Living standards, terms of trade and foreign ownership: reflections on the Australian mining boom*

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Australia is experiencing its largest mining boom for more than a century and a half. This paper explores, from a national perspective, important economic differences that arise when a mining boom, such as the current one, is generated by sustained export price increases (trading gains) rather than export volume increases. Since 2003, the terms of trade changes – through their direct trading gain effect and indirect real GDP effects – have increased Australian living standards. The increase, measured from official data and relative to the United States, is about 25 per cent; an increase that probably places Australian living standards well above those of the United States. But official data inadequately adjusts for foreign ownership of mining resources suggesting that this estimate is probably a little too high.

Key words: economic growth, foreign ownership, real GDP, resource booms, terms of trade.

1. Introduction

I was extremely pleased to be invited to contribute reflections on the current mining boom on the 36th anniversary of the publication of 'Some Implications of the Development of the Mining Sector' (the mineral paper) in the Australian Journal of Agricultural Economics, 1976. The mineral paper provided the dominant intellectual framework for analysing resource reallocation and exchange rate implications of the 1970s mineral boom and led to the subsequent development of the Dutch Disease literature (Gregory 1976).

The mineral paper, responding to the 1970s economic environment, was designed with two purposes in mind. One purpose was to increase understanding of the potential effects of two policy instruments that had not generally been used in Australia – a large across-the-board tariff cut and

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changes in the nominal exchange rate.[1] The other purpose was to increase understanding of the relationship between the development of the new mineral export sector during the 1960s and 1970s and the large structural breaks that were occurring in the Australian economy. The structural breaks were mainly evident in large falls in the male full-time employment/population ratio that continued for the next two decades.

The new mineral export sector was generating significant changes in the price ratio of traded to non-traded goods and, in this way, crowding out old export industries, primarily rural products, and industries that competed with imports, primarily manufacturing.[2] A sectoral resource competition – real exchange rate framework of the mineral paper – is now reasonably well understood so these reflections will focus more on an issue that is less well understood and, to my mind, is the defining characteristic of the current mining boom.[3]

This boom is different from that analysed in the 1976 paper.[4] At this point, the current mining boom is being driven, overwhelmingly, by sustained export *price* changes and not by export *volume* growth generated by new discoveries. The new analytical issue, therefore, revolves around whether it matters whether a mineral boom is being generated by *price* or *volume* changes? These reflections argue that it matters a great deal. Large and sustained increases in export prices raise a range of new analytical questions that give rise to exciting new research agendas. The issues we focus on are how to measure living standard changes in response to these price increases and the relevance of this measurement for interpreting the changes that are occurring in the Australian economy.

These reflections are arranged as follows. Part *II* sets the scene and documents the relative contributions of prices and volumes to the new mineral export boom. It then discusses how to measure the impact of mineral prices on average living standards and applies the measurement formula to

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[1] It must be difficult for those who were not part of the policy discussions during the mid-1970s to understand the extent of disagreement as to what was taking place in the economy and disagreement as to the proper role of these two policy instruments. It may seem inconceivable now but at that time the Australian Treasury opposed both an across-the-board tariff cut and a system of flexible exchange rates, being firmly of the view that a fixed exchange rate was necessary to impose fiscal discipline on government. For a flavour of the debate surrounding tariff cuts, see Gruen (1975).

[2] Much of the discussion was focused on the import competing manufacturing sector. At 1970, manufacturing employment was 20 per cent of all employment. Today, that proportion is 9 per cent.

[3] The mineral paper lead to wide-ranging contributions to the mineral boom literature by Australian economists including Blundell-Wignall and Gregory (1990), Corden (1984), Forsyth (Forsyth and Kay (1981), Maddock and McLean (1983), Long (1983), Snape (1977), Stoeckel (1979), Warr (2006), and Shann (1983). Forsyth's association with the Institute of Fiscal Studies was an important early channel for the ideas to travel to the UK. The IFS invited me to give presentations and introduce the mineral paper ideas to officials from the UK Treasury, Bank of England, and to academics. Subsequently, Corden and Neary (1982) added to and more firmly established these ideas in the international academic literature. They adopted the term 'Dutch Disease' from a Nov 26, 1977 Economist article rather than the colonial 'Gregory Thesis', a term originally applied by the Australian newspaper and C. Hurford, the Member of Parliament from Adelaide, South Australia.

[4] For a detailed analysis of different outcomes of the two mining booms see Gruen (2006, 2011).

Australian data. The mining impact is so large that the living standard increase is placed in an international context and Australian outcomes compared with those of the United States. The results of the comparison are spectacular and indicate that Australian average living standards now exceed those of the United States. Part *III* explores in more detail the nature of the living standard calculations, develops the analysis a little more, and begins to map out new research agendas. It explores who receives the living standard increases, the importance of foreign ownership of the mining sector and conjectures what might happen if export prices and the terms of trade return to their long-run trend values. Part *IV* offers concluding comments.

2. Terms of trade, trading gains, and Australian living standards

In the Australian international trade model, pioneered by Wilson (1931) and Swan (1960) and developed further by Salter (1959), Corden (1960), and Gregory (1976), there are three goods: exports, imports, and non-internationally traded home goods. The model becomes analytically powerful when the terms of trade – the price of exports relative to the price of imports – are fixed. The model can then be reduced to two goods and two prices: non-traded goods and traded goods (exports and imports can be aggregated using their fixed price relativity). The price ratio of traded to non-traded goods is referred to as the real exchange rate.

  The mineral paper was firmly within this tradition and assumed fixed terms of trade. But the data indicate that a fixed terms of trade model is not sufficient today. Figure 1, for example, plots prices for two important mineral
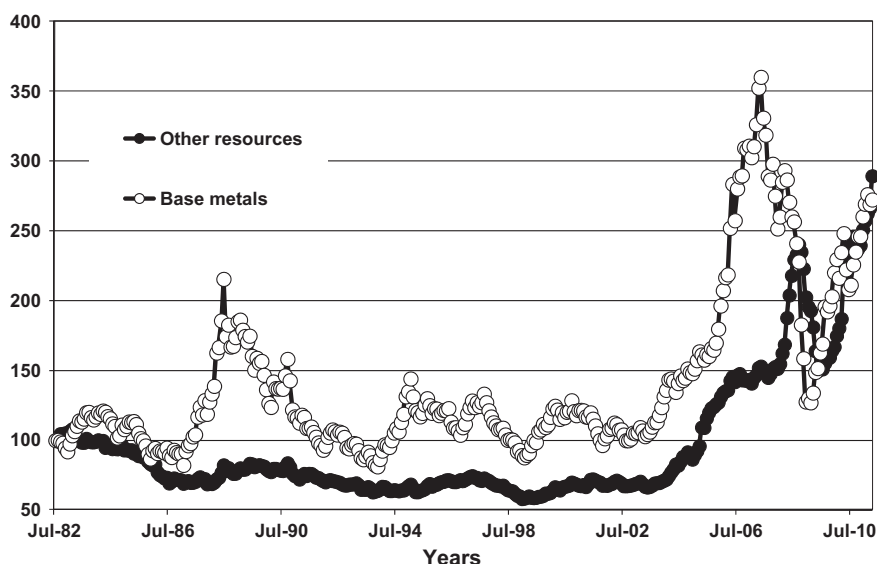

Figure 1 Commodity Prices, Australia Index 1982 = 100, Based on 2008/09 weights. Source: RBA Statistics, Table G5, RBA Index of Commodity Prices.

export groups – Basic Metals and Other Resources. Beginning from 2003, the price increases are extraordinary and of the order of 250 to 350 per cent. The large price increases, for a significant share of exports, convert into large terms of trade changes.

Australian terms of trade always improve during world economic booms – 1972–73, 1988–89 – but the increases are relatively short lived and last < 3 years (Figure 2). This mineral boom is quite different. The terms of trade upswing is three times larger than any upswing over the last 50 years, the increase is longer lasting – the increases have extended over a decade – and the terms of trade, fuelled by fast growth in India and China, have remained high even though the developed world is in recession.

Such large and sudden shifts in the terms of trade, and such persistence at high levels, suggest that the analytical emphasis should be placed on export price increases and not increases in export volumes. A fixed terms of trade model applied to the current mining boom is clearly inadequate. To emphasise this point, Figure 3 plots the total export/GDP volume ratio set at unity in 1959. These data show a constancy of the export/GDP share during the 1970s, a fairly strong increase during the 1980s and early 1990s and then, somewhat surprisingly, near constancy in this ratio for the last two decades. The other noticeable feature of Figure 3, which we will discuss further, is the rapid rise in import volumes as a share of GDP. Since the terms of trade began to increase from 2003, the import/GDP volume ratio increased 50 per cent and the export/GDP volume ratio fell marginally. To this point, export price increases have had their largest impact on import volumes and little impact on export volumes. There is no mining export volume boom of sufficient magnitude to change the total export/GDP volume ratio.
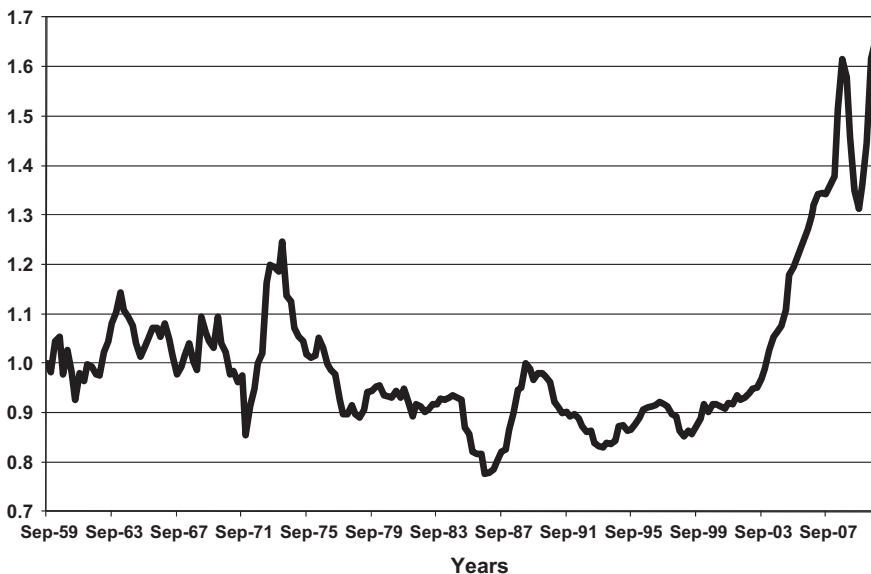

Figure 2   Terms of Trade, Australia Index 1959 = 1.0. Source: RBA, Statistical Table G4.
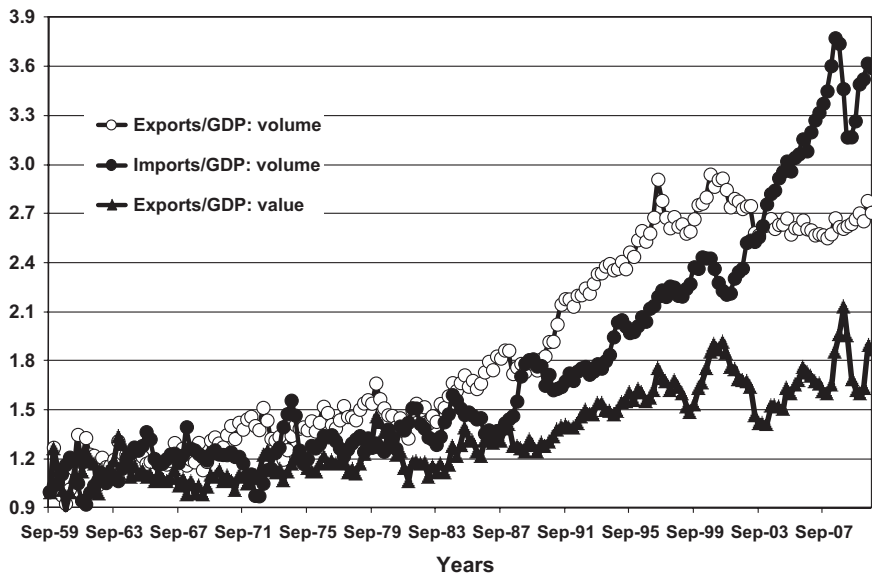
Figure 3 Volume and Value $m Ratios (sa), Mar 1959 = 1.00 Australia, 1959–2010. Source: ABS Cat No 5206, Table 3 and 5.

2.1 Measurement mechanics: the income effect of terms of trade increases

It has been well known among Australian policy analysts, at least since the Korean War boom, that large increases in the terms of trade can generate large real income gains.[5] What is not well known is how to measure real income changes in response to terms of trade changes (direct price income effects) and how these direct price income effects relate to changes in real income from RGDP responses (the indirect volume effects).

The key analytical issue arises as follows. Most macro-growth analysis relies on real gross domestic product (RGDP) as a measure of a nation's real income. But RGDP is not a complete or adequate measure of real income when there are large changes in the terms of trade. RGDP attempts to measure the *volume* of goods and services produced and, by construction, does *not* attempt to measure real income that arises directly from a change in the *price* of imports or exports. Hence, the usefulness of RGDP as a living standard measure during a mineral boom will depend on whether the additional income from the mineral boom is being generated by an increase in export volumes, measured by RGDP, or an increase in export *prices,* not measured by RGDP.

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[5] The very large, but temporary increases in the Australian terms of trade in response to the Korean War boom, and the associated large increase in national income, helped to provide impetus to the development of the Australian international trade model based on the traded non-traded goods dichotomy – Salter (1959), Swan (1960) and Gregory (1976). But surprisingly, these models invariably assume fixed terms of trade when the Korean War boom was an export price and terms of trade change phenomenon. It should also be noted that the major income loss from the depression of the 1930s was from the terms of trade fall rather than from an output loss, Gregory (1988).

The inadequacy of RGDP can be illustrated by the following example. Suppose export prices double but all other prices and real outputs in the economy are unchanged. In this example, current price GDP increases only because export prices increase. To measure RGDP, national account statisticians deflate each component of current price GDP by its own price deflator to calculate the underlying volume. When the higher export value is deflated by the higher export price, this will indicate correctly that the export volume and RGDP have not changed. But, an export price increase, ceteris paribus, has increased real income.[6] A country must be better off when export sales double in price.

How should this increase in real income, generated by an export price increase, be measured? The usual response can be simply illustrated as follows.[7] Expenditure estimates of current price GDP can be written as

$$GDP = D - M + X \qquad (1)$$

where D is current price total domestic final expenditure, M is the current price value of imports, and X is the current price value of exports. To produce an estimate of RGDP, each item on the right-hand side of Equation (1) is divided by its own price deflator.

To account for the income effect flowing from a terms of trade change, the usual response is to deflate X and M not by their own price deflators but by a common price deflator that will reflect the extra expenditure opportunities (the living standard increase) brought about by the export price increase. Hence, a new concept, real gross domestic income (RGDI), is defined as

$$RGDI = RGDP - (X/P_x - M/P_m) + (X - M)/P^* \qquad (2)$$

The RGDI calculation therefore involves removing from RGDP the value of exports and imports, deflated by their own price deflators P_x and P_m – the second term on the right-hand side of Equation (2) – and replacing them by volume measures of exports and imports calculated by the application of a different deflator, P^*.

The difference between these two sets of import and export 'volume' measures, the second and third terms of Equation (2), is referred to as a 'trading gain,' which can be written as

$$x\left(\frac{P_x}{P^*} - 1\right) - m\left(\frac{P_m}{P^*} - 1\right) \qquad (3)$$

where x and m are export and import volumes, calculated by application of their own deflators. Trading gains arise therefore from relative price changes among exports, imports, and the price deflator P^* and the weights x and m provided by export and import volumes calculated from their own deflators.

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[6] When the terms of trade change, real GDP calculated by the income or expenditure path will no longer equal real GDP calculated from the production path.
[7] The precise definition applied by the ABS can be found at ABS (2004).

If there is no change in any of these price relativities, between one period and the next, there is no price generated trading gain in that period. Under these circumstances, the change in RGDI is equal to the change in RGDP.

What deflator $P*$ should be chosen to measure the trading gain? There is no universally accepted answer to this question, although it has been posed for almost a century (Taussig (1927), Dorrance (1948-1949), Nicholson (1960), Silver and Mahdavy (1989), Diewert and Morrison (1986), UN (1968, 2008). Perhaps the reason for the lack of an accepted answer is that there is no correct response? While it seems straightforward that the extra export revenue generated by higher export prices should be deflated by the price index of the use to which the extra revenue will be put, there is no way of knowing exactly what this use might be or when it might occur. So the only thing to do is to make a reasonable assumption and proceed on this basis. There are two potential price deflators with wide support.[8]

Academics, with an index number focus, are increasingly recommending that $P*$ be measured by the final domestic expenditure deflator. They argue that domestic expenditure (consumption) is the purpose of economic activity and the right living standard measure. They also argue that the domestic expenditure deflator better captures all relative price shifts that are occurring in the economy (Diewert and Morrison (1986), Kohli (2004), Macdonald (2010), Reinsdorf (2010), Feenstra *et al.* (2009a,b). This deflator opens up many avenues for analysis – the role of each of the three price deflators, P_x, P_m and $P*$, and the role of the export and import weights. But with this analytical richness comes complexity.[9]

Official statistical agencies,[10] however, usually adopt a simpler approach and choose the import price deflator as $P*$ which, upon substitution into Equation (3), simplifies the trading gains to

$$x\left(\frac{P_x}{P_m} - 1\right) \tag{4}$$

This calculation effectively adopts an import volume metric for the trading gains.

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[8] As might be expected, official statisticians have been uncomfortable with a concept as amorphous as RGDI. But, even so, it is difficult to comprehend how controversial RGDI and the choice of deflator have been. The UN in their publication, The System of National Accounts (SNA), (UN 1968), recommended that a terms of trade adjustment not be included in official statistical publications (Silver and Mahdavy 1989). But the UN has been slowly changing its position and the 2008 SNA publication suggests that the official statistical bureaus should account for terms of trade changes but offers no single recommendation as to how this should be done (see Kohli (2004), ABS (2001), SNA (2008), Silver and Mahdavy (1989)).

[9] If the terms of trade do not change, there may still be living standard changes if $P*$ changes at a different rate than export and import prices. This price change is labelled a real exchange rate change – a gain from a change in the price of traded to non-traded goods. This concept is central to the fixed terms of trade models of Swan (1960), Salter (1959), and Gregory (1976).

[10] The UK, United States, Canada, and Australia adopt the import price deflator when calculating RGDI.

One argument underpinning the choice of P_m as a deflator is that from a nation's viewpoint, the purpose of exports is to provide foreign currency to buy imports, hence the use of an import metric (Nicholson (1960). Furthermore, if the economy is operating at full capacity, and keeping export production fixed, additional imports is the only margin available for increased resources in the short run. This phenomenon is evident in the rapid increase in import volumes apparent in Figure 3. Other advantages are that the terms of trade enter into the calculation in a simple way and the formula is easy to intuit.

In subsequent empirical analysis, we choose the import price deflator as $P*$ primarily because this is the deflator that underlies the official RGDI series published by the ABS. Also, over the period of interest, the estimated Australian trading gains do not differ significantly when calculated with either of the two main deflators.

The adoption of the import price deflator enables Equation (2) to be written as

$$RGDI = RGDP + x\left[\frac{P_x}{P_m} - 1\right] \tag{5}$$

where RGDI is the sum of two terms RGDP and the trading gain.

As RGDI and the trading gain concepts are not that well known, it is worth spending a little time exploring these concepts when P_m is chosen as the deflator (see also Coleman (2008)).

First, RGDI consists of two parts: a volume measure, RGDP, and a price measure, the trading gain. A terms of trade improvement *must* produce a trading gain for the nation (the direct price effect). There may or may not be a volume effect depending on how RGDP responds to the terms of trade changes (the indirect volume effect). A large export price increase will normally produce a direct price and an indirect volume effect, both of which will normally be positive.

Second, no matter how RGDP responds (the indirect volume effect); it cannot change the trading gain (the direct price effect) as long as the price of exports and imports are exogenously determined on world markets. The Australian response to a terms of trade change is very unlikely to affect the world price of imports (Australia is a small country) but for exports this assumption may not be strictly correct because for many key commodity exports, Australia is a relatively large supplier. For this paper, however, we assume no feedback between Australian RGDP responses and the terms of trade.[11]

Third, the direct trading gain effect can be thought of as a free gift in that it requires no additional resources to produce this increase in income and the

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[11] The RGDP response may affect the trading gain if RGDP changes affect world prices. The nature of this link is complex and will vary with the time horizon. An RGDP change may also increase the export volume weight attached to the trading gain and affect the trading gain via this route. In the short run, both these effects can be safely put aside since they will be small.

free gift cannot be eroded by Australian RGDP changes unless they affect world prices.

Fourth, a change in import prices will affect the measure of the trading gain but a change in import volumes will not. The pattern or volume of imports does not enter the trading gain formula when P_m is chosen as the deflator. There is also no account of whether there is a domestic industry producing close substitutes for imports or whether the value of imports is greater or smaller than the value of exports.[12] Hence, there is no direct mapping from trading gains to structural changes or resource reallocation across domestic sectors of production. Any volume effects or resource reallocation costs must work through the RGDP component of RGDI.

Fifth, an import price fall or an export price rise has the same effect on trading gains. But it does not follow, in the short run, that the effect on RGDP is the same irrespective of the source of the terms of trade change. In the short run, RGDP effects will depend, in part, on different export and import intensities of industries.

Sixth, export and import prices may not change relative to each other – the terms of trade may not change – but if import and export prices change relative to domestic prices, there may still be significant impacts on resource flows within the economy, which will impact on RGDP (Macdonald 2010).

Seventh, the trading gain formula takes no account of foreign capital ownership. Export price increases that accrue to foreign capital – the three largest export mining companies in Australia are all or primarily foreign owned – will have a different impact on Australian living standards than if the price increases accrue to Australian capital. In principle, RGDI can be adjusted to account for foreign ownership but this issue is complex and is put aside until Part *III*.[13] Also, the extent to which foreigners capture trading gains will depend on the tax regime, and given the high level of uncertainty and complexity associated with mining taxes at the moment, this is not discussed in this paper.

Eighth, a terms of trade change will affect the Australian nominal exchange rate and has done so in this and the previous mining boom. A change in the nominal Australian exchange rate, however, should not normally affect the terms of trade and therefore should not affect the size of the trading gain.[14] However, an exchange rate change will affect the trading gain allocation.

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[12] The United Nations has suggested that when the value of imports exceeds exports the price deflator chosen could be the export price deflator. Under these circumstances, when the terms of trade change, the import volume will affect the trading gain and export volumes will not.

[13] Real gross national disposable income (RGNDI) goes beyond RGDI and takes account of dividends and interest payments to and from the rest of the world. This adjustment is not straightforward and is discussed later.

[14] We have, by and large, put aside a discussion of exchange rate changes but the association between Australian mining booms, and the exchange rate is very strong (Blundell-Wignall and Gregory (1990)). Between September 2001 and June 2011, the Australian exchange rate appreciated 218 per cent against the US dollar, 176 per cent against SDR's, and 165 per cent against a trade weighted index.

An appreciation will move some trading gain income from the exporter – export prices fall in domestic currency – to the consumer of imports –import prices fall in domestic currency. An exchange rate change, through its effect of relative prices within Australia, will probably also affect RGDP.[15]

2.2 Terms of trade and Australian income growth per capita

How much has Australian income increased in response to the exceptional lift in the terms of trade? There are two important short run gains that lift RGDI.

First, there is direct trading gain income effect that is measured by the income gap between RGDP and RGDI.

Second, there is an indirect trading gain income effect that will increase RGDP. Increased optimism about future mineral prices will usually generate an investment boom and increased output. Of course, this indirect effect is only one contributor to RGDP and consequently there is unlikely to be universal agreement as to its relative impact.[16] Nevertheless, it seems clear that this indirect effect has been very important in Australia. In response to the Global Financial crisis, almost all developed economies are experiencing depressed RGDP growth rates and record high unemployment. Australia, in contrast, has avoided any significant falls in RGDP and is experiencing falling unemployment rates that are currently around 5.0 per cent and are considerably lower than the average of the last 40 years.

An empirical estimate of the indirect effect involves a comparison between actual RGDP and a counterfactual, an estimate of what RGDP would have been without the trading gain. To estimate a counterfactual is a large and complex task, which we do not attempt at this point. Instead, we adopt a descriptive and judgmental approach and turn to accounting identities to describe different sources of income growth and to provide an indication of how large the direct and indirect trading gain income effects might be.

As we are interested in living standards of all Australians, RGDI will be expressed in per capita terms and related to direct trading gains and indirect RGDP effects by the following identity,

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[15] For exchange rate changes to affect the terms of trade measured in domestic currency requires different exchange rate pass through relationships among exports and imports or a different pattern of currency sourcing of exports and imports across countries so that country-specific exchange rates may affect the terms of trade through composition effects. It is unlikely that either of these preconditions matter sufficiently for exchange rates to significantly affect the domestic price ratio of exports and imports (see ABS 2004).

[16] There is incomplete agreement as to the relative contribution of the stimulus package, the mining boom and general stability of the banking system to the stronger performance of the Australian economy since 2008. Treasury publications focused on the period around the Global Financial Crisis tend to downplay the contribution of the mining boom and emphasize the policy response and the good economic environment created by earlier policy decisions (see McDonald and Morling (2011), Morling and McDonald (2011)). At mid-2011, there is concern that the exchange rate effect of the mining boom, along with high interest rates, have begun to depress RGDP growth.

$$\frac{RGDI}{Pop} = \frac{RGDP}{Pop} \times \frac{RGDI}{RGDP} \qquad (6)$$

The first term on the right-hand side of Equation (6) is $RGDP$ divided by the population. This measures living standards without adjustment for direct trading gain effects. The application of the second term, $RGDI/RGDP$, adjusts for the direct income effect of the trading gain. Figure 4 plots the time paths of $RGDI$ and $RGDP$ per capita over the last 50 years (ABS 2011). The gap between the two series in Figure 4 is the contribution of trading gains, $RGDI/RGDP$.

We can learn a little more about changing living standards by using an identity to decompose $RGDP/Pop$ into two terms,

$$\frac{RGDP}{Pop} = \frac{RGDP}{Emp} * \frac{Emp}{Pop} \qquad (7)$$

the product of labour productivity, $RGDP/Emp$, and the proportion of the population employed, Emp/Pop. When $RGDP/Emp$ is added to Figure 4, the gap between $RGDP/Pop$ and $RGDP/Emp$ measures the contribution of changes in the Emp/Pop ratio.

Changes in RGDI per capita can now be divided into the three elements: changes in trading gain income, the proportion of the population employed, and labour productivity. Each of the series included in Figure 4 is presented as an index number based at one hundred in September 1959. We divide the
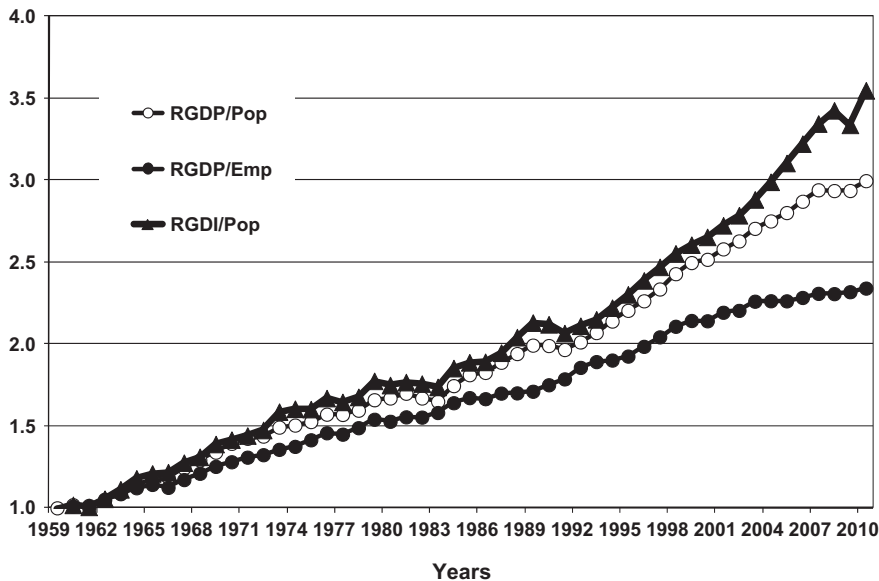

Figure 4 Labour Productivity and Living Standard Measures Australia, 1959–2010. Source: The Conference Board Total Economy Database, January 2011. ABS Cat No 5206, Table 1.

discussion of Figure 4 into two periods: the long period, 1959–2003, and the recent period, beginning 2003.

Over the long period, 1959–2003, living standards increased steadily although there are noticeable downturns during the recessions of the early 1980s and 1990s. Living standards increased almost threefold over 40 years. The path of each series – $RGDI/Pop$, $RGDP/Pop$ and $RGDP/Emp$ – is similar and the gaps between them are narrow, although widening towards the end. Narrow gaps indicate that the driving force for living standard increases were overwhelmingly productivity gains rather than increasing employment/population ratios and direct trading gains.

Over the short period, since 2003, living standards have continued to increase and the growth rate has perhaps accelerated slightly. The recent period, however, is different in three important ways.

First, the gap between $RGDI/Pop$ and $RGDP/Pop$ – the direct income effect from trading gains – has become large and persistent. RGDI has moved to be 13 per cent above RGDP. This is an exceptionally large increase in income over 8 years, accounting for 55 per cent of the per capita income growth. This substantial amount is equivalent to about $8000 per person per year (2011 prices).

Second, the gap between $RGDP/Pop$ and $RGDP/Emp$ has also widened significantly indicating that the contribution of increasing Emp/Pop has become an important contributor to living standard increases.

Third, the growth rate of $RGDP/Emp$ has slowed and is no longer the primary driving force for income increases.

Since 2003, the increase in living standards has been 24 per cent, an exceptionally high growth; 55 per cent is the result of direct trading gains, 30 per cent the result of increased employment among the population, and only 15 per cent the result of labour productivity growth. Of course, Equations (6) and (7) are accounting identities, but they make clear that over the mining boom period it is towards increasing employment/population ratios and the trading gains that we must turn to understand the positive factors contributing to living standard increases rather than towards labour productivity increases.

Finally, much of the commentary on Australian macroeconomic performance over the last decade has been directed towards the *slowdown* in labour productivity growth. Given the size of this productivity slowdown, and its recent trivial contribution to living standard growth, the commentary seems appropriate but, at the same time, commentary has not focussed sufficiently on the large positive contribution from trading gains and increased employment and, in that sense, much of the commentary has missed the main game.

2.3 Australia US living standard comparisons

Because Australia has gained twice from the terms of trade increase – experienced a substantial increase in trading gains and avoided the economic downturn in RGDP – the question is naturally raised as to how

much has Australian income per capita caught up, or pulled ahead, of other nations? Recent experience of countries that have not been advantaged by terms of trade gains, and whose living standards changed over the last 40 years, in much the same way as Australia, might serve as a counterfactual to estimate the path of Australian incomes in the absence of the trading gains.

In this respect, the United States might be a good choice as per capita income usually grows at similar rates to Australia and the United States has not been subject to noticeable terms of trade changes (Reinsdorf 2010). The United States has another advantage in that it is often used to provide estimates of the RGDP per capita that might be possible if the Australian economy were more efficient.[17] The evolution of Australian–US living standards can be described by identities (6) and (7), defining each element as Australian outcomes relative to those of the United States.

The Australian–US comparisons are quite revealing.[18] Consider RGDP per capita (Figure 5). Until 2003, there has been remarkable stability in this relativity. Australian RGDP per capita hovered between 86 and 93 per cent of US levels for 40 years. Despite different economic policies in each country, different immigration experiences, different labour force participation patterns, and the 1970s Australian mineral boom, there was little variation in relative RGDP per capita until 2003.

Since 2003, however, Australia has been catching up and RGDP per capita, PPP adjusted, is now about 97 per cent of US levels. Something has changed over the last 8 years, something which has not been achieved in the previous 40 years. The association of the current mining boom with the sudden lift in RGDP per capita in Australia, relative to the United States, suggests that trading gain impacts on RGDP may be large.

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[17] This comparison was motivated by the following considerations; (i) Australia has gained from a terms of trade improvement and the United States has not; (ii) the United States has experienced the full force of the global financial crisis and Australia has not; and (iii) assessments of Australian economic growth performance usually focus on GDP levels and growth rates and often use US outcomes as the counterfactual 'efficient' production frontier (Gregory (1993), Rahman (2005), Davis and Rahman (2006) and Battersby (2006)).

[18] The series used for the comparison are from The Conference Board, which has put together macro data from the World Bank, IMF, OECD, Eurostat, and national statistical agencies. The series are real GDP per person in current US EKS dollars. The Conference Board takes the Purchasing Power Parity benchmarks between the United States and Australia in 2005 and adjusts this index through time by the GDP deflators in each country. This produces a PPP for each year, which can be applied to nominal GDP data for each country. The use of GDP deflators means that real GDP measures do not include any terms of trade effects. Notice that the exchange rate plays no direct role in these calculations.

There are two PPP adjusted GDP data series available 'Geary-Khamis' (1990 US dollars) and the 'EKS' (2005 US dollars). There is a different level effect between the series but no differences in trends or cycles. Before the large Australian terms of trade change the average 'GK' Australian GDP per capita is about 77 per cent of that of the United States. The 'EKS' average ratio is near 88 per cent. We adopt the OECD preferred 'EKS' series, which is based on later data. For a full data description see Chen *et al.* (2010).
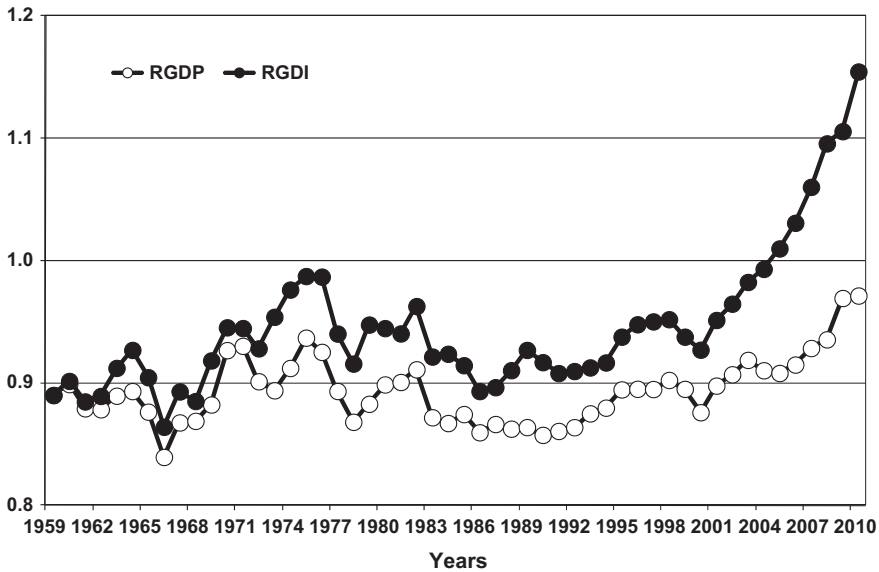
Figure 5   Australia to US Ratio: RGDP and RGDI per capita 1959–2010. Source: The Conference Board Total Economy Database, January 2011, 2010 EKS$ ABS Cat No 5206, Table 1.

What is the source of this sudden catch-up in RGDP? Does it arise from increased Australian efficiency of resource use, which we measure as relative RGDP per employed person, or does it arise from a higher employment utilisation of the population, *Emp/Pop*? We can begin to answer these questions by using identity (7) to decompose RGDP per capita of each country into these two elements. Their contribution is most easily seen if each is expressed as an index number with the 1959 base set at unity (Figure 6).

The decomposition reveals a changing pattern over time, which is quite different during the two mining booms (Figure 6). Over the 1960s, the United States exhibited higher labour productivity and slightly lower employment/population ratios and their interaction produced a higher US RGDP per capita. In this period, labour productivity and employment/population ratios grew at similar rates in both countries and relative RGDP per capita did not change significantly.

These relationships were substantially disturbed by the macro-experiences and mining boom of the early to mid-1970s.[19] Australian labour productivity increased substantially, relative to the United States, and remained at these new relative levels for the next two decades. At the same time, the employment/population ratio across the two countries followed a path, which was

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[19]   In Australia, the 1970s mineral boom was associated with high inflation, substantial real wage increases, and expansion of new welfare programs (Gruen (2006), Gregory and Frijters (2006) and Gregory (1993)). The United States also experienced substantial changes; high inflation and the emergence of skill biased technical change. Both countries experienced very large increases in unemployment to record post–World War 2 levels.
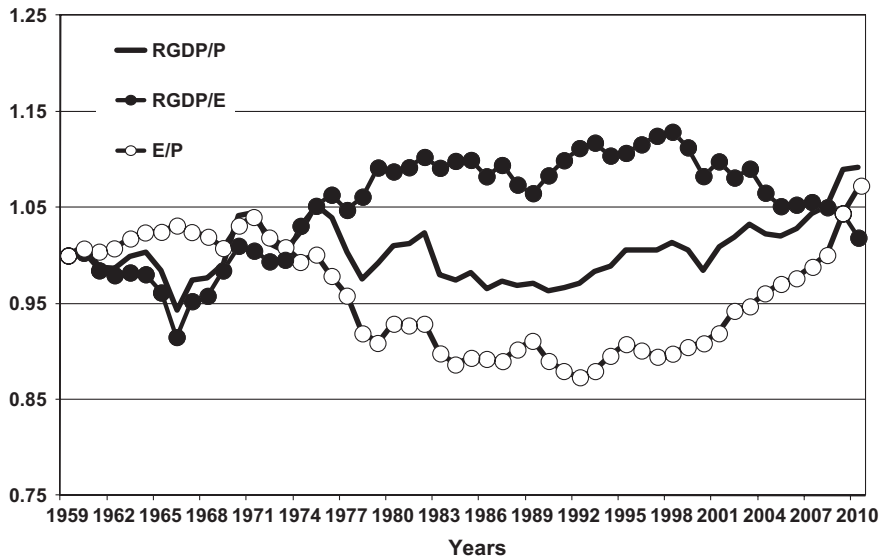
Figure 6   Australia to US Ratios, 1959 = 1.0, 1959–2010. Source: The Conference Board Total Economy Database, January 2011.

the mirror image of the relative labour productivity ratio, increasing substantially in the United States but remaining constant in Australia as an increasing proportion of the Australian labour force entered the expanded welfare programs. The mirror image reflections of labour productivity and employment/population changes meant that relative RGDP per capita continued to be largely unchanged.

From the middle to late 1990s, there is another shift in outcomes as labour productivity and employment/population ratios begin to revert back to their cross-country relativities of two decades earlier. In relative terms, labour productivity begins to fall in Australia and the employment/population ratio begins to rise. Again, each series is largely a mirror image of the other, so the RGDP per capita ratio remains largely unchanged.

Finally, beginning 2003, when significant trading gains begin to occur in Australia, the growth patterns continue but the Australian relative employment/population ratio increases begin to dominate the Australian relative labour productivity declines and Australian RGDP per capita begins to catch-up with the United States. This history suggests two important points which are not widely known.

First, RGDP per capita has not been closely related to the changing relative efficiency of labour utilisation across the two economies. For most of the period, a strong mirror image effect has operated; any increase in relative labour productivity was offset by a decrease in the relative employment/population ratio. Long-run stability of the Australian/US RGDP per capita ratio, until recently, is an important fact to be explained. Why has Australia, until recently, failed to catch-up to the United States?
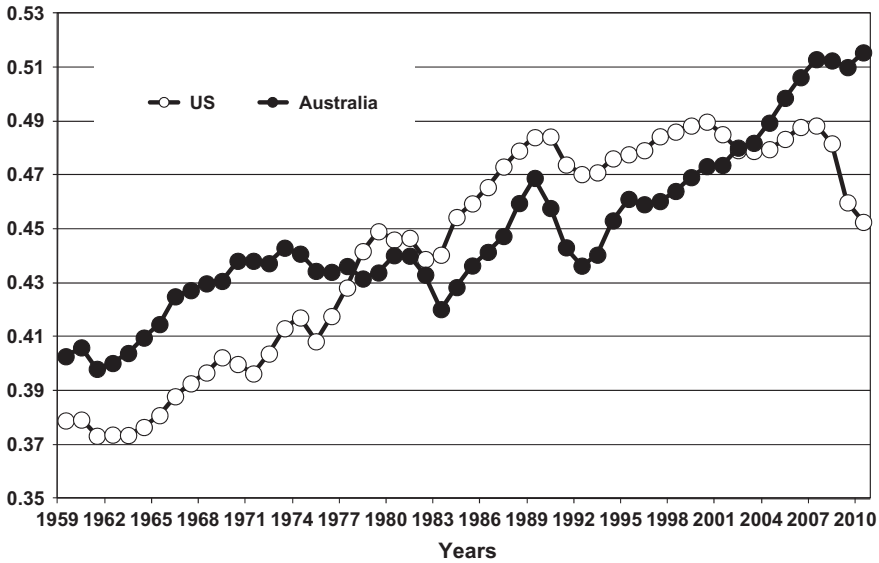
Figure 7   Employment to Population Ratio 1959–2010. Source: The Conference Board Total Economy Database, January 2011.

Second, the decomposition makes clear a major difference between the two mining boom periods – the first boom is associated with large relative employment/population loss in Australia and the second with a substantial gain. Over the last decade, the Australian employment/population ratio has increased 8 per cent and that of the United States has fallen 6 per cent to produce an Australian employment/population ratio that is now 12 per cent above the United States (Figure 7). The Australian employment/population ratio has risen to its highest level ever and that of the United States has fallen to the level prevailing 25 years ago.[20]

RGDP comparisons and decompositions take no account of trading gains.[21] When this is done, the changes in the cross-country living standard comparisons are spectacular (Figure 5). Direct trading gain income effects add a further 12 percentage points to Australian living standards. Together, direct and indirect trading gain income effects have lifted Australian living standards, relative to the United States, from a long-run average of around 92 per cent, over the 1959–2003 period, to a current level of 115 per cent. In just 8 years, Australian living standards have increased an amazing 25 per cent, relative to the United States; an extraordinary change – about one-third attributable to increased production of goods and services per capita and two-thirds attributable to direct income effects from trading gains. The 50-year history of relative income stability across the two countries, before

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[20] There has been a small change in relative hours worked per person across the two countries which do not significantly change the conclusions based on employed persons.

[21] The relative unimportance of US trading gains can be seen by comparing the US Department of Commerce Command GDP series 1959–2009 with the unadjusted GDP series.

the terms of trade change, would have suggested that a move of Australian living standards to be above US levels was simply just not possible.[22]

Indeed, I doubt whether a change in relative living standards, of this magnitude and over such a short period, between Australia and other large developed economies has ever occurred before, outside of war periods and their aftermath, and certainly not since the mining boom of the 19th century. The special feature that makes this change in living standards so substantial is the positive interaction of two forces favourable to Australia, the trading gain and relatively higher growth of RGDP capita, brought about primarily by increasing employment levels and avoiding the current world recession. Usually, Australian trading gains are positively associated with strong economic growth in developed economies, including the United States, and, in these circumstances, the Australian relative income increase is largely confined to the direct effect of the trading gain as all countries share in strong RGDP growth. The dislocation of the close positive relationship between the Australian trading gain and the economic growth cycle of developed countries is a completely a new feature, generated by the decoupling of Asian growth rates – primarily China and India – from the growth rates of the developed economies. Relative to most other developed countries, Australia has been twice blessed by the terms of trade increase.

The understandable failure of recent economic research to anticipate the extraordinary and unexpected lift in Australian living standards is worth noting. The most recent studies of Australian living standards, relative to the United States, have focussed on RGDP per capita, where the dominant fact to be explained, over the 50 years before 2003, is the relative constancy of the Australian–US relativity (Rahman (2005), Battersby (2006), Wilkie and McDonald (2008), OECD (2008)). The focus of these Treasury and OECD studies was primarily to explain why Australian living standards had failed to increase relative to the United States for almost half a century and why in the future it might be expected that there would be very little or no catch-up.

These studies estimate that about half of the living standard gap could be explained by the negative contribution of Australia's distance from world markets (an influence unlikely to be offset). Furthermore, OECD (2008) estimated that the relative favourable advantage delivered by the Australian mineral sector offset only about 2.3 percentage points of the living standard gap with the United States, a contribution about one-fifth as important as the negative contribution of Australia's remoteness.

But, as is demonstrated above, the mining boom, primarily through a trading gain price effect, may have increased Australian living standards by

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[22] There is inevitably uncertainty about relative income levels across countries and from this perspective PPP calculations require more attention and need to be updated. However, as noted earlier, the choice of PPP index from the Conference Board has virtually no effect on changes in income relativities through time because PPP calculations have typically been made for 1 year and then for all other years the PPP calculation is adjusted by the relative rates of GDP price increases for each country.

as much as 25 percentage points, relative to the United States, a much differ-
ent estimate from the OECD estimated mining volume contribution of 2.7
percentage points to narrow the gap. All these studies focus on RGDP, ignore
trading gains and therefore provided an inadequate framework to understand
the very large lift in living standards that has suddenly occurred.

3. Further reflections on free gifts and their macro-implications

Trading gains are produced by *price* changes and *not* by *output* changes.
Hence, no additional resources are required to realise trading gain income.
This special feature raises three sets of interrelated questions.[23]

    First, because no additional resources are required, should trading gains be
thought of as a free gift? Can the free gift really be so large? Who receives this
free gift?[24]

    Second, because no additional resources are needed, trading gains can only
impact on RGDP through indirect output effects generated by the price
changes. What is known about these indirect output effects?

    Third, what happens if the free gift is suddenly withdrawn?

3.1 Who receives the free gift?

Currently, the trading gain is adding 12 per cent to Australian income with-
out any direct resource cost. If trading gains lead to faster changes in produc-
tion patterns, this will add to resource reallocation costs, which should be set
against the free gift, although current unemployment rates suggest that these
costs are not substantial to this point (Gruen 2011).

    The size of the free gift is an artificial construct. Its measurement only exists
when an attempt is made to estimate income in real terms, which will depend
on the deflator choice. But no individual or company only exports and spends
the revenue only on imports. Hence, there can be no simple direct mapping
from the trading gain to an individual or company. It is not possible, in prac-
tice, to be precise as to the magnitude of the gift delivered to various groups.
Trading gains are quite different from RGDP estimates which, in principle,
can be built up from individual or company outputs, income, expenditure,
and the prices received and paid. Nevertheless, rough calculations can pro-
vide some feel for who is receiving trading gain income.

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[23] These questions were not central to the 1976 analysis of resource allocation responses to a
volume-based mineral boom and among the academic community they have been largely
ignored. The Treasury and the Reserve Bank of Australia, however, have begun to focus their
attention on these issues, see Henry (2007), Lowe (2009) and more recently Stevens (2010),
Gruen (2011) and Connolly and Orsmond (2011).
[24] These remarks, of course, refer to a situation where the export price increase was not
anticipated and did not lead to investments in earlier periods that are now just receiving their
anticipated returns. Most mining investments over the previous two decades before 2003
occurred well before there was an indication of such a substantial increase in the price of min-
eral exports.

Table 1   Mining share of total: profit, compensation of employees and value added

	Current price share			Constant price share
	Profit	Total compensation of employees	Value added	Value added
1992	8.3	2.7	5.1	10.7
2002	9.2	2	5.3	10.3
2004	7.3	2.1	4.4	9.3
2006	13.3	2.4	7.4	9.4
2008	14.1	2.7	7.8	9.7
2010	14.9	3	8.6	10.1

Source: 5220.0 Australian National Accounts: State Accounts, Table 4 and Table 10.

In the first round, a substantial part of trading gains from mineral export price increases flows to resources involved in the mining export industry.

Mining is a small employer of labour. Total compensation of mining employees, as a ratio of all industry employee compensation, is very low, around 2 per cent, and this share has not changed significantly in response to the export price increase (Table 1). Labour, therefore, has not and cannot receive a significant share of the free gift through the change in the price of labour in mining relative to other industries.[25]

Mining, however, is very capital intensive and mining shareholders are first round beneficiaries of the free gift. Because the terms of trade improvement, mining profits have doubled as a proportion of all industry profits, increasing from 7 to 14 per cent, and now account for one dollar of profits in every seven; a truly exceptional change equivalent to a 4 percentage point increase in the mining profit share of current price national income. This change, however, is significantly less than the earlier free gift estimate of 12 per cent? Who receives the remaining 60 to 70 per cent of the direct trading gain? This share arises from second round effects.

Trading gains usually change the relative price of traded to non-traded goods and consumption and production patterns respond. The fall in the relative price of traded goods, usually effected in the short run by exchange rate appreciations, takes some of the initial trading gain income away from the mining industry – by reducing export prices in domestic currency – and reallocates the trading gains to those who buy imports or products with a large import component, which are now cheaper in domestic currency than they otherwise would have been. A significant share of trading gains, therefore,

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[25] Finally, Table 1 makes clear that mining industry value added in current prices has doubled as a proportion of the value added of all industry, but, in constant prices, mining value added has not changed as a proportion of industry value added. Hence, to this point, the free gift has not led to noticeable changes in real mining output or a significant increase in utilization of resources in the mining industry. These changes are yet to come. The main direct contribution to RGDP to this point flows from the construction industry building new mining facilities.
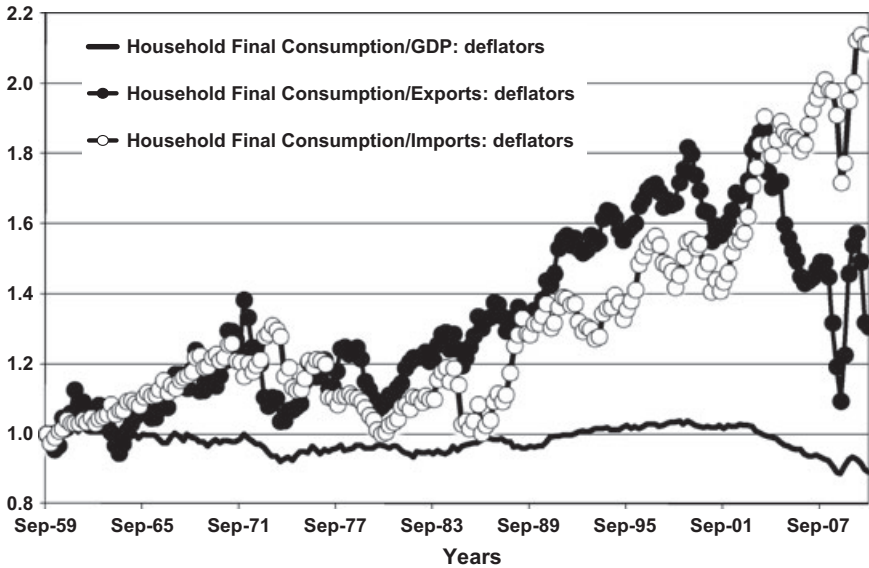
Figure 8   Price ratios (sa), Mar 1959 = 1.0, 1959–2010. Source: ABS Cat No 5206, Table 5.

are likely to be reallocated by an appreciation of the exchange rate, which leaves the terms of trade unaffected – and hence the size of the gift – but reduces both export and import prices relative to domestic prices. Because mining employs only 2 per cent of the labour force, labour will primarily receive its trading gain share through greater purchasing power generated by lower import prices.

Because trading gain income is large, it is to be expected that induced relative price changes will be large. Figure 8 illustrates this for three important price ratios: the Household Final Consumption deflator divided by the price deflator of GDP, exports, and imports.

First, after increasing steadily over the 1979–2000 period, the path of the final household consumption – export deflator ratio – suddenly changes direction in response to the large increase in export prices and falls about 30 per cent, the largest fall over this 50-year period.

Second, there is a noticeable trend change in the household consumption – import price ratio as it begins to increase at a faster pace from the beginning of the last decade as the relative price of imports fall.

Third, there has been a recent 11 per cent fall in the final household consumption deflator relative to the GDP deflator.

These large relative price changes that are producing shifts in real incomes across groups re-emphasise two important points. One point is that the focus on export price increases has tended to overshadow how important falling import prices, relative to domestic prices, have been in redistributing trading gains. Although the terms of trade are independent of exchange rate changes the traded to non-traded relative price is not. Hence, some of the recent

import price falls, relative to the household final consumption deflator, are generated by the export price effect on the exchange rate. Indeed, as was noted earlier, to this point it has been the import/GDP volume ratio that has adjusted to the terms of trade increase rather than the export/GDP volume ratio.

Another point is that because the household final consumption – import price deflator – has increased by 10 per cent relative to past trends, it may be that more than half of the terms of trade gains have been captured by those who consume imports.

Understanding the changing relative price impact on the distribution of trading gain income is a complex and neglected task, and a vigorous research agenda needs to be developed. Establishing a counterfactual path for relative prices, in the absence of trading gains, is an essential input to measuring who is receiving the free gift (Feenstra *et al.* (2009a,b)).

3.2 The importance of foreign ownership

Almost all first round trading gain income flows to mining profits. Who owns these mining profits? Could it be that most of the first round allocation of the trading gain accrues to foreign shareholders and not to Australians?

Suppose, for example, the mining sector was completely foreign owned and export prices increased but output and all other prices and costs are unchanged. Then, *all* the export price component of trading gain income would go to foreigners in the first instance, except for Australian tax receipts. Suppose further, that the trading gain profits are instantly repatriated. Under these circumstances, and putting tax receipts aside, there would be no exchange rate appreciations in response to the terms of trade increase – increased export receipts would be matched by increased overseas remittances. The mining industry would operate as a foreign enclave with no trading gains flowing to Australian residents.[26] In these circumstances, we might think of the Australian mining industry in much the same way as we think of the mining industry in some African states; an economic enclave that delivers no trading gains to domestic residents. Any income effects from export price increases will be effective not through trading gains but through indirect effects on RGDP if mining investment and output responds positively to the export price increase.

Of course, the Australian mining industry is not completely foreign owned but foreign ownership is high.[27] The two largest mining companies, BHP

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[26] This would occur to some degree even if there was a mining investment boom. The enclave aspect would be delayed until after the post-construction period when the extra exports would make few demands on Australian resources and a large share of the export receipts could be repatriated.

[27] There was a large shift in ownership between 2000 and 2005. Of the top 20 mining companies on the Australian Securities Exchange in 2000, only seven of these were still listed in Australia at the end of 2005 (Connolly and Orsmond 2011).

Billiton and Rio Tinto, seem to be about 85 per cent foreign owned, and Xstrata, the third largest, is 100 per cent foreign owned. For the industry as a whole, foreign ownership might be 80 per cent (Edwards 2011). It is surprising, therefore, that the trading gain–foreign ownership relationship has not received more analytical attention.[28]

One way to explore the empirics of foreign ownership relationships is to turn to ABS statistics. Surprisingly, however, the ABS does not publish current foreign ownership data. Furthermore, some data, which at first glance might be thought to be useful as a measure of the changing importance of foreign profits in mining, is not particularly helpful.

To adjust for foreign ownership, and measure the change in Australian consumption possibilities in response to trading gains, the ABS calculates real gross national income, RGNI, by subtracting from RGDI 'real incomes payable to and receivable from the rest of the world'. This subtraction includes dividends and reinvested earnings. If all trading gains were flowing into profits of foreign-owned companies and repatriated as dividends, the gap between RGDI and RGNI would widen significantly to encompass trading gain effects as measured by increased foreign dividends.

The RGDI-RGNI gap, before the terms of trade increase, was 2.5 per cent of RGDI. Today the gap is 3.7 per cent, an increase of only 1.2 percentage points, or about one-tenth of our earlier trading gain estimate and one-third of the mining industry profit increase. Why is the change in the RGDI-RGNI gap so small when the foreign ownership in mining is so high? The answer lies, in part, in national accounting conventions.

When companies distribute profits as dividends, the ABS appropriately subtracts foreign dividends from RGDI. The foreign dividend share is calculated in proportion to the foreign share of company ownership. But currently mining industry dividends are relatively unimportant. Profits are being kept within foreign companies as retained earnings to finance much of the new mining investment. A large proportion of trading gain foreign profits therefore is not immediately flowing out of Australia as dividends.[29]

Foreign retained profits, however, are treated quite differently from foreign dividends and are not allocated according to the foreign proportion of share ownership. The ABS, following international standards, allocates retained earnings according to a foreign influence concept (OECD, 2008).

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[28] One obvious implication of a high degree of foreign ownership is that the mining tax incidence will fall overwhelmingly on foreigners and not Australians. Looking back over the Australian mining tax debate, it does seem strange that so much of the debate was focused on the differential treatment of large and small mining firms rather than tax incidence between foreigners and domestic residents. It also seems incongruous that the foreign-owned companies that financed the advertising campaign against the mining tax, which in part lead to replacement of an Australian prime minister, stressed that Australian citizens would lose most from the mining tax rather than their foreign share holders who are overwhelmingly in the majority.
[29] World wide, Rio Tinto reinvested earnings are nine times larger than their distributed profits.

For this purpose, only the share of retained earnings attributable to foreign identities which own 10 per cent of more of the shares are treated as foreign remittances. Thus, BHP Billiton and Rio Tinto, for example, are probably classified as domestic as no one foreign entity holds more than 10 per cent of shares. On the other hand, X Strata as a wholluy owned foreign owned subsidiaty would have all its retained earning treated as foreign remittances. The adjustment of RGDI to calculate RGNI will subtract retained earnings from Xstrata but make no adjustment for retained earnings of BHP Billiton and Rio Tinto. This differential accounting treatment of the same economic phenomenon has all sorts of important implications. Thus, during the current foreign company mining investment phase, financed largely by retained earnings, there may be little indication in the changing RGDI–RGNI gap that there is a large increase in foreign profits from trading gains.

It seems clear that Australian data collection and accounting practices, as they relate to foreign ownership of the mining industry, are not as good as they should be. International national accounting conventions are not serving Australia well in this instance.[30]

To sum up, a proportion of the trading gain will accrue to foreigners and the estimated lift in Australian living standards as measured in Figure 4 will need to be adjusted downwards. The extent of the adjustment will vary through time. In the short run, my guess is that currently the foreign share of the trading gains, depending in part of the impact of the new mining tax regime, will be about one-fifth of the 12 per cent increase in 'living standards'. Currently, because of the exchange rate appreciations, most of the gains have gone to those who are consuming cheaper imports. In the long run, when the investment phase is finished, export volumes have increased, and more profits are repatriated, it should be expected that the exchange rate will depreciate and the trading gains reallocated back to the mining industry. Then, perhaps the foreign share might be about half of the trading gain, depending on the tax regime.

3.3 What if the free gift is taken away?

In the past, large Australian trading gains have tended to be short lived. Are circumstances different now? Will there the lift in Australia's living standards be permanent?

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[30] Trading gain–foreign ownership relationships become more complex when we move to the general equilibrium effects in response to any exchange rate adjustment that reallocates some of the trading gains from exporters to those who buy imports. At this point, the relative degree of foreign ownership across different sectors of the economy becomes relevant. For example, if a large proportion of the additional and cheaper imports flow to parts of the economy with a high degree of foreign ownership, or to the mining industry as investment goods, the trading gain impact on domestic residents will be less.

It is not possible to confidently predict the future terms of trade path as is evident from the surprising fact that industry and policy experts did not foresee the large, rapid, and sustained export price increase that began around 2003 (Treasury 2002-03).[31] The current consensus, however, is that the terms of trade will not fall back to previous levels, although in the past they have always done so and fallen beyond the previous low point.[32] But what if the terms of trade did fall? How far could Australian living standards decline? What adjustments would occur?

The direct living standard fall, measured by a trading gain loss, is a straightforward calculation. If the terms of trade moved back to their 2003 ratio, RGDI, without any indirect RGDP response, would fall 12 per cent. This would be the largest negative macro-shock to Australian living standards since the 1930s depression (Gregory 1988).[33]

During recent recessions, 1981–84 and 1990–1993, RGDI falls were temporary and much smaller than 12 per cent and yet they produced considerable and long-lasting increases in unemployment. In the early 1980s recession, RGDI fell 7 per cent between June 1982 and March 1983 and then increased rapidly to reach a new peak within five quarters. Unemployment, however, increased from 6.8 to 10.3 per cent over a similar period and remained high for many years. In the early 1990s recession, RGDI fell 3 per cent between June 1990 and December 1991 and then increased quickly to reach a new peak in four quarters. Once again unemployment increased to around 10 per cent and was slow to fall.

Because the trading gain loss would be two to four times, the RGDI declines during the 1982 and 1991 recessions, and would be longer lasting, could unemployment increase two to four times that of previous recessions?

Furthermore, if RGDP responds to the fall in RGDI, as might be expected, the decline in living standards will be even greater. For example, if the RGDP–RGDI elasticity were unity – a 12 per cent drop in living standards,

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[31] In the year that the terms of trade began to increase to their highest level ever in the postwar period, generated by mineral price increases, the Treasury commented in Statement Number 4 of the Budget Papers that, '*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'. Treasury 2002–03, (My italics). Treasury, along with many others, were focusing on import price changes and increased export diversification and completely missed the coming export mineral price boom.

[32] The Treasury in the 2010 Intergenerational Report assumes that the terms of trade will remain above the previous 1974–75 peak for the next 20 years but will steadily decline to be about 30 per cent above the 1980–2000 average. These projections therefore assume that Australian living standards are likely to remain above those of the US for some time unless US RGDP per capita begins to reverse its recent deterioration relative to Australia.

[33] Of course, if the terms of trade were to fall to the level predicted on the basis of long-run trends, the fall would be even greater.

generated by a trading gain income loss, produces a twelve per cent fall in production of domestic goods and services – then Australia would be subject to a 24 per cent reduction of living standards, a decline that is three to eight times greater than the fall in the 1981 and 1990s recessions. Would a 24 per cent decline in living standards produce a seven to eightfold increase in unemployment to levels in excess of 30 per cent?

These calculations might seem to be alarmist, and I think they are, but they illustrate a number of interesting and important points.

One point is that a real income loss from removal of a 12 per cent trading gain, and assuming a RGDP-RGDI elasticity of unity, produces a living standard loss that is very similar to the last decade loss in US living standards relative to Australia. So the mechanical calculation of changing living standards if the free gift is taken away seems about right. So why do I not believe that a 24 per cent reduction in living standards would increase Australian unemployment to three to eight times that of the 1981 and 1991 recessions? Is it because a living standard loss of one dollar of trading gains is quite different from a living standards loss of one dollar of RGDP? It must be related to this, in part, because relative unemployment between Australia and the United States only changed by about 5–6 percentage points and not 24 percentage points.

There are many slippages between living standard changes and labour market outcomes as measured by employment and unemployment. These slippages can be summarised by key parameters that need to be better understood.

First, employment responds to RGDP and not to direct trading gains. So the first parameter of interest is how RGDP responds to trading gain losses. If RGDP is unaffected by the trading gain removal, then presumably nothing happens to employment even though living standards are significantly reduced. All the trading gain income loss falls on imports. But this seems an extremely unlikely event except in the long run. In the short run, RGDP should fall, reduce employment and contribute further to the reduction of living standards. The RGDP–RGDI elasticity should not be zero.

So what might be a reasonable guess as to the RGDP elasticity to a trading gain loss? How might this elasticity change over time? There have been very few attempts to answer these important questions, partly because Australia has not found itself in this situation since the Korean War. But there are some indirect estimates that can be found.

First, in an appendix to an OECD paper, Turner (2006) uses 2006 simulations of the Treasury TRYM model to measure the effect of a terms of trade increase.[34] These simulations suggest, in the first year, that RGDP

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[34] Although the model had been fitted to data before the recent large terms of trade changes, the output simulations can be used to provide some idea of the relevant elasticity. The simulations are for a 7 per cent increase in the terms of trade from an increase in export prices. This is equivalent to a 1.4 per cent trading gain. We assume symmetry and linearity of the response.

falls in response to the living standard increase, the fall being generated by resource reallocation across industry in response to the exchange rate appreciation. From the second year, RGDP begins to increase, the elasticity is about 0.15 per cent, and from the third year forward the elasticity remains at about 0.4 per cent. An elasticity of 0.4 per cent suggests that a trading gain loss of 12 per cent would produce a RGDP loss of about 5 percentage points; this would produce a marginally greater RGDP loss than that of the recessions of the early eighties and nineties although, in this instance, it would be a permanent rather than a cyclical loss. The permanent loss must have very adverse effects on unemployment as in the previous recessions the loss of living standards only lasted four or five quarters.

Is 0.4 per cent a reasonable estimate for this elasticity? I don't know. It depends, in part, on the time period. Living standard changes generated by trading gain changes are made effective through import variations. So, in the long run, the trading gain RGDP elasticity could be very low as imports rise or fall to deliver the changing trading gain contributions to changing living standards. In this short run, however, the RGDI-RGDP elasticity might be higher because of the investment response.

Second, there may be a link between changes in trading gains and changes in labour productivity although the nature of this link is not clear. The sketchy empirical evidence seems to suggest, somewhat surprisingly, that trading gain income may reduce productivity both in the mining industry and at the macroeconomy level (Macdonald 2010).[35] This association is already evident in the Australian data.

Third, depressed labour demand leads to withdrawal from the labour force, which acts to mute the unemployment increase when trading gains are withdrawn. Since 2003, relative employment between the United States and Australia has fallen 12 per cent but 60 per cent of this fall has been reflected in relative labour force participation rate withdrawal rather than relative unemployment increases.

To conclude, very little is known about the interrelationships between variations in living standards, RGDI, RGDP, employment, and unemployment. Given our extensive ignorance the simple empirical exercise of adopting a US counterfactual is probably the best that can be done at this point. But the need for more research, probably with an econometric economy-wide model framework, is essential.

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[35] At the macro level, Macdonald (2010) remarks that the four countries with the largest increase in trading gains have all experienced relative productivity declines but offers no explanation as to whether this association is causal. At the micro level, the ABS (2010) and Topp *et al.* (2008) have recently provided productivity estimates that show, between 1974–75 and 2007–08, that multifactor productivity has fallen in mining by 25 per cent and, over this 30-year period, mining has been the only industry that has reduced Australian living standards by productivity falls.

4. Concluding remarks

I have welcomed the opportunity to provide these reflections and have been surprised at the wide range of emotional responses and intellectual challenges I have experienced.

I have been excited by the process of documenting the extraordinary changes that are occurring in the Australian economy. In peace time, and over such a sustained period, Australia has never experienced such a large increase in income relative to so many other advanced economies. It now appears, following current national accounting practices, that Australian per capita income levels have increased about 25 per cent relative to the United States and now exceed US levels.

It has been difficult to tie together in a coherent and simple way the large changes that have been occurring. It is frustrating not to understand better the wide range of theoretical and empirical links between trading gains, foreign ownership, RGDP, productivity, and labour force changes. There is considerable theorising, model building, and data collection yet to be done.

One area in which I have felt least comfortable is the analysis of future possible time paths of the mineral boom. A significant fraction of RGDP, and the employment growth being generated today, is not from an export volume boom but from a construction boom as new mines are built. This has two interesting features. One feature is that the mining boom is primarily foreign financed, largely from retained earnings and this foreign investment 'inflow' may be accounting for a significant proportion of the exchange rate appreciation that is allocating a significant proportion of the trading gain to wage and salary earners. The other feature is that construction is a labour-intensive activity, which is generating substantial employment and RGDP increases. When construction stops, these two features of the mining boom will disappear. Additional mining exports will add to RGDP but employ very little labour. Export profits will be increasingly repatriated and offset potential exchange rate appreciations induced by the extra exports. The exchange rate should depreciate. Does this scenario imply a substantial resource reallocation back to the industries that they previously left? Can this return be as easy as the reallocation that is occurring in response to the investment boom or will there be a long drawn out period of insufficient employment? Furthermore, productivity will increase as exports increase but the productivity gains will largely accrue to foreigners.

Another worrying issue is that a substantial proportion of the RGDI gain in living standards is being delivered to wage earners by real wage increases generated by lower import prices in response to the exchange rate appreciations. These price changes have significantly lowered inflation in Australia. If the exchange rate begins to depreciate, it will reallocate trading gain income back to mining industry profits through higher export prices in domestic currency and away from labour. The real income falls for labour will make it difficult to manage the transition phase from construction to export growth.

To conclude, I have been surprised that the simple question – What difference does it make whether the mining boom is generated by a price or volume increase? – has led to reflections that are so wide-ranging and untidy, perhaps an inevitable outcome of the rapid changes that are occurring. We are certainly living in extremely interesting times, but hopefully not in the 'Chinese' sense of the phrase, although China is largely at the centre of these amazing changes.

References

Australian Bureau of Statistics (2001). Real net national disposable income – a new national accounts measure. Australian National Accounts: National Income, Expenditure and Product (Cat. No. 5206.0), December Quarter.

Australian Bureau of Statistics (2004). *The terms of trade and the national accounts*, *Australian National Accounts: National Income, Expenditure and Product, September Quarter 2004*, Cat. No. 5206.0, ABS, Canberra.

Australian Bureau of Statistics (2010). *Experimental Estimates of Industry Multifactor Productivity, Australia: Detailed Productivity Estimates*. Cat. No. 5206.0.55.002. ABS, Canberra.

Australian Bureau of Statistics (2011). *Australian National Accounts; National Income, Expenditure and Product*. Cat. No. 5206.0. ABS, Canberra, March.

Australian Treasury (2002-03), Statement 4, ''Australian terms of trade, stronger and less volatile'', Budget Paper No. 1, Budget Strategy and Outlook, 2002–03, Canberra.

Battersby, B. (2006). Does distance matter? The effect of geographic isolation on productivity levels, *OECD Economic Studies* 42 (42), 206–225.

Blundell-Wignall, A. and Gregory, R.G. (1990). Exchange rate policy in advanced commodity – exporting countries. the case of Australia and NZ. OECD Economic Development, Working Paper 83, OECD Publishing.

Chen, V., Gupta, A., Therrien, A.D., Lervanon, G. and van Ark, B. (2010). Recent productivity developments in the world economy: an overview from the conference board total economy database. International Productivity Monitor, The Conference Board.

Coleman, W. (2008). Gauging economic performance under changing terms of trade real gross domestic income or real gross domestic product, *Economic Papers* 27 (4), 1–116.

Connolly, E. and Orsmond, D. (2011). The mining industry: from bust to boom, the australian economy in the 2000s. Reserve Bank of Australia, 15–16 August.

Corden, W.M. (1960). Geometric representation of policies to attain internal and external balance, *Review of Economic Studies* 28, 1–22.

Corden, W.M. (1984). Booming sector and dutch disease economic survey and reconcilation, *Oxford Economic Papers* 33, 59–380.

Corden, W.M. and Neary, P. (1982). Booming sector and de-industrialization in a small open economy, *Economic Journal* 92, 825–845.

Davis, G. and Rahman, J. (2006) Perspectives on Australia's productivity prospects. Treasury Working Paper, 2006–04, September.

Diewert, W.E. and Morrison, C.J. (1986). Adjusting output and productivity indexes for changes in the terms of trade, *The Economic Journal* 96 (383), 659–679.

Dorrance, G.S. (1948-1949). The income terms of trade, *The Review of Economic Studies* 16 (1), 50–56.

Edwards, N. (2011). Foreign ownership of Australian mining profits. Briefing paper prepared for the Australian Greens.

Feenstra, R.C., Heston, A., Timmer, M.P. and Deng, H. (2009a). Estimating real production and expenditure across nations: a proposal for improving the penn world tables, *The Review of Economics and Statistics* 91 (1), 201–212.

Feenstra, R.C., Mandel, B.S., Reinsdorf, M.B. and Slaughter, M.J. (2009b). Effects of terms of trade gains and tariff changes on the measurement of US productivity growth. NBER Working Paper, 15592, Dec.

Forsyth, P.J. and Kay, J.P. (1981). Oil revenues and manufacturing output, *Fiscal Studies* 2 (2), 9–17.

Gregory, R.G. (1976). Some implications of the growth of the mineral sector, *Australian Journal of Agricultural Economics* 20, 71–91.

Gregory, R.G. (1988). An overview, in Gregory, R.G. and Butlin, N.G. (eds), *Recovery from the Depression Australia and the World Economy in the 1930s*. Cambridge University Press, Melbourne, pp. 1–30.

Gregory, R.G. (1993). Aspects of Australian and the US living standards; the disappointing decades 1970–1990, *Economic Record* 69 (204), 61–76.

Gregory, R.G. and Frijters, P. (2006). From golden age to golden age, Australia's great leap forward, *The Economic Record* 82 (257), 207–224.

Gruen, F.H. (1975). The 25% tariff cut was it a mistake?, *The Australian Quarterly* 47 (2), 7–20.

Gruen, D. (2006). A tale of two terms of trade booms. Economic Roundup, Treasury, Summer, 21–34.

Gruen, D. (2011). The macroeconomic and structural implications of a once in a lifetime boom in the terms of trade. Address to the Australian Business Economics Annual Conference, 24 November.

Henry, K. (2007). Achieving and maintaining full employment. The 2007 Sir Roland Wilson Foundation Lecture, Canberra, August.

Kohli, U.R. (2004). Real GDP, real domestic income and terms-of-trade changes, *Journal of International Economics* 62, 83–106.

Long, N.V. (1983). On the effect of a booming export industry on the rest of the economy, *Economic Record* 59, 57–60.

Lowe, P. (2009). The growth of Asia and some implications for Australia. Reserve Bank of Australia, Bulletin, November.

Macdonald, R. (2010). Real gross domestic income relative prices and economic performance across the OECD, *Review of Income and Wealth* 5 (3), 449–650.

Maddock, R. and McLean, I. (1983). Supply side shocks, the case of Australian gold, *The Journal of Economic History* 44 (4), 1047–1067.

McDonald, T. and Morling, S. (2011) Reasons for resilience: the Australian economy and the global downturn Part 1. Economic Roundup, Issue 2, Commonwealth of Australia.

Morling, S. and McDonald, T. (2011). The Australian economy and the global downturn Part 2: the key quarters. Economic Roundup, Issue 2, Commonwealth of Australia.

Nicholson, J.L. (1960). The effect of international trade on the measurement of real national income, *Economic Journal* 70, 608–612.

OECD (2008). *Benchmark Definition of Foreign Direct Investment*, 4th edn. OECD, Paris.

Rahman, J. (2005). Comparing Australian and United States productivity. Economic Roundup, Autumn, Commonwealth of Australia, Canberra.

Reinsdorf, M.B. (2010). Terms of trade effects, theory and measurement. The Review of Income and Wealth, Series 56, Special Issue, June.

Reserve Bank of Australia (2005). Commodity prices and the terms of trade, *Reserve Bank of Australia Bulletin* April, 1–7.

Salter, W.E.G. (1959). Internal and external balance; the role of price and expenditure effects, *Economic Record* 35, 225–230.

Shann, E.W. (1983). *Policy Issues in Mineral Sector Growth, A Keynesian Model*. Discussion Paper No. 60, December, Centre for Economic Policy Research, Australian National University, Canberra.

Silver, M. and Mahdavy, K. (1989). The measurement of a nation's terms of trade effect and real national disposable income within a national accounting framework, *Journal of the Royal Statistical Society, Series A* 152 (1), 87–107.

Snape, R. (1977). Effects of mineral development and the economy, *Australian Journal of Agricultural Economic* 21, 147–156.

Stevens, G. (2010). The challenge of prosperity. Address to the Committee for the Economic Development of Australia (CEDA), Melbourne, 29 November.

Stoeckel, A. (1979). Some equilibrium effects of mining growth on the economy, *Australian Journal of Agricultural Economics* 21, 1–22.

Swan, T.W. (1960). Economic control in a dependent economy, *The Economic Record* 36, 57–66.

Taussig, F.W. (1927). *International Trade*. The Macmillan Co., New York.

Topp, V.L., Soames, D., Parham, D. and Bloch, H. (2008), Productivity in the mining industry; measurement and interpretation. Productivity Commission Staff Working Paper, Dec.

Turner, D. (2006). Should measures of fiscal stance be adjusted for terms of trade effects. Economic Department Working Paper, No 519, OECD Paris.

United Nations (1968). *A system of national accounts*, *Studies in Methods*, Ser. F, No. 2, 3rd Revn. United Nations, New York.

United Nations (2008). *System of National Accounts 2008*. New York.

Warr, P. (2006). The Gregory thesis visits the tropics, *The Economic Record* 82 (257), 177–194.

Wilkie, J. and McDonald, T. (2008). Economic geography and economic performance in Australia. Economic Round-up Issue No. 3, The Treasury, Australian Government.

Wilson, R. (1931). *Capital Imports and the Terms of Trade Examined in the Light of 60 years of Australian Borrowing*. Melbourne University Press, Melbourne.