are based on published data up to 2013, then model simulations. A divergence between the simulations and subsequently published data is especially noticeable for the unemployment rate. It is also worth noting that AUS-M longer-term projections of the unemployment rate were lower than projections of other forecasters.

The lower unemployment rate and higher energy prices that accompany the mining boom placed upward pressure on inflation. However, these effects were initially more than offset by the appreciation of the exchange rate, which lowered import prices. The estimated net effect in the first few years of the mining boom was to lower the inflation rate by an average of about half a percentage point (Graph 6). However, in AUS-M, the effect of a change in the exchange rate on inflation is temporary, whereas the effect of a change in the unemployment rate is highly persistent. So, by 2008, the unemployment effect begins to dominate and inflation is higher.

Graph 6
Inflation*
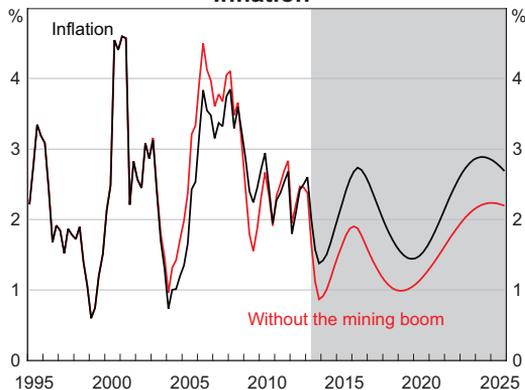
* Inflation is measured as the four-quarter percentage change in the household consumption deflator; this national accounts measure differs slightly from the consumer price index
Source: Downes, Hanslow and Tulip (2014)

In the first few years of the boom, interest rates are estimated to have been slightly lower than they otherwise would have been (Graph 7). This reflects lower inflation (as a result of the exchange rate appreciation) offsetting stronger activity. However, as the effects of the exchange rate on inflation diminished, interest rates rose in reaction to the tight labour market. By 2013, interest rates were almost 2 percentage points above their estimated levels without the boom. Interestingly, interest rates are estimated to remain positive in the counterfactual. That is, even without the strong growth in Asia and its effects on commodity prices, and without the surge in mining investment, the model suggests
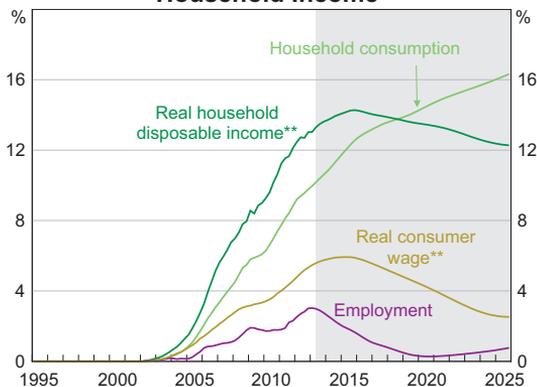
Graph 7
Interest Rates
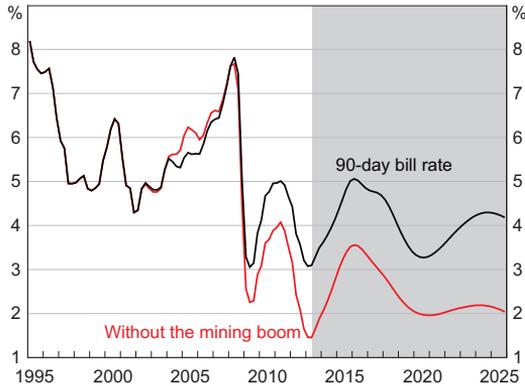
Source: Downes, Hanslow and Tulip (2014)

that Australia would still have escaped the zero lower bound on interest rates that has constrained monetary policy in many other countries. The strong fiscal stimulus following the global financial crisis may be one reason for that.

Sectoral Effects

The mining boom raises household income through several different channels within the model (Graph 8). As of 2013, employment was 3 per cent higher than in the counterfactual, largely due to the boost to aggregate demand. Real consumer wages were about 6 per cent higher, reflecting the effect of the higher exchange rate on import prices. Property income increased, reflecting greater returns to equities and real estate. A larger tax base led to lower average tax rates, all of which helped raise real household disposable income by about 13 per cent.

Graph 8
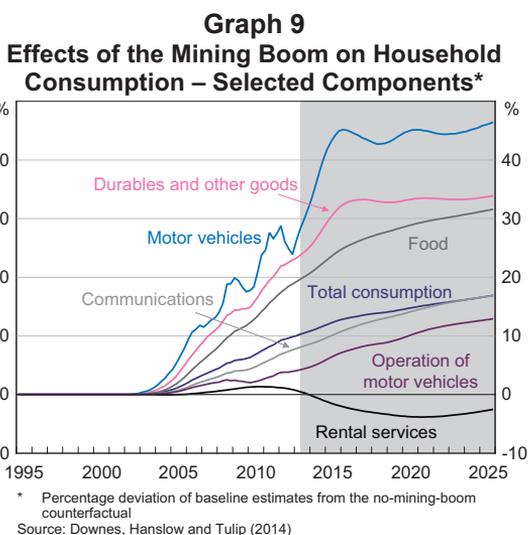**Effects of the Mining Boom on Household Income***

* Percentage deviation of baseline estimates from the no-mining-boom counterfactual
** Real incomes are deflated by the national accounts consumption deflator
Source: Downes, Hanslow and Tulip (2014)

As can be seen in Graph 8, household consumption is estimated to initially rise more slowly than real household disposable income. That is, the saving rate increases. This reflects inertia in consumption behaviour, coupled with a default assumption that households initially view the boom as temporary. In the medium to long run, as it becomes apparent that the change in income is persistent, savings return
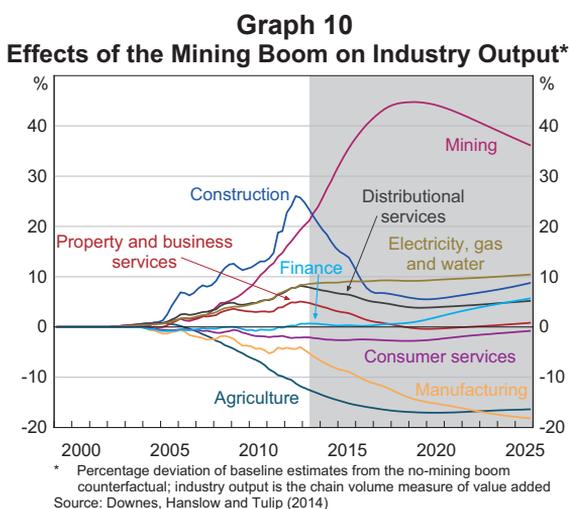
toward normal and consumption rises further. In the long run, consumption will adjust by about the same proportion as the rise in household disposable income.

Changes in the composition of consumption are an important determinant of how the mining boom affected different industries (Graph 9). Demand for motor vehicles and other consumer durables are estimated to have increased strongly, reflecting lower import prices and strong income growth. Relative price changes for most other categories of consumption were smaller, with consequently less effect on their relative demand.

Effects of the mining boom on industry output are shown as shares of real GDP in Graph 10. The industries that are estimated to benefit most from the boom, outside mining itself, are construction, electricity, gas and water, and distributional services. These industries sell a disproportionate share of their output to the mining industry. An industry that bears some of the largest burdens of the boom is agriculture.[4] It is an industry heavily dependent on export earnings, which fall with the exchange rate appreciation. It gains little benefit from the surge in domestic incomes and demand associated with the mining boom.

Graph 9
Effects of the Mining Boom on Household Consumption – Selected Components*

* Percentage deviation of baseline estimates from the no-mining-boom counterfactual
Source: Downes, Hanslow and Tulip (2014)

Graph 10
Effects of the Mining Boom on Industry Output*

* Percentage deviation of baseline estimates from the no-mining boom counterfactual; industry output is the chain volume measure of value added
Source: Downes, Hanslow and Tulip (2014)

The increase in household disposable income has involved a surge in demand for housing. However, whereas most other elements of consumption are supplied elastically, the supply of housing is relatively fixed in the short run. Thus, the mining boom results in a substantial reduction in vacancy rates and an increase in rents. Although high rents and house prices encourage housing construction, these effects are more than offset by higher interest rates after 2009 relative to the counterfactual (Graph 7), which depress dwelling investment. So despite a large increase in nominal consumption, the supply of housing declines, compounding the downward pressure on vacancies and upward pressure on rents.

The manufacturing sector has been the focus of concern about the 'Dutch disease' and 'deindustrialisation'. In the short term, manufacturing output is supported by the higher incomes and expenditure associated with the mining boom. In particular, manufacturing benefits from strong demand for equipment and material used in construction. As a result, investment by manufacturing is higher in the first few years of the boom. However, this effect is more than offset by the 40 per cent appreciation of the exchange rate, which makes manufacturing less competitive. In the first decade of the boom the net effect is moderate,

4   This is consistent with previous studies, such as Stoeckel (1979).

with manufacturing output estimated to be about 5 per cent lower in 2013 than it would have been in the absence of the boom (Graph 10). Then, as mining investment fades, and with it the demand for manufacturing inputs, the relative price effects increasingly dominate. By 2016, manufacturing output is estimated to be about 13 per cent lower, an effect that continues to increase over time.

However, it would be wrong to conclude that the mining boom is the main source of the manufacturing sector's relative decline. Manufacturing has been declining as a share of total employment for decades (Graph 11). The mining boom accentuates this trend, but its contribution is small compared with the changes that have come before.

Graph 11
Manufacturing Employment Share

Source: Downes, Hanslow and Tulip (2014)

Conclusion

The mining boom can be viewed as a confluence of events that have boosted mineral commodity prices, mining investment and resources production. This combination of shocks has boosted the purchasing power and volume of Australian output. It has also led to large changes in relative prices, most noticeably an appreciation of the exchange rate. The combination of changes in income, production and relative prices has meant large changes in the composition of economic activity. While mining, construction and importing industries have boomed,

agriculture, manufacturing and other trade-exposed services have declined relative to their expected paths in the absence of the boom. Households that own mining shares (including through superannuation) or real estate have done well, while renters and those who work in import-competing industries have done less well.

All of these results are estimates that depend on linkages and assumptions which are open to debate. Some confidence can be placed in the broad pattern of responses discussed above, which is in line with previous research. There is less certainty about magnitudes and the timing of responses. ⋎
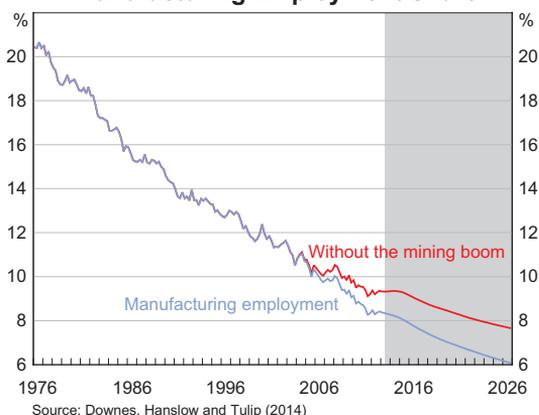
References

Downes P, K Hanslow and P Tulip (2014), 'The Effect of the Mining Boom on the Australian Economy', RBA Research Discussion Paper No 2014-08.

Stoeckel A (1979), 'Some General Equilibrium Effects of Mining Growth on the Economy', *The Australian Journal of Agricultural Economics*, 23(1), pp 1–22.

Stone A, T Wheatley and L Wilkinson (2005), 'A Small Model of the Australian Macroeconomy: An Update', RBA Research Discussion Paper No 2005-11.