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]](#footnote-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 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]](#footnote-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]](#footnote-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]](#footnote-4)

Figure 2.1 Cumulative growth in Australia’s GDP and GDIa and the terms of trade index, 1959-60 to 2011-12

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

|  |
| --- |
| Cumulative growth in Australia’s GDP and GDI and the terms of trade index, 1959-60 to 2011-12. This figure shows that GDI grew more rapidly than GDP in the 2000s, once the terms of trade started to rise sharply after 2002-03. |

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]](#footnote-5) (figure 2.2) to a level hardly witnessed over the last 140 years.[[6]](#footnote-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]](#footnote-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.

### 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)

|  |
| --- |
| . GDP per hour, GDI per person and the terms of trade. This figure shows that growth in GDI per person and growth in GDP per hour were closely aligned in the 1990s when the terms of trade were flat. GDI per person grew more rapidly than GDP per hour in the 2000s when the terms of trade rose rapidly. |

*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]](#footnote-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 |
|  |
|  |

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]](#footnote-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]](#footnote-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.

Figure 2.3 Labour, capital and multifactor productivity

indexes, 1999-00=100

|  |
| --- |
| Labour, capital and multifactor productivity. This figure shows strong growth in labour productivity in the 1990s, with weaker growth in the 2000s. Capital productivity was flat in the 1990s and declined substantially in the 2000s. Multifactor productivity increased in the 1990s, but was stagnant in the 2000s. |

*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]](#footnote-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.

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 2000sa

percentage points

|  |
| --- |
| Industry contributions to growth in market sector income, 1990s and 2000s. This figure shows that the largest increases in contributions to market sector growth in income in the 2000s came from the Mining and the Constructions industries. |

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.

1. Chained volume measures, as reported here, also take account of structural change by incorporating annual updates of industry shares in the total economy. [↑](#footnote-ref-1)
2. The average annual rate of growth in GDI from 1999-00 to 2010-11 was 4.1 per cent. [↑](#footnote-ref-2)
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. [↑](#footnote-ref-3)
4. The average over the 1990s was, however, lowered somewhat by the decline in average income during the early-1990s recession. [↑](#footnote-ref-4)
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). [↑](#footnote-ref-5)
6. There were spikes in the 1920s and in the early 1950s (PC 2012, chapter 11 and Plumb, Kent and Bishop 2013). [↑](#footnote-ref-6)
7. 0.9 percentage points out of 3.9 per cent per year growth. [↑](#footnote-ref-7)
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. [↑](#footnote-ref-8)
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. [↑](#footnote-ref-9)
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. [↑](#footnote-ref-10)
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. [↑](#footnote-ref-11)