

The Evolution of Mining Employment

By NAB Group Economics

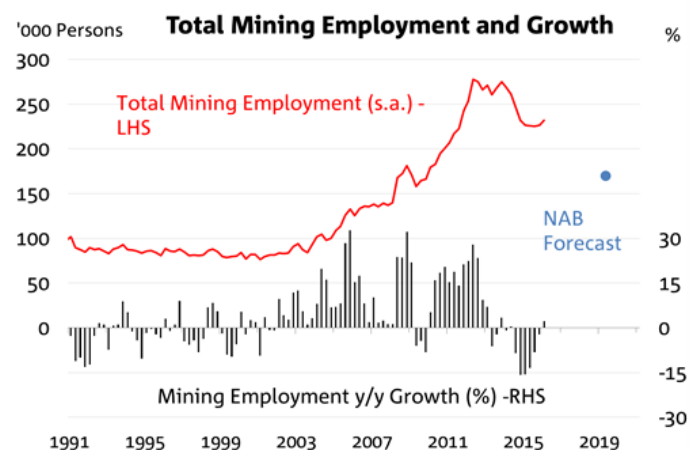


Key Points:

- Mining employment has been relatively resilient given the extent of the mining investment downturn so far. We believe that mining investment is currently more than half-way through the cycle, while employment is slightly below the half-way mark – with the difference likely to be related to the significantly higher labour intensity of LNG projects in the late stages (near –completion/completion) of the construction phase.
- We undertook a different approach from the Reserve Bank of Australia (RBA) in identifying the employment trends through the three main mining developmental stages of “exploration”, “construction” and “operation”. Leveraging on micro ABS employment data by occupation, we estimate that 122k mining construction jobs were created between the start of the mining boom (in 2004-05) and the peak (2012-13), compared to the creation of 34k operational jobs and 13k exploration-related jobs.
- We estimate that 46k mining jobs were shed between the peak in 2012-13 and 2014-15 and around 50k more will be cut going forward. The majority of the job losses are likely to come from WA due for a number of reasons, including that: 1) WA’s mining investment and employment cycles are currently less progressed than Queensland, 2) WA accounts for a larger share of total investment and employment in the country, and 3) the labour intensity of commodity projects in their operational phase in WA is lower than in Queensland.
- This will cause significant headwinds, especially in geographically affected regions and in certain specialised skill groups. However, it is not unmanageable at the national level with offsetting job creation elsewhere (particularly in services sectors) - we are forecasting 18k additional jobs to be created per month over the next few years, with the unemployment rate to track down towards 5½% by mid-2017 before inching up thereafter.
- The larger-than-expected declines in commodity prices from their 2014 levels and the forecast prolonged nature of the low-commodity price

environment will continue to limit the number of new projects, suggesting limited upside to mining investment and employment going forward.

Chart 1: Mining Employment

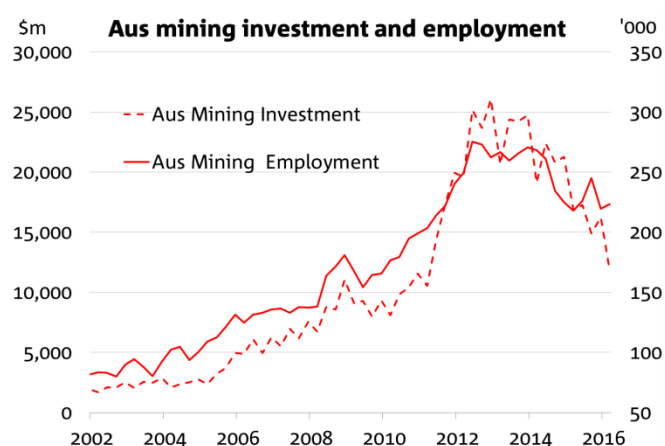


Source: ABS, NAB Group Economics

Background

The run-up in mining investment from mid-2000s to 2012 led to a surge in resources sector-related employment, as a large number of workers were required to build new mining facilities. According to ABS employment by industry data, mining employment rose sharply between May 2005 and May 2012, equivalent to 13.6% of annual growth and representing the fastest growing industry over the period *in percentage terms*. In level terms however, labour-intensive services sectors such as health (+364k), education (+244k) and professional services (+174k) added more jobs than mining (+164k).

Chart 2: Aus mining investment and employment

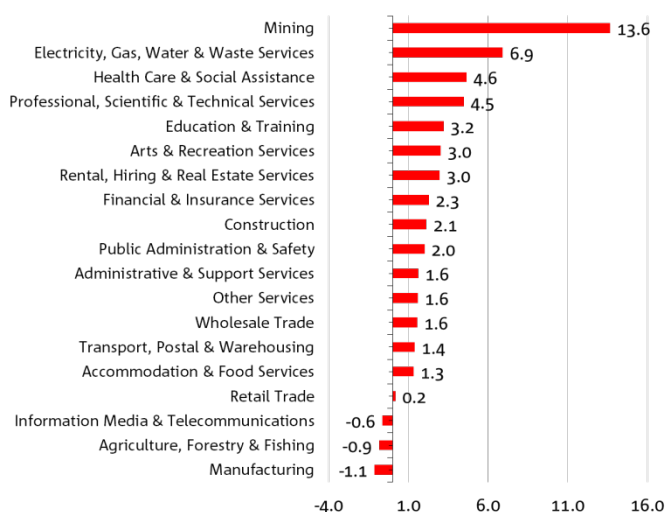


Source: ABS, NAB Group Economics

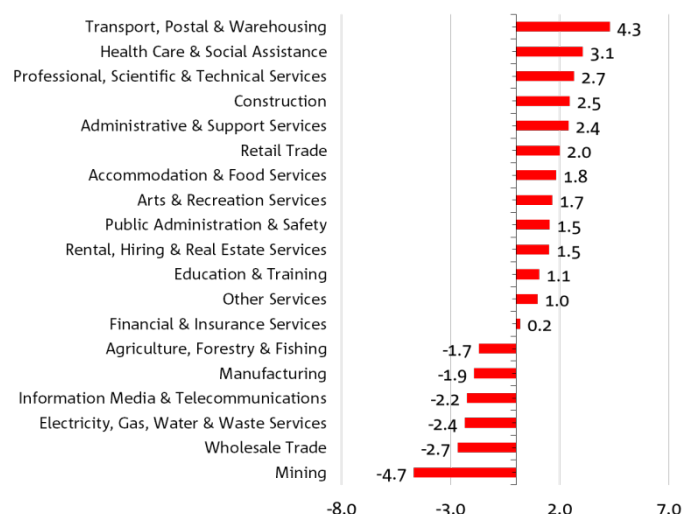
As the significantly more labour-intensive mining construction phase transitions into the less labour-intensive operational phase, the large number of temporary construction jobs created will be cut back. We observe that the job shedding process has already taken place to some extent since the peak of mining investment in 2012-13, but the job loss to-date has not been as severe as previously anticipated for this point in the mining investment cycle. Some of the possible factors contributing to this phenomenon will be discussed in the second last section of this document.

Charts 3 and 4: Annual Growth in Employment by Industry

Annual Growth in Employment by Industry Between May 2005 and May 2012 (%)



Annual Growth in Employment by Industry Between May 2012 and Feb 2016 (%)



Source: ABS, NAB Group Economics

Mining Employment Characteristics

Mining employment can be broadly categorised into three types based on the development stages of the resource production cycle: exploration, construction and production (operation). However, given that the ABS employment by industry data is only disaggregated by the employers' industry classification rather than the nature of employment, it is not easy to accurately distinguish between the three types of mining employment and hence their evolutionary patterns throughout the mining cycle.

Mining employment classifications by the ABS

There have been a few studies undertaken by institutions and industry bodies, including the RBA, which attempted to estimate the size and composition of mining employment through time using official ABS data. However, we believe that the way in which the ABS industry classification data have been interpreted in these studies is debatable. **The few studies conducted to-date¹, including the one by the RBA², have made the assumption that employment classified by the ABS to the mining industry includes only those engaged directly in mining production (please see Appendix A for further discussion of this approach).**

However, we were explicitly informed by the ABS that the employment data has been categorised based on the registered business types of employers, and not based on the nature of activity engaged in by the

¹ AWP (Australian Workforce and Productivity Agency) (2013), *Resources Sector Skills Needs 2013*, AWP, Canberra.
² Doyle, M. (2014). "Labour Movements during the Resources Boom", *RBA Bulletin*, Dec qtr 2014, p. 12

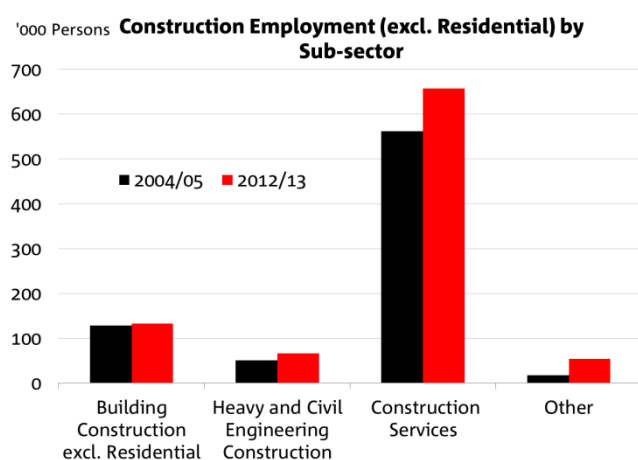
workers. For example, employees by Santos, an oil and gas extraction company, could have undertaken a range of different activities (exploration, construction and operational) but their employment would still be classified under “oil and gas extraction” in the official data. As such, we are sceptical of the claim that all employment classified under “mining” is solely to do with mining operations, while construction-related jobs within the mining sector is classified under “construction”. Furthermore, the sharp increase in mining employment between 2004-05 and 2012-13 is difficult to explain satisfactorily through a pick-up in operational jobs, given that the mining investment phase was associated with a disproportionate increase in construction jobs.

NAB's approach

Based on the arguments above, we propose an alternative hypothesis that the additional jobs created during the mining boom, both construction and operational, were mostly classified under “Mining” in the ABS employment by industry data. Leveraging detailed ABS occupation data, we attempt to shed some light on the split between construction and operational jobs within mining employment, as well as to identify the extent to which they have changed over the mining investment cycle.

That said, we acknowledge that there were likely to have been some employment “spill-over effects” due to indirect employment into other industries, especially business and professional services and construction. However, quantifying the latter remains a challenge.

Chart 5: Construction employment



Source: ABS, NAB Group Economics

Mining employment characteristics in 2004-05, 2012-13 and 2014-15

To distinguish between construction and operation-related jobs within the mining employment data, we first obtained detailed ABS occupation data (at 4-digit level) for the mining industry from the Labour Force Survey for the years of 2004-05 (representing the start of the mining boom), 2012-13 (peak of mining boom) and 2014-15 (the most recent yearly data). The idea was to then allocate the highly detailed occupational data within each year across the three types of employment typically found in the mining cycle (exploration, construction and operation) to varying degrees based on the specificity of their titles.

For any single year, exploration-related occupations are separately identified as the first step and, and in any case, only represent a small share of total employment. For the remaining occupations, the ones that come across as straightforward in terms of being construction or operation-related are then assigned to those two categories accordingly, while occupations which suggest a mix of both construction and operation activities are classified under the “part-construction” category until the relative weights of construction versus operation employment within those occupations are determined. For example, “construction managers” and “general clerks” are clearly suggestive of being associated with construction and operation respectively, but there are many occupations which are not as clear-cut, such as “machine operators” and “mining engineers”, which potentially encompass a mix of construction and operational activity. Occupations which we believe to be solely related to construction are shown in **Table A in Appendix B**, production-only jobs are in **Table B**, while occupations which are “part-construction” are shown in **Table C**.

The next step involves the estimation of the relative size of construction and operation employment within the “part-construction” occupations during each of the three years of 2004-05, 2012-13 and 2014-15. To accomplish that, we have to make further assumptions for the shares of construction employment in those occupations in each of those three years which denote a different stage of the mining cycle. The assumptions are made based on our understanding of the relative distribution of labour intensity across the different types of mining activity overtime. The employment figures contained within the occupations under the three categories of exploration, construction and operation are subsequently aggregated for each of those years.

Fair to say, estimates of the different types of employment based on this approach are associated with a high degree of uncertainty, which we would seek to address by presenting two different scenarios. For both scenarios, we have assumed that the average ratio for construction to operation employment (for the “part construction” occupations) was 3 to 1 during the mining investment peak of 2012-13 – based on the employment estimates published by the Department of Industry – but they have different starting (2004-05) and ending (2014-15) ratios.

In the first scenario (our central case), the construction share for “part-construction” occupations is set at 0.25 in 2004-05, 0.75 in 2012/13 and 0.55 in 2014-15 respectively. This stems from our assumption that construction jobs constituted a relatively small share in the “normal” period prior to the boom, and then momentum intensified greatly during the boom period, before easing over the last three years. In the second scenario, construction jobs are assumed to be more “sticky” with a higher starting threshold share of 0.4 in 2004-05, 0.75 in 2011/12 and 0.60 in 2014-15 respectively. The results of this exercise for Scenario 1 & 2 are shown in Table 1 and 2 respectively below:

Tables 1&2: Occupational structure of mining industry

Scenario 1 (Central Case):

	Exploration	Construction	Operation	Total
2004/05				
Persons	12,965	22,394	68,499	103,858
%	12%	22%	66%	100%
2012/13				
Persons	25,988	144,046	102,428	272,462
%	24%	53%	38%	152%
Change between 04/05 and 12/13 (Persons)	13,023	121,652	33,930	168,604
2014/15				
Persons	28,636	91,346	106,196	226,178
%	13%	40%	47%	100%
Change between 12/13 and 14/15 (Persons)	2,648	-52,700	3,768	-46,284

Scenario 2:

	Exploration	Construction	Operation	Total
2004/05				
Persons	12,965	31,616	59,277	103,858
%	12%	30%	57%	100%
2012/13				
Persons	25,988	144,046	102,428	272,462
%	10%	53%	38%	100%
Change between 04/05 and 12/13 (Persons)	13,023	112,430	43,151	168,604
2014/15				
Persons	28,636	98,002	99,540	226,178
%	13%	43%	44%	100%
Change between 12/13 and 14/15 (Persons)	2,648	-46,044	-2,888	-46,284

Source: ABS, NAB Group Economics

The results from our Scenario 1 (our central case) suggest that the increase in construction-related employment (+121,652) was more than 3 times the increase for operation-related employment (+33,930) between the start (2004-05) and the peak (2012-13) of the mining boom. Since then, the gradual transition of the mining cycle from the high labour-intensity construction phase to lower labour-intensity operational phase has witnessed some degree of construction-related job shedding. **In the two years to 2014-15, our central case suggests that around 53k construction-related jobs were terminated, but they were partly offset by a 3k and 4k increase in exploration and operation jobs respectively, creating a net loss of 46k jobs between 2012-13 and 2014-15.**

Meanwhile, Scenario 2 points to a slightly smaller increase of 112k construction jobs in the boom period between 2004-05 and 2012-13, and a similar decrease since the latter year to 2014-15 of around 46k jobs. Operation jobs decline by around 3k in this scenario, which seem unlikely given the magnitude of the increase in operation activity.

That said, the two scenarios do come to a relatively similar conclusion that construction-related mining employment continued to remain at an abnormally elevated level by the end of 2014-15 and has a fair way to decline, even if we were to assume for a slightly higher equilibrium level of construction employment at the end of the current cycle.

More recent developments in mining employment:

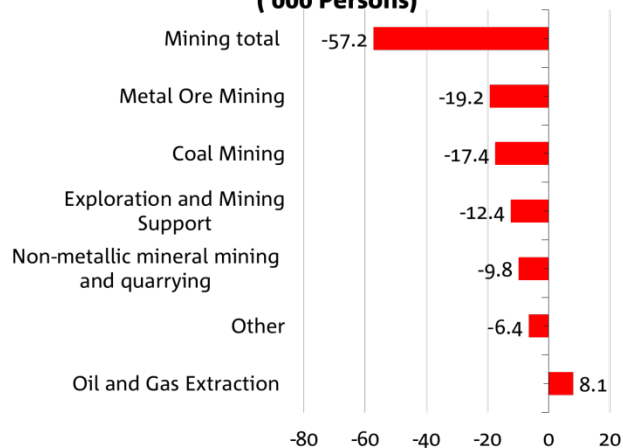
Mining employment fell notably between May 2012 and Feb 2015, before showing signs of stabilisation over most of 2015, and a minor uptick more recently.

At its current level, mining employment is moderately higher than previously anticipated given the level of mining investment. Based on original quarterly data, the sub-industry sectors of metal ore mining and coal mining showed the largest declines over this period of 19,100 and 17,400 jobs respectively. Meanwhile, oil and gas extraction employment rose by 8,000. This potentially reflects the completion of a number of smaller coal and iron ore projects during this time, and the intensifying construction activity of a number of larger LNG projects.

In 2015, stronger labour requirements on the back of the completion/near-completion of several major LNG mining projects such as Pluto, Queensland Curtis LNG (QCLNG) and Gladstone LNG (GLNG), which are significantly more labour-intensive than most other types of commodity projects, appear to have propped up mining employment. **This suggests further downside risks to mining employment once the construction phase of these “lumpy” projects wind down.**

Chart 6: Change in mining employment by sub-sector

Change in Employment by Mining Sub-industry over May 2012 and Feb 2015 ('000 Persons)

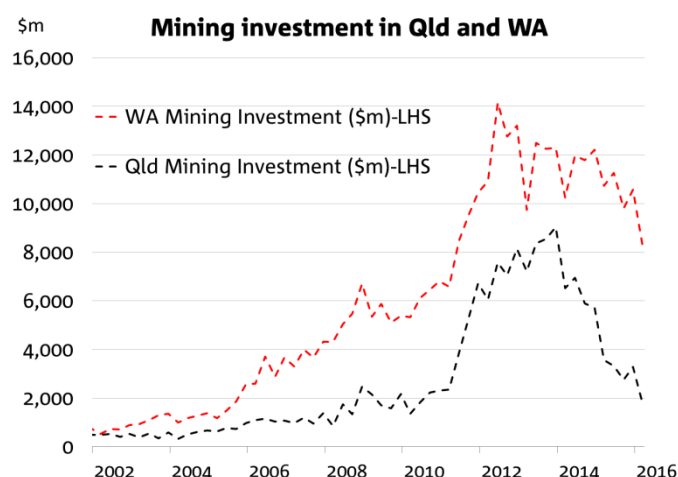


Source: ABS, NAB Group Economics

State details

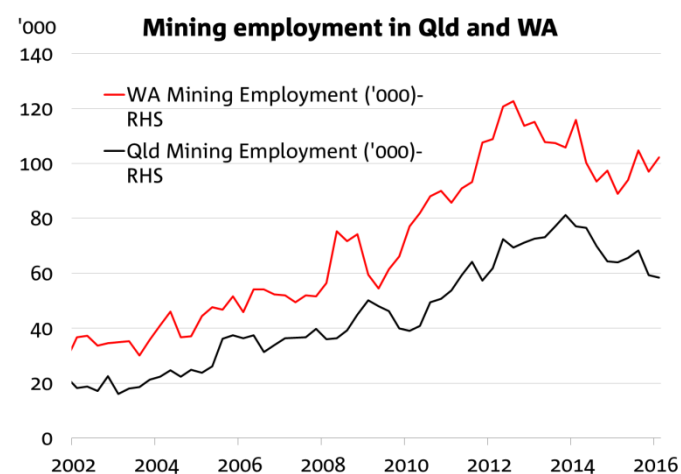
The dramatic rise in mining investment and employment from the mid-2000s to 2012-13 has been largely driven by Western Australia and Queensland. However, the type and timing of mining projects that have dominated in each state have varied across time. **This has resulted in investment trajectories which are quite different, with Queensland at a more advanced stage in its mining employment cycle (see Chart 7).** However, the employment trajectories for Queensland and WA have been more in sync (Chart 8).

Chart 7: Mining investment in WA and Qld



Source: ABS, NAB Group Economics

Chart 8: Mining employment in WA and Qld



Source: ABS, NAB Group Economics

As can be seen quite clearly from Chart 7 above, the pick-up in mining investment in WA occurred slightly earlier than in Queensland, and its trajectory is generally less “lumpy” over time. This is largely attributable to the large iron ore mining projects commenced in the early 2000s in the Pilbara region by Rio Tinto and BHP. This included the development of the Hope Downs and Cloud Break mines, before the commencement of the large LNG projects of Pluto and Gorgon in the second half of the 2000s, followed by the Wheatstone (LNG) and Roy Hill (iron project) projects in 2011. Besides iron ore, there was also significant mining investment in WA over the 2000s in commodities such as nickel, alumina and gold which contributed to a relatively diverse range of projects.

In the case of Queensland, coal projects in the Bowen Basin constituted most of the mining investment prior to 2010, before the significantly

