Australian Government
Productivity Commission

Labour's Share of Growth in Income and Prosperity

Visiting Researcher Paper

September 2013

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ISBN 978-1-74037-451-4

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An appropriate citation for this paper is:

Parham, D. 2013, *Labour's Share of Growth in Income and Prosperity*, Visiting Researcher Paper, Productivity Commission, Canberra.

JEL code: D

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This publication is the fourth in an occasional series presenting the work of visiting researchers at the Productivity Commission.

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To assist the research effort, the Visiting Researcher Program seeks to attract established researchers in areas closely related to the Commission's primary research themes. Visiting researchers share their expertise and knowledge with Commission staff and contribute to the work of the Commission during appointments which are usually for terms up to one year.

During their stay with the Commission, visiting researchers take an active interest in the work of the Commission and mentor its staff. It is common for visiting researchers not only to conduct their own research in conjunction with Commission staff but also to contribute to the research work of others in their areas of expertise. However, *the views expressed in this series are those of the visiting researchers themselves, and do not necessarily represent those of the Commission*.

More details on the Visiting Researcher Program and released papers are available on the Commission's website at www.pc.gov.au/research.

Preface

This paper examines the distribution of production income between labour and capital. In particular, it looks for explanations for the fall in labour's share of income in Australia since the turn of the millennium. An examination of the industry sources of change makes the origins of the fall in labour's share — or more aptly, the rise in capital's share — quite clear. The increase in the terms of trade and the associated investment boom in mining are revealed as driving the overall trend in labour's share of income in Australia over the past decade.

Jenny Gordon, Mike Woods and Shiji Zhao assisted in the development of the paper. Derek Burnell, from the Australian Bureau of Statistics, and Shawn Sprague, from the US Bureau of Labor Statistics, assisted with data enquiries.

Helpful comments on an earlier draft were received from Bob Gregory, from the Australian National University, and from Jenny Gordon, Shiji Zhao, Lisa Gropp and Noel Gaston of the Productivity Commission.

Dean Parham was a part-time Visiting Researcher at the Productivity Commission from April 2012 to June 2013 when the research for this paper was undertaken. Until 2008, he was an Assistant Commissioner at the Commission, where he led a team engaged in research on Australia's productivity. He was also a Visiting Researcher at the Commission in 2011.

OVERVIEW

Key points

- The labour share of income fell by 4 or more percentage points in the 2000s.
- However, labour was no worse off in the process.
  - Labour income grew at a faster rate in the 2000s than in the 1990s through stronger growth in both wages and employment.
- The labour income share only fell because capital income growth accelerated even more.
- The rise in the terms of trade meant that product prices rose faster than consumer prices. While labour received a smaller share of income at product prices, the slower growth in consumer prices meant that the real value of each dollar earned was worth more in terms of its purchasing power. This purchasing power effect (which was available to all income earners) more than outweighed the apparent reduction in labour's share of national income.
- The large rise in Australia's terms of trade brought strong growth in real income — even stronger than the growth in the 'productivity decade' of the 1990s.
  - This provided scope for growth in both labour and capital income to rise.
- Other high-income countries also experienced a decline in the labour income share, but driven by a different set of factors. In other countries, growth in labour income has suffered.
- The mining boom was overwhelmingly responsible for the fall in labour share in Australia:
  - Development of mining and associated capacity added to the economy's capital stock, leading to more capital-intensive production overall.
  - Higher output prices for minerals (and construction) reduced the real cost of labour so that growth in real wages fell behind labour productivity growth.
- The two other industries most affected by the mining boom — Construction and Manufacturing — served to *increase* the labour income share.
  - In Manufacturing, a slowdown in capital income growth meant the industry contributed more to labour income than to capital income at the aggregate level.
  - Construction had stronger growth in capital income than in labour income. However, because the industry is labour intensive, growth in Construction's labour income had a greater effect on aggregate labour income than growth in its capital income had on aggregate capital income.
- As the terms of trade now decline, the labour income share will rise. But with a more capital-intensive economy, the share is unlikely to revert fully to previous levels.
- Action to restore the old labour income share or to recover 'lost' income share through wage rises would probably only have adverse consequences for employment and inflation and for industries already facing adjustment pressures.
- With the prospect of declining terms of trade, a focus on productivity growth will be the way to sustain growth in real wages.

Overview

Labour's share of income fell sharply in the 2000s.

However, labour was no worse off. Put succinctly, while labour got a proportionately smaller slice of the income pie, the real value of its slice continued to grow in absolute size and, indeed, at a faster rate. In fact, with more-rapid growth in employment and real wages, the real income of labour continued to grow unabated.

The labour income share fell because there was an even greater acceleration in capital income growth.

Over the first decade of the 2000s, the Australian economy benefited from one of the strongest lifts in its terms of trade ever seen. That shift in relative prices boosted growth in income for both labour and capital, changed the industry sources of income, lifted the rate of investment in capital and employment growth, and reallocated capital and labour between industries.

In the process, the rise in the terms of trade brought about the fall in the labour income share. Essentially, the economy became more capital-intensive through the mining boom.

The labour income share has fallen in other developed economies, and notably in the United States. But the experience is quite different from that in Australia. Growth in labour income in other countries has fallen and the reasons for the fall in labour share have to do with technological advance and globalisation, rather than the terms of trade.

This study finds that the same 'rule of thumb' — that labour and capital tend to share proportionately in the growth in income — do not seem to apply in an economy experiencing an improvement in its terms of trade.

There are aspects of the terms of trade shift that are still not fully understood. The implications for labour market adjustment, wage determination and income shares are important examples. In unpacking some of the drivers of change in the labour income share, this project is in large measure a foray into the ways in which the terms of trade shift brought structural change in the economy. The analysis is a start. It is not definitive and the details of findings should be taken as tentative and indicative.

Context: income growth and its sources

Usually, growth in the volume of output (GDP) also indicates growth in real income. That is true when the terms of trade (the ratio of export prices to import prices) are stable.

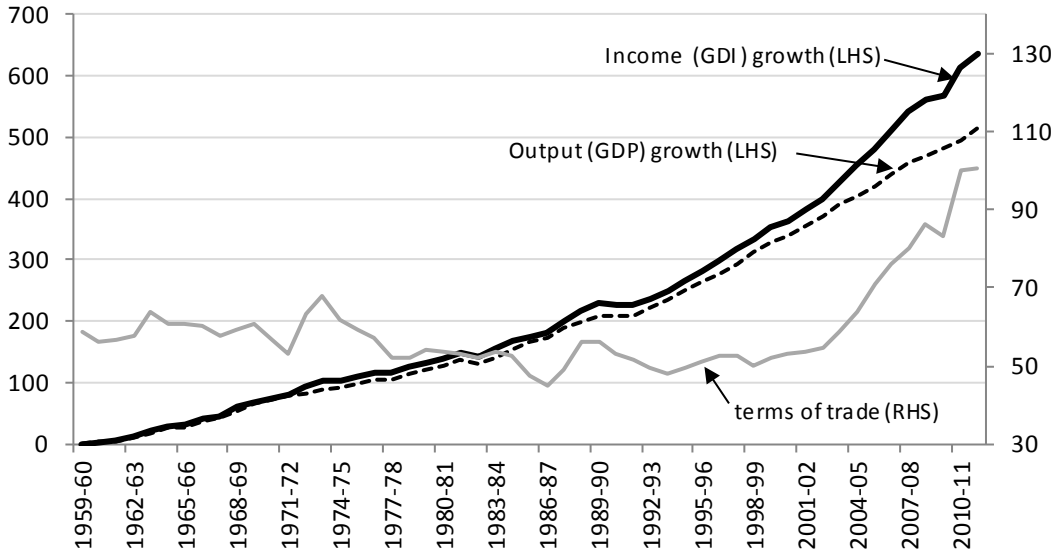
However, Australia's terms of trade jumped by over 80 per cent in the first decade of the 2000s to levels hardly seen over the last 140 years. Export prices rose on the back of steep rises in the prices of mineral exports, while import prices fell with appreciation of the exchange rate and lower world prices for some products.

The rise in the terms of trade lifted real incomes through two mechanisms. First, higher export prices meant a given volume of exports earned more income. Second, lower import prices raised the purchasing power or real value of Australian incomes.

The terms of trade shift maintained — and in fact increased — the rate of growth in real income in the 2000s, despite a slowdown in output growth (figure 1). The terms of trade accounted for more than 20 per cent of real income growth over the decade.

Figure 1 **The terms of trade lifted real income growth beyond output growth in the 2000s**

per cent growth since 1959-60 (LHS), index 2010-11=100 (RHS)



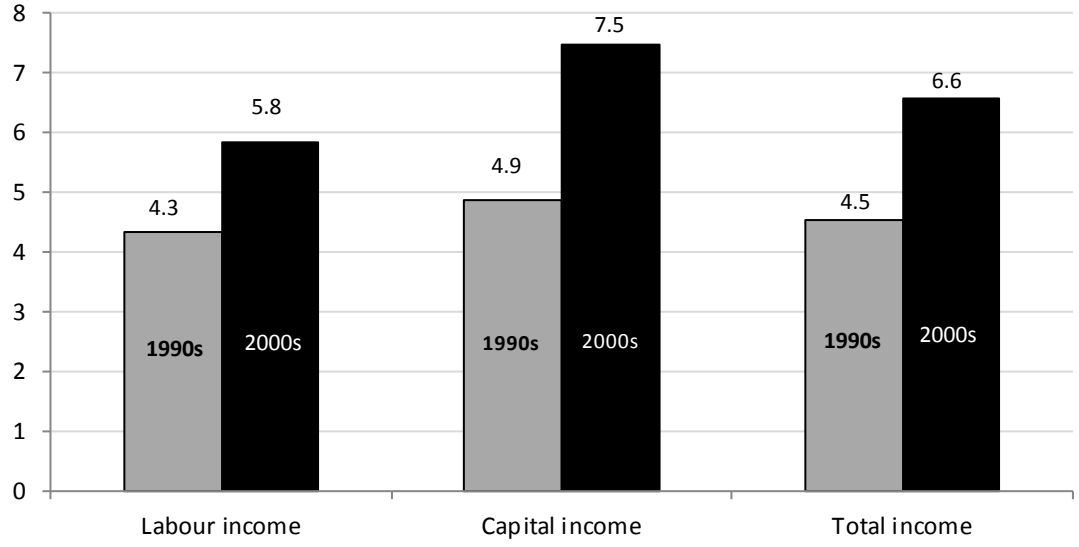
Within the market sector

As figure 2 shows, compared with the 1990s, the 2000s brought:

- faster growth in total income
- faster growth in both labour income and capital income
- a stronger acceleration in the rate of growth in capital income than in the rate of growth in labour income.

Figure 2 **Growth in labour income lifted in the 2000s but growth in capital income lifted more**

average annual rates of growth in nominal income (per cent)



The faster growth in income was not spread evenly over industries.

- Mining and Construction contributed about two-thirds of the acceleration in market sector income growth.
    - … Mining accounted for 40 per cent and Construction accounted for 25 per cent.
- Manufacturing, Accommodation, Telecommunications and the Arts reduced their contributions to market sector income growth, compared with the 1990s.
    - – Manufacturing had a small decline in contribution but, with strong growth elsewhere, its share of market sector income fell markedly over the 2000s.

The effects of the terms of trade boom are clearly evident in these relative industry movements. The more rapid income growth in Mining and Construction reflects higher minerals prices and the investment phase of the mining boom. The relative decline of Manufacturing partly reflects exchange rate pressures — a manifestation of the so-called 'two speed economy'.

The fall in the labour income share

The labour income share is the proportion of gross income generated from the production of goods and services that is paid in labour costs, either in wages or in on-costs.

The remainder of gross income is attributed to capital (assets owned by companies and proprietors). Capital income is gross income before any allowance for depreciation and before the payment of interest and tax.

Obviously, a fall in the labour share means an equal rise in the capital share.

The labour income share is not a 'primary' indicator of economic performance or economic wellbeing. Sometimes, however, a shift in share reflects underlying changes that can have important effects on employment, inflation and income distribution.

It is important therefore to understand the underlying reasons for a change in income share.

There was a large fall in the labour income share in Australia over the first decade of the 2000s. According to one Australian Bureau of Statistics (ABS) measure, the share fell by 4 percentage points from 57 per cent to 53 per cent over the first decade of the 2000s. According to other measures, the fall was even larger. The 2000s fall followed a period in which the share was stable through the 1990s.

The recent fall in the labour income share can be examined from different angles:

- relative rates of factor income growth
- changes in the relative quantities and prices of capital and labour
- changes in real wage rates relative to labour productivity.

While the three ways of looking at changes in labour's share are simply alternatives, taking these different perspectives helps to ensure that a comprehensive and robust explanation is found. It turns out that all three angles generate the same result.

Disparity in factor income growth

At its simplest, the labour income share fell in the 2000s because capital income grew faster than labour income (figure 2).

The Mining sector accounted for all of the disparity between growth in capital income and growth in labour income at the aggregate level. The growth in Mining was principally in the form of capital income and added much more to growth in aggregate capital income than it did to growth in aggregate labour income.

From this perspective, the mining boom accounted for all of the fall in the (market sector) labour income share. Other industries made much smaller positive and negative contributions that offset each other.

Construction and Manufacturing — the two other industries most affected by the terms of trade rise — worked in the direction of *increasing* the labour income share. They made stronger contributions to aggregate labour income growth than to aggregate capital income growth.

This industry pattern is explained further in box 1.

Box 1 **Industry contributions to growth in labour and capital income**

Mining and Construction were the key sources of additional growth in income in the 2000s. Manufacturing's importance dwindled.

Mining accounted for the entire fall in the labour income share

Labour and capital both benefited in the mining sector. Mining is a capital intensive industry and is now the major source of capital income, receiving one in five dollars of capital income in the market sector. The growth in capital income in mining added much more to aggregate growth in capital income than its growth in labour income added to aggregate growth in labour income. And so, the Mining sector brought about a fall in the aggregate labour income share.

Construction increased the labour income share

Labour and capital both benefited in the Construction sector. The labour income share within the industry declined because growth in capital income exceeded growth in labour income. However, Construction is labour intensive and is now the most important source of labour income in the market sector. Its growth in labour income had greater effect on aggregate labour income than its growth in capital income had on aggregate capital income. And so, the sector served to increase the aggregate labour income share.

Manufacturing increased the labour income share

Manufacturing made a stronger contribution to labour income growth than to capital income. The sector is an important (but declining) source of both labour and capital income, but is more important to labour than it is to capital income. Since there was stronger growth in labour income than capital income, the sector served to increase the aggregate labour income share.

'Quantity' versus 'price' effect

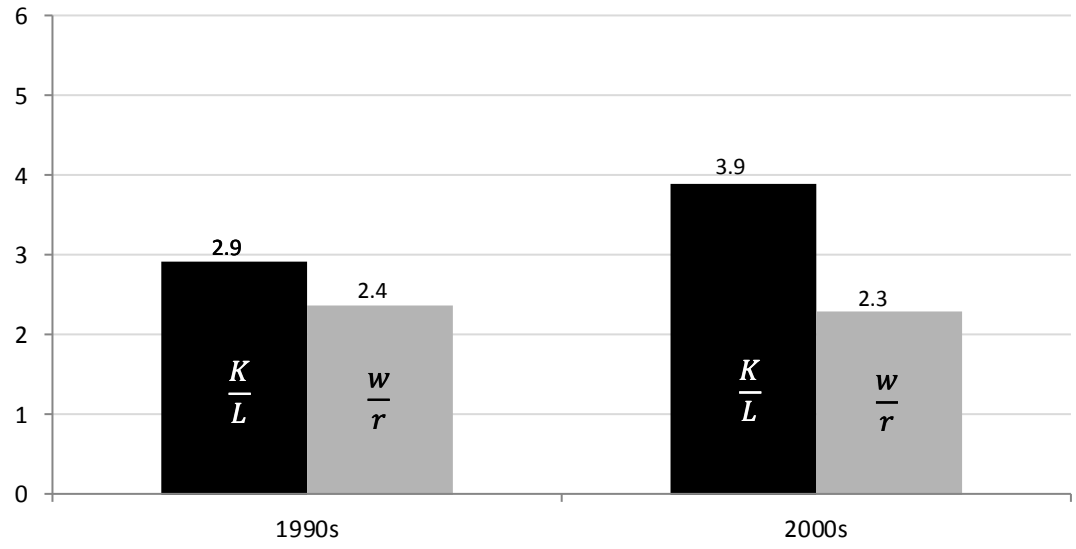
The second way to view income shares is through changes in the 'quantity' ratio (capital-labour ratio) relative to the 'price' ratio (the wage rate to the rate of return on capital). The labour income share falls if the quantity ratio increases more rapidly than the price ratio. A fall could come about through capital deepening (more capital relative to labour) or an increase in returns to capital (relative to wages).

From this perspective, the 2000s fall in labour income share was due overwhelmingly to a quantity effect, rather than a price effect. This is based on the findings that:

- growth in the capital-labour ratio was greater than growth in the price ratio in the 2000s decade (figure 3)
- growth in the capital-labour ratio accelerated from the 1990s, whereas growth in the price ratio was virtually the same as it was in the 1990s.

Figure 3 **The fall in the labour income share was due to a quantity effect rather than a price effect**

growth in the capital labour ration ($\frac{K}{L}$) and in the wage rate of return ration (per cent per year)



While the conclusion that additional capital deepening provides the main explanation remains firm, there is some uncertainty about the exact size of the quantity and price effects. Capital measurement issues suggest that the extent of capital deepening in the 2000s may be overstated and consequently the growth in the price ratio is overstated in the estimates based on the ABS National Accounts. A measurement problem arises where there are lengthy lags between investment in capital and its use in production combined with the very large acceleration in investment. This has been the case with the mining boom and the scale of investment has been so large that it may have affected aggregate estimates of capital growth.

The additional capital deepening was primarily due to more rapid growth in capital. While use of capital and labour both grew more rapidly in the 2000s than in the

1990s, the acceleration in use of capital was greater than the acceleration in use of labour.

The nominal wage rate and the nominal rate of return both grew more rapidly in the 2000s than in the 1990s, according to the data used, but the acceleration in the two was equal in size.

The Mining sector accounted for the entire gap between growth in the quantity ratio and growth in the price ratio. That was because investment in mining capacity added so much to the aggregate capital stock (much more than its increased use of labour added to aggregate hours worked). Mining did also lift the aggregate rate of return (relative to the wage rate), but this effect on the aggregate was neutralised by contributions in favour of wages in other industries.

Again, other industries' contributions offset each other and, again, Construction and Manufacturing had a positive effect on the labour income share. Construction added more to the use and reward of labour than to the use and reward of capital. Manufacturing reduced the use of labour, but increased wages, and increased capital, but reduced the rate of return.

Real wage rates and productivity

Some simple mathematics shows that a fall in the labour income share emerges whenever growth in real wages falls short of growth in labour productivity. While there is no necessary reason for real wages to grow in line with labour productivity, there has been a tendency for it to happen over the long term in advanced economies.

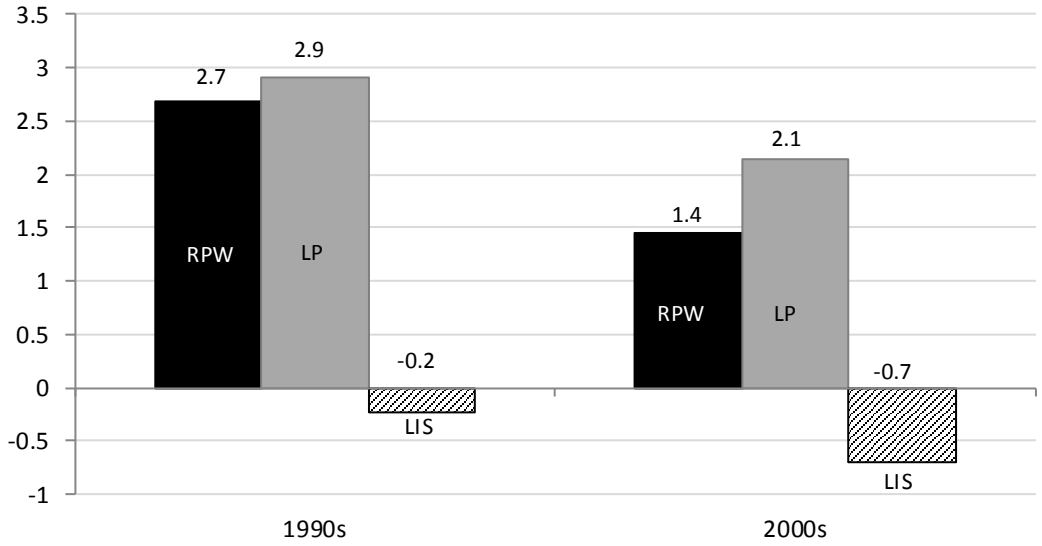
The real wage in this context is the real cost to producers of employing labour. The nominal wage, deflated by product prices (the prices of goods and services produced), is referred to as the real product wage (RPW).

The RPW showed weaker growth than labour productivity in the 2000s decade, leading to a decline in the labour income share (figure 4). Compared with the 1990s, growth in the RPW slowed more in the 2000s than did labour productivity.

The same pattern of industry contributions is observed. Mining accounted for all the market sector disparity between growth in the RPW and in labour productivity (LP). Other industries offset each other. And Construction and Manufacturing made stronger contributions to RPW growth than to labour productivity growth.

Figure 4 **The labour income share fell because of much weaker growth in the real cost of labour**

growth in the real product wage (RPW), labour productivity (LP) and the labour income share (LIS) (per cent per year)



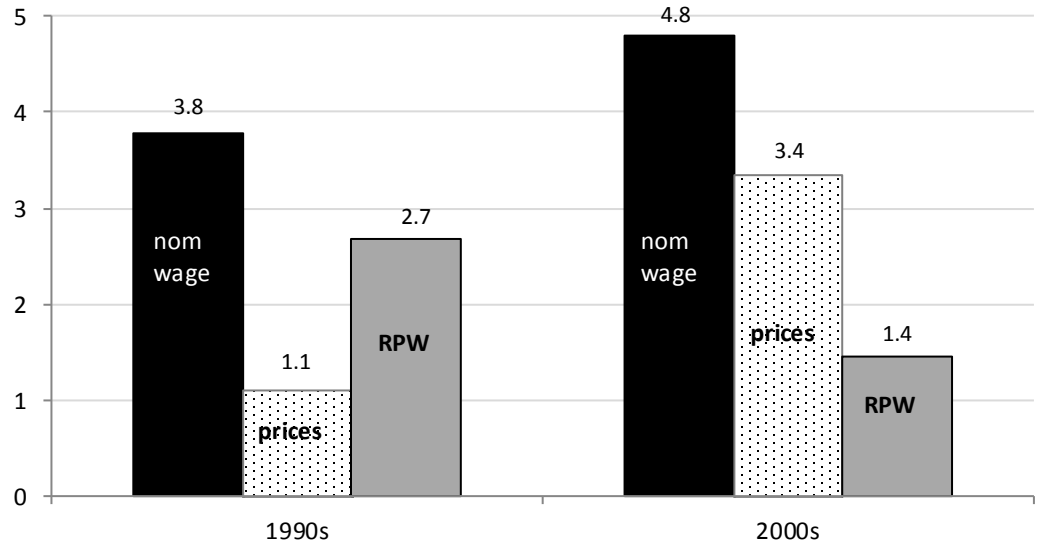
Product price inflation

Growth in the real product wage fell further than productivity growth, not because of any slowdown in growth in nominal wages, but because of higher product price inflation (figure 5).

The Mining sector was primarily responsible for the increase in product price inflation, as a result of the boom in mineral commodity prices. Construction also made a major contribution in the 2000s, well up on its 1990s contribution.

Figure 5 **The lower real cost of labour was due to higher product price inflation**

growth rates in nominal wages, output prices and the real product wage (per cent per year)



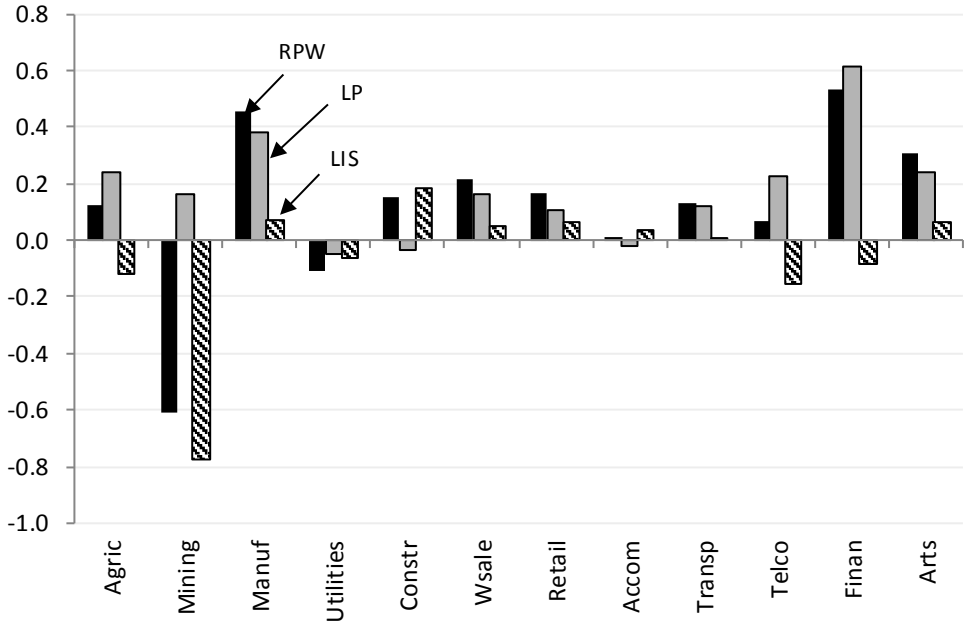
The decline in share has not been a macro phenomenon

The Mining sector is so dominant in the explanations the question arises as to whether the fall in the labour income share can appropriately be considered a macro phenomenon.

Figure 6 shows the extent to which the gap in growth between market sector labour productivity growth and growth in the real product wage stemmed from the mining sector. Mining made such a strong negative contribution to the labour income share because its contribution to growth in the RPW was so strongly negative. There was only one other industry (the Utilities) to make a negative contribution to RPW growth and that was relatively mild. In turn, Mining's RPW contribution was so strongly negative because of the large rises in relative output prices in the industry.

That is, the terms of trade effects on the labour income share were mostly played out in the Mining sector, where large rises in output prices sent the industry's RPW contribution deeply negative. The effects of the terms of trade shift were not widespread.

Figure 6 **The fall in labour share was a mining-specific rather than a general phenomenon**



Other perspectives

Another terms of trade effect

Although labour received a lower share of total income, the real value of each dollar of income increased. For ease, the discussion reverts to considering the growth in the RPW as a macro phenomenon. However, the point being made here does not depend on taking that view.

The rise in the terms of trade drove a wedge between movements in product prices (prices of the goods and services that Australia produces) and consumer prices (prices of goods and services that Australians consume) (figure 7). Higher export prices, especially for minerals, fuelled strong growth in product prices, with little effect on domestic consumer prices, while cheaper imports helped keep rises in domestic consumer prices in check.

This disparity in prices also drove a wedge between growth in real wages as a cost to producers (the real product wage) and growth in real wages as income to labour (the real consumption wage). The real consumption wage (RCW) deflates nominal wages by the consumer price index, rather than product prices. Consumer price inflation is relevant to those employed as it determines the real value or purchasing power of their incomes.

The lower growth in consumer prices meant that growth in the RCW was greater than growth in the RPW in the 2000s. While growth in the RPW fell behind growth in labour productivity, growth in the RCW did not (figure 8). This was especially true once the terms of trade started to rise from 2002-03

And so, while labour received a less-than-proportionate share of income growth in the 2000s (measured at product prices), each dollar earned was worth more in purchasing power terms. The increase in purchasing power more than compensated for the gap between the growth in the RPW and in labour productivity (and therefore the fall in the labour income share).

It is important to note, however, that this purchasing power gain was available to all income earners and from all sources of income. It was not confined to labour income, nor to workers in particular industries.

Broader distribution and wellbeing

As previously noted, shifts in the labour income share can reflect developments that have broader implications:

- a decline in the labour income share can reflect conditions that are more favourable to employment growth
  - while demand conditions are usually the most important determinant of employment, a lower real cost of labour (relative to labour productivity) can lead to increased labour demand at the margin
- a shift against labour can lead to a more unequal distribution of personal income
  - capital income is distributed more unequally than labour income
  - other research at the Productivity Commission has shown that, while the distribution of market incomes has become more unequal in Australia, the effects on the household distribution of income have been mitigated to a large extent by an increased rate of employment
- a shift in share toward capital can also affect government tax revenues
  - capital income is taxed at a lower rate than personal income
  - however, a 'scale' effect appears to have dominated in Australia, with government revenues boosted by the strong growth in capital income.

Foreign participation also has a bearing on what the income growth means for the wellbeing of Australians. The Mining sector has a high degree of foreign ownership and a large slice of the additional capital income accrues to foreign investors.

Figure 7 **The terms of trade drove a wedge between product prices and consumption prices**

the GDP implicit price deflator and the consumer price index, 1999-00=100

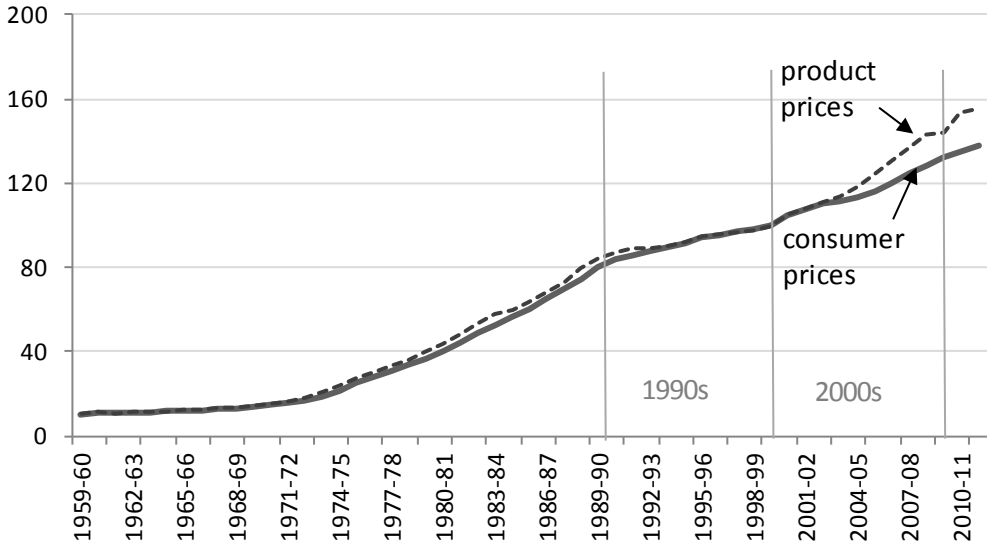
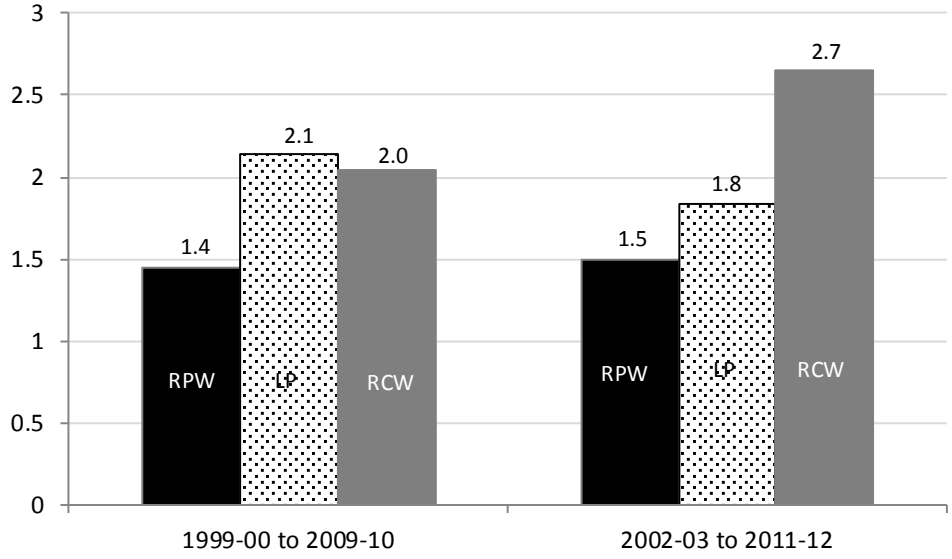


Figure 8 **Growth in real wages as income was stronger than growth in the real cost of labour**

rates of growth over the first decade of the 2000s and from 2002-03 (per cent per year)



The fall in Australia's labour share is distinct from falls in other countries

The labour share has fallen in a number of advanced economies in the 2000s, reinforcing concerns about a fundamental shift in the distribution of income.

Two explanations are prominent — globalisation and technological change. Globalisation is seen to have reduced employment opportunities and wage growth in advanced economies, especially for middle-income and middle-skill workers, through a large increase in the world supply of cheap labour and of cheaper goods. Technological change is seen to have brought substitution of capital (especially information and communications equipment) for unskilled labour.

The way in which the pain of the global financial crisis has been distributed has undoubtedly also had an effect.

But the Australian case is not part of the international trends. A few comparisons between Australia and the US, a prominent overseas case of a sharp decline in the labour income share, clearly indicate that different sets of factors have been at work in the two economies.

It was the distribution of pain versus the distribution of plenty. The US had the burden of slow growth and contraction, whereas Australia had the bounty of even stronger expansion.

There was a slowdown in growth in labour income in the US, but not in Australia. The labour income share fell in the US because labour income decelerated more than capital income did. The labour income share fell in Australia because the acceleration in labour income was overshadowed by the acceleration in capital income.

The industry footprints of change in output and income growth were also very different. In the US, manufacturing was the major industry source of the 2000s income slowdown and shift in income share away from labour. In Australia, the mining boom was the principal source of additional income and of the fall in labour income share. And Manufacturing served to increase the labour income share in this country.

While the presence of the structural pressures that have been at work in other economies cannot be ruled out, if they are present in Australia, they have been swamped by the effects of the mining boom.

Capital productivity and income growth

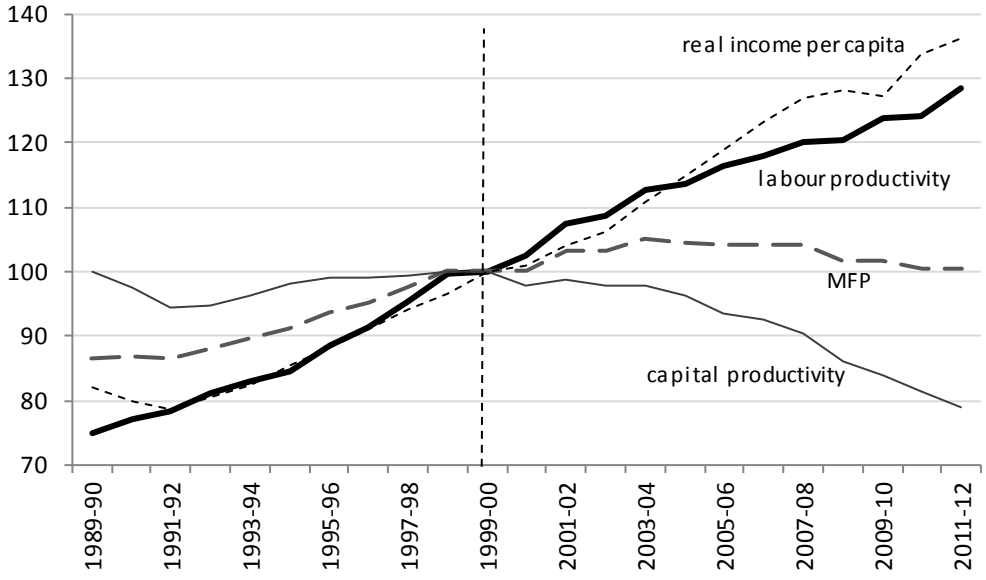
Ordinarily, productivity growth is the prime source of improvements in average living standards. This can be seen in the 1990s trends (when growth in real income per capita was closely aligned with growth in labour productivity (aside from the early-1990s recession).

But growth in real income per capita continued unabated in the 2000s, even though labour productivity growth slowed (figure 9). That, of course, was due to the rise in the terms of trade.

Capital productivity became a drag on overall productivity growth (figure 9). The decline in capital productivity reflects the fact that the economy has shifted to more capital-intensive production, especially through the Mining sector.

Figure 9 **Productivity growth needs to pick up if the same rate of growth in living standards is to be maintained**

cumulative growth since 1993-94 (per cent)



While in isolation a fall in capital productivity would imply a poor allocation of capital leading to a loss of income and a deterioration in living standards, this does not appear to have happened over the past decade. First, the rise in the terms of trade has offset the effect of the decline in capital productivity on income growth. Second, these two developments are at least partly linked, as much of the investment in increased capital capacity was implemented to take advantage of the terms of trade (mineral price) gain.

Looking ahead

Income growth

Real income growth is unlikely to be boosted further by the terms of trade. If the terms of trade were to remain stable, income (and prosperity) would move in line with output growth. Any fall in the terms of trade, which is more likely, would detract from real income growth.

Reinvigorated productivity growth will be needed to maintain the rate of improvement in Australian living standards. Labour productivity growth would have to return to something in the order of 2.5 to 3 per cent a year for growth in real average income to continue at around the same pace as it has over the past two decades. That would be the case if the terms of trade remained stable. If the terms of trade fall, additional productivity growth will be required.

Some multifactor and more labour productivity growth will return whenever capital productivity eases its decline. The decline in mining's capital productivity should ease, once major developments in the pipeline are completed and output comes fully on stream. The decline in capital productivity in other industries will slow to the extent that utilisation of infrastructure capacity rises, further infrastructure investments are economically wise, and the restructuring of industries and firms underway sees out its course.

However, the extent to which capital productivity will halt its slide, and the timing, are quite uncertain.

There are reports that, as minerals prices have started to come off, miners themselves are starting to focus more on containing costs and improving productivity. There are also reports that those firms and industries subject to adjustment pressures, especially from a higher exchange rate, are looking for avenues to improve productivity.

The labour income share

The labour income share is likely to rise. The extent of falls in commodity prices will be crucial. All other things being equal, price falls will:

- reduce profits associated with resource rents
- reduce incentives for further mining investment and expansion in capital capacity

- raise the real cost of employing labour and thereby reduce the tendency for growth in real product wages to fall behind growth in labour productivity.

However, the share is unlikely to recover to its former level, at least in the medium term. The chief factor here will be the extent to which the economy remains more capital intensive. A greater intensity of capital use will command a greater proportion of income. When the dust settles and some new equilibrium is reached, a capital income share higher than it used to be is likely to be an offset for a level of capital productivity lower than it used to be.

Should anything be done about the decline in labour income share?

As noted, there is likely to be a partial recovery in the labour income share.

Any attempts to restore the labour share (or catch up for past lost share) through general wage increases are likely to have negative impacts on employment and add to any inflationary pressures. They are likely to exacerbate the adjustment pressures that non-mining industries face.

To the extent that labour did not share proportionately with capital in the gains over the 2000s, this was largely confined to the mining sector. Many of the gains to capital are likely to be transient and will fall away with lower terms of trade. If there is an issue, it is probably more to do with how transient gains from resource rents have been shared across the community.

Wage growth without productivity growth is not sustainable. With declining terms of trade, a focus on reinvigorating productivity growth would provide the conditions for sustainable growth in real wages.

1 Introduction

1.1 Focus of the paper

This paper is about the sources of growth in income in Australia and their effects on structural change and the distribution of income between labour and capital.

The main objective is to find an explanation for the fall in the labour share of income in Australia in the 2000s.

A change in the labour income share is worth investigating. While the labour income share is not a 'primary' indicator of economic performance or economic wellbeing, a shift in the share can reflect underlying changes that can have important effects on employment, inflation and income distribution.[1]

The labour income share has fallen in quite a few high-income countries over the 2000s, which raises a question of whether Australia's fall reflects the same underlying causes as in other countries such as the US. This is also investigated.

1.2 Approach

Proximate explanations

The analysis in the paper looks for immediate or proximate explanations for changes in the labour income share. It deals only with the obvious underlying causes. The fall in the labour income share is examined in three ways:

- as a divergence in growth between labour income and capital income

[1] The labour share of income is quite different from the distribution of income (the distribution of income from all sources and after redistributive action is taken via the tax and transfer system). A recent paper by Commission staff (Greenville, Pobke and Rogers 2013) found that there had been a widening in the distribution of market incomes in Australia. However, the effects on the personal and household distribution of income have been mitigated to a large extent by movements of the population into employment.

- whether the changes in relative income growth reflect quantity changes (use of capital and labour inputs) or price changes (wage rates and rates of return on capital
- as a divergence in growth between the real cost of labour and labour productivity.

These three approaches can be applied at a macro or aggregate level. But it is also very instructive to examine them at an industry level.

A 'growth accounting' approach is used. This provides a statistical breakdown of contributions to changes in the labour income share and in other variables. It does not provide a causal analysis of relationships. For example, while a fall in the labour income share can be decomposed into contributions from growth in real wages and labour productivity, there are no means to tell the direction of any causal link between wages and productivity.

Industry contributions

At an aggregate level, changes in the labour income share can reflect similar trends across all industries or large changes in some industries relative to others. The analyses in the paper pay particular attention to the industry sources of change in income flows. The idea is to keep a focus on what has happened to growth in income at the aggregate level, but to identify from which industries that growth has come. An industry contribution is the growth in income in an industry weighted by the importance of the industry in generating aggregate income.

The calculation of industry contributions uses 'chained Tornqvist aggregation', developed in Parham (2012). This method enables a high degree of precision in the calculation of industry contributions over an interval of years. The additivity in the approach also enables contributions to be disaggregated — for example, an income contribution can be disaggregated into a quantity component and a price component. The use of the method in this paper is laid out in appendix A.

Comparison periods

Comparison of growth rates over two decades is key to understanding the factors behind the change in the labour income share in the 2000s. The analysis compares the 1990s (1989-90 to 1999-00) to the 2000s (1999-00 to 2009-10).

These periods are arbitrary, but they do allow a comparison between a period dominated by productivity growth (the 1990s) with a period dominated by a terms

of trade shock (the 2000s). However, these decadal periods do not correspond to productivity cycles, as used in determining underlying productivity trends, nor to turning points in the terms of trade.

Data sources

Nearly all data are sourced from the Australian Bureau of Statistics (ABS) Australian National Accounts. The productivity database within the national accounts is used extensively. This means that the analysis is confined to the market sector of the economy, rather than the economy as a whole. And, since data for the 16-industry market sector do not span the whole of the 1990s, data for the 12-industry market sector are used.

Some caution is required in taking firm conclusions from some aspects of the analyses. The national accounts data are used in this paper to derive wage and rate of return estimates, a purpose for which they are not primarily designed. Greater caution is required in regard to industry estimates. They have not been separately cross-checked against direct survey estimates.

1.3 What the paper does

Although the paper is about how the income 'pie' has been sliced, it is important to keep in mind how rapidly the 'pie' has been growing. The next chapter outlines the trends in income growth over the 1990s and 2000s. It also highlights changes in the sources of growth in income over the two decades, in the first instance, in terms of productivity and terms of trade determinants, and then in terms of changes in the industry sources of income growth.

Chapter 3 presents definitional, historical and international perspectives on the labour income share as a prelude to delving in later chapters into the explanations for the recent fall in Australia. It also includes a comparison of economic developments in Australia and the US in the 2000s as a way of addressing the question of whether the fall in labour share in Australia reflects the same developments as those that have occurred in other countries.

Chapter 4 deals with the decline in Australia's labour income share from the three perspectives set out above at the aggregate level.

Chapter 5 starts the industry analysis. It examines the industry sources of factor income growth and undertakes 'shift-share analysis' of the contributions of shifts of income between industries and shifts in labour shares within industries. It finds

limitations in this approach for the current purpose and puts forward an alternative analysis based on industry contributions to the disparity in growth between labour income and capital income at the aggregate level.

Chapter 6 continues the industry analysis. It examines industry contributions to the changes in factor proportions and factor rewards (or 'quantity versus price') explanation for the fall in the labour income share. It also examines the industry contributions to the relative growth in productivity and costs.

Chapter 7 investigates another implication of the shift in the terms of trade. It drove a wedge between prices of the goods and services produced in Australia and prices of the goods and services consumed in Australia. This in turn drove a wedge between growth in real wages as a cost to producers and growth in real wages as income to labour.

2 Income and its sources

This paper is about changes in the shares of the production income 'pie'. But, before examining shares in detail, it is important to look at how rapidly the pie has been growing.

This chapter outlines the trends over the 1900s and 2000s.

- Section 2.1 observes that growth in income has been strong over both decades.
- Section 2.2 illustrates the role of two key sources of income growth — productivity and the terms of trade.
- Section 2.3 unearths the industry sources of income growth.
- Section 2.4 provides a summary.

2.1 Growth in output, income and prosperity

The volume of Gross Domestic Product (GDP) is usually taken as a measure of both the volume of output and the real income generated from the production of goods and services. As a volume or real measure, it strips out the effects of inflation on the growth in income.[1]

However, the GDP measure overlooks shifts in the terms of trade (the ratio of export to import prices), which also have real income effects. A rise in the terms of trade can come about because export prices rise and so the same volume of goods and services produced for export earns more income. The terms of trade also rise if the price of imports fall, which means all income received here can be used to purchase a greater volume of imported goods and services. Since the command over the purchase of goods and services rises, the real value of a given amount of nominal income rises.

Gross Domestic Income (GDI) is a measure of real income that includes terms of trade effects. It can be thought of as real GDP adjusted for movements in the terms

[1] Chained volume measures, as reported here, also take account of structural change by incorporating annual updates of industry shares in the total economy.

of trade. GDP continues to be a measure of the volume of output in the presence of terms of trade shifts, but GDI is a better measure of real income.

Growth in output and income

Growth in GDP and GDI are compared in figure 2.1. The observations for any year show the cumulative growth in GDP and GDI since 1959-60.

The decade of the 2000s was a period of very strong income growth. Annual average growth in GDI, at 3.9 per cent, was faster than in the 1990s (3.2 per cent) and faster than in any decade since the halcyon years of the 1960s (table 2.1). In fact, the average growth rate over the 2000s decade would have been even stronger if it were not for the slight dip in 2009-10 associated with the global financial crisis.[2]

Real income (GDI) growth was 0.9 of a percentage point a year stronger than growth in the volume of output (GDP) in the 2000s decade. After decades of very similar trajectories (figure 2.1 and table 2.1), GDI growth accelerated from its 1990s rate, while GDP growth slowed.

Growth in prosperity

Prosperity and living standards are typically measured in terms of average income — income per capita. Again, GDI per capita is a better measure of real average income than GDP per capita in the presence of large shifts in the terms of trade.[3]

There was stronger growth in prosperity in the 2000s. The annual rate of growth in GDI per head rose from 2.0 per cent a year in the 1990s to 2.4 per cent.[4]

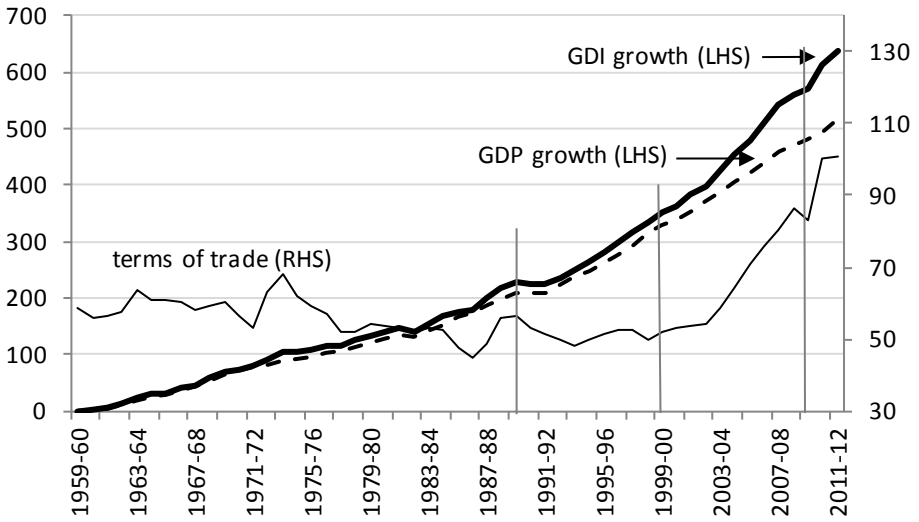
2 The average annual rate of growth in GDI from 1999-00 to 2010-11 was 4.1 per cent.

3 Net national disposable income per person is an even better measure of prosperity and living standards. Net national disposable income adjusts GDP for shifts in the terms of trade, nets out depreciation and takes account of net income flows to foreigners. It indicates the real net income available to Australians.

4 The average over the 1990s was, however, lowered somewhat by the decline in average income during the early-1990s recession.

Figure 2.1 **Cumulative growth in Australia's GDP and GDI[a] and the terms of trade index, 1959-60 to 2011-12**

per cent (left hand side) and index 2009-10=100 (right hand side)



a The chain volume GDP and real GDI series show cumulative growth since 1959-60.

Data source: ABS (Cat. no. 5204.0).

Table 2.1 **Average growth in Australia's real GDP and GDI over decades[a]**

per cent per year

Decade	*GDP growth rate*	*GDI growth rate*
1960s	5.0	5.2
1970s	3.0	3.3
1980s	3.4	3.5
1990s	3.3	3.2
2000s	3.0	3.9

a Calculated over 10 years. For example, for the 1960s, from 1959-60 to 1969-70.

Source: ABS (Cat. no. 5204.0).

2.2 Sources of growth

The 1990s were the 'productivity decade' and the 2000s were the 'terms of trade decade'.

Income, productivity and the terms of trade

The divergence between GDI and GDP growth demonstrates that the terms of trade were an important source of real income growth in the 2000s. The terms of trade

rose by 85 per cent after 2002-03[5] (figure 2.2) to a level hardly witnessed over the last 140 years.[6] Export prices rose with the growth in export demand, particularly for minerals, while import prices fell with exchange rate appreciation, increased world supplies from lower-cost countries and technological advances in overseas production of electronic equipment.

The rise in the terms of trade accounted for over 20 per cent of the average annual growth in GDI over the first decade of the 2000s.[7]

The terms of trade more than replaced the gap in real income growth left by slower productivity growth. Productivity growth was the major contributor to real income growth in the 1990s. GDP per hour worked in the economy as a whole — a broad indicator of labour productivity — contributed 2.1 percentage points, or about two-thirds, of the GDI growth (table 2.2). However, growth in GDP per hour worked fell by 0.7 of a percentage point on average over the course of the 2000s decade. Yet, as already noted, the rise in the terms of trade not only maintained growth in GDI, but also helped (along with stronger hours growth) to push it higher.

Table 2.2 **Decomposition of average annual growth in GDI**
per cent per year

	1989-90 to 1999-00	*1999-00 to 2009-10*	*Change*
MFP growth (MS12)[a]	**1.7**	**0.4**	-1.3
+ capital deepening	1.2	1.8	0.6
= Labour productivity growth (MS12)[a]	**2.9**	**2.1**	-0.8
+ market sector adjustment	-0.8	-0.7	0.1
= GDP per hour growth (economy-wide)	**2.1**	**1.4**	-0.7
+ hours worked growth	1.2	1.6	0.4
= GDP growth	**3.3**	**3.0**	-0.3
+ terms of trade contribution	-0.1	0.9	1.0
= GDI growth	**3.2**	**3.9**	0.7

a 12-industry market sector.

Source: Author's estimates.

5 The terms of trade index rose from 54.5 in 2002-03 to 100 in 2010-11 and 100.6 in 2011-12 (ABS Cat. no. 5204.0, 2011-12 issue).

6 There were spikes in the 1920s and in the early 1950s (PC 2012, chapter 11 and Plumb, Kent and Bishop 2013).

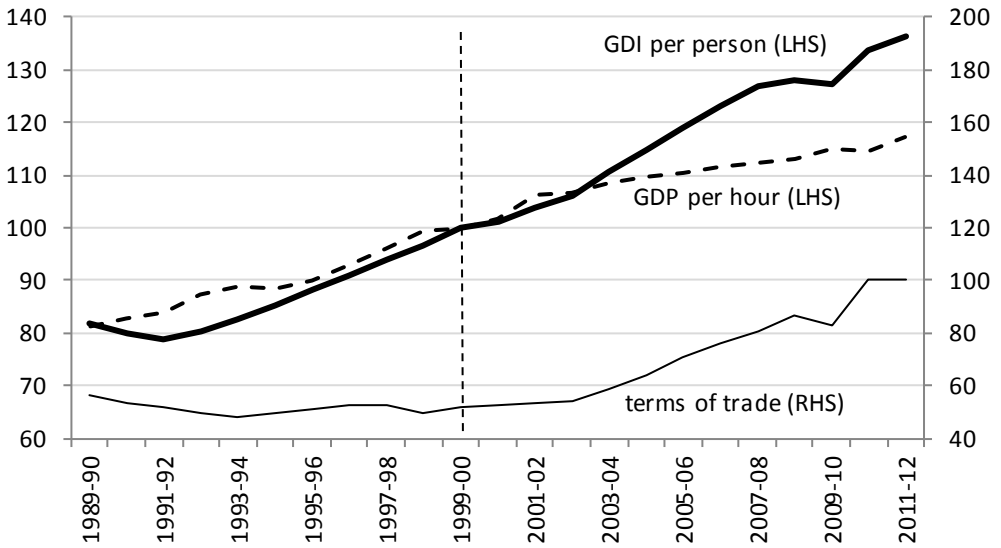
7 0.9 percentage points out of 3.9 per cent per year growth.

Average income

The same trends are evident in growth in real income per capita (figure 2.2).

Average income grew closely in line with productivity growth in the 1990s. Growth in GDI per capita averaged 2.0 per cent and growth in GDP per hour averaged 2.1 per cent. In the 2000s decade, however, GDI per capita accelerated to 2.4 per cent a year, thanks to the terms of trade rise, even though growth in GDP per hour slumped to 1.4 per cent a year.

Figure 2.2 **GDP per hour, GDI per person and the terms of trade**
indexes, 1999-00=100 (LHS) and 2010-11=100 (RHS)



Data source: ABS (Cat. no. 5204.0).

Productivity in the market sector

Labour productivity growth is more accurately measured in the market sector of the economy (box 2.1). (The reasons for using the market sector in this paper will become clear in chapter 4.) Market sector labour productivity growth was more rapid in the 1990s than growth in GDP per hour worked (reflecting faster labour productivity growth in the market than the non-market sector of the economy), although market sector labour productivity fell by a similar magnitude in the 2000s decade (table 2.2).

Labour productivity growth can be viewed as a combination of capital deepening and multifactor productivity (MFP) growth. Capital deepening occurs with increases in the ratio of capital to labour. MFP growth reflects improvements in the

efficiency with which labour and capital are used to produce outputs of goods and services.[8]

Box 2.1 **Industries in the market sector**

The market sector is the part of the economy for which the ABS calculates the official productivity estimates. The key distinguishing feature of market sector industries is that their output can be measured without reference to the amount of inputs used. Output is valued by prices received in market transactions. In non-market industries — Public administration & safety, Education & training and Health care & social assistance — output is largely measured by expenditure on inputs.

The ABS introduced four additional industries into the market sector productivity estimates in 2010. The data for the four additional industries span a shorter period (from 1994-95) than for the 12 industries in the original market sector.

12-industry market sector

- Agriculture, forestry & fishing (Agriculture)
- Mining
- Manufacturing
- Electricity, gas, water & waste services (EGWWS or 'the Utilities')
- Construction
- Wholesale trade
- Retail trade
- Accommodation & food services (Accommodation)
- Transport, postal & warehousing (Transport)
- Information media & telecommunications (Telecoms)
- Financial & insurance services (Finance)
- Arts & recreation services (Arts & recreation)

Additional industries in the 16-industry market sector

- Rental, hiring & real estate services
- Professional, scientific & technical services
- Administration & support services
- Other services

8 Output per hour worked (labour productivity) will improve if one person is supplied with a truck to shift dirt, as a substitute for a wheelbarrow. That is a labour productivity gain from capital deepening. If the one person is supplied with a truck and a co-worker, there will still be capital deepening (in comparison to the initial situation with the sole wheelbarrow operator), but the addition of the co-worker will cause MFP to fall because of 'capital congestion'. Only one person can drive the truck. The other person is 'idle'. If, however, output is measured over two shifts and the two workers can drive the truck in separate shifts, MFP will rise because labour and capital are combined in a way that improves production efficiency.

The fall in labour productivity growth in the market sector between the decades was overwhelmingly due to slower MFP growth. Over half the labour productivity growth was due to very rapid MFP growth in the 1990s. But the MFP contribution was very low over the 2000s decade.[9] For much of the later decade, MFP was static or fell.

Capital productivity

A fall in capital productivity since 2003-04 has been a major development in productivity trends (figure 2.3). Capital productivity was generally flat over the 1990s and early 2000s. This is the typical pattern.[10] But it has fallen about 20 per cent since 2003-04.

The fall in capital productivity has held back growth in MFP. MFP can be thought of as a weighted average of labour productivity and capital productivity. With declining capital productivity, MFP growth stalled after 2003-04.

All other things being equal, the decline in capital productivity would mean a decline in income. The McKinsey Global Institute (Taylor et al. 2012) put an order of magnitude on this effect, estimating that the decline in capital productivity from 2005 and 2011 represented a deduction of some $43 billion dollars from national income.

But, all other things were not equal. That fall in capital productivity is based on the volume of output. As has already been noted, there was more income growth in the 2000s through the terms of trade. And so, the rise in the terms of trade more than 'compensated' for the lower income growth due to lower productivity and output growth.

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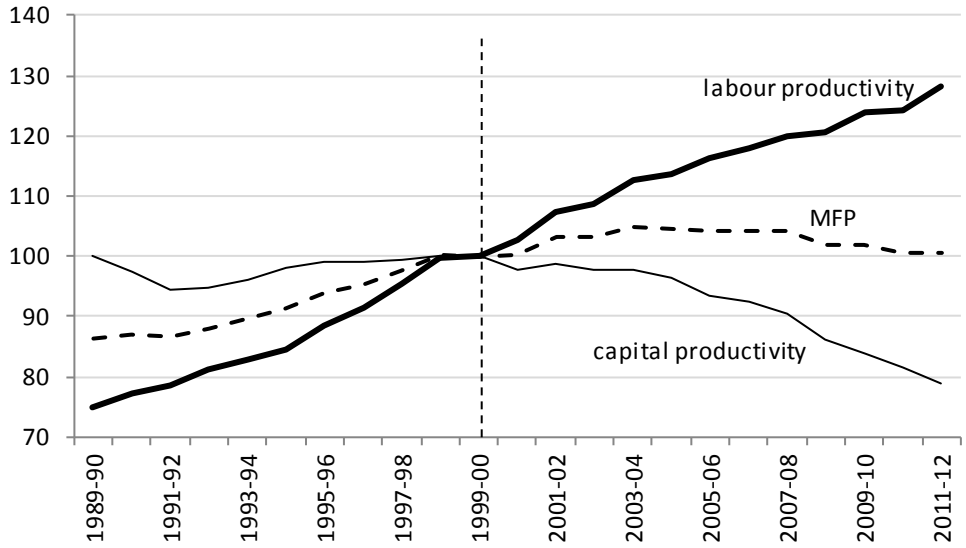
9 Table 2.2 reports the growth rates in productivity over the 1990s and the 2000s. These do not indicate underlying trends measured, for example, over productivity cycles as reported in the ABS National Accounts.

10 Capital productivity was generally flat over two decades from around 1983-84 to 2003-04. What determines the level of capital productivity and why it tends to be flat is a complicated story (Mohun 2009). The following may be at least a partial explanation. In the medium term, a rise in capital productivity would imply an increase in output and income returns to capital, which would tend to induce more investment, leading to a fall in returns or reversion to average capital productivity. Over the longer term, diminishing returns to increased capital intensity tend to be offset by improvements in technology and other efficiency enhancements.

Figure 2.3 **Labour, capital and multifactor productivity**
indexes, 1999-00=100



Data source: ABS (Cat. no. 5260.0.55.002).

2.3 Industry sources of income growth

Did the additional income growth come from a range of industries or just a few?

Growth in income at the industry level for market sector industries is explored using a nominal gross value added measure of output and income. The use of nominal values takes account of the effects of terms of trade shifts on income.[11]

Industry growth and distribution

There was considerable diversity in income growth across market sector industries in the 2000s. Growth rates over the decade ranged from 3.2 per cent a year in Agriculture and Manufacturing to 12.2 per cent per year in Mining. The range was around a market sector average of 6.6 per cent a year (table 2.3).

As a result of the diversity, there were some major reallocations of activity and income among industries.

11 Use of nominal values also means that 'general' inflation effects (as opposed to relative price changes) are taken into account. General inflation effects do not intrude much into comparisons of growth rates across industries or into assessments of industry contributions to aggregate income growth.

Mining's growth, at over 12 per cent a year, was a large step up from 4 per cent a year growth over the previous decade (table 2.3). In growing so strongly in the 2000s, it lifted its share of market sector income by 5 percentage points to 12 per cent.

Construction and Financial and insurance services (Finance) had strong growth at just over 8 per cent a year. In the case of Construction, this was a step up from growth in the 1990s, but it was a slight drop for Finance.

Finance had become the largest industry in the market sector by 2009-10, accounting for over 15 per cent of output and income. Construction and Mining had moved to similar sizes (each around 12 per cent of the market sector), just behind Manufacturing (around 14 per cent).

Manufacturing was the big loser in terms of market sector share. Its share of market sector output and income fell 5.5 percentage points.

Table 2.3 **Industry growth in nominal value added and industry shares: 1990s and 2000s**

per cent average annual growth over the decade

	Growth rate			*Industry share*		
	1990s	*2000s*	*Change*	*1999-00*	*2009-10*	*change*
Agriculture	1.8	3.2	1.4	5.0	3.6	-1.4
Mining	4.1	12.2	8.0	6.8	12.0	5.1
Manufacturing	3.1	3.2	0.1	19.0	13.6	-5.5
Utiliies	1.0	6.0	5.0	4.0	3.7	-0.2
Construction	4.0	8.4	4.4	10.1	12.2	2.0
Wholesale	4.5	5.7	1.2	7.7	7.0	-0.7
Retail	5.1	5.8	0.7	7.9	7.3	-0.6
Accommodation	7.3	5.7	-1.7	4.2	3.8	-0.4
Transport	4.3	6.7	2.4	7.9	8.0	0.1
Telecoms	6.6	5.0	-1.6	6.1	5.2	-0.9
Finance	8.7	8.1	-0.6	13.3	15.5	2.3
Arts & rec	4.8	6.7	1.9	8.0	8.1	0.1
Market sector 12	4.5	6.6	2.0	100.0	100.0	

Source: Author's estimates based on ABS national accounts.

Industry contributions to growth in total income

The industry sources of growth in market sector income can be tracked through 'industry contributions'. An industry's contribution is the growth in income generated in the industry, weighted by the industry's share in market sector income (box 2.2).

The industry contributions to the market sector's average annual rate of growth over the decades of the 1990s and 2000s are shown in figure 2.4 and the estimates are presented in table 2.4.

The three biggest sources of income growth in the 2000s were Finance and Mining (each around 18 per cent of market sector growth) and Construction (14 per cent).

Most of the *additional* income growth in the 2000s was generated in Mining and Construction. Of the additional 2 percentage points in annual average growth in market sector income, Mining contributed 40 per cent and Construction 25 per cent. Because Finance made a strong contribution in both the 1990s and the 2000s, it did not add nearly as much to the acceleration in income growth over the two decades.

Box 2.2 **Industry contributions to market sector growth**

Measures of 'industry contributions' are used a lot in this paper. Clarity about what they mean is therefore paramount.

The basic idea behind an industry contribution is that it reflects the magnitude of the effect an industry has on growth in a market sector variable. An industry contribution takes account not only of the rate of growth in the variable within the industry, but also how important the industry is in the market sector.

For example, contributions to growth in market sector income in the 2000s are essentially growth in industry income (second column in table 2.3) multiplied by an industry share (as also shown in table 2.3).

The practical problem is which industry share to use — base period, end period or mid-period? Selection makes a difference to the size of computed contributions. Regardless of selection, industry contributions are unlikely to add up to the market sector growth over the period, especially if there are large variations in growth rates across industries and therefore relatively large movements in shares over the decade.

There is a way to get around this problem — 'chained Tornqvist aggregation' as developed in Parham (2012). The idea is to calculate *annual* growth in industry income and use annual share weights and then accumulate and average the weighted annual changes over the decade. As a result, the industry contributions over the decade sum very closely to the growth in the market sector total over the decade.

Details of the method are provided in appendix A.

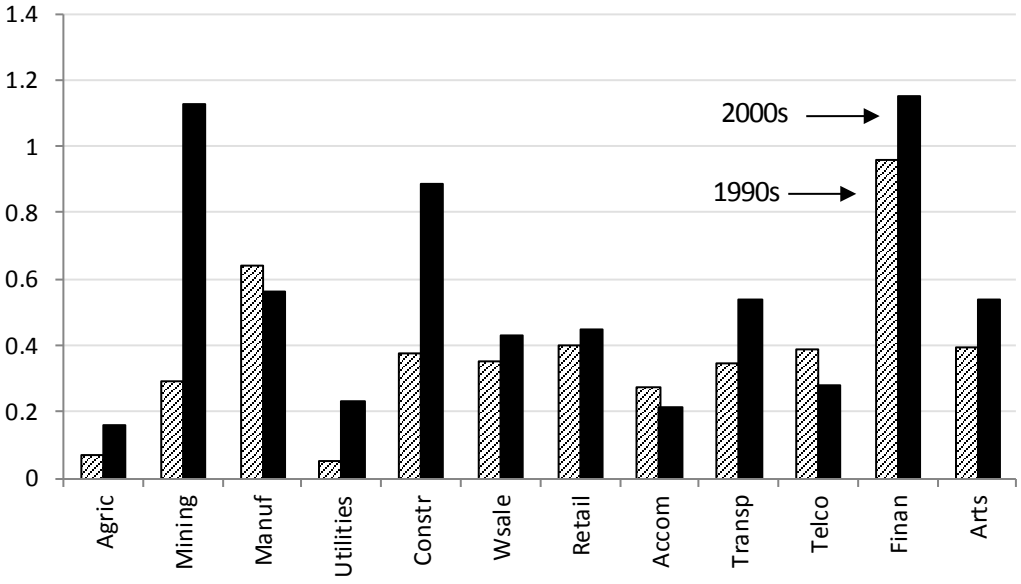
The importance of the mining boom

The footprints of the mining boom are clearly evident. The rise in commodity prices raised income growth in Mining and stimulated a boom in mine development to raise mining capacity. The Construction industry benefited from the construction phase of the mining boom. While Manufacturing's share of activity has been in

decline for some time, the decline is likely to have been exacerbated by the higher exchange rate associated with the mining boom.

Figure 2.4 **Industry contributions to growth in market sector income, 1990s and 2000s**[a]

percentage points



a 1989-90 to 1999-00 and 1999-00 to 2009-10.

Data source: Author's estimates based on National Accounts.

Table 2.4 **Industry contributions to growth in market sector income, 1990s and 2000s**

			Change	
	1990s	*2000s*	*Percentage points*	*Per cent*
Agriculture	0.07	0.16	0.09	4
Mining	0.29	1.13	0.84	41
Manufacturing	0.64	0.56	-0.08	-4
Utilities	0.05	0.23	0.18	9
Construction	0.37	0.89	0.51	25
Wholesale	0.35	0.43	0.07	4
Retail	0.40	0.45	0.05	2
Accommodation	0.28	0.22	-0.06	-3
Transport	0.35	0.54	0.19	9
Telecoms	0.38	0.28	-0.10	-5
Finance	0.96	1.15	0.19	9
Arts & rec	0.40	0.54	0.14	7
Market sector 12	4.5	6.6	2.0	100

Source: Author's estimates based on National Accounts.

2.4 Key point summary

- Australia's 'income pie' grew quite quickly in both the 1990s (the 'productivity decade') and the 2000s (the 'terms of trade decade').
  - Growth in real income and real income per capita were stronger in the 2000s than in the 1990s.
- The stronger growth in the 2000s was due to the very large rise in the terms of trade.
  - Real income growth was stronger in the 2000s, even though output growth was weaker.
  - Productivity growth was the major propellant of prosperity, or improvements in average living standards in the 1990s. But the terms of trade more than filled the gap left by slower productivity growth in the 2000s.
  - The terms of trade accounted for over 20 per cent of the growth in real income in the 2000s.
- A decline in capital productivity was the major proximate factor holding back productivity growth in the 2000s.
  - Ordinarily, a decline in capital productivity would mean a decline in income associated with output growth.
  - But there has been income growth due to the terms of trade gains.
- The additional income growth in the 2000s was largely generated in the Mining and Construction industries.
  - The pattern of reallocation of income among industries points to the mining boom as being a driving influence.

3 The labour share: historical and international perspectives

Attention now turns to income shares.

- Section 3.1 explains the nature of the labour income share.
- Section 3.2 sets the context for the 2000s experience by briefly reviewing historical and international trends in the labour income share.
- Section 3.3 compares economic conditions in the Australian and US economies.
  - This helps to address the issue of whether the recent fall in Australia's labour income share is part of an international trend.
- Section 3.4 provides a summary.

3.1 What is the labour income share?

The labour income share is the proportion of income generated from production that is allocated to labour in wages and on-costs.[1] Labour income is measured in gross terms, with no allowance for tax liabilities incurred.

Shares are calculated as a proportion of current price gross value added (GDP at the economy-wide level). Current price value added (as opposed to the volume of value added) includes terms of trade effects on production.[2]

1 According to ABS conventions, labour income covers wages, salaries and supplements such as allowances, bonuses and overtime payments and indirect payments such as employer contributions to superannuation and workers' compensation schemes, and payments in kind. All forms of employment are included — casual, permanent, full- and part-time. Remuneration packages to senior executives are also included.

2 Current producer prices reflect increases in export prices received and lower import prices paid on intermediate inputs.

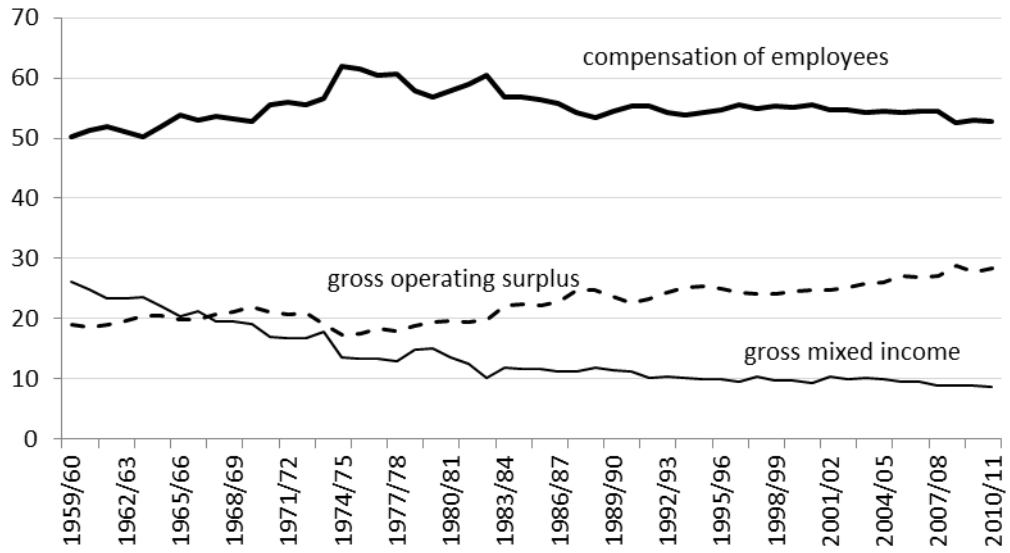
The use of value added as the income measure means that all non-labour income is attributed to capital. This means that capital income is a measure of gross returns to capital, before deductions of tax, depreciation and interest.[3]

This division between capital and labour income requires an allocation of proprietors' income (Krueger 1999). The income of proprietors, labelled gross mixed income in national accounts data, combines a capital component (return on proprietors' capital) and a labour component (return to proprietors' labour input). Figure 3.1 gives an idea of the importance of gross mixed income relative to income received by incorporated businesses (gross operating surplus) and labour costs.

The allocation task can be approached in a number of ways (which accounts for some of the imprecision in estimates and differences across sources of estimates).[4]

Figure 3.1 **Share of income going to employees, companies, and proprietors**

per cent



Data source: ABS (Cat. no. 5204.0).

3 Income attributed to capital is essentially what is left over from revenue after paying for intermediate goods and services and all labour costs.

4 Another important issue that accounts for differences in estimates is industry coverage. Broad economy-wide estimates include owner-occupied housing, which only has a capital income component, and the government sector, for which capital income is taken not to accrue. With reliance on market sector estimates in later chapters, these issues do not arise in this paper.

The common starting point to allocating proprietors' income is to impute a labour income component based on hours worked and the average employee wage in the same industry.[5]

Since payments to labour and capital exhaust available income, the labour income share and the capital income share sum to 100 in percentage terms. Obviously, a fall in the labour income share means a rise of the same size in the capital income share.

This simple division of gross income between labour and capital means that important allocations of income from production are overlooked, including those to:

- governments through various taxes and charges
- depreciation to cover replacement of the nation's capital stock and its income-earning potential
- foreigners, through their part ownership of the capital stock and through direct labour participation.

3.2 Trends in the labour income share

Trends in the labour income share (LIS) in Australia and other countries are now briefly reviewed. The review is intended to provide context, rather than detailed treatment of trends and causes.[6]

Historical

Labour and capital income shares, or the functional distribution of income, were of keen interest to the classical economists of the 18th and 19th centuries and later to others such as the neoclassical, Marxian and post-Keynesian schools. But interest waned as evidence of the constancy of the labour and capital income shares came to light and Kaldor (1957) famously declared the constancy to be a stylised fact.[7] The

5 For details and comparisons of imputation methods for Australian estimates see, for example, ACTU (2013), appendix A.

6 EC (2007) and Bertoli and Ferina (2007) provide reviews of contemporary issues and literature.

7 The constancy of the factor income shares is also known as Bowley's Law, after a British statistician who drew attention to it in the 1920s (see for example, Schnieder 2011).

conventional wisdom became that upward movements in capital-labour ratios were offset by movements in the ratio of wage and profit rates, leaving the LIS constant.[8]

There was, nevertheless, scope for short-term variability in response to the business cycle or temporary shocks. The labour income share is considered to be counter-cyclical (EC 2007). It rises in the down phase of the cycle, for example, as businesses hoard labour and profits fall, while nominal wages remain 'sticky'.

International

Interest in the LIS was rekindled with evidence of medium- to long-term movements in the post-WWII era. The evidence challenged earlier assumptions about the behaviour of income shares or, at least, the time periods over which correcting responses occurred.

As a general pattern across developed nations, the LIS rose in the late 1960s and 1970s, and then declined gradually over the 1980s and 1990s (EC 2007; Rodriguez and Jayadev 2010; Karabarbounis and Neiman 2012). This was clearly evident, for example, in most European countries (and Japan), where the LIS rose to a peak in the late 1970s and early 1980s, and then steadily declined (EC 2007). It was mildly evident in the US (see below).

The general view is that the rises were associated with a combination of wage increases due to institutional arrangements that increased the bargaining power of labour, economic shocks (oil prices) and a slowdown in productivity growth (Bertoli and Farina 2007).

The extent of the decline varied across countries, due in part to differences in the extent to which labour income shares had risen from their pre-1960s levels. The declines in Europe and Japan, for example, were much greater than the decline in the US.

Various reasons for the decline in labour shares have been put forward. They include capital deepening (increases in the capital-labour ratio) as businesses substituted capital for more-expensive labour, technological advance that increased profits and augmented capital and substituted against labour, shifts in industry composition away from labour-intensive toward capital-intensive industries, more

8 This happens if the elasticity of substitution between capital and labour has a value of one (and factors are paid in line with their marginal products). The constancy of labour and capital income shares has been taken as support for the validity of the Cobb-Douglas production function and its implied unitary elasticity of substitution between labour and capital. While estimates of this elasticity vary, more recent estimates suggest that it could be well above 1 (Karabarbounis and Neiman 2013).

competitive markets that reduced those economic rents captured by labour, increased globalisation that increased the global supply of cheap labour, and institutional developments that have reduced labour bargaining power (EC 2007; Bertoli and Farina 2007; OECD 2012; Sweeney 2013). Of these, technological advance may be the most important over the broad sweep of the decline (Bassanini and Manfredi 2012).

Interest in the labour income share has intensified in recent years as part of more general concerns about a more unequal distribution of income in advanced economies. The concerns arise not only from an equity point of view, but also about macro stability (demand patterns and tax revenues) and even social cohesion (EC 2007; OECD 2011, 2012).

United States

The US is a prominent case in point. The US labour income share had been very stable, especially in comparison with other countries (EC 2007). But it has fallen sharply in the 2000s.

Figure 3.2 shows the commonly-referenced data for the US non-farm business sector.[9] Some downward trend is evident in the 1980s and 1990s, but there was a recovery towards the end of the 1990s. According to these commonly-used estimates, the LIS has dropped more than 5 percentage points since 2000 and is now, by far, below its previous low point during WWII (Fleck, Glaser and Sprague 2011). There is some dispute, however, about the depth of the fall and how 'out of normal bounds' it is (Gomme and Rupert 2004, Rupert 2012). On the other hand, the fact that the share should fall so far in the midst of a deep recession is unusual.[10]

This sharp fall has received a lot of attention (for example, Jacobson and Occhino 2012; CEA 2013). It is one element of concern in the US about a shift in the distribution of personal and household income toward high-income earners. The fall is seen as contributing to a more unequal distribution because capital income is distributed more unevenly than employment income (CBO 2011). The fall has also raised concern about the sustainability of government revenues, since capital income is taxed at a lower rate (CEA 2013).

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9 Of passing interest, figure 3.2 also shows the short-term variations that tend to be associated with the business cycle.

10 As noted above, the labour share usually behaves in a counter-cyclical fashion. According to figure 3.2, the late-2000s recession only brought a temporary stay in the fall.

The fall in the US labour share sits alongside related evidence of:

- a 'decoupling' of the real purchasing power of wages from productivity growth, according to which the typical worker has not received any gains from productivity growth (Sharpe et al. 2008; Michel and Gee 2012)
- a concentration of earnings growth among high-income earners (CBO 2011; Brynjolfsson and McAfee 2012)
- a 'hollowing out' of the middle class through loss of job opportunities for middle-income and middle-skill workers, while opportunities have grown in low-pay jobs (Autor, Katz and Kearney 2008)
- an increase in unemployment and decline in participation in the wake of the global financial crisis.

The concerns have undoubtedly come to the fore in the wake of the global financial crisis and the perception that the burden of stagnation and contraction has been borne disproportionately by low- and middle-income earners, while the top-income earners have continued to prosper.

Notwithstanding recent developments, the sharp drop since 2000 has stirred considerable international interest in the US case from the point of view that it may indicate what may be in store for other countries (Sweeney 2013).

Australia

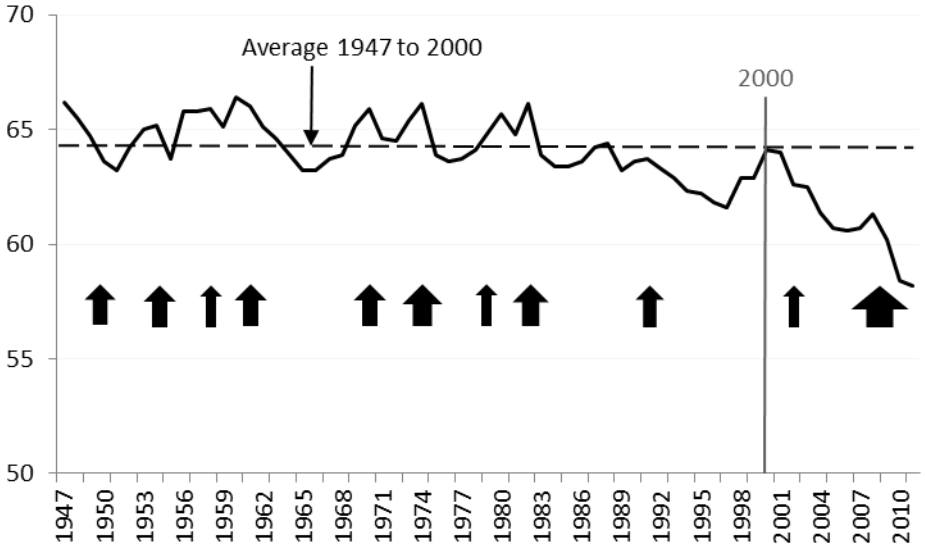
An LIS series for Australia's market sector is shown in figure 3.3. The currently available series commences in 1973-74.[11]

There is other evidence to suggest that the rise in the labour share from around 1973-74 to the late 1980s was similar to the 'hump shape' evident in other countries. That is, the share was stable for some years prior to 1973-74 (see Parham et al. 2000[12] and the wage shares in figures 3.1 and 3.4). It then rose before falling to the longer run level at the end of the 1980s.

11 Of passing note, Australia's labour income share appears to be lower than the US share and has shown wider medium- to long-term variation. This pattern is confirmed in other sources that use comparable data. The difference in levels could be due in part to different industry mixes in the two economies.

12 Estimates in Parham et al. (2000) commence in 1964-65 and show little change in the labour income share until around 1973-74.

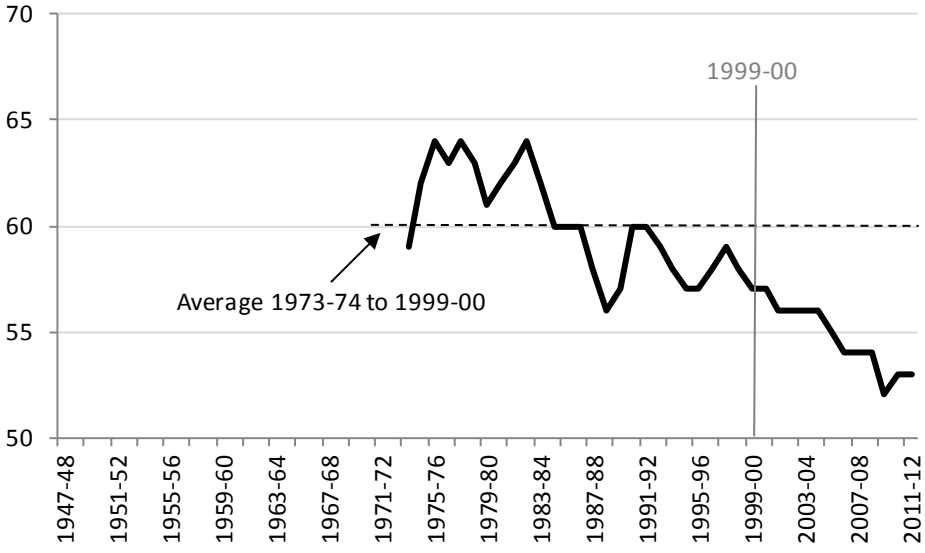
Figure 3.2 **Labour income share in the US non-farm business sector**[a]
per cent



a Arrows indicate timing (and duration) of recessions as designated by the National Bureau of Economic Research.

Data source: Fleck, Glaser and Sprague (2011).

Figure 3.3 **The labour income share in Australia's market sector**[a]
per cent



a 12-industry market sector.

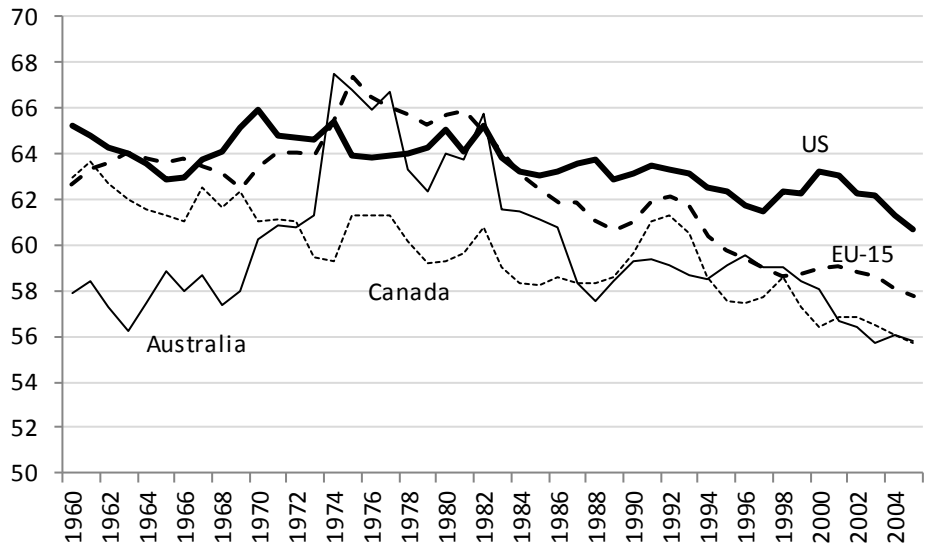
Data source: ABS (Cat. no. 5260.0.55.002).

As discussed in Parham et al. (2000) and ACTU (2013), Australia had:

- a strong increase in the labour share in the early 1970s (which was sustained until the early 1980s)[13]
  - this was associated with a wages 'push' and the 'real wage overhang'
- a decline in the labour share through the 1980s (back to around pre-1970s levels)
  - this was engineered through the Prices and Incomes Accords, which traded benefits outside of labour remuneration (increases in the so-called 'social wage') for restraint in nominal wage growth and this helped to bring reductions in real wage costs
- relative stability in the LIS through the productivity decade of the 1990s.

The medium- to long-term movements in Australia's LIS over the second half of the 20th century were large by international standards (figure 3.4).

Figure 3.4 **Wage share in selected countries**[a]
per cent



a Compensation per employee in proportion to GDP per person.

Data source: EU AMECO database.

13 The recession around 1982-83 may also have propped up the labour share.

The labour share has fallen sharply in Australia in the 2000s. The exact size of the fall depends on which estimates are used. ABS data, relied on here in later chapters, suggests a fall of 4 percentage points. The ACTU (2013) used an alternative estimation method that generates a fall of 5.8 percentage points. According to OECD data, as presented in ACTU (2013), the fall in Australia (4.8 percentage points) was larger than in the US (4.0 percentage points).

Causes of change in the labour share of income

As previously noted, a variety of research studies, analyses and commentaries have attributed the changes in the distribution of market incomes in advanced economies to a number of causes. The OECD (2011, 2012), in reviewing the evidence, emphasised:

- skill-biased technological change
  - in particular, more intensive use of information and communications technologies is seen to substitute for low-skill jobs but to complement high-skill jobs
- increased globalisation
  - the internationalisation of production has effectively increased the supply of low- and middle-skill workers, which has reduced job opportunities and wages for these types of workers in high-income countries.

While these trends contribute to higher growth in total income, they tend to increase the dispersion of personal incomes. In addressing possible policy responses to the greater dispersion, the OECD noted that slowing down technological change and globalisation is not a sensible option, because these factors are important in determining the amount of income there is to share.[14] It put forward further investment in human capital as its favoured remedial approach.

3.3 An Australia–US comparison

A key question is whether the fall in Australia's labour income share is part of the international trend and, more specifically, a reflection of the same developments that appear to be at work in the US economy.

[14] Recent research paper by Commission staff found that while there has been in increased dispersion of hourly wages and individual market incomes in Australia, all income deciles had experienced significant income growth over the last decade (Greenville, Pobke and Rogers 2013).

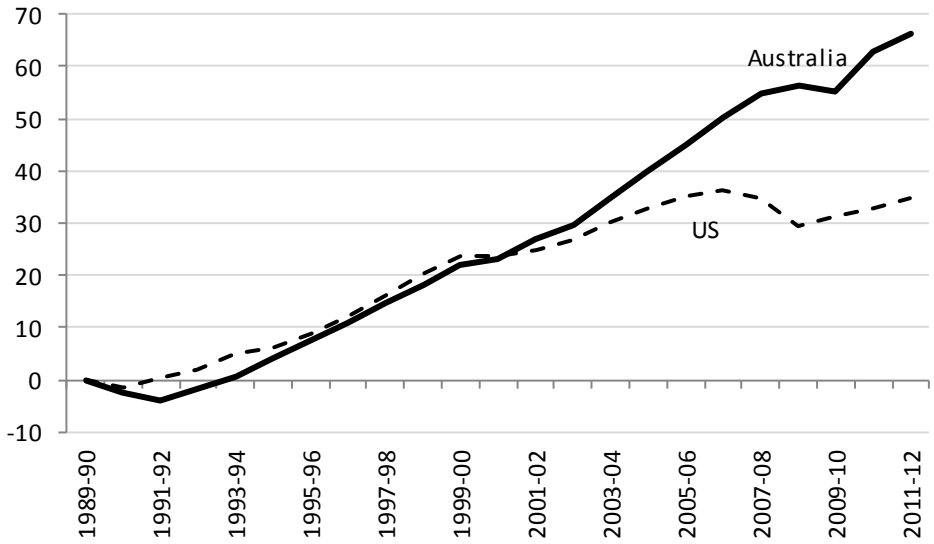
A comparison of selected economic conditions and developments in the Australian and US economies helps to address this question.

Average income growth

The US did not share Australia's continued growth in prosperity in the 2000s. While growth in real average income was very similar in the two countries over the 1990s, US growth drifted well behind Australian growth in the 2000s (figure 3.5). While growth in Australia's average income accelerated (chapter 2), growth in US average income fell from a rate of 2.1 per cent a year in the 1990s to 0.6 per cent a year over the decade of the 2000s.

Figure 3.5 **Growth in real average income in Australia and the US since 1990[a]**

per cent



a GDI per person in Australia. GDP per person in the US. The terms of trade contribution to real income growth does not matter for the US. Trade represents only a small proportion of the US economy and, besides, the US terms of trade *fell* in the 2000s.

Data sources: US Bureau of Economic Analysis; ABS.

The distributional changes over the 2000s were therefore taking place in quite different contexts. It was the distribution of pain versus plenty. In the US, it was essentially sharing the burden of slow growth and contraction. In Australia, it was essentially sharing the bounty from continued expansion.

Growth in labour and capital income

This distinction comes into sharp relief when trends in labour and capital income are compared.

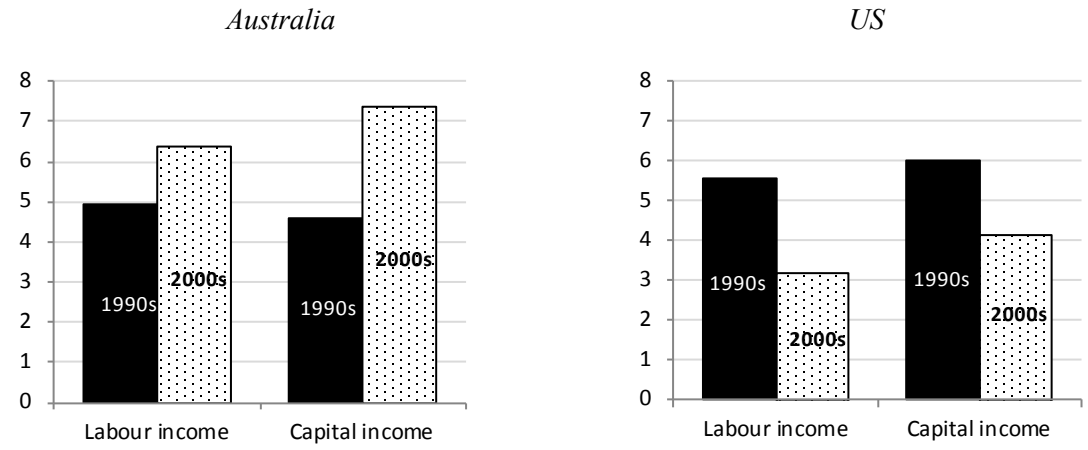
Deceleration versus acceleration in labour and capital incomes

The labour income shares fell in the two economies for quite different reasons. There was a fall in growth in labour income in the US, but not in Australia.

In the US, the rate of growth in both capital income and labour income fell in the 2000s, compared with the 1990s (figure 3.6). The labour income share fell because labour income decelerated more than capital income did.

Figure 3.6 **Growth in labour and capital income in Australia and the US in the 1990s and 2000s[a]**

annual average rate of growth (per cent)



[a] Labour income is compensation of employees. Capital income is the residual (excluding ownership of dwellings). Both are measured in current prices.

Data sources: US Bureau of Economic Analysis; ABS .

In Australia, the rate of growth in both labour and capital income picked up in the 2000s. The labour income share fell, not because there was slower growth in labour income, but because the acceleration in labour income was overshadowed by the acceleration in capital income.

Industry sources

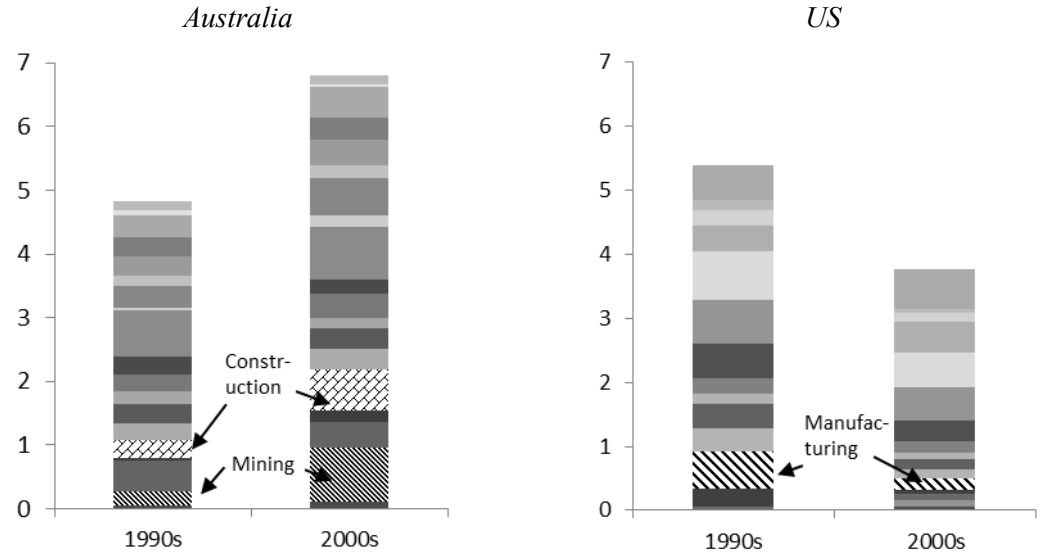
The industry sources of change in output and income growth were also very different.

In the US, a much weaker manufacturing contribution was the major industry source of the 2000s slowdown (figure 3.7). The Council of Economic Advisors (CEA 2013) reported that about half the decline in the US labour share since 2000 is attributable to Manufacturing.

In contrast, Mining and Construction were the main sources of more-rapid expansion in the Australian economy (figure 3.7).[15] There was only a minor contraction in the Manufacturing contribution to growth in Australia. At face value, the mining boom and its associated construction activity are the most likely source of changes in income patterns in Australia. The following chapters investigate the industry sources.

Figure 3.7 **Industry contributions to income growth in Australia and the US**[a]

percentage points



a Contributions to non-dwelling current price GDP.

Data sources: US Bureau of Economic Analysis; ABS.

15 This was shown for the market sector in chapter 2, but is also true for the economy in general as shown here.

3.4 Key point summary

- The labour income share is the proportion of income generated from production that is allocated to labour in wages and associated on-costs.
- The perception that the labour income share remains constant can be challenged on the evidence.
  - In many countries, there was a 'hump shaped' pattern in the second half of the 20th century. The labour income share rose in the 1960s and 1970s and returned to longer run levels in the 1980s and 1990s.
  - There have been further falls in a number of countries in the 2000s.
- Technological advances and increased globalisation are considered to be major factors behind the general decline in the labour income share in advanced economies.
- The US has taken a somewhat unusual path.
  - Its labour share followed the hump shape pattern to a mild degree in the second half of the 20th century, but was essentially stable, especially in comparison to other countries.
  - Its share has fallen sharply in the 2000s.
    - The fall is widely regarded as unprecedented.
    - It is one of a number of developments that have raised concern about growing disparities in the distribution of income and their broader economic and social impacts.
    - The US case has stirred international interest from the point of view that it might herald trends for other countries.
- Australia has shown considerable variation in its labour share from an international perspective.
  - It followed the hump shape in the second half of the 20th century, with a relatively large upswing in the 1970s and reversion in the 1980s.
  - The share was stable through the 1990s.
  - It fell sharply in the 2000s — at least as sharply as in the US.
    - This raises the question of whether the same factors are at work in Australia as in the US.
- A comparison of economic developments in the US and Australia strongly suggests that the labour share has fallen in the two countries for quite different reasons.

- It has been a case of the distribution of pain in the US versus the distribution of plenty in Australia.
- The labour income share fell in the US because growth in labour income *decelerated more* than capital income. The labour share fell in Australia because growth in labour income *accelerated less* than capital income.
  - Growth in labour income slowed in the US, but not in Australia.
- The income developments had different industry sources. The decline of Manufacturing was at the heart of the slower growth in income in the US and the shift in income away from labour. The mining boom, manifest in the Mining and Construction industries, was the main source of growth in income in Australia.

4 The labour share: aggregate perspective

This chapter returns to Australia's market sector and seeks further proximate explanations for the fall in the labour income share.

The chapter takes the following course.

- Section 4.1 reviews trends in the labour income share in the market sector over the 1990s and 2000s.
- Section 4.2 reiterates the explanation for the fall in labour share in terms of a stronger acceleration in capital income than in labour income.
- Sections 4.3 and 4.4 find explanations in terms of:
  - increased capital intensity
  - a gap between real wage growth and labour productivity growth.
- Section 4.5 provides a summary.

4.1 The labour income share in the market sector

The labour income share (LIS) was generally flat over the course of the productivity decade, but fell markedly over the terms of trade decade.

Income shares over the past two decades

ABS estimates of the LIS in the market sector of the economy are used to examine trends. The market sector is used for three reasons.

First, the ABS only apportions the income of proprietors (who provide a combination of capital and labour services) into a capital component and a labour component for the market sector.

Second, use of the market sector avoids complications that arise from the inclusion of ownership of dwellings (capital income only) and industries in the government sector (no return on capital).

Third, the use of market sector data on the LIS allows the analysis to be integrated with productivity estimates that are better-formed with respect to the market sector.

Data for the 12-industry market sector (MS12) are used in the rest of this paper, because they encompass all of the 1990s, as well as the 2000s. The data for the 16-industry market sector (MS16) do not span the 1990s.

The 1990s

Australia's labour income share changed little overall in the productivity decade of the 1990s. Although there was a rise in the early part of the decade, its significance can be heavily discounted as it was a temporary change associated with the recession at that time.[1] The LIS declined by 2 percentage points between 1989-90 and 1999-00, on the raw data (figure 4.1). In another long-term ABS series, in which some of the year-to-year volatility has been removed, the LIS did not change over the decade.[2] The ACTU (2013) study shows and notes no overall change in the LIS over the 1990s.

The 2000s

The LIS clearly fell more sharply, however, over the terms of trade decade. It fell by 4 percentage points in both the 12-industry and 16-industry market sectors[3] between 1999-00 and 2009-10 (figure 4.1). The LIS fell further, but recovered, over the following two years.

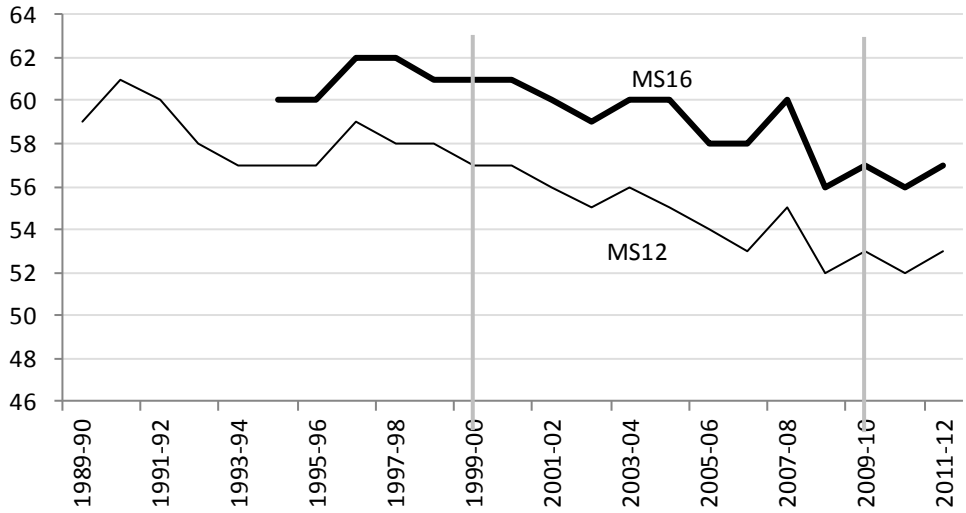
By way of comparison, the ACTU (2013) study reports a fall in the LIS of 5.8 percentage points between 1999-00 and 2011-12. The ACTU paper canvasses a range of methods which provide results that are different in degree, but all show there has been a large fall in the LIS over the 2000s. The 4 percentage points gap presented here, based on ABS market sector data, would appear to be at the low end of the range of estimates.

1 The LIS tends to rise in recessions, as businesses hoard labour and wages are 'sticky' or limited in their downward movements, while profits fall (chapter 3).

2 The ABS publishes two LIS series for the 12-industry market sector: one from 1989-90 and another from 1973-74, which contains two-period averages. The latter is presented in figure 3.3 in the previous chapter.

3 See box 2.1 in chapter 2 for the industry composition of the two market sectors.

Figure 4.1 **Labour income share in Australia's 12-industry market sector (MS12) and 16-industry market sector (MS16)**
per cent



a The coverage of the 12-industry and 16-industry market sector is outlined in box 2.1.

Data source: ABS (Cat. no. 5260.0.55.002).

4.2 Relative growth in capital and labour income

The previous chapter noted that economy-wide capital income grew faster than labour income in the 2000s. This was also true for the market sector.

Growth in capital income exceeded growth in labour income

The fact that there was more growth in capital income than in labour income in the 2000s meant that, by definition, the labour income share fell. Figure 4.2, which shows in the right panel that capital income more than doubled between 1999-00 and 2009-10, whereas labour income grew 80 per cent. In terms of annual average rates, capital income grew 1.6 percentage points faster than labour income (table 4.1).

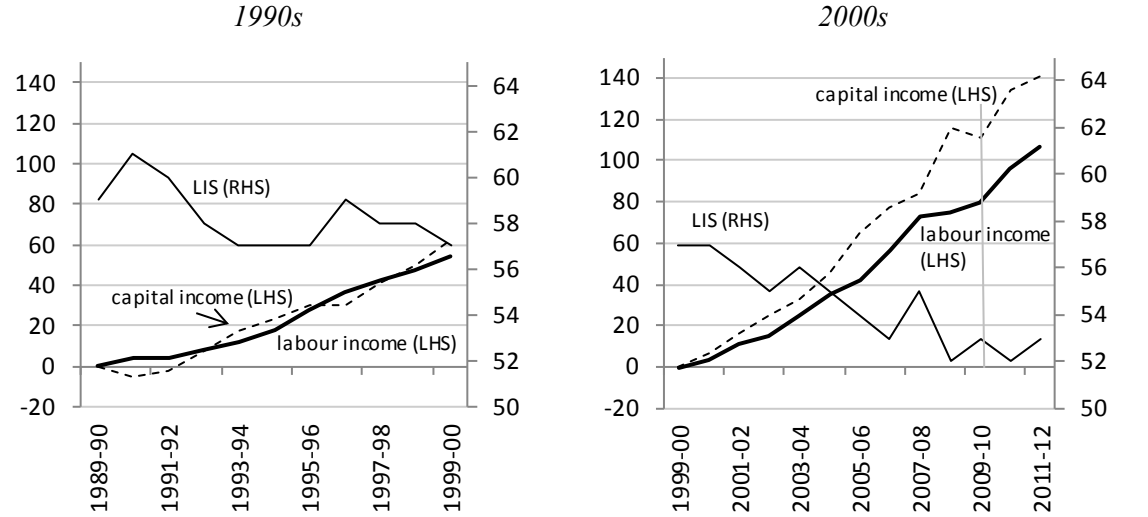
There was no reduction in growth in labour income

As suggested in the previous chapter, and unlike what happened in the US, the labour income share did not fall as a result of a slowdown in growth in labour income. In fact, as figure 4.2 shows, nominal labour income grew more in the 2000s

decade (80 per cent) than it did in the 1990s (55 per cent). The annual average rate of growth was 1.5 percentage points faster in the 2000s decade (table 4.1).

Figure 4.2 **Cumulative growth in labour and capital income and the labour income share in the 1990s and the 2000s**

per cent



Data source: ABS (Cat. no. 5260.0.55.002).

Table 4.1 **Growth in labour, capital and total income, 1990s and 2000s**

per cent per year

	1989-90 to 1999-00	*1999-00 to 2009-10*	*Percentage point change*
Total income	4.5	6.6	2.0
Labour income	4.3	5.8	1.5
Capital income	4.9	7.5	2.6
Difference (cap - lab)	0.6	1.6	1.1

Source: Author's estimates based on ABS (Cat. no. 5260.0.55.002).

There was a stronger acceleration in capital income

Capital income growth exceeded labour income growth in the 2000s because capital income accelerated more than labour income, from their growth rates of the 1990s. The growth rates of capital and labour were similar in the 1990s, with capital income growing around 60 per cent or at a rate of 4.9 per cent a year. In the 2000s, capital income grew an additional 50 percentage points or at 7.5 per cent annual average rate. The 2.6 percentage points acceleration in the rate of capital income growth rate compares with the 1.5 percentage points acceleration in the labour income rate.

4.3 Factor proportions and relative rewards

The stronger growth and acceleration in capital income, relative to labour income, could be due to one or a combination of:

- a quantity effect
  - the quantity of capital used increases relative to the use of labour
  - this would be a 'factor proportions' contribution;
- a price effect
  - the rate of payment of income to capital increases, relative to the rate of payment to labour
  - this would be a 'relative rewards' contribution.

The objective in this section is to discover whether the quantity or price effect dominated in the 2000s.

In the assessment that follows, the capital-labour ratio (K/L) is defined in terms of capital services delivered (K) and hours of work provided (L). The reward ratio (w/r) is formed from labour income divided by hours worked and capital income divided by the productive capital stock. The wage rate is therefore the average hourly cost of labour (w). The gross rate of return (r) is the average gross return on capital, before tax, depreciation and interest.[4]

Factor proportions, reward ratios and the labour income share

The capital-labour ratio tends to increase over time. For the LIS to remain constant in these circumstances, growth in the reward ratio (wage rate to rate of return) has to match growth in the capital-labour ratio. A fall in the LIS means that growth in factor proportions exceeds growth in the reward ratio (box 4.1).

[4] Data from the ABS productivity accounts are used to generate the estimates in this section. Consequently, capital is measured as a capital services index and the gross profit rate is measured as an index of capital income per unit of capital service (and since capital services are proportional to the productive capital stock this index is also an index of the gross rate of return on the productive capital stock). While this does not conform to the normal concept of a gross rate of profit, a very similar pattern of divergence between the capital-labour ratio and the wage to gross profit ratio (as shown in figure 4.3) emerges if capital is measured as net capital stock.

Box 4.1 **Changes in the LIS and quantity and price contributions**

One way to capture the relationship between changes in the labour income share (LIS) and quantity and price effects is to express the ratio of the LIS and the capital income share (KIS) in terms of their quantity and price components.

$$\frac{LIS}{KIS} = \frac{L.w}{K.r} \cdot \frac{Y}{Y} = \frac{L}{K} \cdot \frac{w}{r}$$

where K is capital services, L is hours worked, w is the nominal average hourly wage rate, r is the rate of return on capital and Y is nominal output.

To put this relationship in growth rate terms:

$$\widehat{LIS} - \widehat{KIS} = \left[\widehat{\frac{w}{r}}\right] - \left[\widehat{\frac{K}{L}}\right]$$

where the hat symbol '^' over a variable refers to a growth rate in that variable.

If the LIS remains constant, so does the KIS (because KIS = 1- LIS). In this case the left hand side equals zero and the condition for that result is that growth in the capital labour ratio is equal to the growth in the reward ratio.

A decrease in the LIS will mean that the left hand side is negative and growth in the capital-labour ratio is greater than growth in the reward ratio. However, the size of the gap between growth in the price and quantity ratios does not indicate the extent of the decline in the LIS.

The 1990s experience provides an illustration, albeit an inexact one. The labour income share was mostly flat and, as figure 4.3 (left panel) shows, growth in the capital-labour ratio and the reward ratio were fairly closely aligned over the decade.[5]

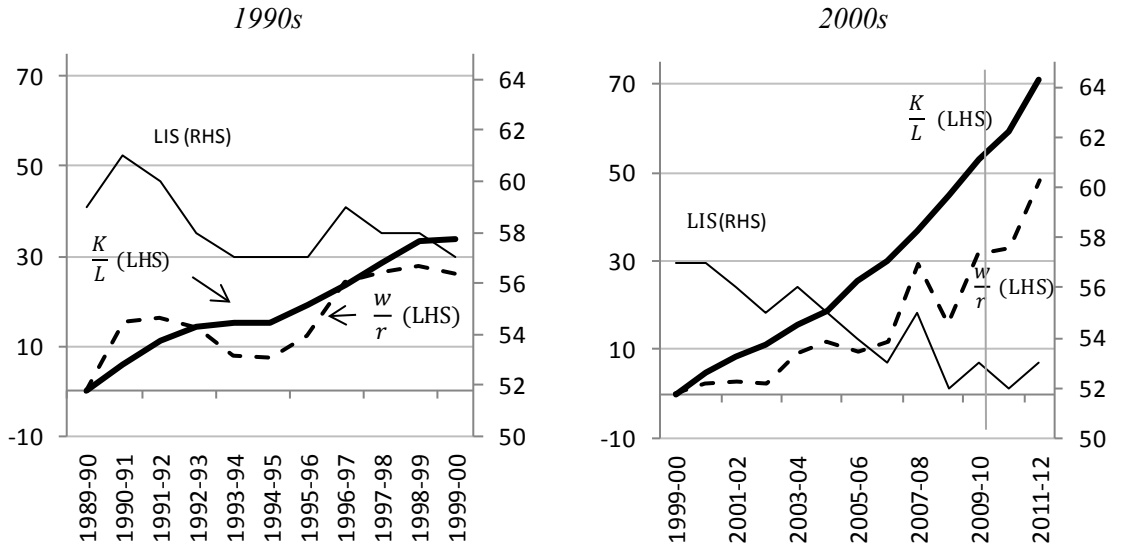
The 2000s, when the LIS fell more markedly, were different. As the right-hand panel of figure 4.3 shows, the capital-labour ratio grew much more (53 per cent) than the wage-return ratio (32 per cent).

However, the growth in the quantity and price ratios should be treated as orders of magnitude, rather than as precise estimates. As will be discussed in chapter 6, there is some uncertainty about the accuracy of the capital and rate of return estimates.

5 Again, there was a temporary aberration in the early 1990s associated with the recession, when profit rates declined relative to wage rates.

Figure 4.3 **Cumulative annual growth in factor proportions and reward ratios and the labour income share, 1990s and 2000s**[a]

per cent



a 1989-90 to 1999-00 and 1999-00 to 2009-10.

Data source: Author's estimates based on ABS (Cat. no. 5260.0.55.002).

The quantity effect dominated

If the 1990s are taken as a benchmark in which 'typical' growth in the capital-labour ratio is approximately offset by 'typical' growth in the reward ratio[6], the fall in the LIS in the 2000s can be attributed predominantly to an increased quantity effect. Factor proportions grew much more in the 2000s (70 per cent) than they did in the 1990s (34 per cent), whereas growth in the reward ratio was similar (32 and 26 per cent respectively). (See figure 4.3.)

Table 4.2 provides the comparisons in growth rates. The average annual rate of growth in the capital-labour ratio accelerated by 1 percentage point between the decades, whereas the rate of growth in the reward ratio remained stable.

The quantity effect was the result of an investment boom

The faster growth in the capital-labour ratio in the 2000s was due to more rapid growth in capital (table 4.2). While growth in hours worked picked up in the 2000s (a 0.5 percentage points faster rate), the 2000s investment boom lifted the rate of growth in the capital stock by even more (1.5 percentage points faster). Capital

6 There are no equivalent data to determine long-term trends.

input growth was a very rapid 5.0 per cent a year on average over the first decade of the 2000s.

Increased growth in wages and profits largely offset each other

The rate of growth in wages and profits both lifted in the 1990s, but to about the same extent. Growth in nominal wage rates rose 1 percentage point and growth in rates of return rose 1.1 percentage points (table 4.2). And so, the growth in the reward ratio was approximately the same over the two decades.

Table 4.2 **Rate of growth in factor proportions, reward ratios and their components**[a]

per cent per year

	1989-90 to 1999-90	*1999-00 to 2009-10*	*Percentage point change*
Capital [K]	3.5	5.0	1.5
Labour [L]	0.5	1.1	0.5
K/L	2.9	3.9	1.0
Wage rate [w]	3.8	4.8	1.0
Profit rate [r]	1.4	2.5	1.1
w/r	2.4	2.3	-0.1
$\widehat{LIS} - \widehat{KIS}$	-0.6	-1.6	-1.0

a See box 4.1 for derivation of relationships.

Source: Author's estimates, based on ABS (Cat. no. 5260.0.55.002).

Labour and capital had stronger growth in both quantity and price terms in the 2000s

All labour and capital quantities and prices grew more rapidly in the 2000s (figure 4.4). On the labour side, the hours worked growth rate picked up from 0.5 to 1.1 per cent a year, and the rate of wages growth picked up from 3.8 to 4.8 per cent a year.

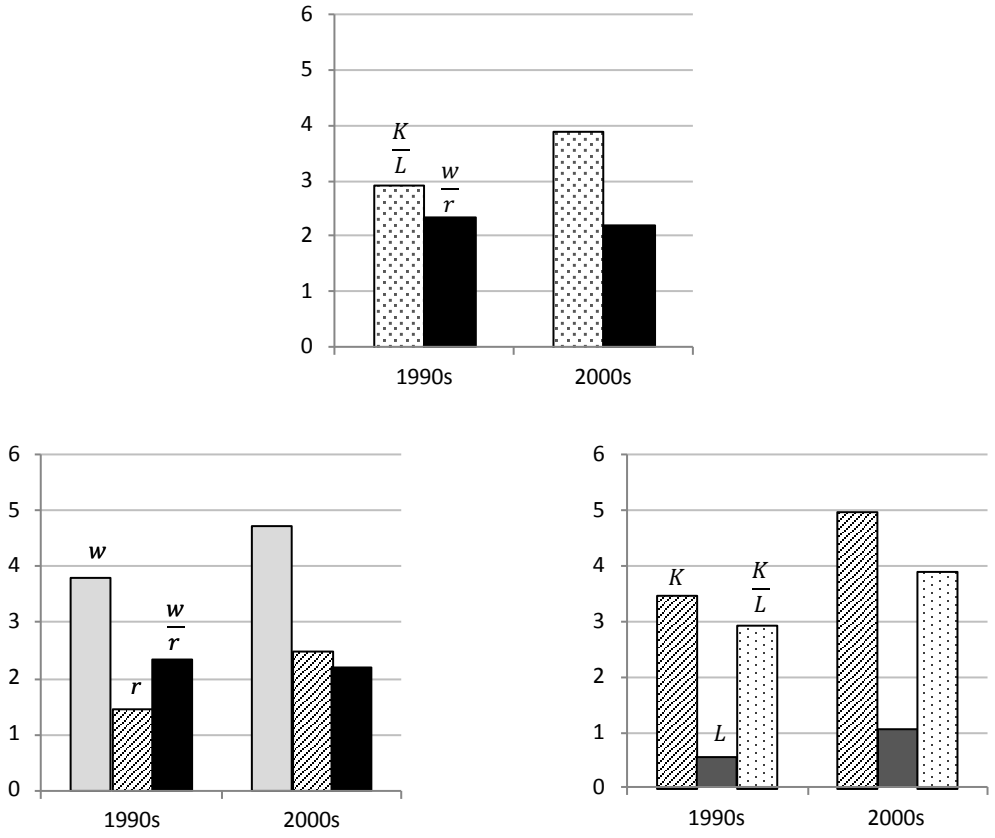
The growth in capital and labour inputs over the 2000s was strong by historical standards. The average rate of growth in hours worked of 1.1 per cent a year compares with a long-term average of 0.8 per cent a year.[7] The average rate of growth in capital services of 5.0 per cent a year compares with a long-term average of 4.2 per cent a year.

7 The long-term averages provided in ABS data are from 1973-74 to 2007-08.

Similar data on long-term average rates of growth in wages and rates of return are not available.

Figure 4.4 **Growth in factor proportions, reward ratios and their components**

per cent per year



Data source: Author's estimates based on ABS (Cat. no. 5260.0.55.002).

4.4 Productivity and costs

The fall in the labour income share can be viewed in yet another way. The LIS is equivalent to the real unit cost of labour, which is the real *cost* of an hour of labour (the real wage) divided by the real *product* of an hour of labour (labour productivity). Box 4.2 demonstrates the equivalence between the LIS and real unit labour costs (RULC).

The real wage concept used in this context warrants explanation. Growth in real wages here is the change in the real cost of labour to producers. The nominal wage rate is the hourly cost of labour (all forms of compensation, including on-costs). The real cost of labour is measured with reference to movements in the prices of the

goods and services for which the labour is engaged to produce. That is, movements in *product* prices are used to convert nominal wage costs into real wage costs. A real wage increase means the nominal cost of an hour of labour has risen faster than product prices.

This real wage is referred to as 'the real product wage' (RPW). As will be seen in chapter 7, it is important to distinguish between a real wage based on the prices of goods and services *produced* and a real wage based on the prices of goods and services *consumed*.

Box 4.2 **The labour income share, growth in real wages and labour productivity and real unit labour costs**

The labour income share is mathematically equivalent to the real unit cost of labour.

Real unit labour costs ($RULC$) are the real costs of labour (LC^r) divided by the number of units of output (Y^r):

$$RULC = \frac{LC^r}{Y^r} \quad (1)$$

The labour income share (LIS) is the nominal cost of labour (LC^n) divided by the nominal amount of income (Y^n):

$$LIS = \frac{LC^n}{Y^n}$$

$$= \frac{LC^n}{Y^n} \cdot \frac{P^Y}{P^Y} = \frac{LC^r}{Y^r} = RULC$$

Real unit labour costs can be defined in terms of the real product wage (RPW) and labour productivity (LP). Multiplying and dividing (1) by the number of hours worked:

$$RULC = \frac{LC^r}{H} \cdot \frac{H}{Y^r}$$

$$= \frac{RPW}{LP} \quad (2)$$

Equation (2) can be expressed in growth rate terms, where a hat '^' over a variable signifies a growth rate in that variable:

$$\widehat{RULC} = \widehat{RPW} - \widehat{LP} \ \left[= \widehat{LIS}\right] \quad (3)$$

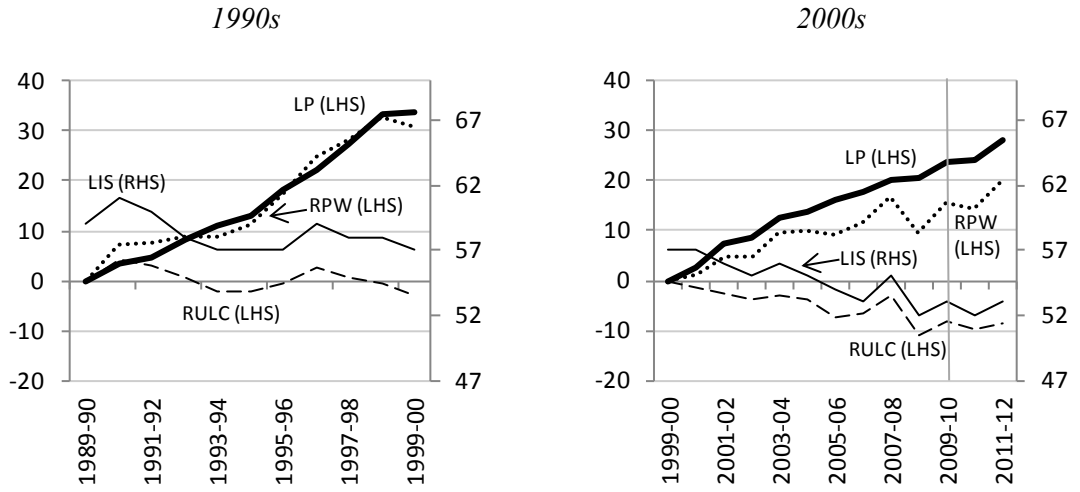
Labour productivity and wages

According to the decomposition in box 4.2, a decline in the LIS means there is a decline in RULC, which in turn means that growth in real wage rates does not keep pace with growth in labour productivity (LP). The evidence from the 2000s (figure 4.5) bears this out.

Real wage growth did not keep pace with productivity growth in the 2000s

The real product wage moved mostly in line with LP growth during the productivity decade of the 1990s.[8] There was little change in both RULC and the LIS (left panel of figure 4.5).

Figure 4.5 **Cumulative growth in the real product wage (RPW), labour productivity (LP) and real unit labour costs (RULC) and the level of the labour income share (LIS),1990s and 2000s**
index, 1999-00=100 (left hand side) and per cent (right hand side)



Source: Author's estimates based on ABS (Cat. no. 5260.0.55.002).

However, growth in the RPW was about 9 percentage points below LP growth over the first decade of the 2000s (right panel of figure 4.5). In keeping with the growth gap, RULC declined by 9 per cent.[9]

In terms of annual average rates, growth in the real product wage was 0.7 of a percentage point behind LP growth in the 2000s (table 4.3).

8 Again the aberration associated with the early 1990s recession is evident.

9 A decline in LIS from 57 to 53 per cent is a 7 per cent decline. The difference between 7 per cent and the 9 per cent decline in RULC is likely to be due to 'rounding', since the LIS is expressed only in terms of integers and not with decimal place precision.

Growth in real wages slowed even more than productivity growth

It is well known that productivity growth slowed from the record highs achieved in the 1990s. A slowdown is reflected in the 0.8 of a percentage point slower decadal rate of growth in LP presented here (table 4.3).

However, the slowdown in real wage growth was even larger (figure 4.5). Annual average RPW growth was 1.2 percentage points slower in the 2000s than in the 1990s (table 4.3).

Table 4.3 **Decomposition of growth in real unit labour costs into growth in the real product wage and growth in labour productivity**
per cent per year

	1990s	*2000s*	*Percentage point change*
Real product wage (RPW)	2.7	1.4	-1.2
– nominal wages	3.8	4.8	1.0
– output prices	1.1	3.4	2.3
Labour productivity (LP)	2.9	2.1	-0.8
– real output	3.4	3.2	-0.2
– hours worked	0.5	1.1	0.5
Real unit labour cost (RULC)	-0.2	-0.7	-0.5

Source: Author's estimates based on ABS (Cat. no. 5260.0.55.002).

The slowdown in real wage growth was mainly due to faster output price inflation

Table 4.3 also provides a decomposition of the growth in the RPW into its nominal wage and product price components. Here, product prices refer to goods and services produced in the market sector[10]. Growth in RPW is, of course, equal to growth in the nominal wage less the rate of inflation in product prices.

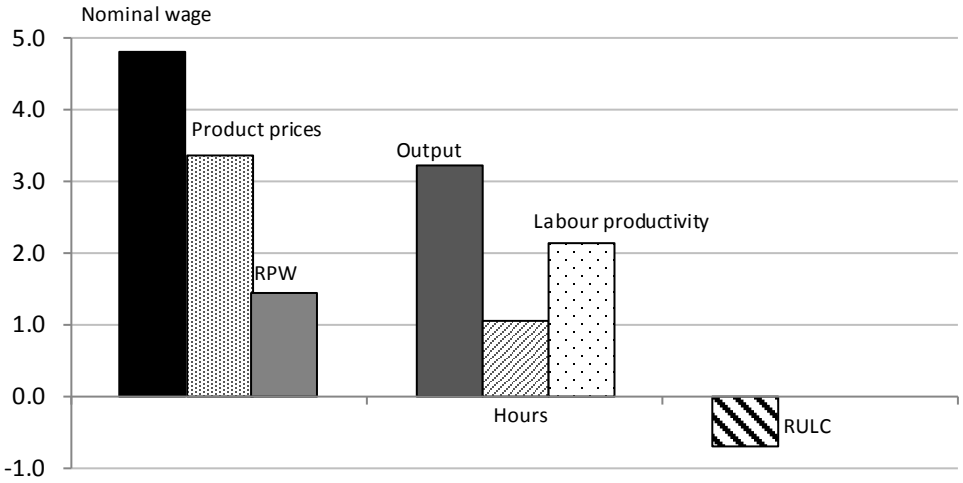
The much stronger inflation in product prices was the main reason for the slower RPW growth in the 2000s. As noted before, nominal wages grew at a healthy 4.8 per cent a year, or 1 percentage point a year faster than in the 1990s. But a 2.3 percentage point acceleration in the rate of product price inflation more than offset the acceleration in nominal wage growth. And so, the rate of RPW growth fell.

The full decomposition of RULC growth for the 2000s is presented visually in figure 4.6.

[10] Output prices are measured as implicit prices for value added — that is, the ratio of current-price value added to the volume of value added.

Figure 4.6 **Decomposition of 2000s[a] growth in RULC into elements of productivity and costs**

per cent per year



a 1999-00 to 2009-10.

Data source: Author's estimates based on ABS (Cat. no. 5260.0.55.002).

4.5 Key point summary

- The labour income share in the market sector of the economy was stable over the 1990s, but fell 4 percentage points over the 2000s.
  - This is at the low end of a range of estimates of the fall.
- The LIS fell in the 2000s because there was stronger growth in capital income than in labour income.
  - Capital income more than doubled over the decade, whereas labour income increased by 80 per cent.
- But there was more growth in labour income in the 2000s (80 per cent) than in the 1990s (55 per cent).
- The fall in the LIS was predominantly associated with an increased quantity effect.
  - Compared with the 1990s, there was much stronger growth in the capital-labour ratio.
    - Capital and labour both grew more rapidly in the 2000s.
    - But the investment boom meant that growth in the capital stock picked up more than did growth in the use of labour.
  - The reward ratio grew at about the same rate as it did in the 1990s.

- ... There was also stronger growth in both the wage rate and the rate of return in the 2000s.
- ... But they accelerated from the 1990s to about the same degree.

- The fall in the LIS is equivalent to a fall in real unit labour costs.
  - This means that growth in the real product wage does not keep pace with growth in LP.
  - The slowdown in growth in the real product wage in the 2000s was even greater than the slowdown in productivity growth.
    - ... This was due to more rapid inflation in product prices in the 2000s.
    - ... The growth in nominal wages was stronger in the 2000s than in the 1990s.

5 The contribution of changes in industry structure

Chapter 2 pointed to the mining boom as being the main source of additional income growth in the 2000s. The financial sector continued to be important, but the mining and construction sectors together accounted for two-thirds of the additional growth in income, relative to the 1990s. At the same time, the relative importance of the manufacturing sector as a source of output and income declined.

Chapters 3 and 4 noted that the labour income share (LIS) declined in the 2000s because there was more growth in capital income than in labour income. Chapter 4 went on to attribute the divergence between capital and labour income growth primarily to a quantity effect — that is, to an increase in capital intensity. That chapter also explained the fall in the labour share as a failure of growth in the real product wage to keep pace with growth in labour productivity, primarily because of much stronger product price inflation.

This and the next chapter explore the role that structural change has played in the decline in the labour share. Whether industries associated with the mining boom — or other industries or other factors — played a key role is of particular interest. This chapter looks at changes in the structure of industries and the industry structure of labour and capital income. Industry contributions to the 'quantity versus price' and 'productivity and costs' explanations are considered in the next chapter.

The importance of the mining boom and structural change is not as obvious as it might at first seem. The ACTU (2013) study concluded that structural change only played a small part. It attributed the fall in the labour share primarily to widespread shifts in income away from labour within individual industries.

To some extent, there is a methodological issue tied up in this conclusion. The vehicle typically used to compare structural change and within-industry effects — shift-share analysis — has some limitations in this context of factor income shares. An alternative method is put forward that leads to a different conclusion — one in which the mining boom essentially explains all of the change in LIS.

In this chapter:

- section 5.1 outlines the changes in the industry structure of activity and changes in industry structure of factor incomes that took place in the 2000s
- section 5.2 reports the relative contributions of changes in industry mix and changes within industries in explaining the fall in the labour income share, using shift-share analysis
- section 5.3 identifies the industries that contributed to the disparity in growth in factor incomes at the market sector level.

Section 5.4 provides an assessment of the role of structural change and the mining boom and section 5.5 provides the key point summary.

5.1 Industry sources of factor income growth

Chapter 2 identified the large and rapid redistributions of output and incomes across industries that took place in the 2000s.

As will now be shown, those redistributions also brought large and rapid changes in the distributions of factor incomes.

Labour income

Labour income within industries grew in a range of 1 per cent a year (Agriculture) to 10.4 per cent a year (Mining), around a market sector average of 5.8 per cent a year (table 5.1).

Even with 10.4 per cent a year growth, Mining remained a relatively small source of labour income in the market sector. It accounted for less than 5 per cent of labour income in 2009-10 (table 5.1).

Construction's 7.8 per cent a year growth made the industry the largest source of labour income in the market sector (over 15 per cent) by the end of the decade.

Manufacturing lost the most share of market sector labour income. Because its growth was weak relative to other industries, its share fell 4 percentage points over the decade. In the process, Manufacturing lost its position as the prime source of labour income in the market sector.

Growth in labour income was also relatively strong in Financial and insurance services (Finance) and Electricity, gas, water and waste services (Utilities). Finance increased its share to third place, behind Construction and Manufacturing.

Table 5.1 **Growth in labour income by industry and industry shares in market sector labour income**

per cent per year

	Growth rate			*Industry shares*		
	1990s	*2000s*	*Percentage point change*	*1999-00*	*2009-10*	*Percentage point change*
Agriculture	4.0	1.0	-3.0	3.9	2.4	-1.5
Mining	1.6	10.4	8.8	2.8	4.5	1.6
Manufacturing	2.8	3.5	0.8	19.1	15.2	-4.0
Utilities	-2.2	7.1	9.4	2.2	2.5	0.3
Construction	4.0	7.8	3.8	12.8	15.6	2.8
Wholesale	4.9	5.4	0.4	9.2	8.8	-0.4
Retail	5.9	5.0	-0.8	10.8	10.0	-0.9
Accommodation	7.8	4.6	-3.2	5.9	5.2	-0.7
Transport	3.8	6.1	2.4	8.4	8.6	0.3
Telecoms	5.0	3.4	-1.6	4.2	3.3	-0.9
Finance	6.6	7.9	1.3	11.7	14.5	2.7
Arts & rec	4.8	6.5	1.7	8.9	9.5	0.6
Market sector 12	4.3	5.8	1.5	100.0	100.0	

Source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

Decadal change in growth

It was noted in chapters 3 and 4 that growth in labour income in the 2000s was more rapid than in the 1990s.

That was mostly also true at the industry level. The biggest uplift in growth was in the Utilities, followed by Mining (table 5.1). Construction's growth in labour income was also quite a deal stronger in the 2000s. And growth also picked up, albeit to a relatively small degree, in Manufacturing.

Growth was weaker in the second decade in Accommodation and food services (Accommodation), Agriculture, forestry and fishing (Agriculture), and Information media and telecommunications (Telecoms).

Capital income

Capital income grew in the range of 2.7 per cent a year in Manufacturing to 12.7 per cent a year in Mining, around a market sector average of 7.5 per cent a year (table 5.2).

Table 5.2 **Growth in capital income by industry and industry shares in market sector capital income**

per cent per year

	Growth rate			*Industry shares*		
	1990s	*2000s*	*Change (pp)*	*1999-00*	*2009-10*	*Change (pp)*
Agriculture	0.3	4.7	4.5	6.5	4.9	-1.6
Mining	5.1	12.7	7.6	12.3	20.7	8.4
Manufacturing	3.6	2.7	-0.9	18.9	11.7	-7.2
Utilities	2.9	5.4	2.5	6.4	5.2	-1.2
Construction	4.0	9.8	5.8	6.5	8.1	1.7
Wholesale	3.6	6.3	2.7	5.6	5.0	-0.6
Retail	2.6	8.3	5.8	3.9	4.3	0.4
Accommodation	5.4	9.2	3.7	1.9	2.2	0.3
Transport	5.1	7.4	2.3	7.3	7.2	-0.1
Telecoms	7.9	6.0	-1.9	8.6	7.4	-1.2
Finance	11.5	8.3	-3.2	15.4	16.8	1.4
Arts & rec	4.8	6.9	2.1	6.8	6.4	-0.4
Market sector 12	4.9	7.5	2.6	100.0	100.0	

Source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

With such strong growth, Mining became the largest source of capital income by the end of the 2000s decade, accounting for one in five dollars of capital income in the market sector.

Construction had the next strongest growth at nearly 10 per cent a year, which pushed its share of market sector capital income to 8.1 per cent at the end of the decade. However, Construction remained a more important source of market sector labour income (15.6 per cent).

With the weakest growth, Manufacturing lost the biggest share. It had been the largest source of capital income in the market sector at the turn of the millennium, but its share fell 7.2 percentage points to 11.7 per cent, well behind Mining and Finance. Manufacturing lost more capital income share than labour income share.

There was also relatively strong growth in Accommodation, Finance and Retail trade (Retail). Accommodation and Retail, however, are relatively small sources of capital

income. The financial sector remained the second largest source of capital income over the decade.

Decadal change in growth

An acceleration in capital income growth from 1990s rates was also widespread. The strongest uplift was, unsurprisingly, in Mining. Construction and Retail also had strong rises in growth rates.

Growth slowed in Finance (from a high rate), Telecoms and Manufacturing.

Industry labour income shares

Since the incidence of stronger growth in capital income than in labour income was widespread at the industry level, the incidence of falls in the LIS was also widespread (table 5.3):

- Mining and Construction had falls of 4 percentage points.
- The largest falls were in Agriculture (-9 percentage points), Accommodation (-8 percentage points), Retail (-6 percentage points) and Telecoms (-6 percentage points).

Table 5.3 **Industry labour income shares**
percentage points

	1989-90	*1999-00*	*2009-10*	*2000s change*
Agriculture	36	45	36	-9
Mining	31	24	20	-4
Manufacturing	60	58	60	2
Utilities	44	32	36	4
Construction	73	73	69	-4
Wholesale	66	69	67	-2
Retail	73	79	73	-6
Accommodation	77	81	73	-8
Transport	64	61	58	-3
Telecoms	47	40	34	-6
Finance	63	51	50	-1
Arts & rec	64	64	63	-1
Market sector 12	59	57	53	-4

Source: ABS (Cat. no. 5260.0550.02).

The LIS *increased* in two industries — the Utilities (4 percentage points) and Manufacturing (2 percentage points). The increase in Manufacturing is particularly noteworthy, as it suggests the relative decline of the industry was focused more on capital than on labour.

5.2 Changes in relative size and changes within industries

There were major reallocations of output and income among industries over the 2000s decade (section 2.3 in chapter 2). In particular, a large share of total income was redistributed from Manufacturing to Mining. Finance and Construction also received a higher proportion of income, while Agriculture received a lower proportion.

Output and income reallocations affect the market sector LIS. A shift toward industries with low LISs and away from industries with high LISs will bring about a fall in the average (aggregate) LIS. The converse is also obviously true.

The 2000s reallocations would have had mixed effects. Mining, being capital intensive, has a low LIS and Manufacturing has an LIS just above average (table 5.3). Those reallocations would have reduced the aggregate LIS. On the other hand, the shift toward the Construction industry, which has a high LIS, would have increased the market sector LIS.

The widespread falls in LIS *within* industries would have worked to reduce the aggregate LIS. On the other hand, the rise in the LIS in the relatively large Manufacturing sector would have raised the aggregate LIS.

Shift-share analysis

Shift-share analysis provides a means of tracking the 'within-industry' changes in LIS and the 'between-industry' shifts in industry mix and establishing their relative importance in explaining the fall in aggregate LIS.

The essence of the methodology is to add up:

- the within-industry or change in LIS components
  - these are the change in an industry's LIS, weighted by the relative size of the industry
- the between-industry or structural change components

– these are the change in the relative size (total income) of an industry, weighted by the LIS of the industry.

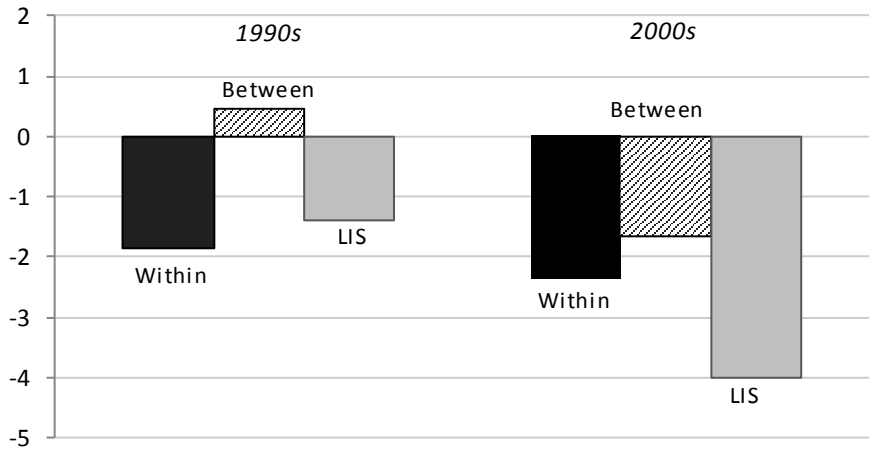
The sum of these two components across industries equals the change in market sector LIS. The methodology is set out in appendix A.

Structural change a major contributor, but 'within-industry' effects more important

The widespread falls in industry LISs had the greater effect on reducing the market sector LIS in the 2000s (figure 5.1).

However, the structural change component was also important. Between-industry effects accounted for around 40 per cent of the 2000s fall. The structural change component was pivotal in explaining the change between decades. It changed from a small positive component in the 1990s to a much larger negative component in the 2000s (figure 5.1).

Figure 5.1 **Decomposition of change in the market sector labour income share into between-industry and within-industry components**[a]
percentage points



a 1989-90 to 1999-00 and 1999-00 to 2009-10.

Data source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

Mining was the largest industry contributor to the 2000s fall

Industry results are presented in table 5.4. Entries in the 'total contribution' column are the sum of entries in the 'within' column and the 'between' column. The industry contributions sum to the market sector totals at the bottom of the table.

The Mining sector was the stand-out contributor, accounting for half of the decline in market sector LIS. Most of that contribution came from structural change — the shift in activity towards this capital-intensive industry. This was, by far, the largest single contribution of all the within-industry and structural change elements.

It was quite a long way back to the 'second tier' contributions from Retail (-0.6 percentage points) and Accommodation (-0.4 percentage points). A within-industry fall in LIS was the more important element in both cases.

Construction only made a small negative total contribution. Its positive structural change contribution (shift toward an industry with above-average LIS) was more than offset by a relatively-large negative within-industry contribution.

Table 5.4 **Industry contributions to the change in the market sector LIS through within, between and total effects**
percentage points

	1989-90 to 1999-00			*1999-00 to 2009-10*		
	within	*between*	*total*	*within*	*between*	*total*
Agriculture	0.60	0.19	0.79	-0.45	0.24	-0.21
Mining	-0.50	0.09	-0.41	-0.27	-1.70	-1.97
Manufacturing	-0.44	-0.03	-0.47	0.38	-0.38	0.00
Utilities	-0.68	0.43	-0.25	0.16	0.04	0.20
Construction	0.00	-0.08	-0.08	-0.40	0.33	-0.08
Wholesale	0.23	0.00	0.23	-0.15	-0.09	-0.25
Retail	0.45	0.09	0.54	-0.48	-0.11	-0.59
Accommodation	0.13	0.24	0.37	-0.33	-0.07	-0.41
Transport	-0.24	-0.01	-0.25	-0.24	0.00	-0.23
Telecoms	-0.34	-0.20	-0.54	-0.36	0.16	-0.20
Finance	-1.05	-0.27	-1.32	-0.13	-0.07	-0.20
Arts & rec	0.00	0.01	0.01	-0.08	0.01	-0.07
Market sector	-1.9	0.5	-1.4	-2.4	-1.6	-4.0

Source: Author's estimates based on ABS (Cat No 5260.0550.02).

Manufacturing made no overall contribution. Its relatively-large and positive 'within' contribution (0.4 percentage points) was offset by a relatively-large and negative 'between' contribution (-0.4 percentage points), which came about because there was a shift away from this industry with its above-average LIS.

The major industry contributors to the within-industry component of the LIS fall were: Retail (-0.5 percentage points), Agriculture (-0.5 percentage points), Construction (-0.4 percentage points), Telecoms (-0.4 percentage points) and Accommodation (-0.4 percentage points).

The ACTU study

The ACTU (2013) drew attention to the fall in Australia's LIS as 'a worrying development'. It correctly associated the fall with a growth in real wages that has not kept pace with labour productivity growth (chapter 4). The ACTU study states that a period in which real wages rise faster than labour productivity growth is needed merely to restore the labour income share of the 1990s.

The ACTU study included a shift-share analysis. It attributed a higher proportion (72 per cent, rather than the 59 per cent found here[1]) to the within-industry component.[2] By way of further comparison, an OECD (2012) study attributed around two-thirds of the fall in Australia's LIS from 1990 to 2007 to within-industry effects.

The difference in shift-share results between this and the ACTU study does not matter a lot. It is likely due to several factors:

- different industry coverage
  - the ACTU study covered all industries, rather than the 12-industry market sector used here
  - this may be the most important explanation for the difference in results
- different method of calculating labour income shares
  - the ACTU used an alternative method of allocating the income of sole proprietors to labour and capital components, whereas the ABS method is relied upon here
  - measurement of income shares is an imprecise science and there are arguments in support of different approaches
- different time periods
  - the ACTU calculations cover 1999-00 to 2011-12, whereas the end-point used here is 2009-10 and the shift-share analysis is sensitive to the choice of end-points
  - however, there was little change in the aggregate LIS over 2009-10 to 2011-12.

1 The ACTU study attributes -4.2 out of -5.8 percentage points to within-industry effects, whereas this study attributes -2.4 out of -4.0 percentage points (table 5.4).

2 The methodology in this study weights share shifts by the deviation of industry LISs from the market sector average. This highlights the role of share shifts by industries with above- and below-average LISs. The ACTU method does not include the market sector average in the calculation of structural change effects. However, this methodological difference affects the distribution of, and not the sum of, structural change effects across industries.

The common conclusion from the two studies is that within-industry and structural change were both important, with at least some weighting in importance toward the within-industry component.

To the extent that the difference is due to industry coverage, it is likely that the importance of structural change via Mining and Manufacturing, found here, is 'diluted' by the inclusion of more labour-intensive industries in the ACTU study.

The ACTU report does not present contributions from individual industries, although it does refer to the falls in LIS in Retail, Accommodation and Transport (which, along with the highest fall in Agriculture, have also been highlighted here).

Seemingly based on the structural change contribution coming in at 28 per cent of the LIS fall, the report concludes:

> Only a small portion of the fall in the labour share can be ascribed to a shift in economic activity towards low-labour share industries such as mining.
>
> It's clear that the mining boom has contributed to the fall in the labour share in the 2000s, but that it accounts for a small part of it. (ACTU 2013, p. 16)

This seems to underplay the role of the mining boom, for two reasons. First, in the shift-share analysis here, Mining accounted for half of the decline in the LIS. Second, as will now be demonstrated, the shift-share approach captures structural change in a way that is limited in this income share context.

5.3 Industry contributions to growth in factor incomes

This section looks at industry contributions to the fall in the LIS in terms of disparities in individual industry's contributions to labour income growth and to capital income growth.

Industry contributions to the 2000s growth in factor incomes

The fall in the LIS came about as a divergence between growth in market sector capital income and growth in market sector labour income (section 4.2 in the previous chapter).

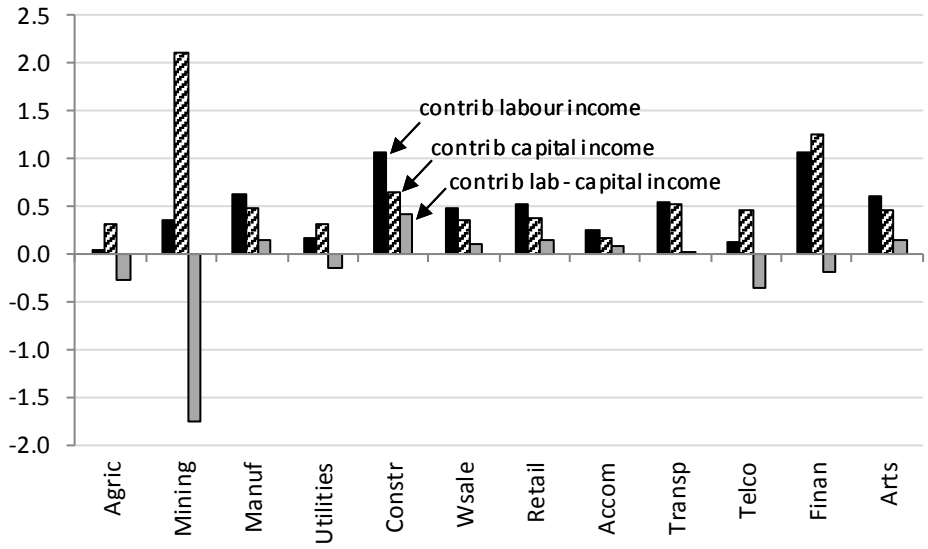
As an extension, industry contributions to the fall in the aggregate LIS can be viewed as the difference between:

- industry contributions to growth in market sector capital income
  - growth in industries' capital income weighted by the industries' share in market sector capital income
- industry contributions to growth in market sector labour income
  - growth in industries' labour income, weighted by the industries' share in market sector labour income.

Industry contributions to growth in labour and capital income and the difference between them are shown in figure 5.2 and table 5.5.

Figure 5.2 **Industry contributions to growth in labour income, growth in capital income and to the difference between them**

percentage points



Source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

Table 5.5 **Industry contributions to the growth gap between labour income and capital income in the 2000s decade**

percentage points

	Labour income	*Capital income*	*difference*
Agriculture	0.04	0.31	-0.27
Mining	0.35	2.11	-1.76
Manufacturing	0.63	0.48	0.16
Utilities	0.17	0.31	-0.14
Construction	1.07	0.65	0.42
Wholesale	0.48	0.37	0.11
Retail	0.51	0.37	0.14
Accommodation	0.25	0.17	0.08
Transport	0.54	0.52	0.03
Telecoms	0.13	0.47	-0.35
Finance	1.06	1.25	-0.19
Arts & rec	0.60	0.46	0.14
Market sector	5.8	7.5	-1.6

Source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

The Mining sector stands out

From this point of view, Mining more than accounted for all of the decline in the market sector LIS in the 2000s. There were other industry contributions that basically offset each other. But Mining accounted for a little more (-1.8 percentage points) than the *entire* excess of growth in capital income over growth in labour income at the market sector level.

The 'second tier' contributors to the income growth gap were Telecoms (-0.4 percentage points), Agriculture (-0.3 percentage points), Finance (-0.2 percentage points) and Utilities (-0.1 percentage points). Finance made strong contributions to both labour and capital income, but the difference between the two was relatively small and in favour of capital income.

It is of particular interest that Construction and Manufacturing worked in the direction of *increasing* the market sector LIS. The Construction contribution is fairly large, contributing 0.4 percentage points more to labour income than to capital income. The Manufacturing contribution was on the low side of 0.2 percentage points.

The industry contributions to the decline in LIS according to this approach differ in some important ways from the findings of the shift-share analysis. But before discussing and examining these differences, the issue of structural change is explored further.

‘Dynamic’ structural change

Shift-share analysis captures structural change in terms of:

- changes in the industry structure of total income
- a ‘comparative static’ analysis of changes in structure and income shares at the start and end of the 2000s decade.

There is a different way to look at the role of structural change, and that is to capture it in terms of:

- separate changes in the industry structure of labour income and of capital income
- a ‘dynamic’ view of structural change based on changes in growth rates.

For the current purposes, the ‘dynamic’ approach takes the growth in factor incomes in the 1990s as a benchmark. The various industry contributions delivered an aggregate LIS that was stable over that decade.

The benchmark comparison is then an exercise to calculate:

- industry contributions to the acceleration in labour income growth in the 2000s (in comparison to the 1990s)
  - these are simply the changes in industry contributions to labour income growth between the two decades
- industry contributions to the acceleration in capital income growth in the 2000s
  - these are the changes in industry contributions to capital income growth between the decades
- industry contributions to the wider gap in growth in factor incomes
  - these are the difference between the first two calculations and are the industry contributions to the difference in accelerations in labour and capital income.

The results are displayed in table 5.6 and figure 5.3.

As was reported in the previous chapter, labour income accelerated by 1.5 percentage points between the decades (from 4.3 to 5.8 per cent a year). Capital income accelerated by 2.6 percentage points (from 4.9 to 7.5 per cent a year). The gap between labour income growth and capital income growth therefore opened up by 1.1 percentage points. These values are shown in the ‘Market sector’ row at the bottom of table 5.6.

Table 5.6 **Changes in industry contributions to labour income growth, capital income growth and to the wider gap between labour and capital income growth**

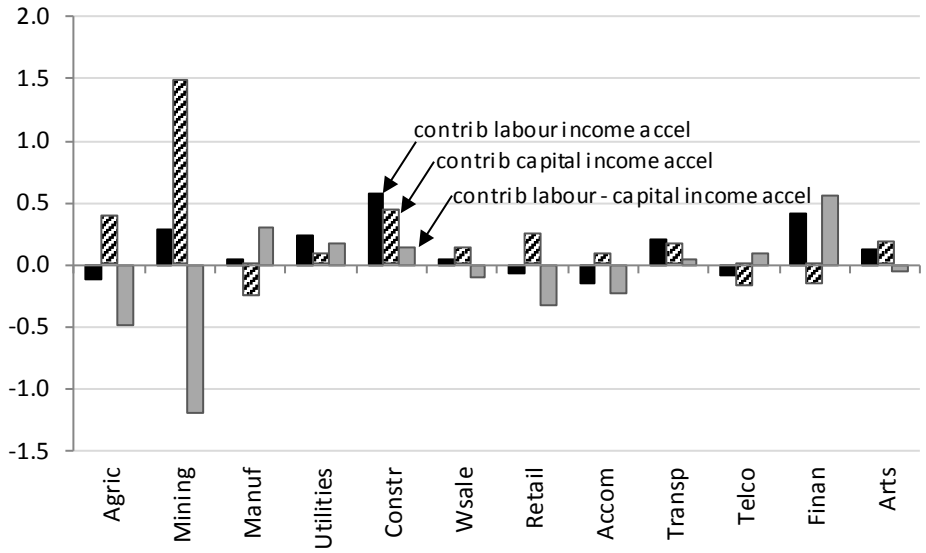
Percentage points

	Labour income	*Capital income*	*difference*
Agriculture	-0.11	0.38	-0.49
Mining	0.29	1.48	-1.19
Manufacturing	0.05	-0.25	0.30
Utilities	0.25	0.08	0.17
Construction	0.58	0.43	0.15
Wholesale	0.04	0.14	-0.09
Retail	-0.07	0.25	-0.32
Accommodation	-0.15	0.08	-0.23
Transport	0.21	0.16	0.04
Telecoms	-0.08	-0.18	0.10
Finance	0.41	-0.16	0.56
Arts & rec	0.13	0.18	-0.05
Market sector 12	1.5	2.6	-1.1

Source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

Figure 5.3 **Industry contributions to accelerations in labour income and capital income and to the difference between the two**

percentage points



Data source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

From this view point, Mining made by far the strongest structural contribution to the fall in the aggregate LIS. It accounted for 1.2 percentage points of the 1.1 wider gap between labour and capital income growth. Unsurprisingly, this was because it

contributed so much (1.5 percentage points) to the acceleration in capital income growth.

Again, the contributions from other industries were smaller and essentially offset each other. The 'second tier' contributors to the wider factor income growth gap were Agriculture (-0.5 percentage points), Retail (-0.3 percentage points) and Accommodation (-0.2 percentage points). Finance made a relatively large counter contribution (0.6 percentage points). It had a much stronger labour income contribution, whereas its capital contribution fell.

Construction and Manufacturing also moved in the counter direction, working to narrow the gap between labour and capital income growth. Construction had a much larger labour contribution, whereas Manufacturing mostly had a smaller capital contribution.

With this approach, 'within-industry' and reallocation effects between industries are not distinguished. Rather this approach identifies what the different industries contributed to the observed aggregate difference between labour and capital income growth. This takes account of the importance of an industry to market sector labour or capital income, which the shift-share approach does not. The shift share approach takes account of the importance of an industry in terms of its share of *total income* in the market sector.

A digression on scale and reallocation effects

There is a way to calculate reallocation effects, within the factor income decomposition approach. But, rather than distinguish between 'within' and 'between' effects, the approach suggested here distinguishes between 'scale' and 'reallocation' effects.

This further decomposition is presented here, more for methodological illustration and confirmation of trends, than for provision of fresh insights.

The first step is to scale up the industry contributions to factor income growth in the 1990s, according to the additional growth in factor incomes in the 2000s. Each 1990s contribution is multiplied by the ratio of 2000s growth to 1990s growth at the market sector level. The results are the entries under the 'Scale' column in table 5.7.

The second step is to take the difference between the actual 2000s industry contributions (table 5.5) and the scaled up contributions. These are the reallocation effects.

The net contributions in panel C of table 5.7 are the differences between the labour contributions (panel A) and the capital contributions (panel B).

Table 5.7 **Scale and reallocation contributions in the 2000s to labour income growth, capital income growth and the difference between them**
percentage points

	Scale	*Reallocation*	*Total*
A. Labour income			
Agriculture	0.21	-0.16	0.04
Mining	0.08	0.27	0.35
Manufacturing	0.79	-0.16	0.63
Utilities	-0.10	0.27	0.17
Construction	0.66	0.41	1.07
Wholesale	0.59	-0.11	0.48
Retail	0.80	-0.28	0.51
Accommodation	0.55	-0.29	0.25
Transport	0.46	0.09	0.54
Telecoms	0.28	-0.16	0.13
Finance	0.89	0.17	1.06
Arts & rec	0.64	-0.04	0.60
Market sector 12	5.8	0.0	5.8
B. Capital income			
Agriculture	-0.10	0.42	0.31
Mining	0.97	1.14	2.11
Manufacturing	1.11	-0.64	0.48
Utilities	0.36	-0.05	0.31
Construction	0.32	0.32	0.65
Wholesale	0.36	0.01	0.37
Retail	0.19	0.18	0.37
Accommodation	0.14	0.03	0.17
Transport	0.54	-0.02	0.52
Telecoms	1.00	-0.52	0.47
Finance	2.16	-0.91	1.25
Arts & rec	0.43	0.03	0.46
Market sector 12	7.5	0.0	7.5
C. Labour income less capital income			
Agriculture	0.31	-0.58	-0.27
Mining	-0.89	-0.87	-1.76
Manufacturing	-0.32	0.48	0.16
Utilities	-0.46	0.32	-0.14
Construction	0.34	0.08	0.42
Wholesale	0.23	-0.12	0.11
Retail	0.61	-0.47	0.14
Accommodation	0.41	-0.33	0.08
Transport	-0.09	0.11	0.03
Telecoms	-0.71	0.37	-0.35
Finance	-1.27	1.08	-0.19
Arts & rec	0.21	-0.07	0.14
Market sector 12	-1.6	0.0	-1.6

Source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

In brief, the results suggest that the most important reallocations among market sector industries in the 2000s were:

- Mining (-0.9 percentage points) because of the very large reallocation of capital income toward the industry (1.1 percentage points)
- Agriculture (-0.6 percentage points), mostly because of an increased allocation of capital income
- Retail (-0.5 percentage points), fairly evenly divided between negative labour and positive capital reallocations
- in the other direction, Finance (1.1 percentage points), Manufacturing (0.5 percentage points) and Telecoms (0.4 percentage points), mainly because of lower allocations of capital income.

5.4 Assessment of the role of change in industry structure

There are some important differences between the shift-share results and the results of the analysis based on industry decompositions of factor income growth.

- The shift-share analysis attributes an important but less-than-complete role to structural change and the mining boom, whereas the analysis based on the industry decomposition of growth in factor incomes attributes the fall in market sector LIS overwhelmingly to Mining.
  - A 'dynamic' view of structural change, using the decomposition of factor incomes approach, similarly attributes the changes in growth rates overwhelmingly to Mining.
- Construction has a slight negative effect on the aggregate LIS in the shift-share analysis but has a positive role in the factor income decomposition analysis.
- Manufacturing had a positive 'within' effect, but no overall effect, in the shift-share analysis, whereas it is found to have had a positive effect on the aggregate LIS in the factor income decomposition analysis.

The differences arise because shift-share analysis captures relative size and 'between' effects in terms of total income. The industry decomposition of factor incomes approach, on the other hand, captures the relative size and significance of industries in terms of labour income and capital income separately.

Consequently, the within-industry changes in LIS in the shift-share analysis overlook the significance that some changes have on the market sector as a whole. Mining and Construction are two prime examples.

In Mining, there was strong growth in labour income, but from a small base as far as the market sector is concerned. The within-industry fall in Mining LIS is not all that large (below average at -2 percentage points), because there is not a lot of difference between growth in industry labour and capital income. However, while the growth in mining labour income had comparatively little significance for the market sector growth in labour income, the growth in capital income in Mining, which is a large source of market sector capital income, had a large effect on aggregate capital income growth. And so, the effect of the growth in factor incomes in Mining has a much greater effect on the market sector LIS than the change in within-industry LIS indicates.

The LIS in Construction fell because capital income grew faster than labour income in the 2000s. The fall of 4 percentage points was of the same magnitude as the fall in the market sector average. This within-industry effect outweighed the structural-change effect in the shift-share analysis. However, because the industry is *the* major source of labour income, the growth in Construction labour income had a larger effect on market sector labour income than the growth in Construction capital income had on market sector capital income. The contribution to aggregate LIS, from the perspective of industry contributions to growth in factor incomes, was positive.

In similar vein, shift-share analysis implicitly assumes in this context that increases in the size (total output and income) of industries can be separated from the way in which industries expand (in capital- or labour-intensive ways). The prime case that challenges this view is Mining, where the expansion of the industry has necessitated higher unit capital requirements. That is, because of depletion and decline in the 'quality' of resource deposits, proportionately more capital investment is needed to maintain and increase output (Topp et al. 2008).

5.5 Key point summary

- There were large reallocations of labour and capital income across industries in the 2000s.
  - The biggest shifts were in capital income — toward Mining and away from Manufacturing.
  - The biggest labour income shifts were toward Construction and Finance and away from Manufacturing.
    - Manufacturing's capital income shift was greater than its labour income shift.

- Most industries experienced falls in LIS in the 2000s.
  - Mining and Construction each had falls of -4 percentage points.
  - The largest falls were in Agriculture (-9 percentage points), Accommodation (-8 percentage points), Retail (-6 percentage points) and Telecoms (-6 percentage points).
  - The LIS *increased* in two industries — the Utilities (4 percentage points) and, importantly, Manufacturing (2 percentage points).
    - The rise in Manufacturing's share was because there was greater downward adjustment in capital income growth than in labour income growth.
- Shift-share analysis attributes important roles to both within-industry falls in LIS and to between-industry shifts toward low-LIS industries and away from high-LIS industries.
  - It attributes more to the 'within' than the 'between' effects.
  - The largest industry effect was through Mining, which accounts for half of the fall in the aggregate LIS, mostly through a between-industry effect (shift to an industry with a low LIS).
  - However, the shift-share approach underestimates the effects of the Mining industry on the aggregate LIS.
- Analysis based on industry decompositions of labour income and capital income growth generates some different results.
  - It attributes the difference in market sector labour and capital income growth (and therefore the fall in LIS) overwhelmingly to the Mining industry.
  - The 'second-tier' contributors were Telecoms, Agriculture, Finance and the Utilities.
  - Construction and Manufacturing are both found to have had *positive* effects on the LIS.
- A 'dynamic' view of structural change, based on the change in growth rates in factor incomes from the 1990s to the 2000s also attributes the changes in factor income growth rates overwhelmingly to Mining.
- The mining boom essentially explained all of the fall in the LIS, even though the other 'major movers', Construction and Manufacturing, worked in the direction of increasing the LIS.
  - There were some other factors, operating in the 'second-tier' industries, but they were swamped by the Mining sector effects.

6 Other industry contributions

This chapter continues the exploration of the industry sources of the fall in the labour income share (LIS).

- Section 6.1 identifies the industry sources of the 'quantity versus price' explanation for the decline in the labour income share.
- Section 6.2 identifies the industries that contributed to the shortfall between market sector growth in real wages and labour productivity.
- Section 6.3 identifies industry contributions to the increased output price inflation in the 2000s, which was a major reason for the weaker real wage growth.

There is a summary in section 6.4.

6.1 Factor proportions and reward ratios

Chapter 4 noted that the fall in the LIS came about through a quantity effect, rather than a price effect (section 4.3). A step up in the rate of capital deepening was found to be the key.

Industry contributions to the market sector growth in factor proportions and growth in the reward ratio are now assessed.

The analysis of wage and return estimates, particularly at the industry level, should be treated with caution. They provide only prima facie evidence that needs further examination and confirmation. These wage and return estimates are based on national accounts data, which are not primarily designed to reveal wage and rate of return trends.[1]

[1] As discussed in chapter 3, the 'wage' is the cost of labour to the industry. It will vary across industries with the skill mix of employees as well as any variations in labour on-costs. It will also vary with the utilisation rate of labour employed in the industry. As a result of these factors there can be substantial variations in the real wage (cost of labour) across industries.

Industry contributions are calculated in a way that allows 'additivity' (see appendix A for details of the methodology). The industry contributions add to market sector rates of growth. But there is further additivity in that industry contributions to growth in the capital-labour ratio, for example, can be formed from the separate industry contributions to capital growth and to labour growth.

The industry contributions to the market sector developments in the two decades are shown in table 6.1, with three columns for each decade.

- The first column shows industry contributions to growth in the market sector reward ratio (wage rate to rate of return).
- The second presents the industry contributions to growth in market sector factor proportions (the capital-labour ratio).
- The third contains the industry contributions to the gap in growth between the reward ratio and factor proportions;
  - that is, entries in column 1 less the entries in column 2
  - these do not show magnitudes of contributions to change in the aggregate LIS, but they do indicate direction (negative entries in this third column indicate cases that contributed to the fall in the market sector LIS).[2]

The industry contributions for the 2000s decade are also displayed visually in figure 6.1.

2 The entries are not a reliable indicator of the extent of an industry's contribution to the fall in LIS because the gap in growth between the reward ratio and factor proportions is equal to the growth in the LIS less the growth in the capital income share. See box 4.1 in chapter 4.

Table 6.1 **Industry contributions to the gap in growth between reward ratios and factor proportions, 1990s and 2000s**

per cent per year

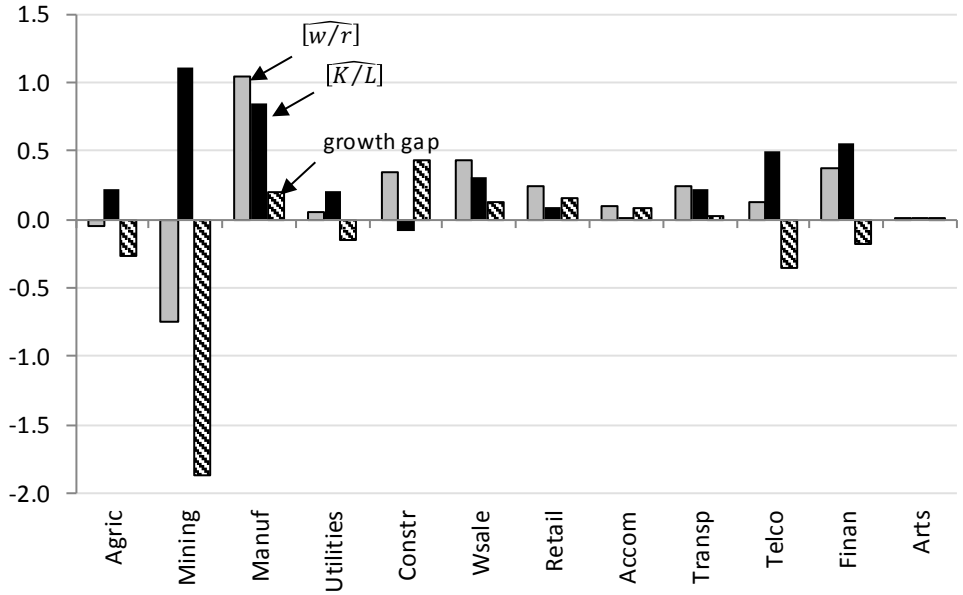
	1989-90 to 1999-00			*1999-00 to 2009-10*		
	w/r	K/L	Gap (pp)	w/r	K/L	Gap (pp)
Agriculture	0.24	0.00	0.24	-0.04	0.22	-0.27
Mining	-0.05	0.55	-0.60	-0.75	1.11	-1.87
Manufacturing	0.72	0.85	-0.13	1.04	0.84	0.20
Utilities	-0.14	0.19	-0.33	0.05	0.20	-0.15
Construction	0.24	-0.07	0.31	0.34	-0.08	0.43
Wholesale	0.47	0.25	0.23	0.43	0.31	0.12
Retail	0.55	0.04	0.51	0.24	0.09	0.15
Accommodation	0.14	-0.20	0.34	0.09	0.00	0.09
Transport	0.06	0.07	0.00	0.25	0.22	0.03
Telecoms	0.11	0.56	-0.46	0.13	0.49	-0.36
Finance	-0.11	0.65	-0.77	0.38	0.56	-0.18
Arts & rec	0.07	0.02	0.05	0.02	0.00	0.01
Market sector 12	2.3	2.9	-0.6	2.2	4.0	-1.8

Note: pp = percentage points.

Source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

Figure 6.1 **Industry contributions to growth in the reward ratio, factor proportions and the gap between them, 2000s**

percentage points



Data source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

Mining made the largest contribution

The mining boom stands out as the driver of the fall in the LIS from the quantity and price perspective.

The Mining sector had a profound effect. In a sense, it alone contributed all (strictly, a little more than all) of the gap between growth in the reward ratio and growth in the capital-labour ratio at the market sector level.[3]

Mining's contribution came, in large part, from a very strong contribution to growth in the market sector capital-labour ratio, as a result of the industry's heavy capital investment. However, with strong growth in returns on the back of higher resource rents, Mining also made a strong negative contribution to the wage-return ratio.

It should be noted, however, that the growth in capital in Mining is overstated somewhat in ABS estimates. Topp et al. (2008) drew attention to the fact that the ABS assumption that mining investment is added to the capital stock as it occurs, rather than when development projects are completed means that growth in capital input in Mining occurs in advance of when it produces output. This becomes a problem when there is an acceleration in investment, as has occurred in the past decade. In reality, annual investment represents work-in-progress, until the project is completed and production then comes on stream. Topp et al. estimated the typical lag between commencement and completion of a project in the mining industry to be three years.

With a rapid acceleration in investment continuing through the latter part of the decade, the extent of growth in capital in Mining (and the market sector as a whole) is likely overstated. Since the capital stock is the base for calculating the rate of return, this also means that the growth in the rate of return on capital would be understated.

This measurement issue is likely to soften the conclusion, but is very unlikely to undermine the conclusion that the fall in the LIS was attributable to a quantity effect.

'Second-tier' contributors

The set of second-tier contributors to the fall in LIS is the same set identified in the decomposition analysis of factor income growth (section 5.3 of the previous chapter). The set comprises Telecoms, Agriculture, Finance and the Utilities. The

3 There is a small approximation or rounding error between the market sector growth gap reported here (-1.8 percentage points) and that reported in chapter 4 (-1.7 percentage points).

negative LIS effect in these industries was due to a dominant capital contribution. In the case of Finance, this was still the case even though the industry made the strongest contribution of all industries to growth in the average wage rate.

Construction, while it generated a lot more income via the mining boom, had a positive effect on the LIS. It made a stronger contribution to growth in use of labour than it did to growth in use of capital. It also made a stronger contribution to growth in the average wage than it did to the rate of return.

Manufacturing, which was negatively affected by the mining and terms of trade booms, also made a positive contribution to the LIS. That positive influence came despite a fall in its use of labour. Manufacturing made, by far, the largest contribution to the growth in the reward ratio, as well as a strong contribution to the growth in the capital-labour ratio. The reward ratio effect came about because Manufacturing was a strong source of growth in wages, whereas it had a negative impact on the rate of return. It was a source of growth in capital but reduction in use of labour.

Some broader implications

It would appear at face value from these results that some of the gains from the mining boom were captured by the Construction sector. Furthermore, it seems that labour captured more of the gains than capital in both quantity (employment) and price (wage) terms. It also appears that, in Manufacturing, capital has borne more of the burden of adjustment through lower returns than labour has through moderation of wage growth. There is no way to tell from the current analysis, but this may be because of a tendency for wage relativities to be maintained across industries.

The importance of wage growth in Finance is of interest. This could be a case of skill-biased technological change associated with information and communications technologies. Since there was little change in employment in the industry, the strong wage growth could reflect some substitution of more skilled for less skilled workers. Further research is needed to take this view beyond mere speculation.

6.2 Real product wage and labour productivity

Chapter 4 also analysed the LIS fall as a shortfall between growth in the real product wage and growth in labour productivity (section 4.4). From this 'productivity and cost' perspective, the fall in LIS was shown to be equivalent to a fall in real unit labour costs (RULC).

The industry contributions to growth in the real product wage (RPW) and labour productivity (LP) are now assessed. The details of the 'additive' methodology are set out in appendix A. Again, the wage estimates used here need to be treated with caution.

Table 6.2 presents the industry contributions to the decline in market sector labour income share as decompositions of the rate of growth in market sector RULC. The decline in market sector RULC at 0.7 per cent a year over the 2000s is (approximately) equivalent to the 4 percentage point fall in the LIS from 57 per cent to 53 per cent.

Again, there are three columns for each decade in the table. An industry's contribution to market sector growth in the RPW, less its contribution to market sector LP growth equals its contribution to growth in market sector RULC. Industry contributions in each column sum to the market sector growth presented at the bottom of each column.

The contributions for the 2000s are also presented visually in figure 6.2.

Table 6.2 **Industry contributions to the real product wage (RPW), labour productivity (LP) and real unit labour costs (RULC), 1990s and 2000s**

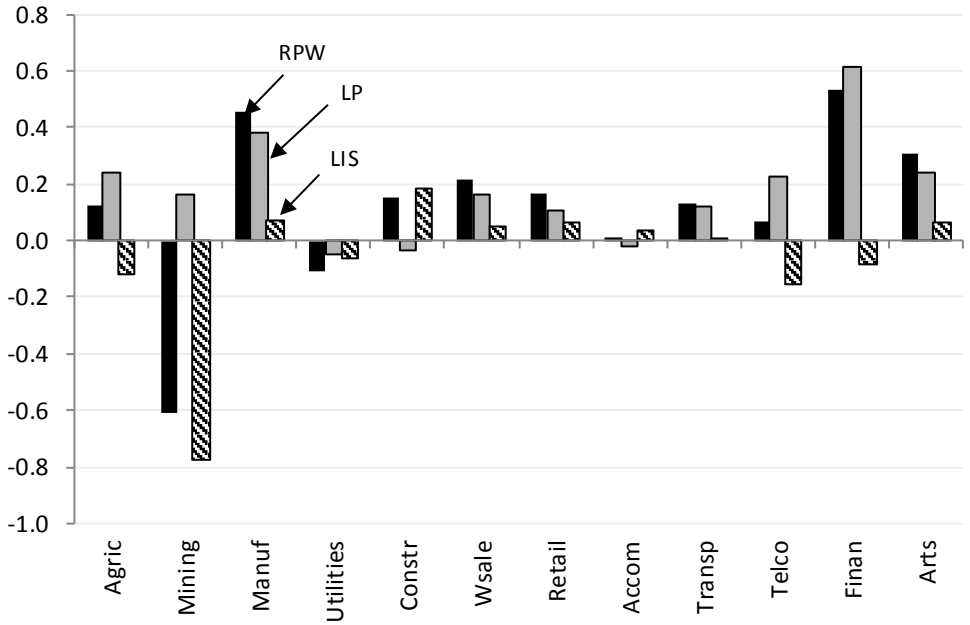
percentage points

	1989-90 to 1999-00			*1999-00 to 2009-10*		
	RPW	*LP*	*RULC*	*RPW*	*LP*	*RULC*
Agriculture	0.27	0.19	0.08	0.12	0.24	-0.12
Mining	0.08	0.31	-0.23	-0.61	0.16	-0.78
Manufacturing	0.40	0.45	-0.06	0.45	0.38	0.07
Utilities	0.03	0.15	-0.12	-0.11	-0.05	-0.06
Construction	0.16	0.05	0.11	0.15	-0.03	0.18
Wholesale	0.32	0.24	0.08	0.22	0.17	0.05
Retail	0.30	0.11	0.19	0.17	0.10	0.07
Accommodation	0.00	-0.12	0.13	0.01	-0.02	0.04
Transport	0.17	0.18	-0.01	0.13	0.12	0.01
Telecoms	0.21	0.38	-0.18	0.07	0.22	-0.15
Financial	0.35	0.66	-0.30	0.53	0.62	-0.09
Arts & rec	0.27	0.19	0.08	0.31	0.24	0.07
Market sector 12	2.7	2.8	-0.1	1.4	2.2	-0.7

Source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

Figure 6.2 **Industry contributions to market sector growth in RPW, LP and RULC, 2000s**

percentage points



Data source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

Again Mining stands out

The Mining sector stands out as the major contributor to the fall in LIS from the productivity and costs point of view:

- On its own, Mining accounted for more than all of the decline in RULC.
- That large negative contribution came about mostly through a negative contribution to RPW growth.
  - It was not just that Mining's RPW contribution failed to keep up with its LP contribution. Its RPW contribution was strongly negative.
- Its contribution to labour productivity growth was moderate.[4]

This is the main industry, from the market sector perspective, that led to real wage growth trailing labour productivity growth. It was the industry that contributed most to the decline in RULC.

4 Labour productivity declined within the industry in the 2000s. Nevertheless, it made a stronger contribution to market sector output growth than it did to market sector labour growth.

Mining also had the largest effect on the change in market sector RULC growth between the two decades. A sharper decline in the RPW contribution was the reason. The sector's contribution to growth in market sector labour productivity fell between the decades.

Other industries made largely offsetting contributions

The 'second-tier' contributions to the LIS fall came from the same set of industries as appeared in the price-quantity analysis. They each were relatively small and, as a group, were offset by the industries that made positive contributions.

Again Construction and Manufacturing are found to have made positive contributions to the aggregate LIS. From the market sector point of view:

- the activities in Construction added to growth in real wages but added nothing to labour productivity
  - Construction added equally to output growth and growth in use of labour
- Manufacturing added to both RPW growth and LP growth, with the balance leaning a little toward the former
  - while the industry only made a small output contribution, its labour contribution was negative.

6.3 Industry sources of product price inflation

Chapter 4 drew attention to the fact that an increase in product price inflation in the 2000s was the main reason for growth in the real product wage to trail growth in labour productivity.

The industry contributions to product price inflation are shown in table 6.3 and figure 6.3.

The Mining industry made the most important contribution to product price inflation. It accounted for 25 per cent of the market sector inflation in the 2000s and for over a third of the additional inflation in the 2000s, compared with the 1990s.

Other industries also made important contributions. Manufacturing, Construction, and Finance each contributed around 0.4 percentage points or 13 per cent of the 2000s product price inflation.

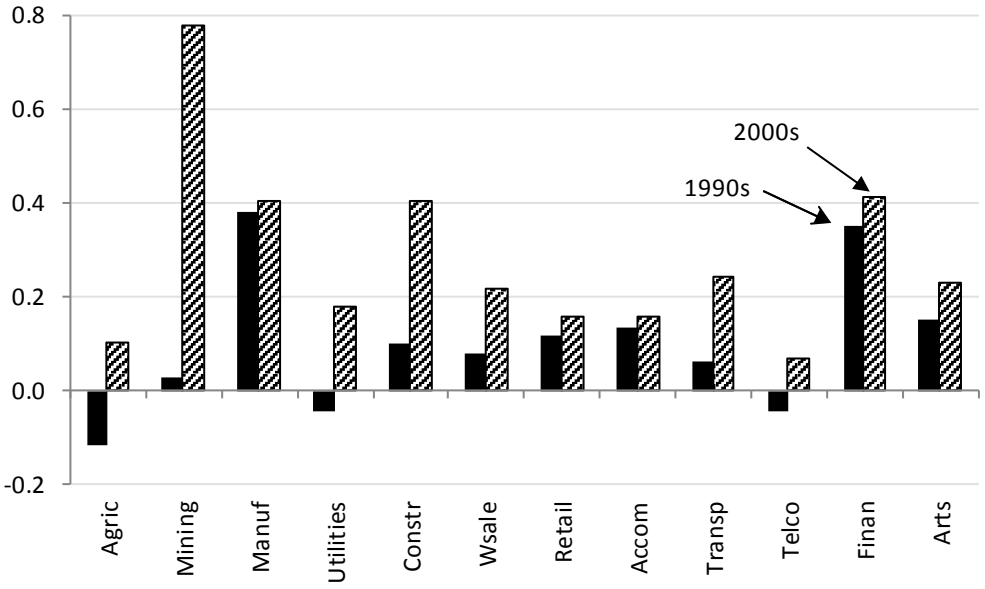
Table 6.3 **Industry contributions to market sector product price inflation, 1990s and 2000s**

	1989-90 to 1999-00		*1999-00 to 2009-10*		*decadal change*	
	pp	%	pp	%	pp	%
Agriculture	-0.12	-11	0.10	3	0.22	10
Mining	0.03	3	0.78	23	0.75	33
Manufacturing	0.38	35	0.40	12	0.02	1
Utilities	-0.04	-4	0.18	5	0.22	10
Construction	0.10	9	0.40	12	0.30	13
Wholesale	0.08	7	0.22	6	0.14	6
Retail	0.12	11	0.16	5	0.04	2
Accommodation	0.13	12	0.16	5	0.02	1
Transport	0.06	6	0.24	7	0.18	8
Telecoms	-0.05	-4	0.07	2	0.12	5
Finance	0.35	32	0.41	12	0.06	3
Arts & rec	0.15	14	0.23	7	0.08	3
Market sector 12	1.1	100	3.4	100	2.3	100

Source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

Figure 6.3 **Industry contributions to growth in product prices in the 1990s and the 2000s**[a]

percentage points



a 1999-00 to 2009-10.

Data source: Author's estimates based on ABS (Cat. no. 5260.0550.02).

6.4 Key point summary

- There are some data measurement issues that caution against taking the findings as being precise.
- Nevertheless, the mining boom, and specifically the mining industry, were the principal drivers of the fall in the LIS, according to the analysis in this chapter.
  - From both the 'quantity and price' and 'productivity and cost' points of view, Mining alone accounted for more than the entire changes associated with the fall in market sector LIS.
  - Mining was not assisted in this role by the other two industries most affected by the mining boom. Construction and Manufacturing worked in the direction of increasing the LIS.
- The same set of 'second tier' contributors to the fall in LIS were observed.
  - Telecoms, Agriculture, Finance and the Utilities.
- Mining had a profound effect on the Market sector LIS through:
  - growth in its capital stock
    - it also contributed to relatively strong growth in the rate of return, but this was offset by relatively strong growth in wage contributions in other industries (relative to their rate of return contributions)
  - its negative effect on the real product wage
  - its role in lifting product price inflation, which was the main factor holding back growth in the real product wage.
- It would seem, at first glance, that Construction may have captured some of the rents from mining.
  - It further appears that labour captured more of the rents than capital, and so the sector had a positive effect on the LIS.
- Manufacturing had a positive effect on the LIS because capital bore more of the adjustment than labour.
  - There was downward adjustment in employment but not wages, which may be because wages are determined by broader conditions than those facing the industry itself.

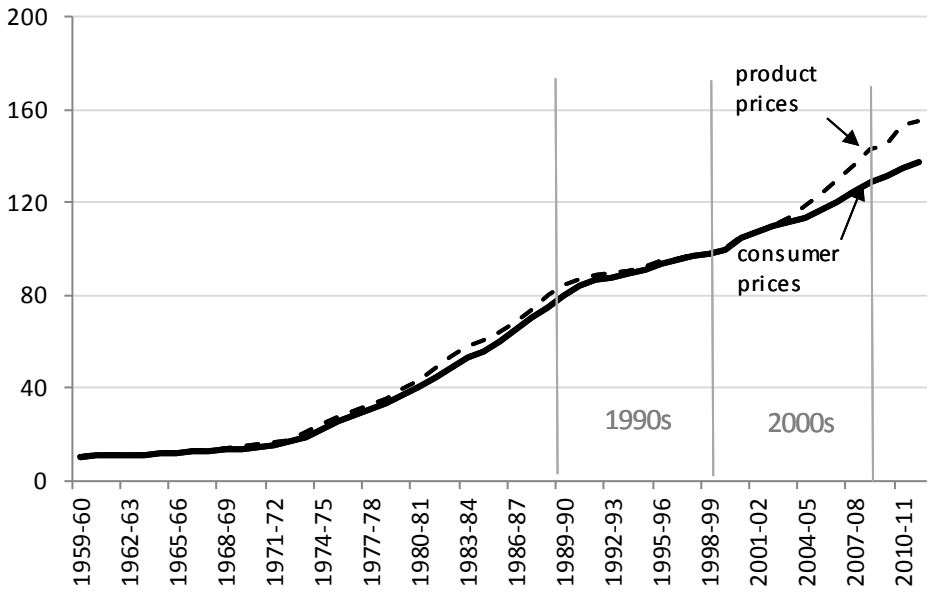
7 Product and consumer prices

The shift in the terms of trade affected prosperity and its distribution in another way.

7.1 A wedge between product and consumer prices

Ordinarily, movements in the prices of goods and services produced in Australia are closely aligned with movements in the prices of the goods and services that Australians consume. Movements in the GDP implicit price deflator, representing product prices, and the CPI, representing consumer prices, were closely aligned from 1959-60 to the end of the 20th century (figure 7.1).

Figure 7.1 **Product and consumer prices[a], 1959-60 to 2011-12**
indexes, 1999-00=100



a GDP implicit price deflator and price deflator for households' final consumption expenditure.

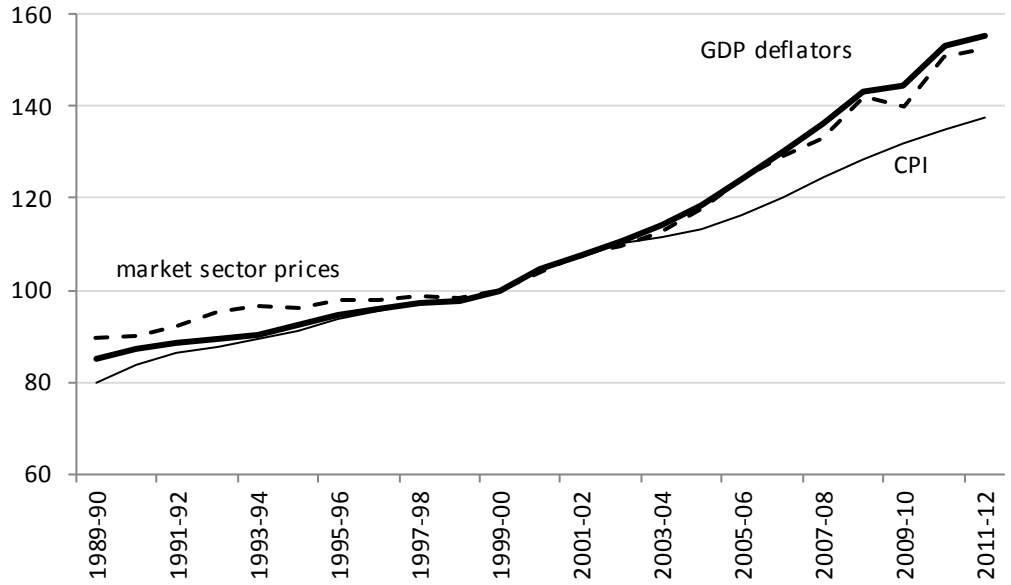
Data sources: ABS (Cat. no. 5204.0); author estimates.

However, product prices rose faster than consumer prices in the first decade of the 2000s. The GDP deflator rose by an annual average of 3.7 per cent, whereas consumer prices rose 2.8 per cent a year on average. The two price series departed after 2002-03, as the terms of trade took off.

The rise in product prices in the 12-industry market sector in the 2000s was quite similar to the rise for the economy as a whole (figure 7.2).[1] According to these estimates, however, the market sector experienced a stronger fall in prices in 2009-10, in the aftermath of the global financial crisis.[2]

Figure 7.2 **GDP deflator, market sector prices and the CPI, 1990s and 2000s**

indexes, 1999-00=100



Data sources: ABS (Cat. no. 5204.0); author estimates.

1 Market sector prices are implicit prices formed from the ratio of current-price to chain-volume gross value added.

2 The departure of market sector prices from the GDP deflator in the 1990s is of passing interest. There was much less rise in market sector prices from 1993-94 until the end of the decade. The market sector was the source of strong productivity gains over this period and the smaller rise in MS12 prices suggests that many of the productivity gains were passed on in the form of lower output prices than would otherwise be the case. This supports the conclusion of Parham et al. (2000).

The wedge between movements in product prices and consumer prices was a manifestation of the shift in the terms of trade. Higher export prices, especially for minerals, fuelled strong growth in product prices, as was demonstrated in the previous chapter. However, these would have had little direct effect on domestic consumer prices. Import prices, on the other hand, fell with exchange rate appreciation and lower supply prices for many goods on world markets. Lower import prices helped to keep domestic consumer prices in check.

7.2 A wedge between real consumption wages and real product wages

The wedge between consumer and product prices meant that there was also a wedge between real wages as a cost to producers and real wages as income to labour. While product prices are relevant to producers in determining the real cost of employing labour, consumer prices are relevant to workers in determining the real value of their incomes as wherewithal to purchase goods and services.[3] The nominal wage deflated by an index of consumer prices is referred to as the real consumption wage (RCW).

Whereas real product wage (RPW) growth fell behind labour productivity growth in the 2000s, RCW growth roughly kept pace with productivity growth (figure 7.3). Over the decade, labour productivity (LP) grew at 2.1 per cent a year on average and the RCW grew at 2.0 per cent a year. RPW, on the other hand, only grew at 1.1 per cent a year (table 7.1).

RCW growth and RPW growth diverged after 2003-04, once the terms of trade had started to rise (right panel of figure 7.3).

The implication is that the consumption gain to workers — the increased purchasing power of their incomes — 'compensated' in a sense for the lower share of income growth from production (at producer prices) in the 2000s. The labour share of income from production fell over the 2000s as growth in the RPW fell behind LP growth. However, growth in RCW kept up with LP growth over the course of the decade.

It is important to note, from a general living standards point of view, that this consumption gain was available to all residents and for all sources of income.

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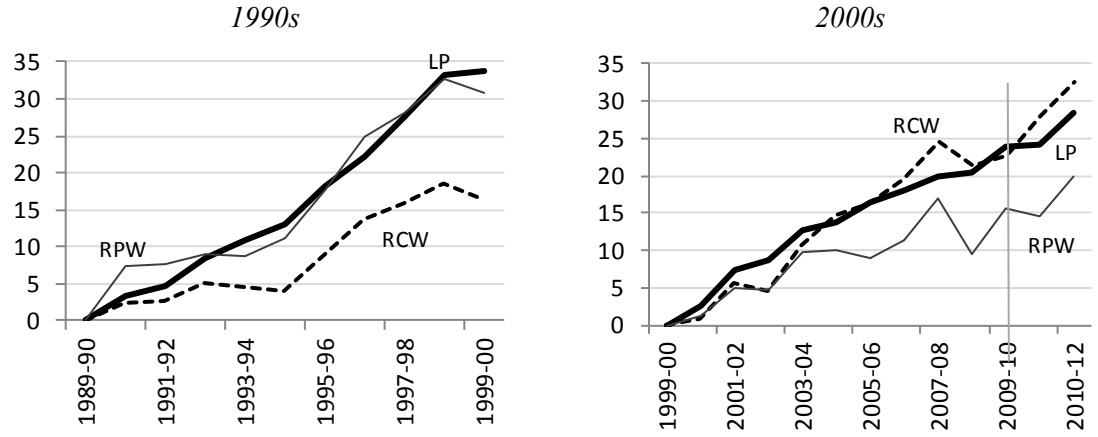
3 There is a further wedge between wages as a cost and wages as income and that is the on-costs that add further costs of employing labour beyond the wage payments received by workers. On-costs have not changed a lot as a proportion of total labour costs over the two decades.

Figure 7.3 **Cumulative growth in labour productivity (LP), the real product wage (RPW) and the real consumption wage (RCW), 1990s and 2000s**

per cent



Data source: Author's estimates based on ABS (Cat. no. 5204.0; Cat. no. 5260.0550.02).

Table 7.1 **Growth in productivity, prices and real wages**

per cent per year

Growth in	*1990s*	*2000s*	*2002-03 to 2011-12*
Labour productivity	2.9	2.1	1.8
Product prices	1.6	3.7	3.8
Consumer prices	2.3	2.8	2.5
Real Product Wage (RPW)	2.1	1.1	1.4
Real Consumption Wage (RCW)	1.5	2.0	2.6

Source: Author's estimates based on ABS (Cat. no. 5204.0; Cat. no. 5260.0550.02).

The 1990s

There was also a wedge between producer and consumer prices in the 1990s. It was, however, smaller in size and opposite in direction. Consumer prices rose more than producer prices. The left-hand panel in figure 7.3 shows that the RCW grew less than the RPW over the 1990s.

Timing, however, played a more precise role. It appears that the divergence in the real product and real consumption wages arose in the early 1990s recession. From 1992-93, however, they ran in close parallel. A fall in the terms of trade in the early 1990s was associated with an exchange rate depreciation, which in turn was likely influenced by the weakness of the domestic economy during the recession.

Labour productivity, the RCW and the RPW moved closely together (in parallel in figure 7.3) from 1994-95. This was the period of strong productivity growth in the 1990s, outside of the recession and with relatively stable terms of trade.

7.3 Key point summary

- The terms of trade drove a wedge between growth in product prices and consumer prices in the 2000s.
  - Higher commodity export prices meant there was more growth in product prices than in consumer prices, which were also held in check by cheaper imports.
- This in turn drove a wedge between growth in the RPW (based on product prices) and the RCW (based on consumption prices).
  - There was stronger growth in the RCW than in the RPW.
- While growth in the RPW fell behind growth in labour productivity, growth in the RCW did not.
  - Both labour productivity and the RCW grew at an average rate of around 2 per cent a year, whereas the RPW grew at half that rate.
  - One way to interpret this is to say that, while labour received a lower share of the income generated, the real value of the income received increased. These effects were offsetting.
- However, the increased value of income was not confined to labour income. It applied to all forms of income.

A Methods for estimating industry contributions

This appendix sets out the methods used to calculate industry contributions. The methods are based on the 'chained Tornqvist aggregation' approach developed in Parham (2012).

A.1 Contributions to growth in market sector income

First, assume that the market sector income (Y_{MS}) is related to the income in individual industries (Y_i) according to a Tornqvist aggregation function. In period *t*:

$$\frac{Y_{MS}^t}{Y_{MS}^{t-1}} = \prod \left[\frac{Y_i^t}{Y_i^{t-1}}\right]^{w_i^t}$$

where the exponents are the Tornqvist weights:

$$w_i^t = \frac{v_i^t + v_i^{t-1}}{2}$$

and v_i^t is the share of industry *i* in market sector income in year *t*.

Growth over one year can be written as:

$$\hat{Y}_{MS}^{t,1} = \sum_i w_i^t . \hat{Y}_i^{t,1}$$

where the hat '^' over a variable signifies the growth in that variable and the '1' in the superscript refers to growth over 1 year.

The growth in market sector income over *n* years accumulates the growth in each of the intervening years:

$$\hat{Y}_{MS}^{t,n} = \sum_{j=1}^{n} \sum_i w_i^{t+j} . \hat{Y}_i^{t+j,1}$$

This 'chaining' method minimises approximation errors that arise from using base-period or end-period shares.

The contribution of industry *m* to market sector income growth over *n* years is then:

$$\sum_{j=1}^{n} w_m^{t+j} . \hat{Y}_m^{t+j,1}$$

A.2 Factor proportions and relative rewards

The objective is to analyse industry contributions to changes at the market sector level in the capital-labour ratio and the reward ratio.

Care is needed in how this is done. To base the analysis on, for example, a weighted aggregation of changes in capital-labour ratios at the industry level would give misleading results in this case. It turns out that the change in the capital-labour ratio in Mining has been negative. While capital has obviously grown strongly in Mining, labour has grown even more — but off a low base, because Mining is capital intensive.

To circumvent this problem, the contribution of industries to market sector capital deepening must be analysed as separate contributions to growth in market sector capital and to growth in market sector labour.

Growth in the market sector capital labour ratio over *n* years from year *t* can be written as:

$$\widehat{\left(\frac{K}{L}\right)_{MS}^{t,n}} = \widehat{K_{MS}^{t,n}} - \widehat{L_{MS}^{t,n}}$$

Industry contributions to growth in market sector capital can be written as:

$$\widehat{K_{MS}^{t,n}} = \sum_{j=1}^{n} \sum_i s_i^{t+j} . \widehat{K_i^{t+j,1}}$$

where the s_i^{t+j} are Tornqvist weights formed from the average of the shares of industry *i* in market sector capital income in year *t+j* and the previous year.

A similar relationship can be written for the industry contributions to growth in market sector labour use:

$$\widehat{L_{MS}^{t,n}} = \sum_{j=1}^{n} \sum_i l_i^{t+j} . \widehat{L_i^{t+j,1}}$$

where the l_i^{t+j} are weights formed from the average of the shares of industry *i* in market sector hours worked in year *t+j* and the previous year.

Because the industry contributions are additive, the contribution of industry *i* to growth in the market sector capital-labour ratio can be written as:

$$contrib\ ind\ i = \sum_{j=1}^{n} s_i^{t+j} \widehat{K_i^{t+j,1}} - \sum_{j=1}^{n} l_i^{t+j} . \widehat{L_i^{t+j,1}}$$

The same procedure can be used to analyse industry contributions to the reward ratio. That is, they are measured as the difference between an industry's contribution to growth in the market sector average wage and that industry's contribution to growth in the market sector gross profit rate.

A.3 Productivity and costs

Growth in the market sector real unit labour costs (RULC) can be decomposed into industry contributions by calculating industry decompositions of the market sector real product wage (RPW) and labour productivity (LP).

Using a subscript *MS* to represent the market sector and a superscript *t* to represent time (years):

$$RULC_{MS}^{t} = \frac{RPW_{MS}^{t}}{LP_{MS}^{t}} = \frac{NW_{MS}^{t}}{PY_{MS}^{t}} . \frac{H_{MS}^{t}}{Y_{MS}^{t}} \qquad (1)$$

where *NW* refers to the nominal rate of compensation, *PY* to output prices, *H* to hours worked and *Y* refers to the volume of output.

Now, each of the variables on the right hand side can be expressed as a Tornqvist aggregation of its industry counterparts. For example:

$$\frac{NW_{MS}^{t}}{NW_{MS}^{t-1}} = \prod_i \left[\frac{NW_i^t}{NW_i^{t-1}}\right]^{q_i^t} \quad \text{and} \quad q_i^t = \frac{lc_i^t + lc_i^{t-1}}{2} \qquad (2)$$

where the subscript *i* refers to industry and lc_i is the share that industry *i* has in total (nominal) labour costs in the market sector.

The weights (q_i in the above equation) used in the other aggregations are:

- industry shares of nominal output for *PY*,
- hours worked shares for *H* and
- nominal output shares for *Y*.

The accuracy of this method in adding up to market sector growth rates is generally high, but does vary from case to case.

Expressing (2) in terms of growth rates over a single year between t-1 and t as:

$$\widehat{NW}_{MS}^{t,1} = \sum_i q_i^t \,.\, \widehat{NW}_i^{t,1}$$

From equation (1), growth in RULC can then be expressed as:

$$\widehat{RULC}_{MS}^{t,1} = \widehat{NW}_{MS}^{t,1} - \widehat{PY}_{MS}^{t,1} + \widehat{H}_{MS}^{t,1} - \widehat{Y}_{MS}^{t,1}$$

$$= \sum_i q_i^t \,.\, \widehat{NW}_i^{t,1} - \sum_i s_i^t \,.\, \widehat{PY}_i^{t,1} + \sum_i u_i^t \,.\, \widehat{H}_i^{t,1} - \sum_i s_i^t \,.\, \widehat{Y}_i^{t,1} \qquad (3)$$

where:

- s_i^t is the average of industry *i*'s output share over *t* and *t-1* and
- u_i^t is the average of industry *i*'s hours worked share over *t* and *t-1*.

Equation (3) expresses the growth in RULC in terms that are additive across industries and components (*NW*, *PY*, *H* and *Y*). Consequently, the contribution of (say) manufacturing to growth in RULC can be calculated by summing the four terms on the right hand side of (3) for *i*=manufacturing.

Growth rates over a number of years are needed for the decadal comparisons in this paper. The 'chaining' method is used for this purpose.

To illustrate for the case of hours worked, the average annual growth rate over *n* years from year *t* would be:

$$\widehat{H_{MS}^{t,n}} = \frac{1}{n} \sum_{j=1}^{n} \sum_i u_i^{t+j} \,.\, \widehat{H_i^{t+j,1}}$$

This formulation can be used on each of the terms on the right hand side of (3) to provide all components of the industry contributions market sector growth in RULC.

A.4 Shift-share analysis

Changes in the market sector LIS can be decomposed into a component that captures changes in industry LISs and a component that captures structural change (or change in an industry's relative size).

The market sector labour income share in year *t* (LIS_{MS}^{t}) is the ratio of payments to labour (W_{MS}^{t}) to output (Y_{MS}^{t}) in current prices.

$$LIS_{MS}^{t} = \frac{LI_{MS}^{t}}{Y_{MS}^{t}}$$

$$= \sum \frac{LI_{i}^{t}.Y_{i}^{t}}{Y_{MS}^{t}.Y_{i}^{t}}$$

$$= \sum LIS_{i}^{t}.y_{i}^{t}$$

where y_{i}^{t} is the current price share of industry *i* in market sector output in year *t*.

That is, the aggregate LIS is the weighted sum of industry LISs, where the weights are the industry shares in aggregate value added.

Now, the change in the market sector labour income share over *n* years is given by:

$$LIS_{MS}^{t+n} - LIS_{MS}^{t} = \Delta LIS_{MS}^{t,n} = \sum LIS_{i}^{t+n}.y_{i}^{t+n} - \sum LIS_{i}^{t}.y_{i}^{t}$$

$$= \sum LIS_{i}^{t+n}.y_{i}^{t+n} - \sum LIS_{i}^{t}.y_{i}^{t} + \sum LIS_{i}^{t+n}.y_{i}^{t} - \sum LIS_{i}^{t+n}.y_{i}^{t}$$

$$\Delta LIS_{MS}^{t,n} = \sum \Delta LIS_{i}^{t,n}.y_{i}^{t} + \sum LIS_{i}^{t+n}.\Delta y_{i}^{t,n} \qquad (1)$$

The first term on the right hand side is the change in industry LIS component — the sum of contributions from changes in industry LISs, holding their size constant at their beginning-period share of market sector value added. The second term is the structural change or change in industry size component — the sum of contributions from the changes in the relative sizes of industries, holding their LISs constant at their starting period values.

This decomposition can be further modified to highlight the effects of structural shifts toward or away from industries with different labour intensities. To do this, industry LISs are measured relative to the market sector average. The LIS is greater than average in labour-intensive industries, whereas it is below-average in capital-intensive industries.

Adding $LIS_{MS}^{t+n}.\sum y_{i}^{t}$ and subtracting $LIS_{MS}^{t+n}.\sum y_{i}^{t+n}$ has no net effect on equation (1) because the sum of the output shares is unity irrespective of time. Therefore:

$$\Delta LIS_{MS}^{t,n} = \sum \Delta LIS_{i}^{t,n}.y_{i}^{t} + \sum LIS_{i}^{t+n}.\Delta y_{i}^{t,n} + LIS_{MS}^{t+n}\sum y_{i}^{t} - LIS_{MS}^{t+n}.\sum y_{i}^{t+n}$$

$$= \sum \Delta LIS_{i}^{t,n}.y_{i}^{t} + \sum (LIS_{i}^{t+n} - LIS_{MS}^{t+n}).\Delta y_{i}^{t,n} \qquad (2)$$

With this formulation, a shift toward ($\Delta y_i^{t,n}$ is positive) capital-intensive industries ($LIS_i^{t+n} - LIS_{MS}^{t+n}$ is negative) will reduce the market sector LIS, whereas a shift toward labour-intensive industries ($LIS_i^{t+n} - LIS_{MS}^{t+n}$ is positive) will increase it.

References

Autor, D., Katz, L. and Kearney, M. 2008, 'Trends in US Wage Inequality: Revising the Revisionists', *Review of Economics and Statistics*, vol. 99, no. 2, pp. 300-323, May.

ACTU 2013, 'A Shrinking Slice of the Pie', *The Working Australia Papers*, No 1 of 2013, ACTU, Melbourne.

Bassanini, A. and Manfredi, T. 2012, 'Capital's Grabbing Hand? A Cross-country/Cross-industry Analysis of the Decline of the Labour Share', *OECD Social, Employment and Migration Working Papers*, No 133, OECD, Paris, July.

Bertoli, S. and Farina, F. 2007, 'The Functional Distribution of Income: A Review of the Theoretical Literature and of the Empirical Evidence Around its Recent Pattern in European Countries', *DEPFID Working Papers*, 5/2007, Dept of Economic Policy, Finance and Development, University of Sienna, Siena.

Brynjolfsson, E. and McAfee, A. 2012, *Race Against the Machine: How the Digital Revolution is Accelerating Innovation, Driving Productivity and Irreversibly Transforming Employment and the Economy*, Digital Frontier Press, Lexington.

CBO (Congressional Budget Office) 2011, 'Trends in the Distribution of Household Income Between 1979 and 2007', CBO Study, Congress of the United States, Washington, October.

CEA (Council of Economic Advisors) 2013, *Annual Report*, transmitted with the *Economic Report of the President*, United States Government Printing Office, Washington, March.

EC (European Commission) 2007, 'The Labour Income Share in the European Union', chapter 5 in *Employment in Europe 2007*, European Commission, Luxembourg.

Fleck, S., Glaser, J. and Sprague, S. 2011, 'The Compensation-Productivity Gap: A Visual Essay', *Monthly Labor Review*, January, pp. 57-69.

Gomme, P. and Rupert, P. 2004 'Measuring Labor's Share of Income', *Policy Discussion Papers*, No. 7, Federal Reserve Bank of Cleveland, November.

Gordon, R.J. and Dew-Becker, I. 2008, Controversies about the Rise of American Inequality: A Survey, *NBER, Working Paper,* no. 13982.

Greenville, J., Pobke, C. and Rogers, N. 2013, *Trends in the Distribution of Income in Australia*, Productivity Commission Staff Working Paper, Canberra.

Gregory, R. 2011, 'Living Standards, Terms of Trade and Foreign Ownership: Reflections on the Australian Mining Boom', *Discussion Paper*, No 656, Centre for Economic Policy Research, Australian National University, Canberra, December.

Jacobson, M. and Occhino, F. 2012, 'Behind the Decline in Labor's Share of Income', *Economic Trends,* Federal Reserve of Cleveland.

Kaldor, N. 1957, 'A Model of Economic Growth', *The Economic Journal,* vol. 67, no. 268, pp. 591-624.

Karabarbounis, L. and Neiman, B. 2012, 'Declining Labor Shares and the Global Rise of Corporate Savings', *NBER Working Paper*, no. 18154, NBER, Cambridge, June.

—— and —— 2013, 'The Global Decline of the Labor Share', *NBER Working Paper*, No 19136, NBER, Cambridge, June.

Krueger, A. 1999, 'Measuring Labor's Share', *AEA Papers and Proceedings*, vol. 89, no. 2, pp. 45-51.

Michel, L. and Gee, K. 2012, 'Why Aren't Workers Benefiting from Labour Productivity Growth in the United States?', *International Productivity Monitor*, no. 23, Spring, pp. 31-43.

Mohun, S. 2009, 'Aggregate Productivity in the US Economy, 1964-2001', *Cambridge Journal of Economics*, vol. 33, no 5, pp. 1023-1046.

OECD (Organisation for Economic Cooperation and Development) 2011, *Divided We Stand: Why Inequality Keeps Rising*, OECD Publishing, Paris.

_____ 2012, 'Labour Losing to Capital: What Explains the Declining Labour Share?', Chapter 3 in *OECD Employment Outlook*, OECD Publishing, Paris.

Parham, D. 2012, *Australia's Productivity Growth Slump: Signs of Crisis, Adjustment or Both?*, Visiting Researcher Paper, Productivity Commission, Canberra.

——, Barnes, P., Roberts, P. and Kennett, S. 2000, *Distribution of the Economic Gains of the 1990s*, Productivity Commission Staff Research Paper, AusInfo, Canberra.

Plumb, M., Kent, C. and Bishop, J. 2013, 'Implications for the Australian Economy of Strong Growth in Asia', *Research Discussion Paper* 2013-03, Reserve Bank of Australia, Sydney.

PC (Productivity Commission) 2012, 'Economy-wide Modelling of Impacts of COAG Reforms', Supplement to *Impacts of COAG Reforms: Business Regulation and VET*, Canberra, July.

Rodriguez, F. and Jayadev, A. 2010, 'The Declining Labor Share of Income', *Human Development Research Paper*, 2010/36, United Nations Development Programme, November.

Rupert, P. 2012, 'Is Labor's Share of Income Declining?' US Economic Snapshot, October 16, www.economicsnapshot.com/2012/10/16/is-labors-share-of-income-declining

Sharpe, A., Arsenault, J., and Harrison, P. 2008, 'The Relationship between Labour Productivity and Real Wage Growth in Canada and OECD Countries, *CSLS Research Report*, No. 2008-08, Centre for the Study of Living Standards, Ottowa.

Schnieder, D. 2011, 'The Labor Share: A Review of Theory and Evidence', *SBF Discussion Paper*, 2011-069, Humboldt-Universitat zu Berlin, Berlin.

Sweeney, P. 2013, 'An Inquiry into the Declining Labour Share of National Income and the Consequences for Economies and Societies', Presidential Address to The Statistical and Social Inquiry Society of Ireland, Dublin, May.

Taylor, C., Bradley, C., Dobbs, R., Thompson, F., and Clifton, D. 2012, *Beyond the Boom: Australia's Productivity Imperative*, McKinsey Global Institute, McKinsey and Company, August.

Topp, V., Soames, L., Parham, D. and Bloch, H. 2008, *Productivity in the Mining Industry: Measurement and Interpretation*, Productivity Commission Staff Working Paper, December.