

The following is a reprint of Statement 4, Australia's Terms of Trade — Stronger and Less Volatile, from Budget Paper No. 1: Budget Strategy and Outlook 2002-03.

STATEMENT 4: AUSTRALIA'S TERMS OF TRADE — STRONGER AND LESS VOLATILE

In recent years, Australia has enjoyed both stronger and less volatile terms of trade, which has raised real incomes, contributed to macroeconomic stability and reduced inflationary pressures. This favourable conjunction has been supported by a more dynamic and efficient private sector in an environment of increased internationalisation, sound macroeconomic policy and sustained microeconomic reform.

Part I: Introduction

The terms of trade — the ratio of export prices to import prices — is an important economic measure. It reflects the capacity of any given amount of exports to pay for a quantity of imports. A rise in the terms of trade enables Australia to buy more imports for a given quantity of exports and thereby increases domestic real income. However, terms of trade volatility tends to induce volatility in consumer spending, investment, economic growth and inflation, and has traditionally made macroeconomic management more difficult.

Through much of its history, Australia has faced declining and highly volatile terms of trade. However, since the trough reached in 1986, the terms of trade has exhibited markedly less volatility, and perhaps a slight upward trend.

Historically, Australia's terms of trade was positively correlated with world economic growth: when world economic growth was strong, the terms of trade rose; when world growth was weak, the terms of trade fell. In contrast, since 2000 Australia's terms of trade has increased despite the slowing of the world economy.

Further, in the past terms of trade increases usually added to inflationary pressures. While still too early to be definitive, recent evidence suggests that this relationship may have changed. The rising terms of trade has more recently reflected import price declines and therefore has tended to put downward pressure on inflation, with consequent benefits for macroeconomic management.

There are a number of factors that have led to a more stable and relatively strong terms of trade. One factor is the diversification of Australia's exports, across both products and markets. A second factor, contributing to Australia's strengthening terms of trade, is significant falls in the prices of Australia's imports, especially for information and communications technology (ICT) goods.

A third factor, contributing to terms of trade stability, is a more stable global economy relative to earlier times. This probably reflects, at least in part, policy improvements adopted by many industrial countries, and could well be an outcome of globalisation, which has promoted international competition, productivity and policy discipline.

While future movements in the terms of trade are uncertain, there are good prospects that terms of trade volatility will remain subdued with the possibility of an upward trend, as long as macroeconomic policy remains sound and microeconomic reform advances.¹

The remainder of this Statement examines aspects of the terms of trade in more detail. Part II examines the major causes and effects of terms of trade movements. Part III looks at the history of Australia's terms of trade. Part IV investigates the key drivers of the terms of trade, including the diversification of exports and imports across products and markets, and the principal price trends. Finally, Part V concludes with some policy messages.

1 Sound *domestic* macroeconomic and microeconomic policies are crucial for reduced terms of trade volatility and increased relative strength. Sound *international* macroeconomic and microeconomic policies may provide additional stability benefits for Australia's terms of trade, but it is unclear what impact this has on the level of the terms of trade.

Part II: Terms of trade movements — causes and effects

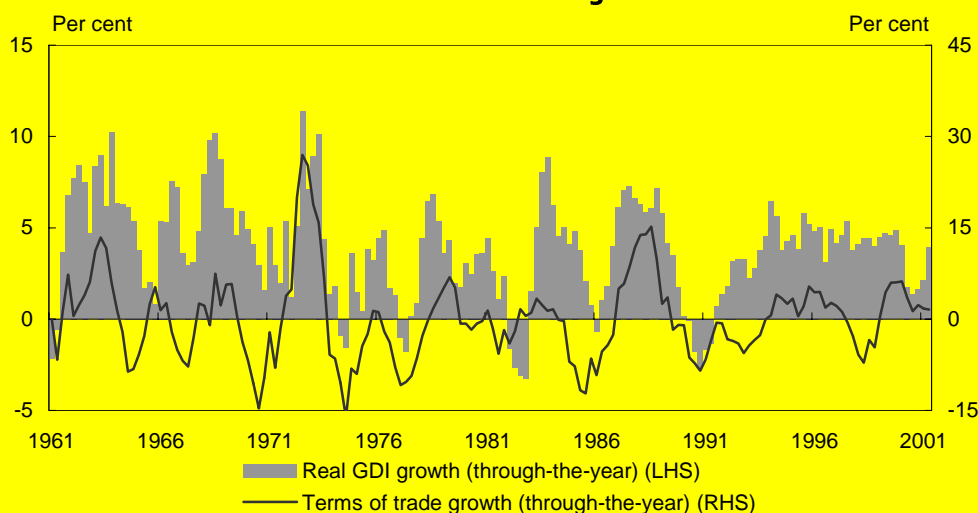
There are two key components of Australia's terms of trade: world prices of Australia's exports and imports, and the composition of the export and import baskets. While Australia has little ability to affect the world relative prices of its imports and exports, developments within Australia can influence the terms of trade to the extent that such developments affect the composition of the export and import baskets. For example, an increase in the world price of coal relative to ICT goods will increase the terms of trade because Australia is a net exporter of coal and a net importer of ICT goods. Similarly, an increase in the relative weighting of a more expensive export (with relative prices held constant) will also increase the terms of trade.

Increases (falls) in the level of the terms of trade raise (reduce) domestic real income by increasing (reducing) the purchasing power of Australia's exports (Box 1). This, in turn, can have flow on effects through the economy to the extent that it results in changes in household spending, business profits, business investment, production and employment.

Box 1: Real gross domestic income and the terms of trade

GDP measures the volumes of goods and services *produced* in Australia, not the volumes *consumed* in Australia. If the terms of trade change significantly over any period, then the measure of GDP will not accurately reflect the changes in real purchasing power of the income generated by domestic production. One measure that attempts to capture the terms of trade effects, or changes in real purchasing power of the income generated by domestic production, is real gross domestic income (real GDI). Chart A illustrates that there has been a broad relationship between the terms of trade and the growth rates of real GDI.

Chart A: The terms of trade and real gross domestic income



Source: ABS Cat. No. 5206.0.

Before the floating of the Australian dollar, sharp increases in the terms of trade often provoked significant outbreaks of inflation. For example, when wool prices soared during the Korean War, inflation increased dramatically, reaching 22.4 per cent in 1951-52. Notwithstanding difficulties with the policy response, inflation subsequently returned to lower levels, falling to 0.9 per cent in 1954-55.²

More recently, however, evidence is mounting that — with a floating exchange rate — terms of trade increases are having less impact on domestic inflationary pressures, and may well reduce and stabilise those pressures under some circumstances. There are

2 In an environment of fixed exchange rates, in order to mute inflationary pressures following a rise in the terms of trade, the exchange rate needed to be revalued. In practice this was difficult, as it directly affected exporters and those in import-competing industries. During the 1950s, this tension resulted in a slow response to movements in the terms of trade, thereby contributing to sharp volatility in inflation.

likely to be several factors at work. First, while increased real income flowing from a stronger terms of trade tends to result in additional domestic expenditure and hence inflationary pressures, this is likely to be at least partly offset by lower import prices in response to a rising exchange rate.³ Second, a floating exchange rate provides a level of insulation against abrupt changes in the terms of trade and therefore tends to reduce inflation volatility. Third, if terms of trade increases are driven principally by falls in import prices on world markets (as in Australia over recent years), rather than rises in export prices, there will tend to be a reduction in inflationary pressures flowing through from lower input costs to production and lower prices to consumers. The historical relationship between the terms of trade and the nominal and real exchange rates is discussed in more detail in Box 2.⁴

While movements in the level of the terms of trade affect real income, significant terms of trade volatility can be destabilising and can affect economic efficiency. For example, where consumers and producers misdiagnose the extent and duration of a change in the terms of trade, efficient resource movements are likely to be impeded as price signals are misread. This tends to inhibit both productivity growth and economic growth because the free flow of resources to their most efficient use is likely to be impeded.

Firms may also experience significant costs associated with high terms of trade volatility. Borrowing costs can increase as lenders charge higher premiums to account for risk, while the volatility may reduce the incentive for firms to invest.

High levels of volatility in the terms of trade can therefore seriously disrupt an economy, increasing the volatility of its growth rate and making macroeconomic policy relatively more difficult to implement. Monetary authorities are more at risk of over- or under-estimating the stimulus/contraction required to maintain low and stable inflation. This tends to increase the volatility of inflation, thus adding to general economic instability. The operation and control of fiscal policy can be similarly more difficult under such circumstances.

3 See Gruen, D. and J. Dwyer, *Are terms of trade rises inflationary?*, Research Discussion Paper 9508, Reserve Bank of Australia, 1995.

4 More detail may also be found in MacDonald, Ronald and Luca Ricci, 'Purchasing Power Parity and New Trade Theory', *International Monetary Fund Working Paper* WP/02/32, 2002.

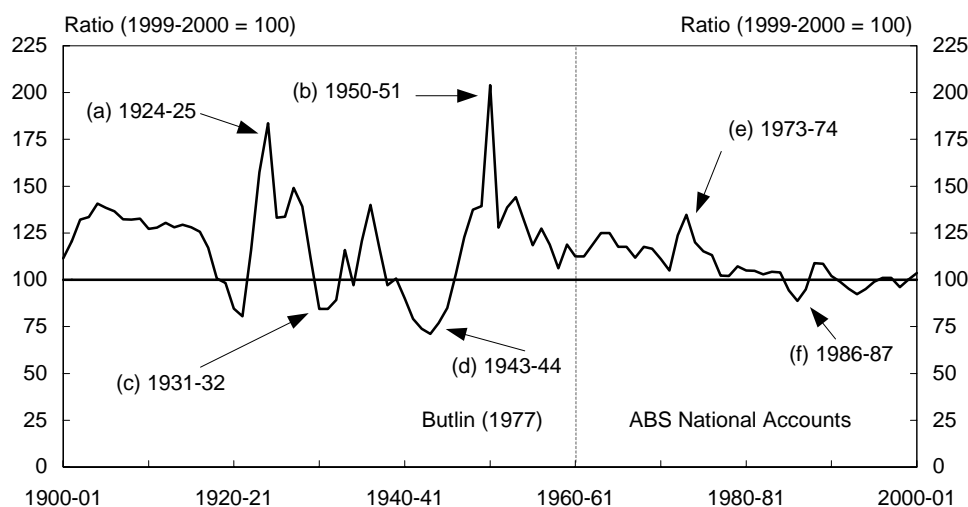
Part III: History of the terms of trade

The level of Australia's terms of trade has been in broad decline over the past century. The comparatively stronger level of the terms of trade in the first half of the twentieth century reflected the fortunate combination of Australia's natural resource endowments and relatively high prices for those commodities on international markets. It also reflected the relative stage of world economic development.

The trend decline in the terms of trade has been accompanied by considerable volatility, with the most prominent movements relating to dramatic changes in commodity prices and slowdowns in the global economy.

The most dramatic increases in the terms of trade were due to the impact of sharply rising commodity export prices in the early 1920s (Chart 1, point a) and the Korean War at the beginning of the 1950s (Chart 1, point b), with both episodes reflecting the boom in (and in the 1950s, the subsequent collapse of) wool prices. Further, the Great Depression (Chart 1, point c) and the Second World War (Chart 1, point d) coincided with periods of sustained declines in the terms of trade.⁵

Chart 1: The terms of trade, 1900-01 to 2000-01



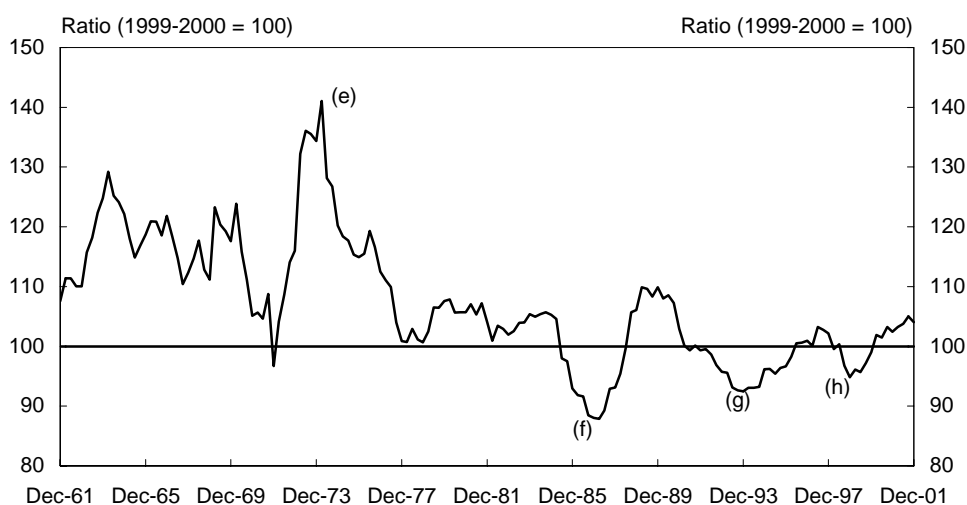
Source: Butlin (1977) and ABS Cat. No. 5206.0 (annual data).

5 The volatility of the historical series has been artificially reduced in parts, with the estimates from 1900 to 1913 recalculated from calendar year to financial year using a two-year moving average. Further, there is a conceptual inconsistency in the series with the inclusion of 'invisible' exports and imports in the deflator from 1948-49 onwards (Butlin M.W., *A Preliminary Annual Database 1900-01 to 1973-74*, Reserve Bank of Australia, Research Discussion Paper 7701, May 1977).

Chart 2 focuses on the terms of trade since 1960-61. The effect of the oil price spike in the mid-1970s can be seen in the decline in the terms of trade from point (e), which followed a commodity price boom. A period of weaker commodity prices in 1986 can be seen at point (f), the early 1990s world recession at (g)⁶ and the Asian financial crisis at (h).

In fact, since 1986 the impact of international developments on the terms of trade has fallen progressively — the terms of trade has exhibited markedly less volatility and perhaps a slight upward trend.

Chart 2: The terms of trade, December 1961 to December 2001

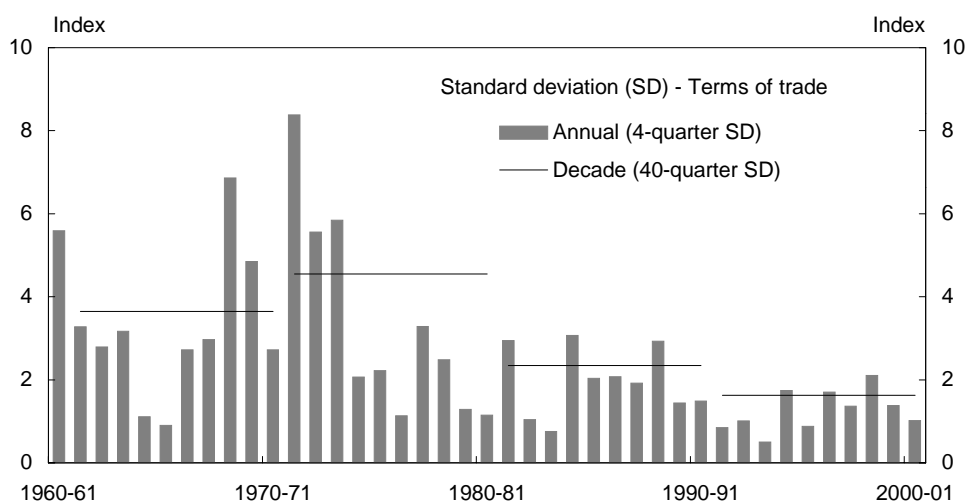


Source: ABS Cat. No. 5302.0. (quarterly data).

Another way to examine the changing volatility of the terms of trade over the past four decades is presented in Chart 3, which shows the standard deviation of movements in the terms of trade (over annual and decade periods) from 1960-61 to 2000-01. Again, the volatility of the terms of trade has been lower over the 1990s than any of the three previous decades.

⁶ While the recession commenced in Australia in 1990, in global terms it commenced in 1991; the decline in the terms of trade reflects lagged effects.

Chart 3: Volatility in the terms of trade, 1960-61 to 2000-01



Source: ABS Cat. No. 5302.0 and Treasury.

This lower terms of trade volatility in the 1990s is also likely to have assisted in both reducing the volatility of economic growth and in lowering inflation by assisting macroeconomic management. Table 1 shows that volatility in both GDP growth and inflation was lower in the 1990s compared with the three previous decades. The second half of the 1990s, in particular, was notable for rising terms of trade, high GDP growth rates (with minimal volatility) and low inflation. Since 2000, the terms of trade has continued to rise.

Table 1: Trends and volatility in major economic indicators

Decade	Terms of trade		GDP		Inflation	
	Average level	Standard deviation	Annual growth	Standard deviation	Annual growth	Standard deviation
1960s	116.5	3.6	5.2	1.9	2.5	0.5
1970s	113.8	4.5	3.3	1.6	10.1	1.3
1980s	101.4	2.3	3.2	1.1	8.3	0.8
1990s	98.5	1.6	3.4	0.7	2.3	0.6
1990's (1st half)	98.3	1.5	2.4	0.8	2.6	0.7
1990's (2nd half)	98.6	1.7	4.4	0.5	1.9	0.5

Source: ABS Cat. No. 5206.0, 6401.0 and Treasury (quarterly data).⁷

⁷ The 1960s are often seen as the 'golden years', but when Australia is compared with the average of the OECD in terms of relative performance, the 1960s were Australia's worst years. See Henry, K.R., *Australia's Economic Development*, Address to the Committee for the Economic Development of Australia, 40th Anniversary Dinner, November 2001.

Part IV: Drivers of the terms of trade

Major world economic events have been one of the most important drivers of both the level and the volatility of Australia's terms of trade. Swings in the growth rates of the major world economies and Australia's major trading partners (MTP) have been traditionally associated with even larger swings in the terms of trade. More recently, however, this effect seems to have become much more muted, with the international downturns in the late 1990s and in 2001 having a much smaller impact on the terms of trade.

The product diversification of Australia's export base is likely to be one factor behind the declining volatility of the terms of trade. Further, the level of the terms of trade has been supported by the diversification of the imports base, particularly the increasing importance of ICT imports in the trade basket, given the rapid and sustained decline in world ICT prices.

The geographic diversification of exports and imports across different markets is an important extra dimension, reducing the exposure of exporters and importers to developments in individual countries or regions.

This diversification notwithstanding, the prices of Australia's exports (particularly commodities) and imports have generally trended down over the past decade (in foreign currency terms). However, the trend decline in import prices has been more rapid, reflecting particularly rapid price falls for ICT goods.

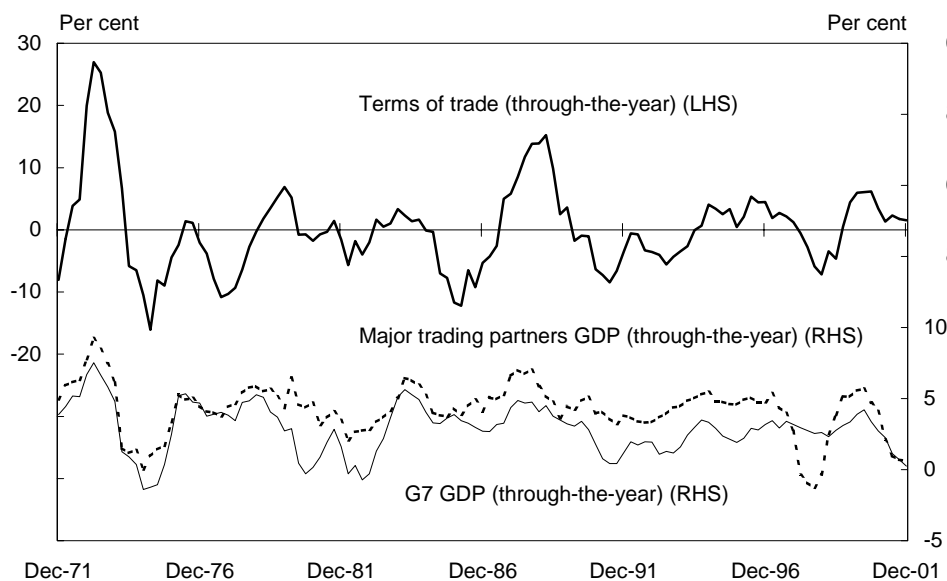
The major influences on Australia's terms of trade are considered in more detail below.

Effect of major world economic events on the terms of trade

International economic conditions have been one of the major drivers of the terms of trade in Australia over the past three decades. Specifically, previous cycles in the economic growth of Australia's MTP and the seven major countries of the OECD (G7) have often prompted large swings in the terms of trade. This link was particularly evident through the global economic cycles in the early 1970s and the mid-1980s; and more recently through the Asian financial crisis in 1997-98 (Chart 4).

It is also apparent from Chart 4 that the volatility of international economic growth rates seems to have declined somewhat since the start of the 1990s. However, the volatility of Australia's MTP economic growth was higher in the 1990s than the 1980s. The Asian financial crisis of the late 1990s resulted in a sharp downturn and subsequent recovery in MTP growth, following a period of considerable stability.

Chart 4: Changes in the terms of trade and world growth



Source: ABS Cat. No. 5302.0 and 1364.0.15.003 and OECD Quarterly National Accounts.

Over the 1980s and 1990s, inflation declined in many countries. Among other things, this reflected the success of structural policies to improve market flexibility and more disciplined fiscal and monetary policies. Lower inflation was accompanied by lower inflation volatility.⁸ Swings in commodity prices and industrial prices became less pronounced, reducing volatility in the terms of trade for many countries.

As noted in the recent IMF *World Economic Outlook*, 'a virtuous circle was created in which as central banks became more concerned about inflation and, therefore, more predictable and credible, this led to more forward-looking behaviour by the private sector, which in turn made monetary policy effects through the expectations channel faster and more effective.'⁹

While the *World Economic Outlook* posits a virtuous circle *within* a country from sound macroeconomic policy, it seems likely that there may also be a virtuous circle *across* countries. Where a significant number of countries pursue sound and consistent policies and provide a strong environment for their private sector to be productive, dynamic and efficient, there may be an added synergy across countries that promotes

8 This relationship was noted in Milton Friedman's Nobel Lecture, published in the *Journal of Political Economy*, Vol. 85, June 1977. Martin Parkinson, *Inflation and Uncertainty*, Treasury Research Paper No. 3, 1999, found that the higher the permanent or trend component of inflation, the greater is the likelihood that the trend and actual rate will change.

9 *World Economic Outlook*, International Monetary Fund, April 2002, page 91.

further stability. That is, if countries tend to instability, world prices will tend to be unstable. If countries tend to stability, world prices will tend to be more stable.¹⁰

While a more stable international macroeconomy is likely to have contributed to the reduced volatility in Australia's terms of trade in recent years, this is unlikely to provide a complete explanation. In particular, the nature of the relationship between world or MTP growth and the terms of trade also seems to have changed.

Historically, the magnitude of the changes to the terms of trade had been substantially larger than the changes in MTP growth. For example, MTP growth fluctuated by more than 9 percentage points in 1972-73 from peak to trough, which corresponded with a swing of 43 percentage points in the terms of trade. Subsequent cycles in MTP growth (until the 1990s) also corresponded with large movements in the terms of trade (Table 2).

This is in dramatic contrast to more recent episodes, where the substantial slowdowns in MTP growth during the Asian financial crisis and the fall in high-technology stock prices in 2000 have had a relatively modest impact on the terms of trade. More remarkably, the terms of trade has, thus far, actually increased modestly during the most recent international slowdown (since 2000).

Table 2: Cycles in MTP growth and the terms of trade

MTP GDP growth (per cent, peak to trough)		Changes to the terms of trade (per cent, peak to trough)	
Mar 73 – Dec 74	-9.2	-43.0	Mar 73 – Mar 75
Mar 76 – Sep 77	-1.5	-12.2	Jun 76 – Sep 77
Dec 78 – Mar 81	-2.7	-12.6	Dec 79 – Mar 82
Mar 84 – Sep 85	-2.7	-15.6	Dec 83 – Mar 86
Sep 88 – Sep 89	-3.4	-23.7	Mar 89 – Jun 91
Mar 97 – Sep 98	-6.6	-12.5	Jun 96 – Dec 98
Jun-00 – Dec 01	-5.1	-4.6	Sep 00 – Dec 01

Source: ABS Cat. No. 5302.0.

This apparent change in the relationship between world (or MTP) growth and the terms of trade suggests that other factors are also at work. Important amongst these are the greater diversification of Australia's export and import baskets, and price trends for export and import items on world markets.

¹⁰ While not drawing strong conclusions on the interrelationships, the recent *World Economic Outlook* (*ibidem*, pages 104-136) concluded that global recessions and recoveries tend to be contemporaneous, raising interesting questions about cross-country linkages.

Greater diversification in Australia's exports

On the exports side, Australia's experience over the past decade and a half was characterised by a gradual move away from relatively price volatile commodities towards a more diversified, and less volatile, export base (Chart 5).

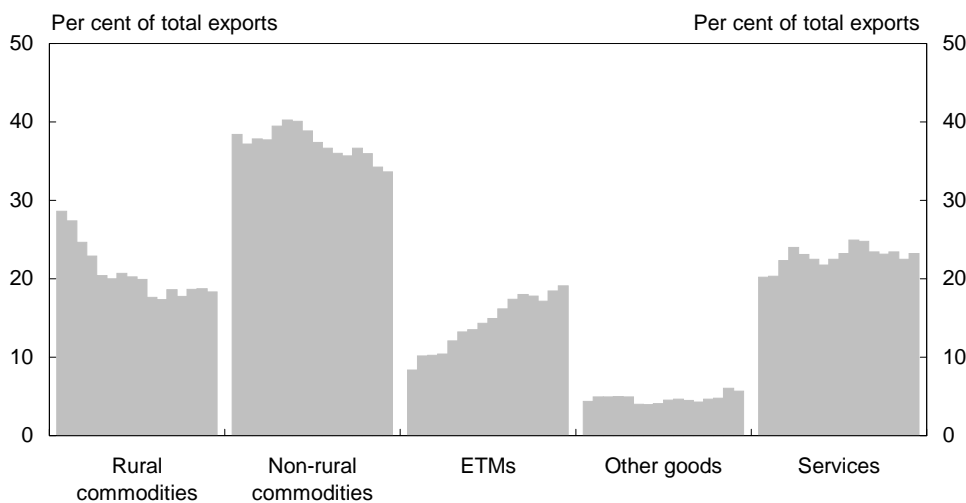
The prices of rural commodity exports have been particularly volatile in history, often reflecting the dramatic fluctuations in the world price of commodities such as wool, wheat, sugar and cotton (see discussion on commodity prices). In this context, the substantial decline in the volume of rural commodity exports — from around 29 per cent of total export volumes in 1985-86 to around 18 per cent in 2000-01 — has been important in ensuring that the flow through from rural commodity price volatility to the terms of trade has been milder than in previous decades.

While non-rural commodities remain the largest export category for Australia, their share in Australia's exports has also declined modestly over the past 15 years, down from just over 38 per cent in 1985-86 to around 34 per cent in 2000-01. The modest decline in the non-rural commodity share of exports has been partly driven by the relatively slower growth in metal ores and minerals.

In addition, Australia now exports a much broader range of rural goods, and related products. In the rural sector, for example, while meat, cereals and wool remain key exports, other products such as dairy, fruit and vegetables have increased significantly since the 1980s.

The export share of elaborately transformed manufactures (ETMs) increased substantially over the past 15 years, rising from 8 per cent of total exports in 1985-86 to 19 per cent in 2000-01. The rapid growth in ETM exports reflected the increase in the exports of such items as passenger motor vehicles, ICT equipment and pharmaceuticals, although ICT exports are significantly lower than ICT imports.

Chart 5: Share of total export volumes, 1985-86 to 2000-01



Source: ABS Cat. No. 5302.0.

Diversification of imports, with a rising share of Information and Communications Technology

On the imports side, there has been a gradual shift from services to consumption and capital good imports, particularly ICT imports (reflecting the rapid adoption of ICT technologies in Australia¹¹), (Chart 6).

The share of consumption goods in overall imports has risen, up from around 20 per cent in 1985-86 to 24 per cent in 2000-01, reflecting a sustained and broad-based increase in most components of consumption goods.

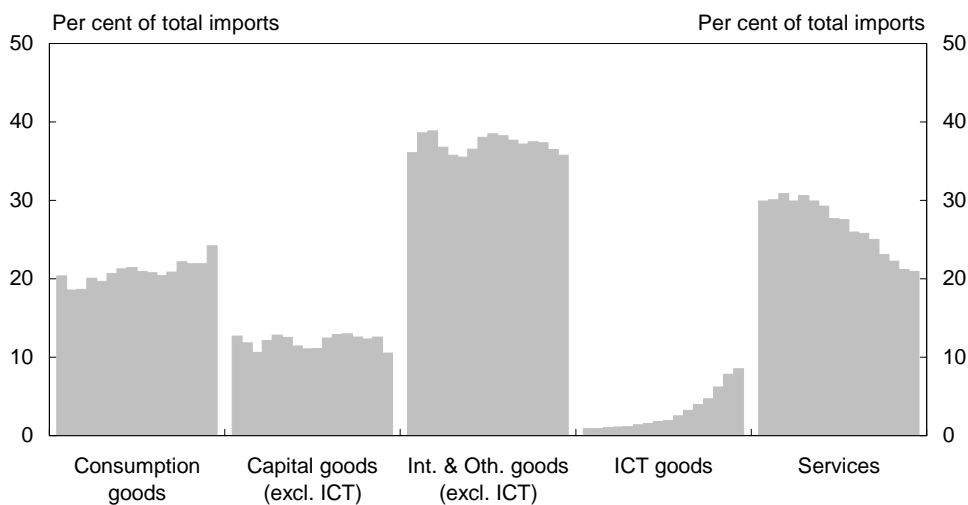
The share of capital and intermediate imports has also increased, mainly reflecting the substantial shift towards imports of ICT goods. Abstracting from ICT goods, the share of capital and intermediate goods imports has remained broadly stable.

The share of ICT goods in the import basket recorded the most dramatic change, increasing from less than 1 per cent of total imports in 1985-86 to be around 9 per cent in 2000-01.

The relatively more rapid growth in imported goods to total imports has lowered the share of imported services, which declined from 30 per cent in 1985-86 to 21 per cent in 2000-01. Broadly, this reflects the slower growth in the freight and other services component of imports, despite solid growth in travel service imports.

11 The OECD found that Australia has amongst the fastest take up of ICT in the industrial world (OECD, *The New Economy: Beyond the Hype*, Final report on the OECD Growth Project, 2001).

Chart 6: Share of total import volumes, 1985-86 to 2000-01



Source: ABS Cat. No. 5302.0.

An illustration of the impact of the changing export and import baskets

One way of illustrating the effect of the changing composition of Australia's export and import baskets is to project forward the terms of trade holding the composition of the export and import baskets constant. This is illustrated in Box 3, where the relative composition of Australia's import and export baskets is assumed to remain at that of 1985.

Box 3 shows that since 1985, the constant basket terms of trade would have been lower than the actual terms of trade. In addition, the constant basket terms of trade would have been significantly more volatile than the actual terms of trade.

Box 3: Compositional effects of the terms of trade

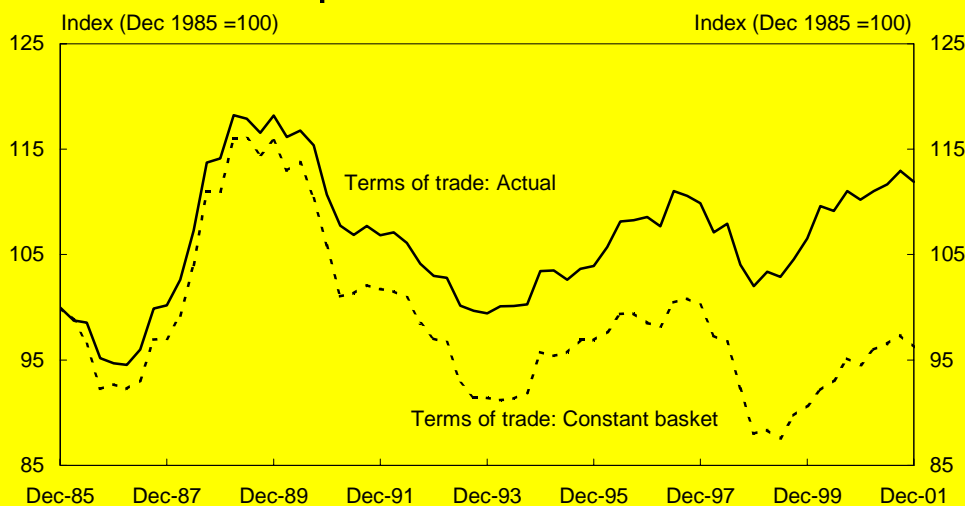
Australia's improved and more stable terms of trade performance can be partly explained by the changing composition of its trade basket.

In broad terms, the volatility in Australia's terms of trade has been reduced by the decreasing reliance on trade of a few export commodities that have relatively high price volatility. Further, the level of the terms of trade has been supported by the continued decline in import prices in foreign currency terms, most evident in the sharply falling prices for ICT components.

By way of illustration, if the relative composition of Australia's trade had remained unchanged from 1985 onwards, the terms of trade would have been considerably lower (and significantly more volatile) than actually observed over recent years (Chart A). In fact, the changing composition of Australia's trade over that time has, in itself, lifted the level of the terms of trade by more than 16 per cent, and contributed to a reduction in its volatility.

The lift in the level of the terms of trade was mainly due to changes in the mix of imports, specifically the exponentially increasing share of ICT goods. The reduction in the volatility of the terms of trade was mostly driven by changes in the mix of exports.

Chart A: Compositional effects on the terms of trade



Source: ABS Cat. No. 5302.0 and unpublished data.

Diversification of exports and imports across different markets

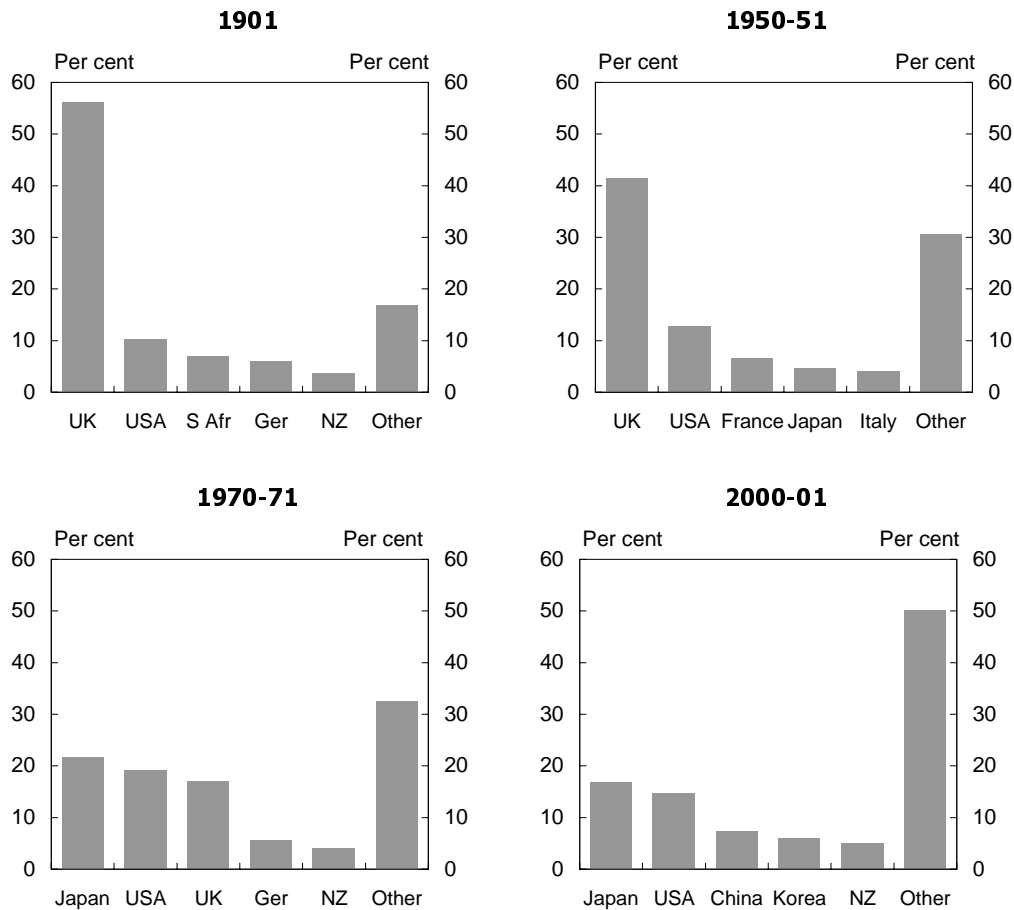
Aside from the diversification of items in the trade basket, Australia has also broadened its range of trading partners. This is particularly evident when changes in Australia's direction and concentration of merchandise trade are considered over the course of the twentieth century, (Chart 7).¹² The trend towards a broader range of markets has been apparent for both merchandise exports and imports. The diversification in Australia's trading partners serves to reduce Australia's trade exposure to any one particular country and highlights the increased flexibility in Australia's tradeable sector.

The proportion of Australia's merchandise trade conducted with the top five trading partners has declined from 83 per cent in 1901, to 67 per cent in 1970-71, to less than 50 per cent in 2000-01. Alternatively, the number of trading partners that account for 95 per cent of Australia's merchandise trade has risen from 9 countries in 1901, to 27 countries in 1970-71, to 30 countries in 2000-01.

One other important aspect is the flexibility with which Australian importers and exporters can move between sources and destinations. This significantly reduces the exposure to a single country and was very important during the Asian financial crisis when, for example, Australia's ETM exporters were able to divert exports to non-crisis countries.

12 Department of Foreign Affairs and Trade, *Direction of Trade Time Series 2000-01, One Hundred Years of Trade*, 2001.

Chart 7: Major trading partners, merchandise trade

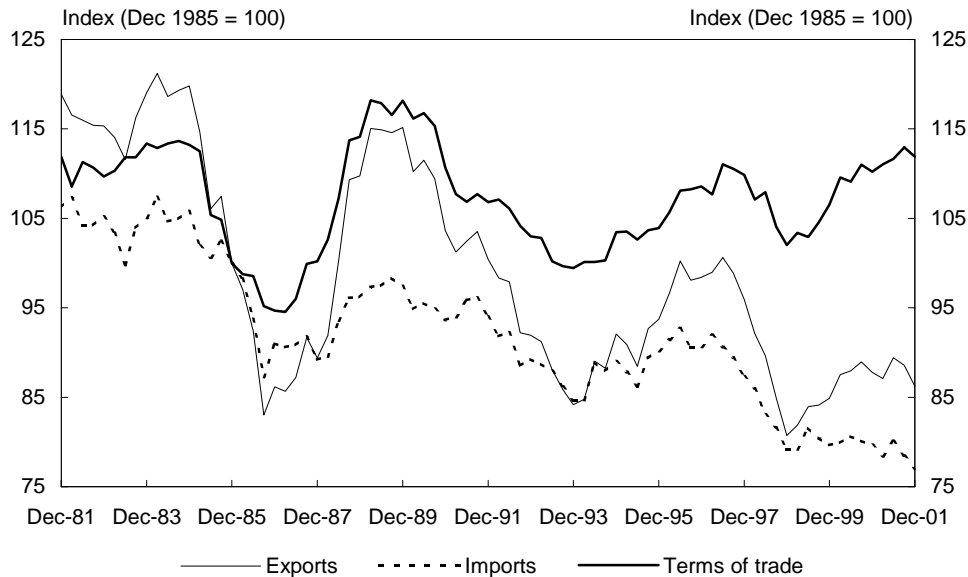


Source: Department of Foreign Affairs and Trade.

Trends in export and import prices

Substantial international competition in conjunction with relatively low and stable inflation in many industrial countries has put downward pressure on many prices in foreign currency terms (defined in terms of special drawing rights (SDR)). Australia's export prices have been more volatile than import prices, but both have been in trend decline (Chart 8). However, the fall in import prices has been more rapid in recent years. While commodity prices have fallen, prices for manufactured products have also been in decline.

Chart 8: Terms of trade, export prices and import prices (SDR)



Source: ABS Cat. No. 5302.0.

Over the past 15 years, the price of ETM exports has declined modestly in foreign currency terms, partly reflecting the falling price for ICT exports.

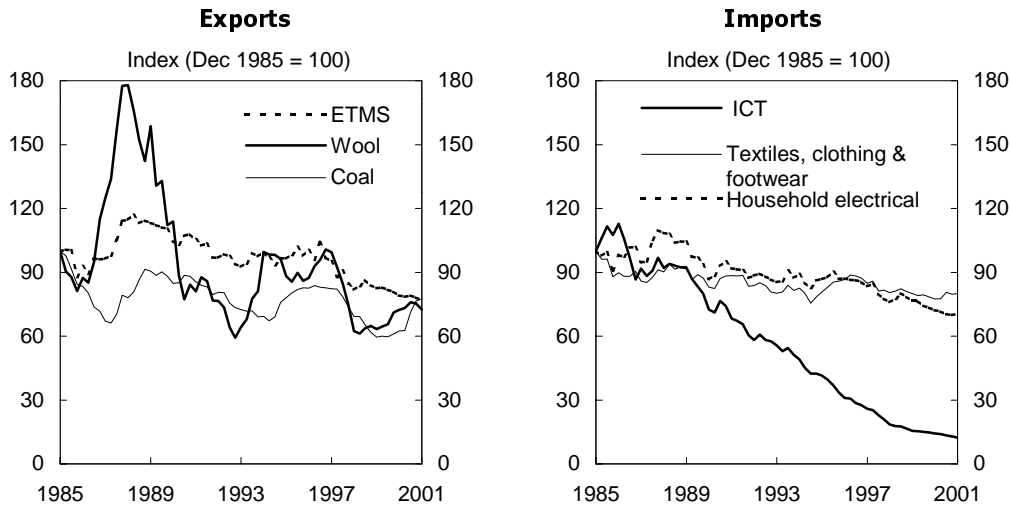
Products such as textiles, clothing and footwear, motor vehicle and electrical equipment have also experienced consistent downward price trends. But the most rapid downward price trend has been for ICT, which has grown substantially as a net import to Australia (Chart 9).

There has been a similar broad-based decline in the foreign currency price of imported goods. The decline in import prices has been reflected in all the broad merchandise components — consumption goods, capital goods and intermediate and other goods, which contrasts with the modest increase in the price of services imports.

The prices for capital and intermediate imports (excluding ICT goods) have fallen steadily over the past 15 years. In particular, capital goods (excluding ICT) averaged a decline of close to 3 per cent per year in foreign currency price terms over this period (reflecting the trend decline in the Australian dollar, the prices were broadly unchanged).

These price falls reflect a mixture of lower global production costs (resulting from technological advances); strong productivity growth in a number of countries; and a more competitive global trading environment. Under such an environment, firms have limited ability to grow margins: prices tend to follow costs downward.

Chart 9: Relative price comparisons in special drawing rights



Source: ABS Cat. No. 5302.0 and unpublished data.

Trends in prices of primary commodities

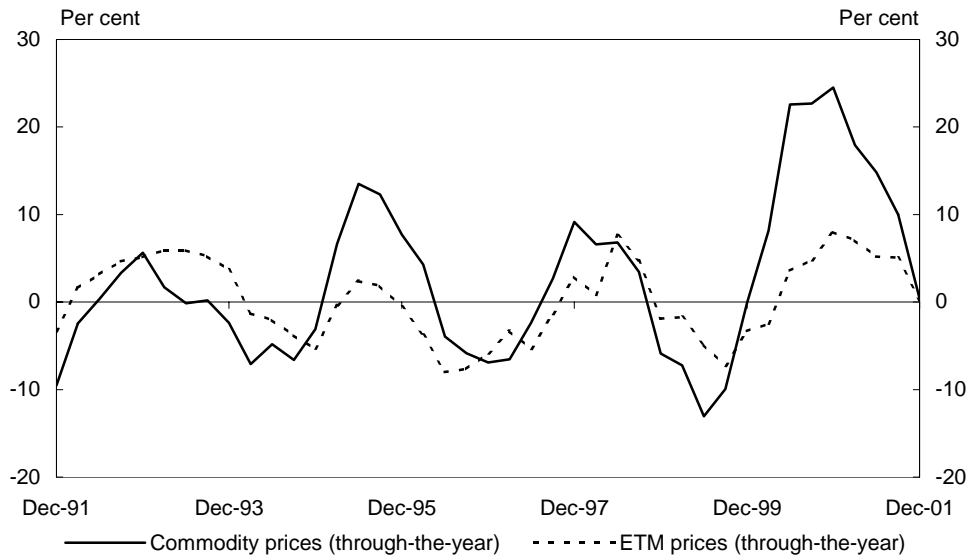
The definition of a 'commodity' is essentially arbitrary. Some properties that may be used to classify an item as a 'commodity' include that it is a relatively homogenous product (thus limiting the scope for product differentiation), with a low response to income changes and with short-run capacity constraints on production. While most commodities are perceived to be primary products, some manufactured products such as aluminium and steel are also considered to be commodities.

In practice most commodities are not perfectly homogenous. Many commodities have different quality grades — for example, there are 19 published price types/cuts of beef and veal quoted in the Kanto Japanese wholesale market. Further, many commodity producers seek to differentiate their products, using brands such as Australian fine wool (the Woolmark). Overall, though, individual commodity producers have little or no pricing power.

Notwithstanding these subtleties, the data clearly show that commodity prices have been relatively volatile when compared with the prices of ETMs over the past decade (Chart 10). A principal driver of commodity price volatility is world economic growth: commodity prices tend to increase during periods of strong world growth and fall during world slowdowns. Another major driver of commodity price volatility is supply volatility.¹³

¹³ Agricultural products, in particular, have very high supply volatility due to the seasonal and climatic nature of production. This tends to lead to periods of bumper harvests (and hence relatively low prices) and other periods of poor harvests (and hence relatively high prices).

Chart 10: Changes in Australian commodity and ETM prices (AUD)



Source: ABS Cat. No. 5302.0.

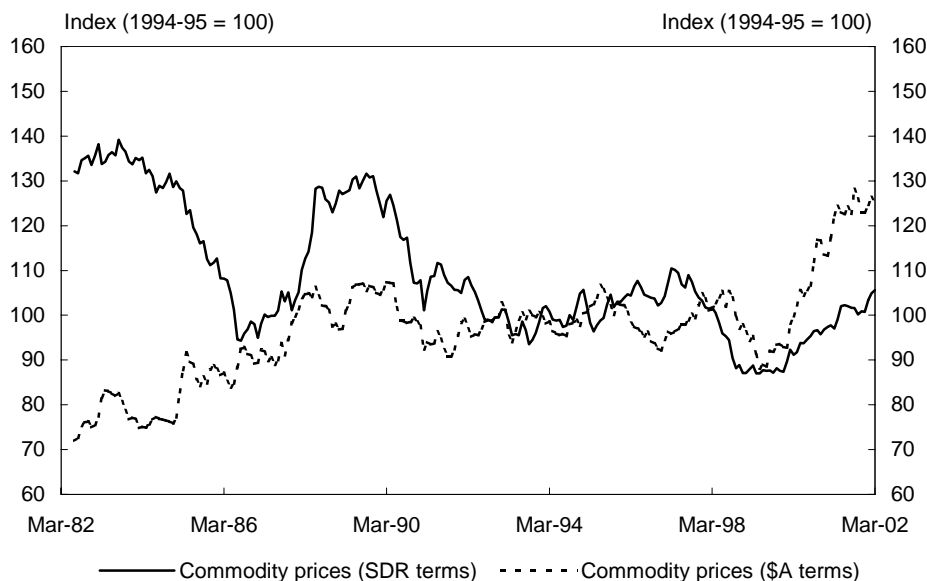
Over the past 140 years real world commodity prices have declined by about 1 per cent each year on average, although prices can change by as much as 50 per cent in a single year — volatility tends to swamp the trend.¹⁴

The Economist's commodity price index dates back to 1845. In an article published in April 1999, *The Economist* noted that the index was 80 per cent below the level attained in 1845.¹⁵ In Australia, the Reserve Bank's commodity price index dates back to July 1982. In SDR terms, the Reserve Bank index has declined by around 20 per cent over its history. However, in Australian dollar terms, there has been considerable recent strength. Offsetting movements in the nominal exchange rate have insulated Australia from a significant portion of the volatility of the SDR commodity price index (Chart 11).

14 See Cashin, Paul and C. John McDermott, 'The Long-Run Behavior of Commodity Prices, Small Trends and Big Variability', IMF Working Paper WP/01/68, May 2001.

15 'Raw deal for commodities', *The Economist*, April 1999.

Chart 11: Reserve Bank commodity price index



Source: Reserve Bank of Australia Commodity Price Index.

Cashin and McDermott¹⁶ found that commodity price volatility increased following the abandonment of the gold standard in 1913, with a further increase in volatility following the breakdown of Bretton-Woods in 1971. The increased post-1971 volatility was experienced as a reduction in the duration of large price cycles and therefore an increase in the frequency of commodity price movements.

As incomes rise, it is likely that a smaller percentage of income will be spent on commodities. Technological advances have increased the supply of commodities, while demand has been tempered through the replacement of products by newer and more effective alternatives.¹⁷ With strong productivity gains and changing demand, it is not surprising to find commodity prices trending downwards.¹⁸

Commodity prices also tend to be volatile partly because of the supply cycle. When prices are relatively high, it encourages additional investment resulting in jumps in capacity which can result in excess supply and price falls. This subsequently leads to a decline in investment and eventual falls in supply, thus fuelling the next round of price rises.

¹⁶ *Ibidem*, page 24.

¹⁷ In a speech to the Dallas Ambassadors Forum in April 1999, Chairman Alan Greenspan of the US Federal Reserve said: 'the physical weight of our gross domestic product is evidently only modestly higher today than it was fifty or a hundred years ago'.

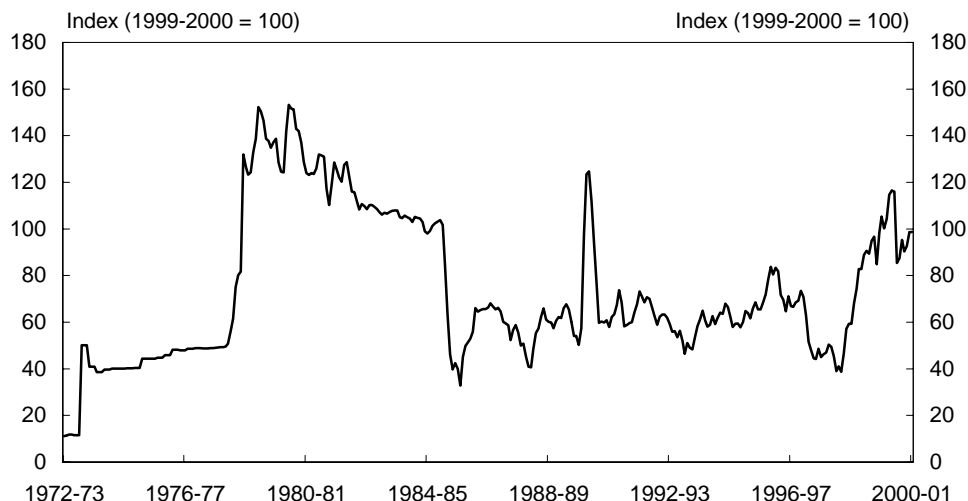
¹⁸ However, with a series that has high volatility and a modest overall trend, the choice of period can have a fundamental effect on the trend calculated.

Technology may lead to lower volatility in commodity prices. For example, there have been significant improvements in capital productivity in the mining sector, with companies now able to use their investment dollars more efficiently and raise output incrementally rather than in large jumps. Similarly, in the agriculture sector, improvements in crop technology offer the prospect of drought resistant crops that could lessen the effect of weather conditions on yields.

Crude oil prices

Crude oil prices are among the most volatile of all components in Australia's trade basket (Chart 12). In the past, dramatic increases in oil prices have had a significant and negative impact on Australia's terms of trade. Indeed, the sharp increase in oil prices following the beginning of the oil embargo in late 1973 coincided with the largest swing in the terms of trade since the 1950s.

Chart 12: Price of crude oil (Dubai)



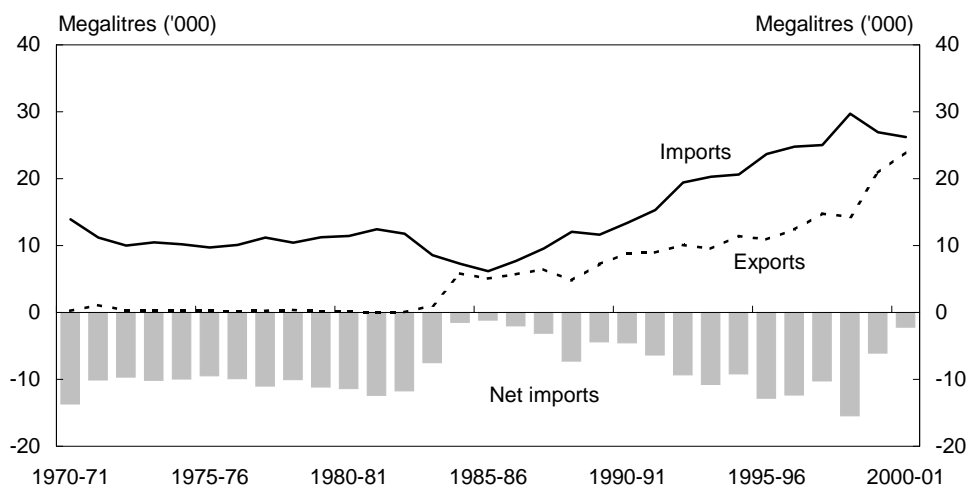
Source: Datastream.

The direct transmission of oil price movements to the terms of trade reflected Australia's historical position as a net importer of crude oil (Chart 13). However, the trade deficit in crude oil has narrowed somewhat with the increase in crude oil exports in the mid-1980s. In recent years, with the development of several new oil fields on the North-West Shelf, Australia has moved towards a relatively neutral position in the crude oil trade. This is providing a natural hedge against the impact of higher oil prices on the terms of trade.

Consequently, sharp increases in oil prices no longer have a direct negative impact on the terms of trade. Further, Australia remains a significant net exporter of other energy products, particularly coal. As a result, the broader increases in energy prices typically

associated with an increase in oil prices may actually result in a rise in the terms of trade.

Chart 13: Trade in crude oil



Source: ABARE Commodity Statistics.

Prices for information and communications technology

As was noted in last year's *Budget Statement 4*, Australian firms have actively applied new technology in the pursuit of productivity gains. ICT investment in Australia has been growing rapidly, with ICT a key enabling technology for productivity improvements.¹⁹ Australian businesses are using technology intensively and innovatively to drive productivity growth, aided by a dramatic fall in the price of ICT goods.

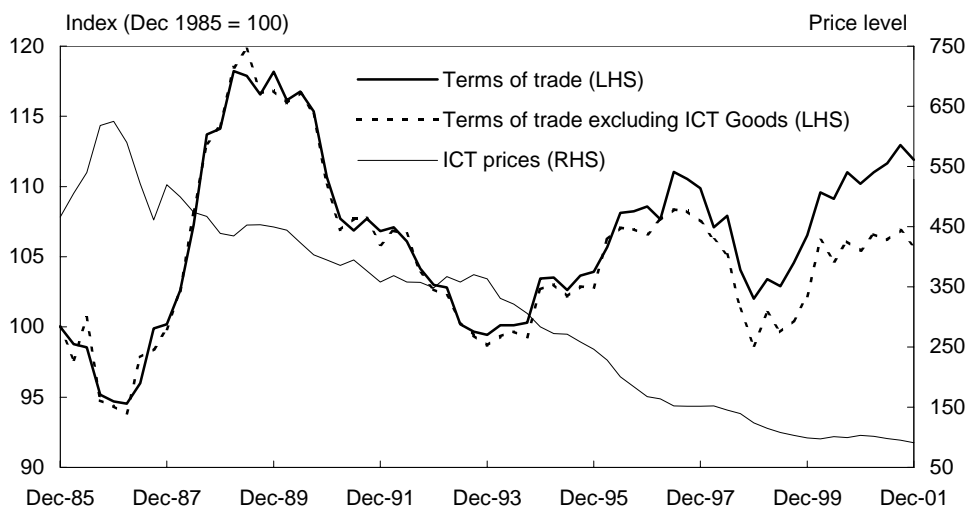
Between 1985 and 2001, the price of imported ICT goods has fallen (Chart 14) by an average rate of 12 per cent per annum in foreign currency terms (or a fall of 9.5 per cent per annum in Australian dollar terms). The pace of this decline has been more rapid over the past six years, with prices falling by an average of almost 15 per cent per annum since 1995 in Australian dollar terms.

The rapid fall in ICT prices, combined with Australia's status as a net importer of ICT goods, has had favourable implications for Australia's terms of trade. The net impact of falling ICT prices increased the Australian terms of trade by an average of around 0.3 per cent per annum between September 1985 and December 2001. The impact has been even greater since 1995 where, other things equal, the net impact of falling ICT

¹⁹ The OECD found that Australia's rapid take-up of ICT had made a significant contribution to its productivity gains. (OECD, *The New Economy: Beyond the Hype*, Final report on the OECD Growth Project, 2001).

prices increased Australia's terms of trade by 0.75 per cent per annum. It is also important to note that the fall in ICT prices may be understated due to the problems associated with measuring pure price changes, where there are large and ongoing improvements in quality (Box 4).

Chart 14: Terms of trade excluding ICT



Source: ABS Cat. No. 5302.0 and Treasury.

The production of ICT hardware is extremely competitive. The price of ICT goods is being driven down rapidly as costs fall, so margins for ICT producers remain tight. The trend decline in the price of ICT has been evident over its history, and the ability of technology continues to rapidly escalate. In 1965 — just four years after the first integrated circuit was invented — Gordon Moore (co-founder of Intel Corporation) predicted that the number of transistors per integrated circuit would double every 18 months until 1975. In fact, this exponential growth has continued to the present day, with some suggestion that it has accelerated more recently.²⁰ In 1971, a typical integrated circuit boasted 2,250 transistors. By 2000, this rose to close to 50 million transistors.

Effectively, ICT is now a commodity. It is characterised by a relatively homogenous product — the integrated circuit and memory chips — with hardware manufacturers behaving as price takers. The market is subject to gluts and shortages, thus producing a substantial amount of volatility around the downward trend in prices.

²⁰ See <http://intel.com>. The time horizon for Moore's Law may have fallen to 12 months. See Parham, Dean, Paul Roberts and Haishun Sun, *Information Technology and Australia's Productivity Surge*, Productivity Commission Staff Research Paper, 2001.

Box 4: Hedonic price index

Ideally, price indices should reflect the pure price change and abstract from variations due to changes in quality. An index that does not account for significant quality changes would tend to overstate prices as quality increases. The ABS attempts to price to constant quality, but this is not a simple matter when dealing with some high technology goods, particularly ICT,²¹ which are technically complex and rapidly changing items. The ABS uses a hedonic model (based on that of the US Bureau of Labor Statistics) to adjust for quality changes in computers, and to avoid an upward bias to ICT prices.

Hedonic regression modelling involves dividing a good into its component characteristics and using these characteristics as explanatory variables for its price. The model is updated every three months due to the rapid pace of change in the ICT market. The parameter estimates, which measure the dollar value per unit of the component (for example, dollar per megabyte of hard drive space, or dollar per megahertz of computing speed), are determined through price observations and are regularly updated.

The hedonic model is a significant improvement over earlier approaches but an inability to account precisely for the rapid introduction of new products and quality changes will lead to some level of bias in the price measures. The model is focussed on component characteristics rather than performance variables that may be more important to the user. The measurement issue is further complicated by the rapidly growing list of performance variables and their relative importance. The hedonic price estimates vary from the pure price of computers to the extent that the price structure of components does not reflect the marginal contribution of different components to computer performance. There is a lack of evidence regarding the biases but it seems reasonable to suggest that prices may continue to be overstated.

Australia is a large net importer of high technology, such as computers, that require quality adjustment to a constant price. Despite the resurgence of manufacturing, the bulk of Australian exports are in homogenous commodity groups that do not require significant quality adjustment. The asymmetry between the composition of exports and imports, the respective quality adjustment requirements, and the possible overstatement of prices from the hedonic adjustment process, may result in an understatement of the terms of trade.

21 There are other areas of the index that are difficult to price to constant quality, such as large and irregular imports of (customised) capital goods. Further, as Australia's export basket tends to consist of products for which quality is relatively stable and its import basket consists of products that have rapid quality improvements, the measured terms of trade are likely to be lower than the 'real' terms of trade.

Part V: Conclusions and policy implications

A strong and stable terms of trade assists in promoting efficient resource allocation and has a stabilising influence on the domestic economy. It also assists macroeconomic management by reducing inflationary pressures. Increases to the terms of trade raise domestic real income, the purchasing power of exports and domestic welfare.

The world relative price of tradeables is exogenous to Australia, fluctuating according to world demand and supply in an unpredictable fashion. But the composition of the export and import bundles — and hence the terms of trade — is reflective of history, comparative advantage, domestic economic efficiency and demand and supply of Australia's consumers and producers.

Ultimately the private sector determines the composition of exports and imports. While Governments can provide incentives and disincentives to particular production, history shows that the ability to pick products that have a high (and sustained) relative price is limited.

Microeconomic reform has promoted a large change in the dynamics of Australia's market economy, enhancing competition and productivity. Over the last decade, an increasing number of firms have been exposed to international competition. This provides incentives for those firms to operate efficiently, flexibly and to price competitively. In conjunction with enhanced technology — Australia being a relatively heavy exploiter of high technology — this has led to extraordinary productivity growth and rapid growth in per capita real income. This dynamic environment has led to changes in the composition of Australia's export and import baskets and in the range of countries with which Australia trades. The ability to switch between countries — sourcing imports and dispatching exports — is an important additional feature providing some protection from exposure to adverse developments in particular overseas markets.

Sound fiscal and monetary policies have also assisted in providing low and stable inflation, the management of which is aided by more stable terms of trade.

This combination of a more competitive, dynamic and flexible market economy with sound fiscal and monetary policy has assisted in reducing the volatility of the terms of trade. This, in turn, has led to a more stable economic growth path, with the volatility in Australia's GDP growth being much less in the past decade compared with previous decades.

The terms of trade is likely to be more stable in the future because of the diversification of Australia's trade baskets (across products and destinations), the improved insulation of the Australian economy from foreign economic events, and the generally more stable global economy. The increasing importance of ICT and other related products in Australia's imports basket is likely to provide continued strength to the level of Australia's terms of trade.

A key requirement for increased internationalisation is for Australia to maintain sound macroeconomic policies and to continue the pursuit of microeconomic reform. The promotion of research and development (through for example the Government's *Backing Australia's Ability – An Innovation Action Plan for the Future*), improving human capital through quality education, tax reform to reduce export costs, and further labour market reform are examples of sound policies. In addition to measures that reduce Australia's own business costs, the sponsorship of sound economic policies throughout the world adds a further dimension to terms of trade stability, and ultimately higher economic growth within and outside of Australia.