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FOREWORD

Regional economic analysis is hampered by the lack of reliable and consistent indicators of change in overall economic activity at the regional level.

This information paper makes a case for the adoption of taxable income as an indicator of economic activity in Australia's regions. It presents statistical analyses and case studies to demonstrate the superiority of taxable income over either population or employment as an indicator of regional economic activity. In doing so it provides a glimpse of the potential of this measure to facilitate spatial analysis of national and regional economic activity and events.

This report is the third release in the Bureau of Transport and Regional Economics (BTRE) *Focus on Regions* series. The series presents empirically based analysis of the spatial dimensions of regional development issues. A complementary *Taxable Income Database* is available at www.btre.gov.au.

This report and the accompanying database were prepared by Geoff Frost, Bree Cook and Leanne Johnson. Dr Judith Winternitz provided executive supervision.

Phil Potterton
Executive Director

Bureau of Transport and Regional Economics (BTRE)
Canberra
June 2005

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EXECUTIVE SUMMARY

This paper explores the potential of the BTRE's *Taxable Income Database* 1980–81 to 2000–01 to shed light on the geographic distribution of production and consumption in the Australian economy. This is a newly developed database derived from individual taxation returns. It makes an initial assessment that the data set is theoretically sound and consistent with, but superior to, existing data sources. It concludes that this data set has the potential to significantly advance the quantitative study of regional economics and development in Australia.

New Regional Measurement Tools

As a nation, Australia has experienced strong economic growth over recent decades, exceeding that of most OECD nations, and in line with that of the United States, Canada and the United Kingdom. To date, however, it has been difficult to ascertain how this strong economic growth has been distributed across Australia's regions.

This information paper proposes the use of regional Aggregate Real Taxable Income (ARTI) as an indicator of economic activity at the sub-state spatial level including at the Statistical Local Area (SLA) and Local Government Area (LGA) levels. It presents and analyses statistical information about ARTI in Australia's regions and argues its theoretical and practical superiority as an indicator of change in economic activity compared to either population or employment numbers. ARTI is more closely related to Gross Domestic Product (GDP) – the accepted source of information on economic activity at the national level – than the other indicators. Movements in GDP and ARTI for Australia are closely aligned. Similarly at State and Territory level, ARTI is shown to be a good measure of economic activity when compared to Gross State Product in most jurisdictions.

At the remoteness class, SLA and LGA levels, the conceptual advantage of the indicator is sufficient to justify its provisional acceptance in the short term. Full practical assessment of the relative efficacy of ARTI can only be confirmed in time with the general acceptance of economists, regional governments, businesspeople and communities that the data and trends shown in the data accord with real economic experience. The paper provides some preliminary analyses for consideration by these groups and invites readers to comment and share their experiences.

As well as ARTI, this paper proposes another indicator to track regional and economic change: Real Income Per Taxpayer (RIPT). RIPT provides a regional insight into average income and is likely to be especially useful in the understanding of interregional equity issues.

Using the Database

As the BTRE's *Taxable Income Database* contains twenty years of data for consistent regional boundaries it is potentially a rich source of information for regions regarding both long-term trends in economic activity and short-term fluctuations in response to economic shocks. The information paper draws out some early conclusions and presents a number of potential applications, including that:

- most of Australia's regions have shared in the positive economic growth experienced by Australia over the last twenty years. However, for the majority of regions, growth was below the national average. One in three regions experienced stronger economic growth than the national average, while about one in four experienced decline. Remote and inland non-metropolitan regions have generally not fared as well as coastal or larger metropolitan and capital city areas. Strong growth was evident in a large number of coastal areas, and outer fringe urban areas, due to growth in population. Economic decline was most common among agricultural regions with a relatively small population base.

- the economic activity of Australia's regions tends to be very closely linked to the national economy. However, this is not universal, with metropolitan regions tending to be more closely aligned to national trends than non-metropolitan regions. Economic growth appears closely tied to a region's level of remoteness, with economic growth highest in the major cities. Regions with economies closely tied to export industries are less closely aligned to national growth patterns.

- national indicators of annual economic growth can hide large variations in regional growth. For example, economic growth patterns in metropolitan areas have been fairly consistent across the 1980s and 1990s with a strong correlation between the LGA growth rates of regions in the two decades. However, in non-metropolitan areas, there is no significant correlation — growth in the 1980s and growth in the 1990s are unrelated.

- the 1980s saw a decline in the overall RIPT in Australia and substantial increase in the difference of RIPT between Australia's regions. Whilst in the 1990s RIPT levels increased, the level of inequality between regions continued to grow.

- capital cities have higher RIPT than the rest of Australia and the gap between them and non–capital city regions has widened considerably since the early 1980s. Similarly, within capital cities, there is evidence of divergence in RIPT of the most affluent and least well off suburbs, due to very high RIPT growth in regions which already had the highest average incomes in 1980–81.

- outside of the capital cities, there is convergence in RIPT through strong growth in regions which started with relatively low RIPT in 1980–81. These regions have tended to "catch up" to regions with a higher starting base.

- investigation of the spatial impacts of the early 1990s recession finds that the decline in economic activity was reflected in the majority of Australia's LGAs. For rural and remote regions, which often have economies that are highly dependent on a single agricultural or mining commodity, the effects of the national recession were dominated by market conditions for that commodity. Regions with a high RIPT tended to experience the greatest declines in income over the recession period. This pattern was most evident in urban areas, and may reflect the effect of greater reliance on non-wage sources of income.

A number of analyses have been conducted in specific regions to look at the ability of the *Database* to cast light on local issues. Five issues and regions are presented in this paper:

- quantification of the overall size and the historical growth of RIPT in suburbs on the north shore of Sydney. This shows that these areas have built on historically high levels of personal income with higher than average levels of growth over the past twenty years.

- the timing and extent of the impact of the 1989 pilots' strike on the tourist-reliant economy of Port Douglas in Far North Queensland. Surprisingly, the expected initial sharp decline was not relieved by the return to normal operations and the effects continued to be felt in the local economy three years after the strike was over.

- ARTI and RIPT are used to show the impact on whole communities of the different water management regimes of the States bordering the Murray River. The data also allows the identification and analysis of "sponge regional city" effects which have been confirmed by local observers.

- growth trends and key development drivers have been analysed for the Townsville-Thuringowa area of North Queensland using taxable income data

- regression analyses are presented to examine the factors impacting on the regional economies in the wheat/sheep belt of Western Australia. These analyses shows that for the towns studied around half of the variation in ARTI of Local Government Areas can be explained using extremely simple measures of national economic activity, drought, national wheat and wool price. The impacts revealed by the regressions are consistent with the known facts regarding industry structure, size of centres and the ability of different production mixes to respond to drought. The success of this exercise suggests that the *Database* may provide the basis for the development of local models to predict economic impacts.

This Information Paper concludes that the BTRE's *Taxable Income Database* provides an exciting new time series measure of economic growth which will open up the quantitative study of Australia's regions in ways that until now have not been possible. The *Database* can be linked with other sources of regional information, in order to gain a richer understanding of the factors influencing regional growth and decline, and to provide another tool for policy analysis.

CHAPTER 1 INTRODUCTION

1.1 OLD AND NEW INDICATORS OF REGIONAL ECONOMIC ACTIVITY

Regional economic analysis is restricted by the lack of reliable and consistent indicators of overall economic activity at the regional level. The internationally accepted measure of national economic activity Gross Domestic Product (GDP) is not available at a small-area level in Australia[1]. Much of the understanding of economic activity in regions to date has, by default, been based on:

- regional comparisons at a single time point, such as census snapshots; or
- looking at proxies of economic activity, such as employment and population growth.

This paper presents new data series for analysing regional economic growth, based on Australian Taxation Office (ATO) taxable income data. The BTRE has reorganised and recreated the original data into a single, consistent 20-year time series at small area level to compile a user friendly resource.[2]

The BTRE's *Taxable Income Database* is derived from the taxable information reported by *individual* taxpayers to the ATO in tax returns during a given financial year but provides:

- data in real (2002–03) dollars to allow easy comparison over time[3]; and,

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[1] The ABS does however calculate and publish a GDP based figure at the state and territory level known as Gross State Product (GSP).

[2] The data has been developed through the application of Australian Bureau of Statistics concordances to existing Australian Taxation Office (ATO) postcode-based data over the period 1980–81 to 2000–01. The result is a twenty one year time series based on consistent Local Government Area (LGA) boundaries and an eleven-year time series (from 1990–91) based on consistent Statistical Local Area (SLA) boundaries as defined in the Australian Standard Geographical Classification 2001 (ABS 2001a).

[3] All dollar figures in the database have been adjusted for changes in prices (i.e. for inflation) using the national Consumer Price Index (CPI).

- data on consistently defined spatial regions to allow comparisons of Australia's Local Government Areas (LGAs) and Statistical Local Areas (SLAs)[4].

1.2 OVERVIEW OF THE INDICATORS PROVIDED IN THE DATABASE

The BTRE Taxable Income Database presents a number of key indicators at small area (Statistical Local Area and Local Government Area) levels for the period 1980–81 to 2000–01.

Aggregate real taxable income (ARTI)

Aggregate real taxable income (ARTI) is the sum of individual taxable income recorded for all individuals that reside in a region (defined here as SLA or LGA).

The reported individual taxable income is an undifferentiated aggregate of all the income accruing to taxpayers from any source. It therefore includes income derived from salary and wages, net business income, distributions from partnerships or trusts, interest and dividends, eligible termination payments, some government pensions and allowances, superannuation payments and reportable fringe benefit amounts less any allowable deductions. ARTI does not include the income of individuals who earned below the tax-free threshold, either positive or negative. Also, taxable income for companies, funds, trusts and partnerships is *not* included[5].

ARTI is obviously a good indicator of the amount of income received by residents of the region. For many regions it will also provide an insight into the levels of production in a region, however ARTI has some limitations and care needs to be taken in making this link[6].

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4 For the purposes of this Information Paper, the definition of regions used is based on individual SLAs and LGAs (and in the case studies, groups of these smaller building blocks as specified).

5 Whilst there have been some changes to the definition of taxable income over the last two decades, the impact of these is considered to have been relatively minor. Most changes to the income tax system have involved changes to tax rates and do not affect the calculation of taxable income itself. Further discussion of this issue is at Chapter 7.

6 Whilst ARTI will always reflect the returns to a region from the factors of production owned by the people of the region, it may not reflect the actual physical location of the production process. Often, especially within major urban areas, people work in one region and reside in another and income from other sources such as interest payments, investments or pensions is likely to be derived from activities across a number of regions. Hence using ARTI for comparison of production in different regions requires some care.

Despite these limitations, ARTI provides a measure of the overall size of the economy of a region and changes are indicative of changes in the total economic activity in a region. This indicator is therefore useful for measuring regional economic developments over time, but is generally not as useful for inter-regional comparisons unless the figures are scaled in some way – for example by comparing rates of growth of ARTI.

A very simple but important observation of ARTI can be made at this stage. Changes over time may come from either a **change in the number of taxable individuals** in a region or **change in the income of those individuals** or both.

Real income per taxpayer (RIPT)

Real income per taxpayer (RIPT) is the aggregate real taxable income (ARTI) divided by the number of taxable individuals (NTI) in a region.

RIPT is an indicator of individual economic wellbeing — that is, how much on average an individual taxpayer of a region receives. Note here that RIPT is only an *indicator* of the average income of regional residents. People who did not submit a tax return or those who had taxable incomes below the income threshold are not included and so RIPT is likely to overestimate the actual average income of regional residents.[7]

As the indicator is not dependent on the region's population size, it can be used to compare incomes across regions, as well as over time.

Number of taxable individuals (NTI)

The number of taxable individuals (NTI) is the number of people who submitted tax returns on which tax is payable. That is, people with a taxable income above the tax-free threshold.

The number of taxable individuals is often discussed in relation to the ARTI and the RIPT, since RIPT is calculated as ARTI/NTI.

Some thought should be given to the selection of regional boundaries if the physical location of production is an important issue. Common sense suggests that ARTI is more likely to reflect the physical location of productive activity in small rural regions than within major urban settings or in regions containing large numbers of retirees.

7 This has been confirmed by calculations undertaken by the Rural & Regional Statistics National Centre (ABS 2005a)

Change in the NTI usually reflects variation in the population of a region, but strictly is a measure of the number of people actively participating in the economy rather than population.

Number of non-taxables

The number of non-taxables represents the number of people who submitted a tax return on which no tax was payable (that is, the income was below the tax-free threshold). Figures are provided for this parameter for all but the first two years of the database (1980–81 & 1981–82), under the heading "Non-taxables". Arguably, this series could be included with the NTI as an indicator of the number of economically active individuals.

Throughout this paper the "number of non-taxables" may be referred to as the "number of non-taxable individuals" or sometimes "non-taxables".

Aggregate real net tax (ARNT)

The database also includes the aggregate real net tax (ARNT) for each region. Whilst this is generally not discussed in this paper, it could potentially be used to provide insight into inter-regional transfers resulting from the national system of income tax. This series represents the actual tax paid by individuals.

1.3 HOW USEFUL ARE THE INDICATORS IN THE DATABASE?

These indicators describe parameters of economic and social interest in their own right. However we propose they have additional value as indicators of economic and social activity and change in regional economies. In particular, the paper proposes ARTI as a measure of overall economic activity for regions.

The major advantage of taxation based statistics is that they provide a spatial dimension to income statistics that until now has not been routinely available. These income based statistics have the potential to replace the two commonly available alternative measures of small area economic activity and growth — population and employment. As a consequence, a theme of what follows in this paper is to compare ARTI with those other commonly used indicators and where possible test all three against the commonly accepted standards of Gross Domestic Product (GDP) and Gross State Product (GSP).

Chapter 2 looks at the conceptual properties expected of an indicator of economic progress and compare the three potential small area indicators on the basis of theoretical considerations, measurement and estimation techniques and availability in appropriate geography.

Chapter 3 looks at international and national statistics and the similarities and differences in the relationship between ARTI, population, employment and GDP since 1960–61. This chapter also explores the close relationship between GDP and ARTI growth and investigates some of the historical economic factors and events that impacted on it.

Chapter 4 looks at the relative performance of the States and Territories over the past 20 years and explores the statistical relationship between State and Territory ARTI, Gross State Product (GSP) and GDP. This chapter also examines the overall spatial patterns of taxation data using the ABS's remoteness classes. Snapshots and trends in remoteness classes are used to explore some of the spatial differences and similarities across the nation.

Chapter 5 compares population and employment with taxation statistics at the small area (SLA and LGA) levels. It goes on to examine the patterns revealed by examination of sub-regions and Australia as a whole using parameters such as growth in ARTI, correlation of small area ARTI with national growth, persistence in ARTI growth over time, distribution of RIPT, growth of RIPT, correlation with the national growth in RIPT and persistence in the growth of RIPT over time. This chapter provides an insight into the spatial and temporal patterns across the Australian continent in a way only before glimpsed by examination of other datasets.

The following two chapters look at some potential applications of the *Taxable Income Database*. Chapter 6 uses the database to examine some of the spatial implications of the 1990s recession as well as the issue of income convergence as a result of growth in the 1980s and 1990s. As interesting as these issues are in themselves, the underlying theme of this chapter is to demonstrate the ability of the *Database* to afford insight into the regional impacts of national economic events and fresh insight into the nature of the events themselves.

The *Database* is potentially a rich source of information for the analysis of smaller regions. The five case studies presented in Chapter 7 consider long-term trends in economic activity and shorter-term fluctuations in response to economic shocks concluding with a study using multiple regression to analyse ARTI in a number of wool and wheat regions in Western Australia. This last study suggests the potential for the *Database* to underpin regional modelling exercises.

Technical aspects of the construction of the *BTRE Taxable Income Database* are provided in Appendix I. The appendix examines the methodology used to develop the database, including explanations of the estimation process and the application of geographic concordances. Advice on using the database is also provided including the limitations and qualifications to be applied to its use.

CHAPTER 2 AGGREGATE REAL TAXABLE INCOME AS AN INDICATOR OF ECONOMIC ACTIVITY

Comparisons of economic performance at the sub state regional level are important. National and state based analyses centred on production (GDP and GSP) can overlook significant spatial differences in economic status within Australia. Whether it is the relative rates of growth of Sydney, Melbourne, Perth and Adelaide, the capacity of small communities to resist the "drift to the cities" or tracking of economic expansion in Queensland compared to the southern states, the ability to identify and quantify economic trends amongst and between regions is important for public policy and private investment.

To date, the spatial statistics available to assist with these issues have been limited. Possibly due to the lack of suitable alternatives, two annual data series have become routinely used as indicators of regional economic growth or decline – population and employment numbers[8]. This paper argues that ARTI provides a more accurate indicator of economic status for sub state regions.

2.1 COMPARISONS OF ARTI, POPULATION AND EMPLOYMENT AS INDICATORS OF REGIONAL ECONOMIC ACTIVITY

Some conceptual issues

At the national level, the conventional measure of economic activity is Gross Domestic Product (GDP)[9]. GDP is a measure of production for the economy as a

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8 These indicators were developed for demographic purposes and to allow the calculation of the unemployment rate. They have subsequently been dragooned into service as estimates of regional economic progress.

9 GDP has general acceptance, although a number of commentators point to its limitations in terms of its ability to reflect social and environmental change — England (1996) or Hamilton (1997). However, alternate measures have not found sufficient favour among economists or the general public to replace GDP as the commonly accepted standard for assessing national economic activity.

whole. It is calculated as the sum, for a particular period, of the gross value added of all resident producers ABS (2000)[10].

The Australian Bureau of Statistics (ABS), as one of its major functions, publishes annual national and state level economic statistics, including GDP and Gross State Product (ABS 2002a, ABS 2003a). GDP is calculated in accordance with internationally accepted standards and is the key indicator of economic activity at the national level. Unfortunately, no similar indicators are produced for smaller regions.[11]

In searching for a measure of regional economic activity, we are looking for the regional equivalent of GDP — ie Gross Regional Product (GRP). It is reasonable to assume that GRP, if it were to be calculated, would be accepted as the standard measure of a region's economic activity.

Conceptually, the total value of a region's economic activity can be defined (and in the case of GDP, measured) as the value of production and estimated as the sum of the returns from labour, capital and land to the people in that region. That is:

Gross Regional Product (GRP) = *f*(Economically active population, returns from labour, capital and land to that population)

Simply put, GRP is a function of the number of people receiving income in the region and the amount they earn.[12] Changes in either factor will impact on GRP.

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10 Gross value added is equal to output less intermediate consumption. GDP less consumption of fixed capital (depreciation) is called net domestic product. GDP can also be derived as the sum of factor incomes (compensation of employees, gross operating surplus and gross mixed income) and net taxes on production and imports; and as the sum of all final expenditures by residents (final consumption expenditure and gross fixed capital formation), changes in inventories and exports less imports of goods and services.

11 For more information on the method of calculation of GDP see ABS (2000) or Harris (1989).

12 This definition is somewhat controversial as it attributes product(ion) on the basis of the residential address of owners of the factors of production. As noted above, this is not necessarily the same region in which the production actually takes place. Often (especially in non-metro areas) the result is the same, but where there is travel between regions (eg. in metro areas or fly in/fly out mining operations) the outcome can be quite different. Arguments can be made for either method, with some people preferring the actual site of production (although identifying this will be extremely difficult for many industries) whilst others will seek to recognise the importance of the supporting role played by regions where the factors of production reside. The argument for the latter view can be shown using a fly in/fly out mining example. Consider a mine in the WA goldfields owned by Perth residents which flies in all its labour and other supplies directly from Perth. The mine will have limited impact on the goldfields economy but a considerable impact on Perth's. The mine's production will draw much more on Perth based assets (labour and capital supported by

Both population and employment are, at best, coarse indicators of economic activity — they are after all, intended for other uses. **Population** figures only estimate the first part of the above function — the potential number of recipients of economic returns in a region. Using population as an indicator of spatial or temporal differences in GRP implicitly assumes that people across space and/or time on average receive equal incomes. This assumption is unlikely to hold, given differences in populations with respect to age, education, social status, wealth etc.

The use of **employment** numbers partially addresses this problem since it focuses on the number of people actually physically involved in the economic process. Compared to population counts, this figure reduces distortions due to interregional differences in the numbers of children, young adults not yet in the workforce, the unemployed or retirees. However, the assumption of equal distribution still remains across this smaller group. In addition, this indicator focuses entirely on returns to labour and so disregards the contribution of returns from capital and land. Whilst wages and salaries are the dominant source of income (ATO 2002), investment returns from land and capital are likely to be especially significant in regions that are wealthy or where there are high numbers of retirees.

Neither population nor employment numbers address the second part of the function — differences in the <u>amount</u> of money received by the people of a region. So although these indicators provide a approximate measure of economic activity — few people would seriously dispute that large or long term increases or decreases in population or employment are likely to reflect similar changes in GRP — they do not provide a full picture. Differences in the amount of income received by people within regions will almost certainly confound the one to one relationship between these indicators and GRP.

Taxation based data on the other hand mirror both aspects of the above relationship. Specifically relationship between the key indicators in the database can be written as:

Aggregate Real Taxable Income (ARTI) = Number of Taxable Individuals (NTI)
X Real Income Per Taxpayer (RIPT)

From this equation it is clear that ARTI incorporates indicators of both the number of people receiving income in the region and the amount they receive. Consequently we could expect ARTI to respond in a similar way to GDP, GSP and GRP. However, whilst ARTI is similar to GRP, it is definitely not the same. In particular, business income that is not distributed to Australian owners is not

Perth based communities) than the goldfields (land/ore) and so can be described as an activity of the Perth population rather than that of the goldfields.

included; ARTI excludes people with taxable income below the tax threshold (currently $6000) and individual taxable income is defined by taxation laws which include considerable allowances for deductions and therefore is different to the definitions of income used in calculating GDP. Further, there are a number of other definitional and measurement issues that complicate the comparison. The impact of these differences is significant – nationally ARTI is only around fifty per cent of GDP. In addition, spatial impacts of the redistribution of income by governments mean that ARTI is likely to be even less representative of the value of production in any specific region.

We can therefore conclude that from a conceptual viewpoint, although ARTI is a much more satisfactory <u>indicator</u> of economic activity than either population or employment numbers, it can by no means be regarded as an accurate <u>estimate</u> of GRP.

Measurement, Availability and Geography of the Potential Indicators

Table 2.1 provides a summary of some characteristics of the three potential data sets. A more detailed discussion of the differences relating to the three indicators is provided in Appendix II. As the table suggests, the quality of the ARTI figures provided in the BTRE *Database* is at least equal to either population or employment data at the SLA and LGA level. The consistency of this data with ABS census and its Labour Force Survey data has been confirmed by the ABS in ABS (2001c) and the ABS now publishes regional estimates of regional wage and salary earnings based on ATO taxation data (see ABS 2003b).

TABLE 2.1 COMPARISON OF DATA CHARACTERISTICS

	Annual Population Data	**Employment Estimates**	**Taxable Income Database**
Source	Australian Bureau of Statistics.	Dept of Employment & Workplace Relations.	BTRE Website.
Measurement	Model informed by previous census and local data.	Model estimate derived from ABS survey of Labour Market regions.	Based on Australian Taxation Office individual tax returns.
Availability	Two most recent years and five years ago.*	Quarterly on Internet. Back issues available for purchase.	Annual from 1980–81. Latest data is 2-3 years behind current year
Geography	Current ASGC (SLA & LGA).	Recent ASGC. Changed periodically. Estimates regarded as unreliable at LGA level.	All years in ASGC 2001 (SLA & LGA).

* The ABS will generate additional data on a fee for service basis.

2.2 EMPIRICAL COMPARISONS

Whilst the theoretical analysis suggests that ARTI should be regarded as the preferred indicator of economic activity at the regional level, the true test of any indicator's usefulness is its ability to reflect reality "on the ground".

At the beginning of each of the next three chapters we include a comparison of ARTI, employment numbers and population at the Australian, State and Territory and regional levels respectively. In Chapters 3 and 4, all three indicators are also compared to the ABS's GDP and Gross State Product (GSP) figures. The results of these comparisons strongly support the contention that ARTI is the best indicator of economic activity.

2.3 CONCLUSIONS

Consideration of the conceptual issues suggests that ARTI is a better indicator of economic activity than either population or employment numbers. The reliability of the available data is superior to employment numbers at the small region level. Further, practical considerations of data availability and consistency of geography make ARTI a superior choice for time series comparisons. The ABS (2001c) concludes that taxation based figures are soundly based and comparable with its census based income statistics.

The upshot is that this data series is likely to provide the best available annual data series for comparison of economic activity at the regional level. The chapters that follow consider the empirical evidence at the national, State/Territory and sub state levels.

CHAPTER 3 TAXATION STATISTICS IN THE NATIONAL AND INTERNATIONAL CONTEXT

Although taxation based statistics at the state and national scales are not new (ARTI is available for every year from 1960–61) they are rarely used as an indicator of economic activity or progress. This reflects the world wide acceptance of Gross Domestic Product (GDP) as a national progress indicator and the tool for making international comparisons.

Whilst we do not propose to challenge the dominance of GDP as an indicator at these levels, it is interesting to speculate on whether the slightly different perspective provided by ARTI might improve our understanding of national and state economic history.

3.1 INTERNATIONAL PERSPECTIVES ON GDP AND TAXATION STATISTICS

Taxable income based indicators are not commonly used internationally, although Canada (Canada Revenue Agency 2004) and Sweden (Statistics Sweden 2004) publish statistics at a regional level, and the USA (U.S. Bureau of Economic Analysis 2004) provides regional estimates of income derived from a range of administrative databases, including taxation.

Even where statistics are collected and published, definitional issues and differences in national taxation systems make international comparisons difficult. GDP on the other hand is a consistent internationally specified and recognised measure of economic activity which allows comparisons like those in Table 3.1. This table compares GDP and GDP per capita across selected Organisation for Economic Co-operation and Development (OECD) countries.

The advantage of having figures suitable for international comparisons is obvious. For example from Table 3.1 we can see that between 1970 and 2000, average annual growth of GDP in Australia (3.2%) was higher than in most of the selected OECD countries.

TABLE 3.1 COMPARISON OF GROSS DOMESTIC PRODUCT FOR SELECTED OECD COUNTRIES, 1970 TO 2000

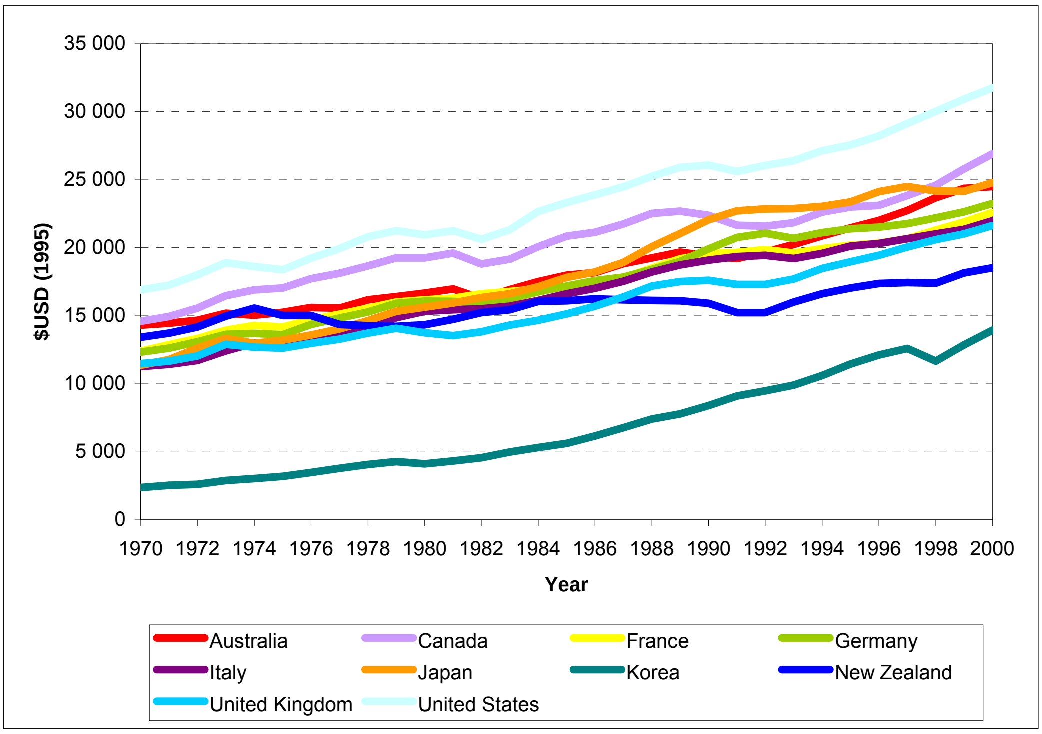
OECD Country	*Gross Domestic Product (2000)*		*Average annual growth 1970 to 2000*	
	Total ($b)	*Per capita ($)*	*Total*	*Per capita*
Australia	472	24 492	3.2%	1.8%
Canada	828	26 901	3.3%	2.1%
France	1 370	22 604	2.5%	2.0%
Germany	1 911	23 252	2.3%	2.1%
Italy	1 269	21 973	2.5%	2.2%
Japan	3 146	24 784	3.3%	2.6%
Korea	655	13 935	7.4%	6.1%
New Zealand	72	18 535	2.2%	1.1%
United Kingdom	1 269	21 627	2.3%	2.1%
United States	8 955	31 741	3.2%	2.1%
OECD Total	23 991	22 528	3.1%	2.1%

Source OECD National Accounts http://www.oecd.org, Downloaded October 2003.

Note GDP and GDP per capita based on price levels and purchasing power parities of 1995 (US dollars).

Graphing the comparable data (Figure 3.1) shows most of Australia's economic growth *per capita* occurring after 1990. By contrast, Japanese and German growth slowed markedly in this period.

FIGURE 3.1 GROSS DOMESTIC PRODUCT PER CAPITA BY SELECTED OECD COUNTRY, 1970 TO 2000



Source OECD National Accounts http://www.oecd.org, Downloaded October 2003.

Note GDP per capita based on price levels and purchasing power parities of 1995 (US dollars).

The pattern of growth for Australia over the period was most highly correlated with the United States (correlation coefficient of 0.69), followed by Canada (0.64) and the United Kingdom (0.48). There was minimal correlation with the remaining selected OECD countries.

In 2000, Australia ($24 492) was 8.7% higher than the OECD as a whole ($22 528). However, United States ($31 741), Canada ($26 901) and Japan ($24 784) had higher levels than Australia.

3.2 AUSTRALIAN NATIONAL GDP TRENDS

Long term analysis of growth in GDP and GDP per capita by the Commonwealth Treasury (Commonwealth Treasury of Australia 2001) highlights the following characteristics since Federation:

- Highly volatile economic growth in the first half of the 1900s, with periods of strong economic growth interspersed with years of very large declines.[13] This reflected volatility in agricultural production, two world wars and the Great Depression. The second half of the century shows higher and more stable economic growth after WWII.

- Although there was an average growth in GDP over the century of 3.4% per annum, the average masks decades of poor performance (1% during the decade of WWI, and 2% during the 30s) as well as periods of spectacularly high growth (5.3% in the 1960s).

- GDP per capita, which provides an indication of living standards, increased on average by a more modest 1.7% a year over the century. The 1960s and 1990s were decades of high growth, at 3.2% and 2.2% per year respectively, while growth in the 1970s (1.8%) and 1980s (1.9%) was only just above the century average.

- Australian GDP often moves in different ways to the GDP of other OECD nations. The 1960s was Australia’s worst decade relative to most of the industrialised world, which experienced exceptional growth. In the 1990s Australia’s rate of growth per capita exceeded the OECD average (Commonwealth Treasury of Australia 2001; Henry 2001).

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13 Historical data on GDP from the earliest periods are likely to be less reliable, and these estimates should be treated with caution (Commonwealth Treasury of Australia, 2001).

3.3 PATTERNS OF NATIONAL ARTI COMPARED TO POPULATION, EMPLOYMENT GROWTH AND GDP

How does national growth in ARTI compare with growth in population (ABS 2003c) and employment (ABS 1986, ABS 2003d) between 1960–61 and 2000–01?[14]

Average annual growth in Australia was small and positive for all three series, but highest for ARTI (3.9%), and lower for employment (1.9%) and population (1.6%). Real GDP for the period grew at 3.7%, at once suggesting that ARTI is a better estimator of the overall quantum of GDP growth over time. This is consistent with the closer conceptual definitions noted in earlier sections.

Figure 3.2 plots the annual per cent changes in the indicators over the forty years to 2000–01. It shows that population growth has been consistent over the period (with the exception of a short period of exceptional growth in the early 1970s). By comparison, ARTI, and to a lesser extent, employment, were relatively volatile.

For each pairwise combination of ARTI, employment and population time series, the correlation coefficient exceeds 0.97, but when the rate of change is considered, the three indicators are relatively weakly correlated (population & employment, 0.26; ARTI & employment, 0.21; and ARTI & population, 0.18)[15]. The slightly better correlation between population and employment compared to either with ARTI is consistent with the definitional similarities and differences noted earlier.

Figure 3.2 also allows comparison of each indicator with the widely accepted indicator of economic progress, GDP. The visual similarity of movement between ARTI and GDP is confirmed by the results of statistical analysis presented in Table 3.2. This table compares real GDP with ARTI, population and employment. The first line shows the high degree of correlation between each of the indicators and GDP, typical of time series with strong serial correlation.

When the serial correlation is removed by looking at the percentage change figures (the second line of the table), not only are the correlations much weaker but significant differences emerge between ARTI and the other two indicators.

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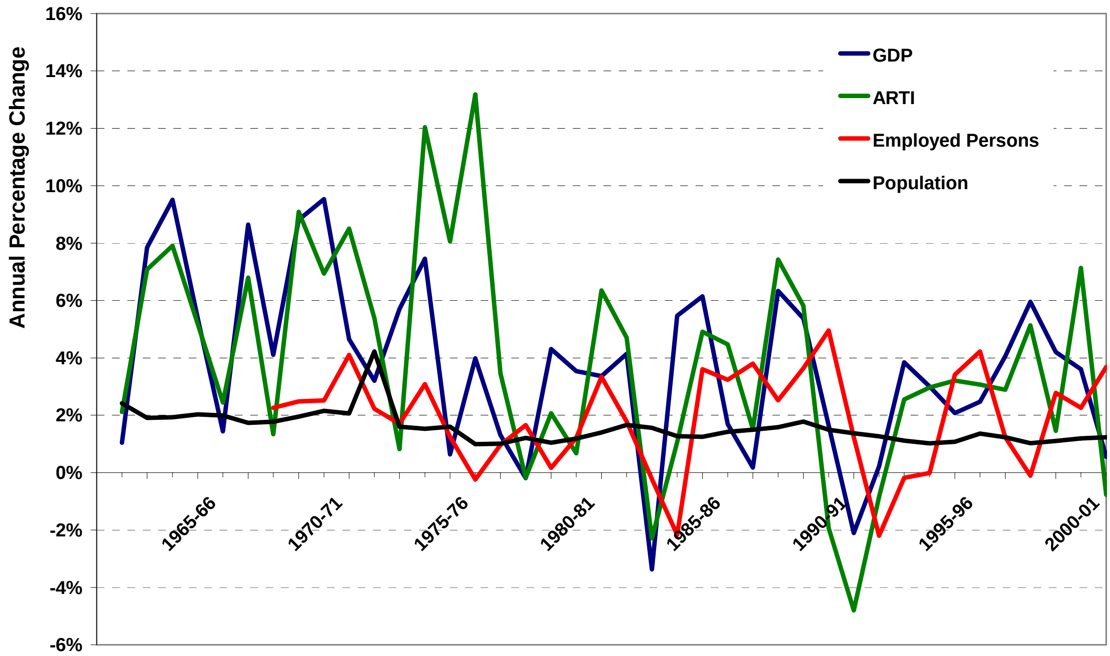
14 Employment data is only available from 1966–67, and so employment results (including correlations) relate to the 1966–67 to 2000–01 period.

15 Very high correlations often occur in time series with strong serial correlation – where each observation is statistically dependent on the previous one. The effects of serial correlation can be avoided by comparing the percentage changes from year to year (Wannacott & Wannacott 1984).

GDP correlation with ARTI (0.657) is far higher than its correlation with either population (0.189) or employment (0.215).

FIGURE 3.2 COMPARISONS OF CHANGES IN POPULATION, EMPLOYMENT AND ARTI FOR ALL AUSTRALIA, 1960–61 TO 2000–01



Source BTRE calculations based on data from the Australian Taxation Office Taxation Statistics, 1960–61 to 2000–01 as well as ABS 1986, ABS 2003c and ABS 2003d.

A similar result emerges if simple regression relationships between the series are attempted. The very high R^2 values for the raw data fall dramatically when percentage change data is used. Population and employment explain less than five per cent of the variation in GDP growth. On the other hand, ARTI explains more than 43 per cent. An attempt to use the three series in combination (see Appendix III for details) further confirmed the superiority of ARTI over either population or employment numbers as a predictor of GDP.

TABLE 3.2 CORRELATION COEFFICIENTS AND R-SQUARED VALUES OF REGRESSION OF GDP AGAINST THREE ALTERNATE INDICATORS, AUSTRALIA, 1960–61 TO 2000–01

	ARTI	Population	Employment
Correlation Coefficient (Raw Data)	0.991	0.995	0.990
Correlation Coefficient (% Change)	0.657	0.189	0.215
Regression R^2 (Raw Data)	0.982	0.990	0.980
Regression R^2 (% Change)	0.431	0.046	0.036

Source BTRE calculations based on data from the Australian Taxation Office Taxation Statistics, 1960–61 to 2000–01 as well as ABS 1986, ABS 2003c and ABS 2003d.

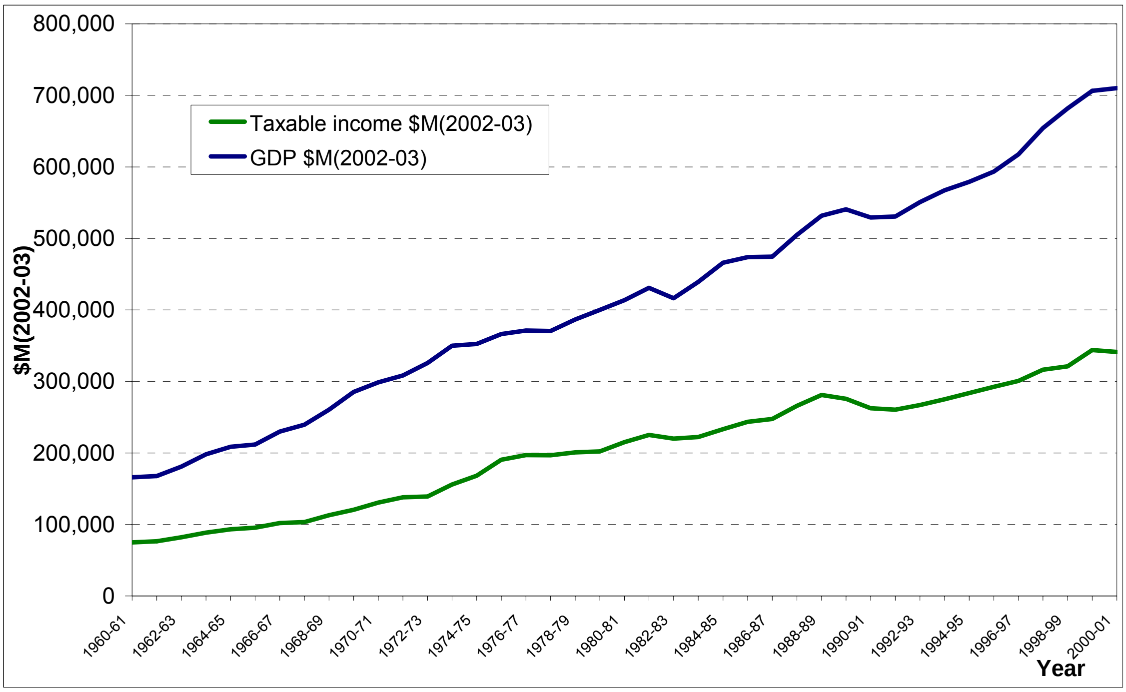
Note Employment data relates to 1966–67 to 2000–01 period.

3.4 AUSTRALIAN ARTI AND GDP GROWTH: 1960–61 TO 2000–01

What is the relationship between GDP and ARTI?

GDP is a measure of production. ARTI is a measure of income. As suggested above, conceptually (and certainly in the long term), production and income must move together. The last section suggests that over forty years this link is confirmed empirically by the close statistical relationship between ARTI and Australian GDP. Visual comparison of the plots in Figure 3.3 and the correlation coefficients and regression R^2 values presented in Table 3.2 confirms that, for the most part, production (GDP) and income (ARTI) do in fact move together. However the large diversion of RIPT from real GDP per capita, shown in Figure 3.4, suggests that the relationship is far from a simple extrapolation. It is important to understand the nature of these deviations and, in particular, if they are related to known economic trends, events or strategies.

FIGURE 3.3 COMPARISON OF GROSS DOMESTIC PRODUCT AND ARTI, AUSTRALIA, 1960–61 TO 2000–01



Source BTRE calculations based on data from Australian Taxation Office Taxation Statistics, 1960–61 to 2000–01 and Reserve Bank of Australia, Prices and Output Tables: Table G12 Gross Domestic Product – Income Components

Long Term Trends

Figure 3.3 compares long term national trends in ARTI with trends in GDP in the period 1960–61 to 2000–01. It shows Australia experienced strong growth in ARTI over the forty-year period, at an average of 3.1% annually, from $94 billion in 1960–61 to $344 billion in 2000–01. It has largely followed the pattern in growth observed for GDP (average of 3.7% per year), but has generally been of a smaller magnitude, except during the 1970s. Growth in ARTI was strongest during the 1970s (5.1% per year), while for GDP the strongest growth period was the 1960s. ARTI also experienced relatively strong growth at this time (3.4% per year).

There has been a long term widening of the gap between ARTI and GDP throughout the period, particularly since the early 1990s. Growth in ARTI from 1990–91 to 2000–01 was 2.0% compared to 3.0% for GDP, noting that the figures for both series were depressed by a (GST inspired) spike in the CPI in 2000–01[16].

Growth in Real Income Per Taxpayer (RIPT) has been more modest than ARTI growth, increasing by 1.4% per year on average between 1960–61 and 2000–01. This is uncontroversial given the increased workforce participation rate over the period, with the entry of large numbers of women and the "bubble" of baby boomer workers that entered the workforce during the 1960s and 1970s (see Dowrick 1999).

Divergence from the Long Term Relationship

The long term average growth figure for RIPT disguises some important shifts during the period. Figure 3.4 shows RIPT and real GDP per capita from 1960–61 to 2000–01. GDP per capita shows a relatively constant upward trend throughout the period interspersed with temporary downturns associated with the 1982–83 drought and the recession of the early 1990s. RIPT on the other hand is marked by four distinct periods. A period of relative stability in the 1960s was followed by a period of extremely high growth in the early 1970s. Between 1971–72 and 1975–76 real income per taxpayer grew spectacularly from $24 220 to $36 782 — an increase of almost 52% in just four years. This was followed by a period of slow decline through until 1990–91, after which RIPT again began to grow at a rate more or less matching the rises in per capita GDP.

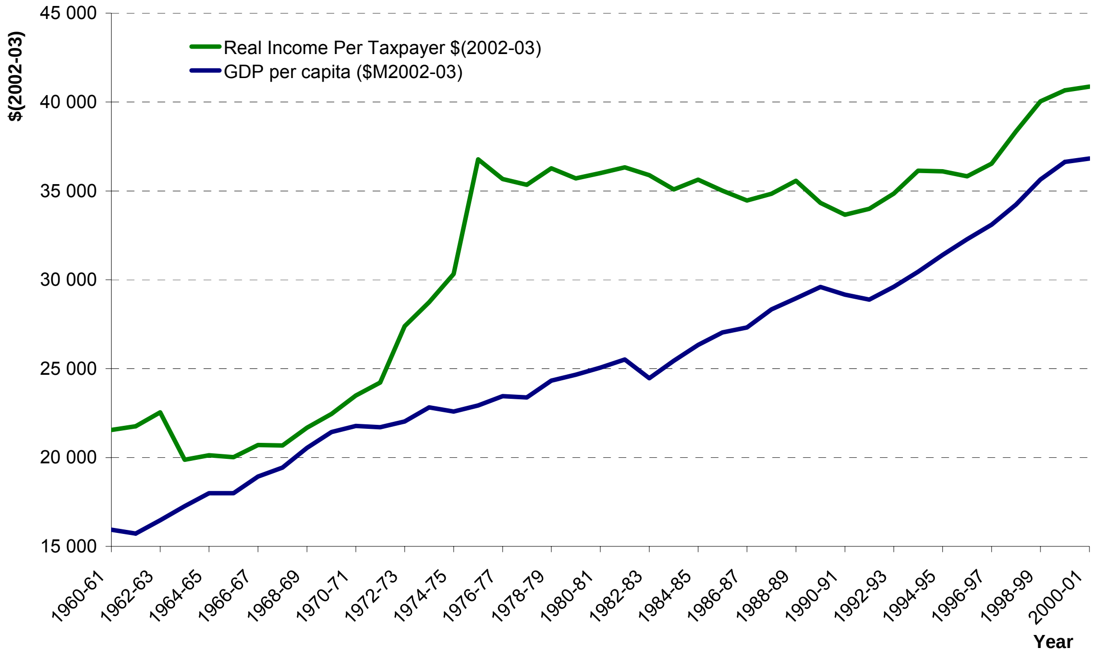
Whilst differences between growth in the real values of per capita national production and factor remuneration[17] can occur in the long term, in a market economy it would be expected that they move in essentially the same way.

16 The introduction of the GST had a once only effect on the consumer price index (CPI) in 2000–01. Whilst effects on the economy itself may have occurred, as the CPI is used to calculate ARTI from nominal income, it may be that the perceived downturn resulted from the once only effect on this calculation and may not be sustained in succeeding years.

17 ARTI is a measure of income. This income is derived from the various factors of production, the most significant being returns to labour, although many of the returns to (Australian owned) capital and land should also be ultimately captured.

However Figure 3.4 strongly suggests a major disturbance in the relationship in the early 1970s that took some 15 years to correct. The differing patterns of growth in these two indicators suggest a closer analysis of short and medium term trends in the core ARTI/GDP relationship may be warranted.

FIGURE 3.4 RIPT AND GDP PER CAPITA IN AUSTRALIA – 1960–61 TO 2000–01



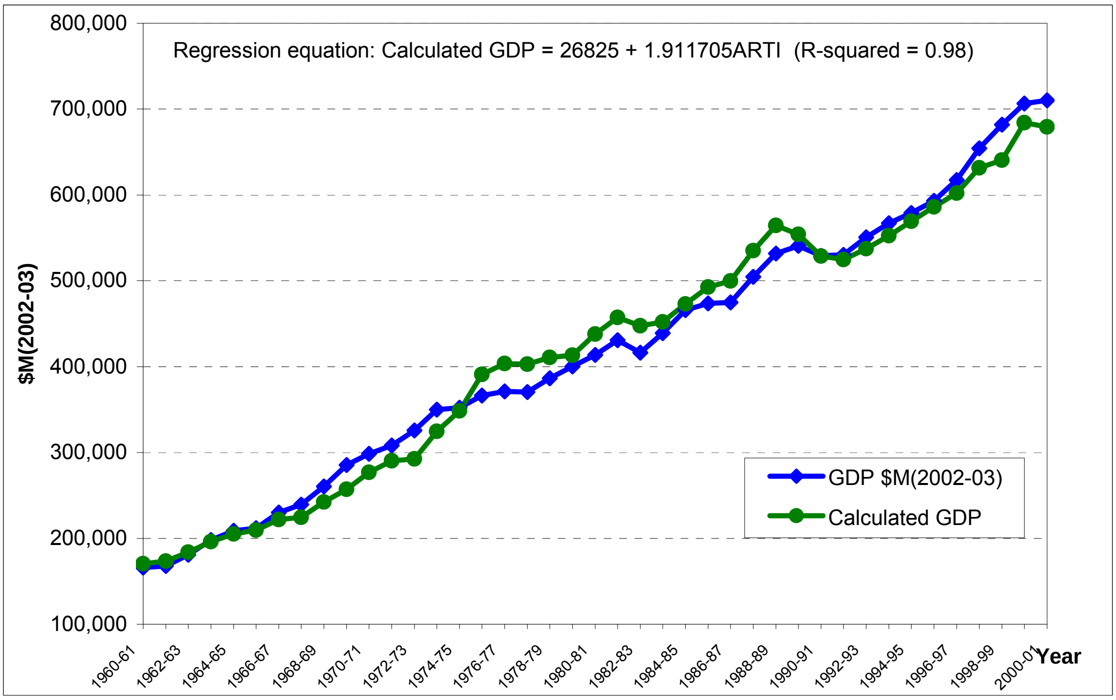
Source: BTRE calculations based on data from the Australian Taxation Office Taxation Statistics, 1960–61 to 2000–01, ABS 2003c and Reserve Bank 2004.

Simple regression analysis can be used to further illuminate the relationship between ARTI and GDP. The predicted value of GDP based on a simple regression of ARTI has been plotted in Figure 3.5. The predicted values of GDP are very similar to the actual ones, but remain noticeably above and below actual GDP for extended periods. The key cross-over points are 1974–75 and 1990–91.

If the early 1970s and the late 1980s/early 90s represent times of re-alignment of the ARTI/GDP relationship; the key question is whether it is indicative of a more basic realignment economic fundamentals. Given the origin of the two indices, it is reasonable to expect that it is representative of a re-alignment of production (measured by GDP) and income (aligned with ARTI) in the economy. When considered in these terms, it is notable that the periods of realignment broadly coincide with the wage and salary blow out of the early 1970s, the period of wage restraint under the Accord of the late 1980s and the recession of the early 1990s.

If a fundamental difference in ARTI and GDP is the difference between production and income, then we should get similar differences by comparing GDP to the national accounts measure of income – "compensation of employees"[18].

FIGURE 3.5 ACTUAL GDP VS PREDICTED VALUES FROM A SIMPLE REGRESSION BASED ON ARTI, AUSTRALIA, 1960–61 TO 2000–01



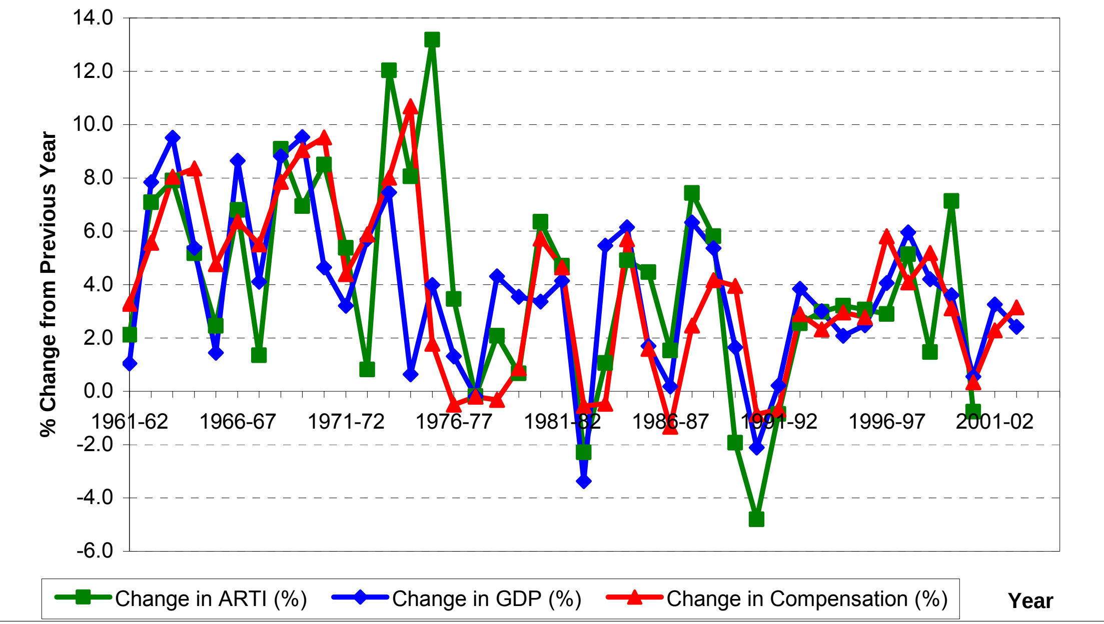
Source BTRE calculations based on data from the Australian Taxation Office Taxation Statistics, 1960–61 to 2000–01 and ABS 2002a.

Figure 3.6 plots the percentage changes in GDP, ARTI and "compensation of employees". Figure 3.6 shows that in the years immediately preceding the first cross over point (the early 1970s), growth in ARTI outstripped GDP growth for four successive years. In the late 1980s and -+early 1990s the reverse occurred (again for four successive years).

The third series in Figure 3.6, "compensation of employees", moves in a similar, but not precisely the same, way as ARTI (presumably reflecting the influence of the additional returns to capital and land present in the ARTI series).

18 "Compensation of employees" is a component of GDP when it is measured using factor cost – effectively the share of GDP paid as wages. ARTI has a mix of sources, but a large proportion (74% in 2000–01) come from salaries and wages (see chapter 7 for further details).

FIGURE 3.6 CHANGE IN GDP, ARTI AND COMPENSATION OF EMPLOYEES, AUSTRALIA, 1961–62 TO 2001–02

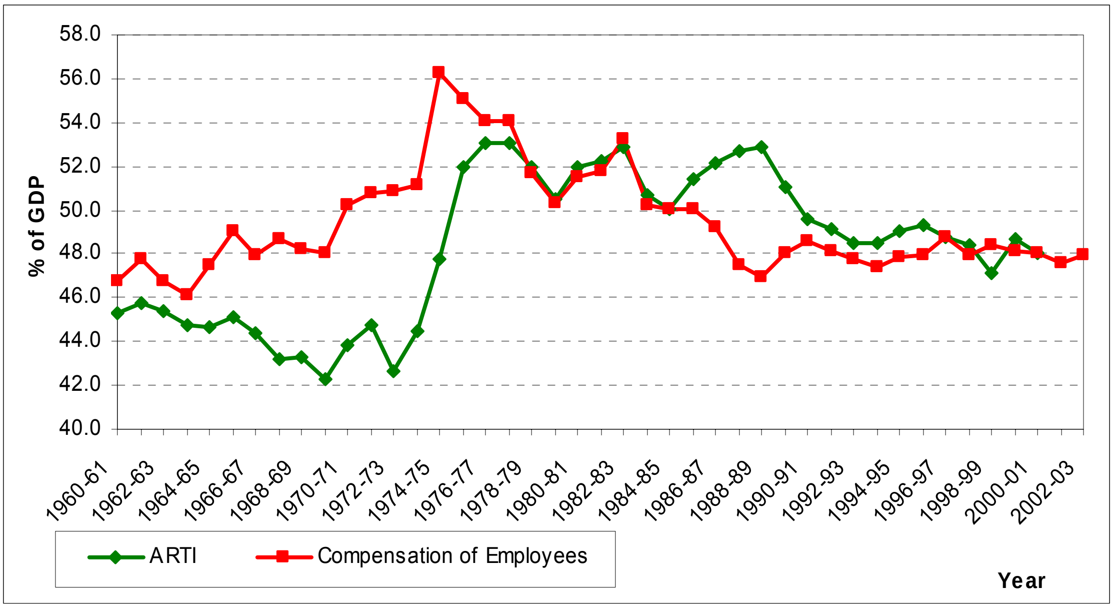


Source BTRE calculations based on data from the Australian Taxation Office Taxation Statistics, 1960–61 to 2000–01 and ABS 2002a.

The realignment of the labour/ARTI share of GDP is even more obvious in Figure 3.7, which shows ARTI and "compensation of employees" as a percentage of GDP from 1960–61 forward. Both the ARTI and "compensation of employees" series show dramatic increases in the early 1970s followed by a period of high ratios (>50%) through the late 1970s and most of the 1980s. This period culminated in a short period in the late 1980s when the two indices diverged before coming together again during the recession of the early 1990s. Since then, the indices have both stabilised at around 48% of GDP. Interestingly, during the periods of realignment (1974–75 and 1990–91), the compensation of employees share leads the ARTI adjustment (especially during the latter adjustment).

The progressive decline in the "compensation of employees" proportion of GDP during the late 1980s coincides with the operation of the Prices and Incomes Accord. As would be expected, the employment related "compensation of employees" indicator shows the impact of the Accord more closely than the more broadly based ARTI measure which lags behind by some three years. Figure 3.7 shows that there was little change during the operation of the Accord Mark I (1983 to 1985), which had full indexation. However, this was followed by a period of decline in the ratio during the effect of the Accord Mark II (1985 to 1987) under which wages were discounted by 2% on the CPI. This trend continued during the course of subsequent versions of the Accord which abandoned indexation altogether (Parham et al 2000, Edge 2003). Stilwell (1993) when examining this trend, suggests that the Accord lost its original intent, which was to focus on all incomes and eventually became simply a wages policy focussed on productivity. He notes that the Accord caused a significant redistribution of national income away from labour and towards capital. The end result was a decline of around 3% in the "compensation of employees" share of GDP in the latter half of the 1980s.

FIGURE 3.7 ARTI AND COMPENSATION OF EMPLOYEES AS A PERCENTAGE OF GDP, AUSTRALIA, 1960–61 TO 2002–03



Source BTRE calculations based on data from the Australian Taxation Office Taxation Statistics, 1960–61 to 2000–01 and ABS 2002a.

On the other hand, ARTI, which reflects the fortunes of a wider constituency, did not react in the same way and did not fall as a percentage of GDP until 1989–90. It is not altogether clear what caused this difference, but consideration of the makeup of ARTI may provide some clues. The ATO (2002) notes that only 73.5% of individual taxpayer earnings came from salary and wages in 1999–00, with almost 20% coming from business related earnings such as net business income or loss, partnership and trust distributions, capital gains and imputation credits. The ATO estimates that 72% of individual taxpayers are salary and wage earners and a further 16% are in the property industry. That is, 28% of taxpayers only report direct income from investments such as rental income, interest, dividends and business income (ATO 2002, ATO 2003). Of course, many salary and wage earners also have investments.

Boyle (1991) and Davidson (2003) propose that much of the increase in capital share of GDP during the late 1980s went into real estate speculation and the finance sectors. This suggests a possible explanation for the continuing relatively high ARTI to GDP ratio in the late 1980s. That is, the reduced employee share of GDP was diverted to an increased profit share (Boyle 1991) or to the finance sector through the introduction of the superannuation guarantee levee and wage–tax trade offs (Davidson 2003, Stilwell 1993). This could result in the redistribution of some of the employee share of GDP to other taxpayers, especially those in the speculative property and finance sectors. Such a transfer would not be revealed by the "compensation of employees" indicator, but would be reflected in ARTI. This may have thwarted or delayed the fall in ARTI as a proportion of GDP until the recession of 1990–91 put pressure on the investment sector.

Whether or not this explanation is well-founded, all three graphs show the 1970s and 1980s as a period of great volatility coupled with lower GDP growth. Figure 3.7 shows that, in contrast, both ARTI and compensation of employees to GDP ratios has been relatively stable throughout the high growth 1990s. Given the low ratios of the 1960s, the 1970s to 1980s period can be seen as distinctly different with quantum shifts around 1974–75 and 1990–91.

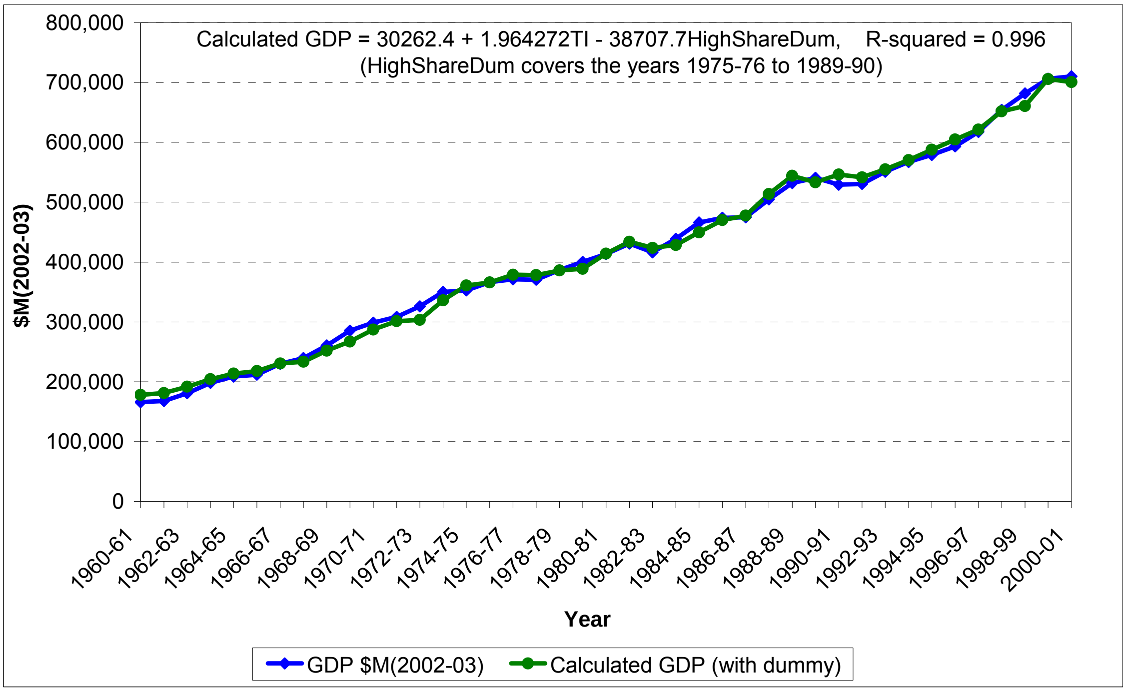
It could be argued that these periods of volatility simply reflect the economic shocks and changes during the breakdown of Keynesian economic management, the 1970s wage break-out, oil shocks, severe drought, deregulation of the financial markets and exchange rates or the stock market crash of the late 1980s. However, as disruptive as these events were, similar shocks occur in most decades, yet the 1950s, 1960s and 1990s remained periods of high growth. What the above analysis suggests is that the robustness of the Australian economy in these periods is associated with a lower employee/ARTI share of GDP.

Refining the ARTI – GDP relationship

Can ARTI be used as an indicator of GDP (or vice versa)? If we wish to do so we need to allow for fundamental changes in the income share of GDP. In Figure 3.8, the regression represented in Figure 3.5 was recalculated with a dummy variable included covering the years where ARTI is greater than 50% of GDP (that is, 1975–76 to 1989–90). Figure 3.8 shows that the already strong relationship between ARTI and GDP (shown in Figure 3.5) is even closer when allowance is made for the quantum shift in the individual income share of GDP.

Predictions based on the relationship presented in Figure 3.8 are likely to be sound. Further, the figure suggests that distortions due to any further quantum shifts in the relationship are likely to be signalled by trend changes in the compensation of employees to GDP ratio well before taxation based data is available.

FIGURE 3.8 ACTUAL GDP VS PREDICTED VALUES FROM REGRESSION BASED ON ARTI WITH A DUMMY VARIABLE, AUSTRALIA, 1960–61 TO 2000–01



Source BTRE calculations based on data from the Australian Taxation Office Taxation Statistics, 1960–61 to 2000–01 and ABS 2002a.

In summary

Internationally, GDP is the preferred tool for measuring and comparing the economies of different countries.

GDP is the generally accepted measure of economic progress at the national level, despite the reservations of some commentators.

GDP and ARTI are conceptually different but related indices. Historically, the movements in GDP and ARTI for Australia have been closely aligned, especially when allowance is made for the quantum shift in the income share of GDP in the period 1975–76 to 1989–90. The closeness of the relationship over a long period that includes periods of prosperity and shocks provides national level evidence that ARTI is a good indicator of economic activity.

CHAPTER 4 TAXATION STATISTICS AND ECONOMIC ACTIVITY IN THE STATES, TERRITORIES AND REMOTENESS CLASSES

4.1 OVERVIEW OF ARTI IN AUSTRALIAN STATES

New South Wales (36.3%) and Victoria (25.4%) have the largest shares of ARTI in Australia – or in real terms, ARTIs of $124 billion and $87 billion respectively in 2000–01 (Table 4.1). This is not surprising given these are the two most populous States. The Northern Territory (1.0%) accounted for the smallest share ($3 billion).

All States and Territories experienced positive growth in ARTI between 1980–81 and 2000–01. However, the NT, Qld, the ACT, WA and NSW all increased their share of Australia's ARTI at the expense of Tasmania, SA and Victoria.

TABLE 4.1 NTI, ARTI AND RIPT GROWTH BY STATE/TERRITORY, 1980–81 TO 2000–01

	Number of Taxable Individuals (NTI)		*Aggregate Real Taxable Income (ARTI)*		*Real Income per Taxpayer (RIPT)*	
State/ Territory	Number (2000–01)	Annual Growth	2000–01 $(2002–03)M	Annual Growth	2000–01 $(2002–03)M	Annual Growth
NSW	2 845 638	1.5%	123 969	2.4%	44 134	0.9%
VIC	2 132 521	1.3%	86 664	2.0%	40 968	0.7%
QLD	1 540 026	3.1%	56 502	3.3%	37 089	0.3%
SA	653 786	0.9%	23 889	1.3%	37 383	0.4%
WA	842 494	2.3%	32 733	2.8%	39 569	0.5%
TAS	193 095	0.6%	6 702	0.7%	35 632	0.1%
NT	78 541	3.1%	3 069	3.0%	40 199	-0.1%
ACT	163 808	2.7%	7 663	3.2%	45 811	0.4%
Australia	8 457 392	1.7%	341 272	2.3%	40 865	0.6%

Source BTRE Taxable Income Database.

Queensland exhibited the strongest growth (average annual growth of 3.3%), followed closely by the ACT (3.2%), the NT (3.0%), and WA (2.8%). More modest growth was experienced by Victoria (2.0%), SA (1.3%) and Tasmania (0.7%).

It is interesting to note the different foundation for ARTI increase across the states. For the smaller states, changes in ARTI tend to reflect the increase in the number of taxpayers (NTI) (itself closely linked to adult population) whilst the small amount of growth in RIPT (less than 0.5% per annum) has little impact. However, in NSW and Victoria, whilst NTI is still important, much more of the ARTI growth can be attributed to increases in RIPT. That is, compared to the other states, the increased income of NSW and Victoria is more a result of increases in the income of individuals than increases in the number of individuals.

Table 4.2 looks at growth by decade. The overall growth in ARTI was greater in the 1990s than the 1980s in all but the three smallest jurisdictions (Tasmania, ACT and NT).

TABLE 4.2 NTI, ARTI AND RIPT GROWTH BY STATE/TERRITORY, 1980s & 1990s

	Number of Taxable Individuals (NTI) % Growth		*Aggregate Real Taxable Income (ARTI) % Growth*		*Real Income per Taxpayer (RIPT) % Growth*	
State	1980s	1990s	1980s	1990s	1980s	1990s
NSW	2.4%	0.6%	2.0%	2.8%	-0.4%	2.3%
VIC	2.2%	0.3%	1.6%	2.3%	-0.6%	2.0%
QLD	4.3%	1.9%	3.1%	3.5%	-1.1%	1.6%
SA	2.1%	-0.3%	1.2%	1.4%	-0.9%	1.7%
WA	3.3%	1.3%	2.5%	3.1%	-0.8%	1.8%
TAS	1.9%	-0.7%	0.8%	0.6%	-1.1%	1.3%
NT	4.5%	1.7%	3.4%	2.6%	-1.1%	0.9%
ACT	4.3%	1.2%	3.4%	2.9%	-0.9%	1.7%
Australia	2.7%	0.7%	2.0%	2.7%	-0.7%	2.0%

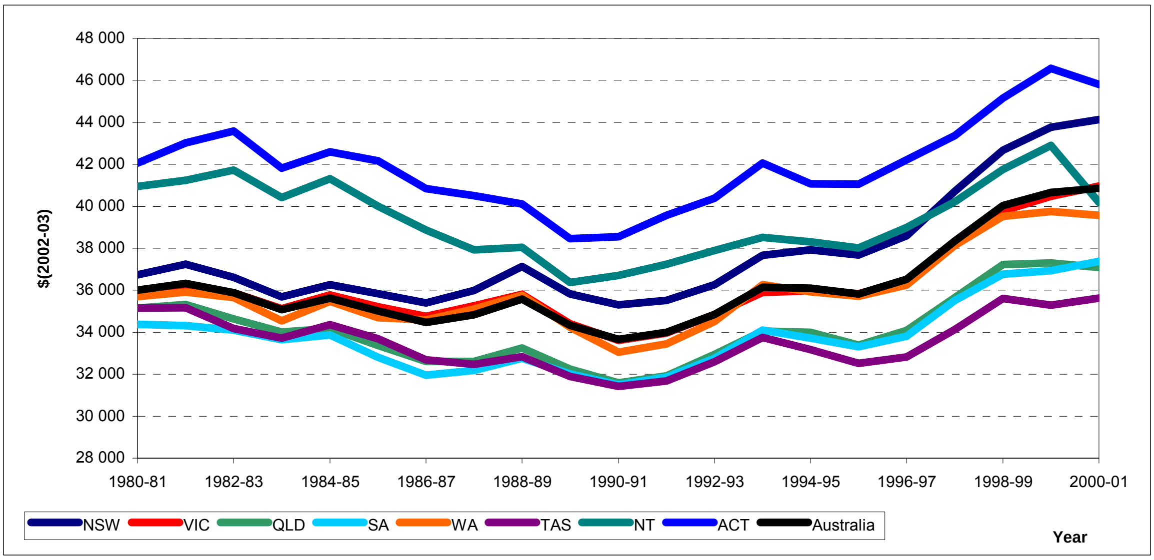
Source BTRE Taxable Income Database.

In the 1980s growth was overwhelmingly driven by increases in the NTI, whilst RIPT actually fell in all jurisdictions. The increase in NTI is reflected in an increase in the Australian labour force participation rate from 61.4% in December 1980 to 63.6% in December 1990 (RBA 2004a). In other words, growth occurred because more people worked. In the 1990s however, it was the rising RIPT that drove ARTI growth with only a relatively small increase in the number of taxpayers (the participation rate in December 2000 was 63.5%, virtually the same as a decade earlier). In SA and Tasmania, ARTI managed to rise despite falls in the NTI (and adult population) over the 1990s.

Figure 4.1 shows the trends in RIPT over the past two decades. There are two points that can be drawn from the graph. The first is the pivotal change of direction in all states and territories in the early 1990s. The overwhelming trend to decline turned around in that period to one of universal growth. This trend has continued almost unabated since, despite falls in 2000–01 in some jurisdictions. Only time will tell if this latter fall represents another fundamental change in direction[19].

A second noticeable feature is the widening of the differences in RIPT between the states and territories. Whilst on first glance the spread seems roughly equivalent, it should be remembered that the two regions with the highest values in 1980–81 (ACT and NT) are the smallest in terms of population. The rest are all within a range of $2360. However this same group in 2000–01 differs by $8502 – a spread over three and a half times as great. Whilst the trend affects all the states, most noticeable are the large rise in NSW and the very small rise in Tasmania compared to the other states.

FIGURE 4.1 REAL INCOME PER TAXPAYER BY STATE/TERRITORY, 1980–81 TO 2000–01



Source BTRE Taxable Income Database.

4.2 COMPARISONS OF GROSS STATE PRODUCT, ARTI, POPULATION AND EMPLOYMENT INDICATORS AT STATE LEVEL

The ABS's Australian National Accounts: State Accounts (Cat.no.5220.0) contains annual estimates of Gross State Product (GSP). These are produced using concepts and conventions applicable to GDP, although measurement below national level raises additional conceptual and data issues, particularly where economic activity crosses borders (see ABS 2000, Chapter 28).

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19 See 13 above.

The calculation of GSP is difficult and is at least in part based on the allocation of GDP constituent elements to the states using mathematical estimation techniques (ABS 2000, ABS 2003a)[20]. The complexity of the derivation of GSP contrasts with ARTI, which is a relatively simple, directly measured statistic, albeit one that is conceptually less satisfying, covering as it does a partial mix of income sources.

Table 4.3 sets out the correlation coefficients for the competing indicators against the GSPs for the period 1989–90 to 2000–01. Figures for the raw relationship and for the percentage change in each indicator are presented. From the table, the raw relationship is strong across the states and territories for all indicators. However, when the percentage change data is considered, population performs poorly in all states and territories. In the larger states (NSW, Victoria, Queensland, SA and WA), GSP is generally better correlated with the ARTI than employment, but the strength of the relationship is weaker in the smaller states. In Tasmania, NT and the ACT, GSP is not correlated with ARTI. Employment too, is poorly correlated with GSP in Tasmania but is more strongly correlated in both the territories. On the other hand, it is not strongly correlated in SA where ARTI exhibits a good relationship with GSP.

These results suggest that we can discount population as an indicator of economic activity once serial correlation is removed[21]. However, the data also suggests that both employment and ARTI have claims as indicators in some, but not all, States and Territories.

One explanation of the patterns in Table 4.3 could be that ARTI is a poor indicator of economic activity when applied to smaller regions. Other possible explanations include the some error as a result of the difficulty in calculating accurate estimates of GSP in the smaller states or the existence of more complex relationships between the parameters than that uncovered by simple correlation techniques.

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20 These techniques use a variety of bases such as economic survey data, population or household income distributions. The relative errors are generally greater for the smaller States and Territories. Consequently, State estimates are regarded as less reliable than the national figure and the Territory figures are even less reliable. Estimates of GSP are in some cases built up estimates from the same data sources as those used for GDP. However, it is quite often necessary to apportion the national figure to the states. In the case of the ACT, the large proportion of national government expenditure within the ACT exacerbates the estimation/allocation problem. Similarly GSP estimates are hampered by the lack of information on interstate trade of goods and services – a factor likely to be of more relative importance in the smaller states.

21 See note 12 above. The effects of serial correlation can be avoided by comparing the percentage changes from year to year (Wannacott & Wannacott 1984).

TABLE 4.3 CORRELATION COEFFICIENTS FOR GSP AGAINST ALTERNATE INDICATORS, 1989–90 TO 2000–01.

Indicator	Raw Indicator	% Change	Indicator	Raw Indicator	% Change
NSW			**WA**		
ARTI	0.98	0.86	ARTI	0.97	0.52
Employment	0.98	0.67	Employment	0.99	0.48
Population	0.99	0.07	Population	0.99	0.56
Victoria			**Tasmania**		
ARTI	0.96	0.73	ARTI	0.85	-0.05
Employment	0.93	0.61	Employment	0.21	0.28
Population	0.98	0.02	Population	0.55	0.01
Queensland			**NT**		
ARTI	0.99	0.80	ARTI	0.92	0.04
Employment	0.98	0.56	Employment	0.95	0.62
Population	0.98	-0.04	Population	0.95	0.30
SA			**ACT**		
ARTI	0.96	0.58	ARTI	0.97	0.04
Employment	0.71	0.14	Employment	0.98	0.64
Population	0.93	-0.49	Population	0.88	-0.36

Source BTRE calculations based on data from the ATO Taxation Statistics, 1989–90 to 2000–01 and ABS 2003a.

4.3 ARTI AND STATE ECONOMIES: THE POSSIBILITY OF MORE COMPLEX RELATIONSHIPS

Whilst the similarities between ARTI and GSP are strong, we know they are measures of different albeit related parameters. As noted earlier, a number of factors including the redistribution of income by government are likely to distort the assumption of perfect equality. This raises the question of the nature of the economic relationship underpinning ARTI at the state level.

Given the generally good correlations between the indicators, simple regressions were calculated to begin to explore the relationship between ARTI and GSP[22]. The R-squared values from the regressions are shown in Table 4.4. These suggest that whilst changes in GSP explain a good deal of the variation in ARTI in the larger States, they explain little or none of the variation in the smaller State economies[23].

22 We have assumed here that ARTI is driven by the local GSP (ie taxable income would be dependent on the level of production).

23 The regressions using the raw values provide very high R-squared values for all but Tasmania (and even this is high at 0.72). However, when we look at the percentage changes, high values in the larger States tail off in the smaller States and are non-existent in Tasmania

This raises the question: if the local GSP is not the driver of change in ARTI in the smaller States, then what is?

TABLE 4.4 R-SQUARED VALUES FROM REGRESSIONS OF STATE & TERRITORY ARTI, GSP & GDP, 1989–90 TO 2000–01

State	*Raw Values*	*% Changes: ARTI against GSP only*	*% Changes: ARTI against GSP + GDP*
NSW	0.96	0.74	0.75
VIC	0.92	0.53	0.65
QLD	0.99	0.64	0.66
SA	0.92	0.34	0.60
WA	0.94	0.27	0.58
TAS	0.72	0.00	0.60
NT	0.85	0.00	0.32
ACT	0.93	0.00	0.03

Source BTRE Taxable Income Database and ABS 2003a.

Casual observation of a large number of graphs of RIPT at the LGA level suggests that for most regions the over-riding characteristic is similarity with national trends. In other words, the key feature of most regional economies is that they are part of the greater Australian economy.[24] This is not unexpected given that management of the economy is overwhelmingly an Australian Government responsibility and the extent to which social and economic policy and programmes are provided on a national basis.

The extent of national influence in State and Territory economies was explored statistically by adding Australian GDP as a second explanatory variable to the regressions. The results are shown in the final column of Table 4.4. Clearly the R-squared for the smaller States and the NT improve considerably and the regressions now explain half or more of the variation in all but the NT and ACT. This suggests that for most jurisdictions, changes in ARTI result from changes in both local and national production.[25] This is consistent with what would be expected from our federal system where the national government is economically significant and active.

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and the two Territories. The introduction of leads, lags or moving averages into the regressions makes little difference to the overall pattern — the high values remain in the more populous States while low values remain in the smaller ones.

24 This is consistent with the findings of Norman and Walker (2004) who used models to examine co-movement of Australian state business cycles. They found that state cycles move closely together, with particularly strong links between the cycles of the larger states.

25 This is also consistent with the findings of Norman and Walker (2004).

In this context, the lack of a significant relationship in the ACT is surprising. The influence of the national government in a small region may help to explain the lack of relationship between ARTI and the GSP, but not the seeming lack of relationship between ARTI in the national capital and the GDP of the country as a whole.[26]

4.4 TAXABLE INCOME IN REMOTENESS CLASSES

The ABS Remoteness Structure groups Australia into five broad regions (classes) of remoteness sharing common characteristics in terms of physical distance from services and opportunities for social interaction. These classes are: Major Cities; Inner Regional; Outer Regional; Remote and Very Remote. Remoteness classes cut across State and local government boundaries.

The concept of remoteness is based upon measuring road distance from any point to the nearest ABS Urban Centre in each of five population size classes. For example, any location within a short distance of an urban centre of more than 250 000 persons belongs to the Major Cities of Australia class. The population size of the urban centre is used as a proxy for the availability of a range of services.

Table 4.5 presents information on the NTI, ARTI and RIPT in 2000–01 and average annual growth rates for the period 1990–91 to 2000–01 for ABS Remoteness classes[27].

The majority of taxable individuals were classified as living in Major Cities (69.1%) and Inner Regional Australia (18.9%). Major Cities accounted for a larger share of taxable individuals than its share of population (66.3%), while for all other remoteness classes the share of taxable individuals was less than their share of population.

Major Cities accounted for 72.9% of Australia's ARTI in 2000–01 ($249 billion in 2002–03 dollars), a slightly larger share than in 1990–91 (71.5%). Very Remote

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[26] The reasons for this more general problem may also be tied to the presence of the national government in the region. It could be argued that Commonwealth Government fiscal actions are often first and most keenly felt in the ACT. In this context, the ACT will be very acutely affected by the pursuit of Commonwealth policy that is divorced from, or even deliberately counter-cyclical to GDP movements.

[27] The estimates are based on ABS concordances translating Statistical Local Areas (SLAs) to the 2001 Remoteness Structure. Population movement constantly changes the boundaries of Remoteness Classes. Therefore some regions will have a different classification under the 2001 structure than they would have had in 1990. Whilst these discrepancies are unlikely to cause large errors over ten years, extending the series back further may be problematic.

accounted for just 0.6% of Australia's ARTI in 2000–01, a smaller share than in 1990–91 (0.8%).

TABLE 4.5 2000–01 NTI, ARTI, RIPT AND AVERAGE ANNUAL GROWTH BY REMOTENESS CLASS, 1990–91 TO 2000–01

Remoteness Class	*2000–01*				*Average annual growth 1990–91 to 2000–01*		
	ARTI ($m)	*% ARTI*	*NTI*	*RIPT ($)*	*NTI*	*ARTI*	*RIPT*
Major Cities	248 723	72.9%	5 770 353	43 104	0.7%	2.9%	2.0%
Inner Regional	56 371	16.5%	1 575 053	35 790	0.9%	2.7%	1.6%
Outer Regional	28 255	8.3%	802 987	35 187	0.4%	2.1%	1.6%
Remote	5 026	1.5%	128 006	39 262	-0.1%	1.2%	1.5%
Very Remote	2 112	0.6%	53 434	39 522	-0.6%	0.8%	1.2%
Australia	341 272	*100.0%	8 351 250	40 865	0.7%	2.7%	1.9%

Source BTRE Taxable Income Database.

Note All incomes in 2002–03 dollars. Columns do not sum to Australian totals which include data from some regions of "unknown" classification.

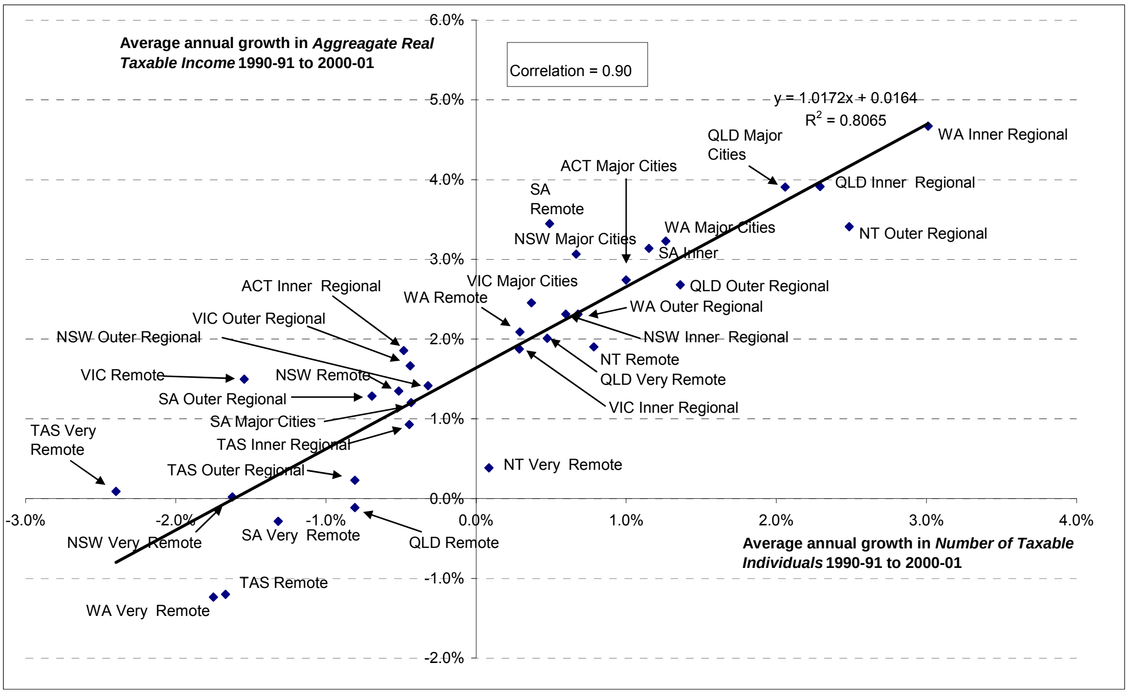
Growth in ARTI declined with remoteness. The average annual growth in ARTI was strongest in Major Cities (2.9% per year between 1990–91 and 2000–01), Inner Regional (2.7%) and Outer Regional Australia (2.1%). Growth was less than half the national average in Remote Australia (1.2%) and Very Remote Australia (0.8%).

Table 4.5 shows that growth in ARTI results from changes in both the NTI (reflecting population changes) and RIPT (individual income), but over this decade changes in individual income dominate the extent of the increase. Those remoteness classes that experienced the greatest growth in ARTI mostly had the greatest growth in the NTI. The exception was the Major Cities remoteness class, where despite NTI growth being less, a sufficiently higher increase in RIPT allowed its overall ARTI growth to eclipse that of Inner Regional areas.

Figure 4.2 presents the average annual growth rates in ARTI between 1990–91 and 2000–01 as a function of growth in the NTI over remoteness classes in each State and Territory. The relationship is strong (correlation coefficient of 0.90 and trendline R^2 of 0.81), showing a close connection between ARTI growth and the growth in NTI. Interestingly, not one region registered a concurrent fall in ARTI and rise in NTI.

It can be seen from Figure 4.2 that the highest growth in both ARTI and NTI was in the Inner Regional areas and Major Cities (particularly in Western Australia and Queensland), and the Outer Regional areas of the Northern Territory (which includes Darwin). On the other hand, Remote and Very Remote areas tended toward very low growth or decline. Table 4.6 emphasises the consistency of this trend in all states but also highlights the overlaying of state differences on this pattern. Queensland for example is growing relatively strongly whilst Tasmania and SA are grouped at the lower end of growth. In particular, the Major Cities class in SA (Adelaide) and the Inner Regional of Tasmania (which includes Hobart and Launceston) represent urban areas of low growth (ARTI growth of 1.2% and 0.9% per annum respectively).

FIGURE 4.2 ANNUAL PERCENTAGE GROWTH IN ARTI AND NTI BY STATE/TERRITORY REMOTENESS CLASSES, 1990–91 TO 2000–01



Source BTRE Taxable Income Database.

It is also interesting to note the relative cross class distributions within each state. Victoria has more evenly distributed growth than the other states, whilst WA has the widest distribution of growth rates. However, overall conclusions need to be tempered by an appreciation that one off local factors can influence these figures. The high growth rate for Remote SA for example, is largely as a result of a doubling of the ARTI of the uranium mining LGA of Roxby Downs over the period. Whilst similar growth of mining enterprises is likely somewhere in Australia over the next ten years, it will not necessarily be in Remote SA.

TABLE 4.6 ANNUAL PERCENTAGE GROWTH IN ARTI BY STATE & REMOTENESS CLASS 1990–91 TO 2000–01

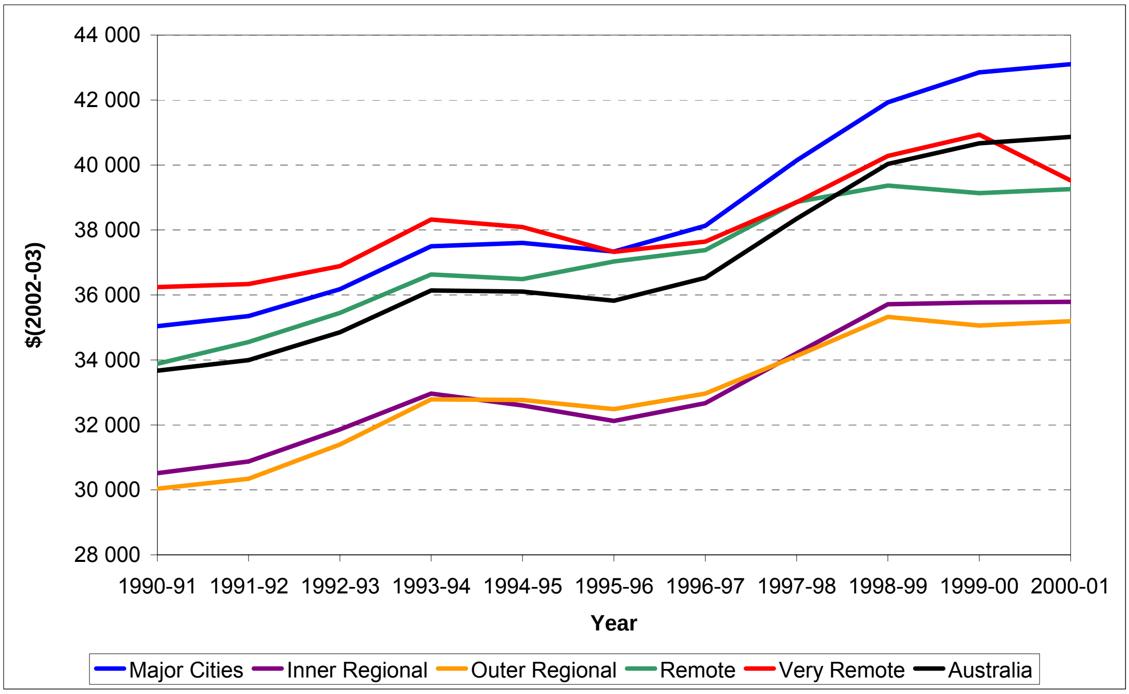
Class	*NSW*	*VIC*	*Qld*	*SA*	*WA*	*Tas*	*NT*	*ACT*	*Aust.*
Major Cities	3.1%	2.5%	3.9%	1.2%	3.2%	N/A	N/A	2.7%	2.9%
Inner Regional	2.3%	1.9%	3.9%	3.1%	4.7%	0.9%	N/A	1.9%	2.6%
Outer Regional	1.4%	1.7%	2.7%	1.3%	2.3%	0.2%	3.4%	N/A	2.0%
Remote	1.3%	1.5%	-0.1%	3.4%	2.1%	-1.2%	1.9%	N/A	1.4%
Very Remote	0.0%	N/A	2.0%	-0.3%	-1.2%	0.1%	0.4%	N/A	0.3%

Source BTRE Taxable Income Database.

Figure 4.3 graphs the RIPT for remoteness class for the ten years until 2000–01. Major Cities is easily the best performing class ($43 104 in 2000–01) and was the only category with a higher RIPT than the national average ($40 865) by 2000–01. RIPT growth was strongest in Major Cities (at 2.0% per year) from an already high starting base. From 1995–96 onward, the average rate of growth in the Major Cities was 2.9% per annum, a third as much again as the next highest (Inner Regional with 2.2% per annum growth). Growth in the remaining classes was half or less of that of the Major Cities.

Whilst Very Remote Australia ($36 241), led the classes in 1990–91, it was outstripped by the Major Cities by 1995–96 and had fallen to a similar level to Remote by 2000–01. Average incomes in Remote Australia were above the national average from 1990–91 to 1997–98, but dropped below it in 1998–99. The relatively high incomes in Very Remote and Remote Australia have traditionally been attributed to mining activities in these areas. The low growth rate (1.2%) is no doubt due in part to a decline in mining activities in some areas, but may also reflect the trend towards fly-in fly-out provision of labour for some, especially newer, mining enterprises. The loss of higher paying jobs, or their attribution to another region (taxation statistics are based on the home address of the individual taxpayer), would force down the RIPT.

FIGURE 4.3 RIPT BY REMOTENESS CLASS, 1990–91 TO 2000–01



Source BTRE Taxable Income Database.

In contrast to the Major Cities, RIPT in Inner Regional and Outer Regional Australia was well below the national average over the full ten-year period from 1990–91 to 2000–01. Although both still had positive average annual growth, at 1.6%, the trend is toward a widening income differential between the Major Cities and all other classes. In 1990–91 Inner and Outer Regional incomes stood at 87% and 86% of income in Major Cities. By 2000–01 the equivalent figures were 83% and 82% respectively. All classes bar Major Cities are less than the Australian average RIPT and have fallen as a percentage of Australian average RIPT over the period.

In summary

There are very strong correlations between ARTI and GSP in all States and Territories when the raw data series are compared. When percentage change figures are used, there is a strong relationship in the larger States but not in the smaller states or Territories. However, if Australian GDP is included as a variable along with the local GSP, highly significant regressions are obtained for all States and Territories bar the ACT. This statistical relationship reflects the real economic ties that could be expected under our federal system of government.

State patterns of ARTI growth since 1980–81 show contrasts between the larger and smaller States. In the smaller States ARTI growth broadly mirrors changes in population. The larger states differ in that they have also experienced an increase in RIPT. Similarly over time, increases in ARTI in the 1980s can be largely attributed to increases in population and workforce participation, whereas in the 1990s, increases more often stemmed from increases in RIPT.

Over the period 1990–91 to 2000–01 growth in ARTI tended to decline with remoteness. Growth was strongest in the "Major Cities" remoteness class and generally weakest in "Very Remote" Australia. However, within States/Territories, Inner Regional areas in Western Australia and Queensland, the Outer Regional areas of the Northern Territory and South Australia experienced the strongest growth.

RIPT is significantly higher in "Major Cities" than other regions and is trending even higher. "Remote" and "Very Remote" Australia have relatively high RIPT but in recent years this has levelled and even fallen. "Outer Regional" and "Inner Regional" Australia maintain their historically low levels compared to other classes and have fallen as a percentage of the Australian average RIPT.

CHAPTER 5 TAXABLE INCOME IN SMALL AREAS

5.1 THE BTRE TAXABLE INCOME DATABASE — TAXABLE INCOME IN SMALL AREAS

The main sets of taxation data presented in the BTRE *Taxable Income Database* have been discussed in Chapter 1. In terms of geography, the database contains both Local Government Area (LGA) and Statistical Local Area (SLA) information based on consistent 2001 Australian Standard Geographical Classification (ASGC) boundaries. Data has been derived for all LGAs in Australia for the twenty one years from 1980–81 to 2000–01 and for all SLAs in Australia for the eleven years from 1990–91 to 2000–01. LGAs have been chosen as the main geographical unit used to describe regions in this information paper, due to the longer time series. The SLA information in the database however allows analysis on the basis of more finely defined regions. This is especially important in the ACT and Brisbane where LGA data is on too large a scale for many purposes.

The LGA is a spatial unit which represents the whole, undivided geographical area of responsibility of either an incorporated Local Government Council, or (in the Northern Territory) an incorporated Community Government Council of sufficient size and statistical significance. LGAs only cover incorporated areas of Australia, that is, legally designated areas for which incorporated local governments have responsibility. The major areas of Australia not covered by incorporated bodies are the northern parts of South Australia, most of the Northern Territory and all of the Australian Capital Territory and the Other Territories (ABS 2001a).

The number of LGAs and their boundaries vary over time. Their creation and delimitation is the responsibility of the respective State/Territory Governments. Traditionally, local governments have developed around communities, with the boundaries to these areas based on physical attributes (i.e. rivers or roads), socioeconomic conditions (e.g. focused around an industry) or government infrastructure provided as an incentive to attract population (ABS 2001a). Based on 2001 boundaries there are 624 LGAs and 9 unincorporated areas.

It should be remembered that an LGA is an area defined for administrative purposes, rather than a logical or functional region and does not necessarily represent a regional economy such as a labour market region might (see BTRE 2004a, BTRE 2004b). For the BTRE *Taxable Income Database*, LGA data have been allocated from the postcodes in the residential address of persons submitting a tax return. People who reside in an LGA do not necessarily earn their income in the same LGA. Similarly, people do not necessarily shop or spend their income in the same LGA as they live. However it is more reasonable in rural areas to assume that people's income is earned in the same LGA that they reside. In larger cities this assumption is less likely to hold.[28]

It is also important to remind ourselves that the geographic size of LGAs is not consistent. This can make comparison of populous and less populous regions difficult, as ARTI and NTI are largely dependent on the size of the population (correlation coefficient of 0.96 between 2001 population and 2000–01 ARTI). Table 5.1 demonstrates the diversity in size of LGAs across States and Territories. Western Australia is made up of a large number of very small LGAs. By contrast, Victoria has a small number of LGAs relative to its population.

TABLE 5.1 POPULATION OF LGAs BY STATE/TERRITORY, 2001

State/Territory	*No. of LGAs*	*Total population*	*Average population per LGA*	*Smallest and largest populations*
NSW	175	6 575 217	37 573	Windouran (414), Blacktown (264 799)
VIC	79	4 804 726	60 819	Queenscliffe (3 276) Greater Geelong (194 478)
QLD	126	3 628 946	28 801	Croydon (288), Brisbane (896 649)
SA	69	1 511 728	21 909	Orroroo/Carrieton (1 017), Onkaparinga (151 010)
WA	143	1 901 159	13 295	Sandstone (133), Stirling (176 710)
TAS	30	471 795	15 727	Flinders (887), Launceston (62 335)
NT	9	197 768	21 974	Coomalie (1 074), Darwin (68 710)
ACT	1	319 317	319 317	
Other territories	1	2 584	2 584	
Australia	633	19 413 240		

Source ABS estimated resident population, 2001.

Note The number of LGAs includes 9 unincorporated regions, one in each State/Territory.

Appendix IV contains maps of Australia's LGAs as they were in 2001. A detailed explanation of the construction of the database is contained in Appendix I and in the preliminary recitals to the database itself which is available at www.btre.gov.au/docs/infopapers/ip49/ip49.aspx.

28 Information on the extent of commuting is available at the SLA-level from the BTRE *Industry Structure Database* (www.btre.gov.au/docs/infopapers/ip49/ip49.aspx).

5.2 REGIONAL COMPARISONS OF TAXABLE INCOME, POPULATION AND EMPLOYMENT GROWTH

As a starting point for Chapters 3 and 4 we used estimates of GDP and GSP as independent data against which to test the efficacy of ARTI, population and employment as measures of annual economic activity. Unfortunately, no similar estimate exists at the smaller regional level and the best we can do in small areas is to examine the extent of similarity or otherwise of the alternate pictures painted by the three proposed indicators.

To demonstrate the relationship between growth in ARTI and growth in population (ABS 2002b) and employment (BTRE 2004a) we can look at the Local Government Area (LGA) level data for all three factors for the period 1990–91 to 2000–01[29]. Over this decade, national average annual growth in ARTI (2.7%) considerably exceeded both employment growth (1.7%) and population growth (1.0%). GDP for the period rose by an average 3.0% per annum – comparable to the ARTI rate.

Examination of the correlation coefficients across Australian LGAs over the period indicates that there is a strong relationship between average annual growth in ARTI and average annual growth in both population and employment at the regional level. The relationship between ARTI and employment is stronger than the relationship between ARTI and population, with correlations of 0.72 and 0.49, respectively.

Table 5.2 presents a matrix of the percentages of LGAs experiencing growth, decline or no change (within 0.5% of zero) in ARTI compared to population and employment.

There was a much greater proportion of LGAs experiencing growth in ARTI (77%) than growth in population (45%) or employment (54%), indicating differences in the behaviour of the three indicators at the regional level. However this is consistent with the national trend noted above where ARTI also tends to record higher growth rates than either population or employment.

The highlighted diagonal cells in Table 5.1 represent LGAs which were identically categorised for ARTI change and population/employment change. These identically categorised cells account for the majority of LGAs with regard to both population (57%) and employment (68%). Thus, for the majority of LGAs, changes in population and employment were in the same direction as changes in ARTI.

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[29] Population and employment data for this exercise was drawn from the census. This data is not readily available on consistent 2001 LGA boundaries for Census collections before 1991.

Most of the LGAs that experienced growth in ARTI also experienced growth in population and growth in employment. Only 12% of LGAs experienced decline in ARTI between 1990–91 and 2000–01, and most of these LGAs also experienced population and employment decline.

TABLE 5.2 PERCENTAGE OF LGAs EXPERIENCING GROWTH & DECLINE IN ARTI, POPULATION & EMPLOYMENT, 1990–91 TO 2000–01

Taxable income	*Growth*	*No change*	*Decline*	*Total*
		Population		
Growth	43.0	20.7	13.4	77.1
No change	0.6	4.7	5.7	11.1
Decline	1.6	1.3	9.0	11.8
Total	45.2	26.7	28.1	100.0
		Employment		
Growth	52.0	16.7	8.4	77.1
No change	0.6	6.2	4.3	11.1
Decline	1.7	0.8	9.3	11.8
Total	54.3	23.7	22.0	100.0

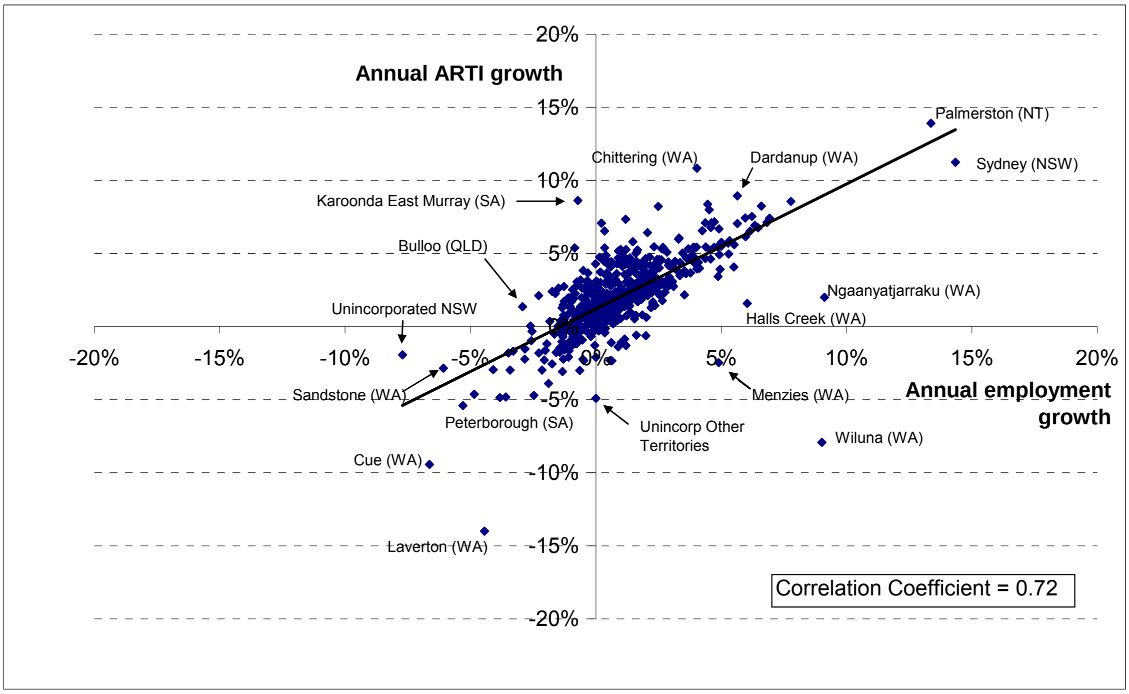
Source BTRE Taxable Income Database, ABS Estimated Resident Population 1991 and 2001 (ABS 2002b), BTRE Industry Structure Database.

Note Employment data is based on the number of employed persons enumerated at home on census night and excludes domestic and overseas visitors to the LGA.
"No change" refers to average annual growth between –0.5% and 0.5%.

The main differences between the three indicators was where there was growth in ARTI but no change in population (this occurred in 21% of LGAs) or employment (17% of LGAs). However, growth in ARTI for the majority of these LGAs was less than 2% per year, suggesting all the series are picking up similar underlying trends. The difference is likely to be where general increases in real average income are picked up by ARTI (and GDP) but not by the other two indicators.

Figure 5.1 demonstrates the positive relationship between growth in ARTI and growth in employment at the regional level. Strong ARTI growth is generally related to strong employment growth. For example, Palmerston in the Northern Territory has experienced average annual growth in taxable income of 13.9% and growth in employment of 13.4%. Much of this growth can be attributed to increases in population (10.4%) with a probable increase in the participation rate due to an influx of young couples to the region. By contrast, Cue in Western Australia has experienced declines in both ARTI (–9.4%) and employment (–6.6%). Again, population decline in this area appears to be a contributing factor (–4.9%) although increasing unemployment and a decrease in RIPT are also likely contributors.

FIGURE 5.1 RELATIONSHIP BETWEEN AVERAGE ANNUAL GROWTH IN ARTI AND EMPLOYMENT, LGAs, 1990–91 TO 2000–01



Source BTRE Industry Structure Database, BTRE Taxable Income Database

Note Employment data is based on the number of employed persons enumerated at home on census night within a given LGA and excludes domestic and overseas visitors to the LGA.

Although the relationship between growth in ARTI and growth in population and employment is strong, the discrepancies between the three indicators demonstrate that focusing regional analysis on population and/or employment growth does not necessarily provide a complete picture of economic activity. As suggested in our discussion of conceptual issues in Chapter 2, these indicators may underestimate economic activity by not addressing changes in the income received by each member of the population. ARTI provides an alternative, superior indicator of changes in economic activity at the regional level.

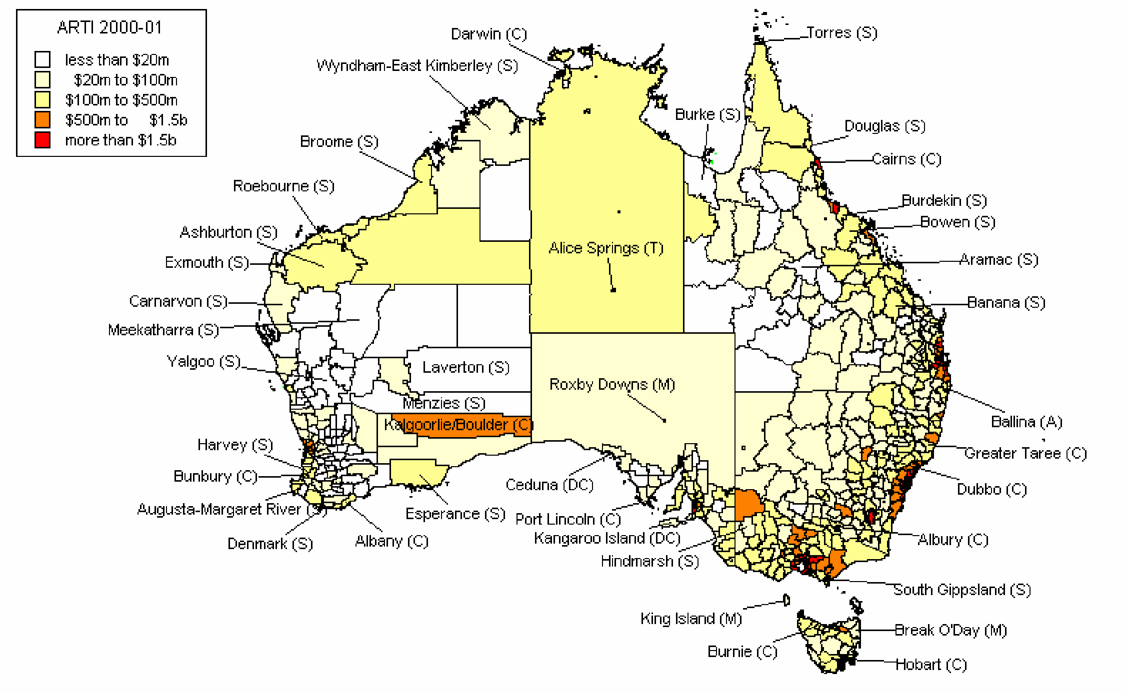
5.3 ANALYSIS USING AGGREGATE REAL TAXABLE INCOME (ARTI)

ARTI in Local Government Areas

ARTI provides an indicator of the overall size of the economy of a region. However, it is heavily dependent on the population of the individual LGAs. Figure 5.2 demonstrates the distribution of ARTI across Australia in the 633 LGAs and unincorporated areas in 2000–01. Local Government Areas with relatively high levels tend to be concentrated around the capital cities and larger regional centres where the majority of Australia's population resides. The figure highlights the large number of LGAs with very small economies (and populations), particularly in Queensland, South Australia, Western Australia and inland New South Wales. It is important to keep the level of ARTI for these

LGAs in mind when interpreting growth rates, as changes can be volatile for regions with a small economic base.

FIGURE 5.2 ARTI BY LGA, AUSTRALIA, 2000–01



Source Produced by BTRE using Taxable Income Database and ABS C-DATA software.

Note Incomes expressed in terms of 2002–03 dollars.

Most LGAs contributed less than 1% to the overall Australian ARTI in 2000–01. The exceptions were Brisbane QLD ($17.6 billion), Unincorporated ACT ($7.5b), Gold Coast QLD ($6.3b), Sutherland Shire NSW ($5.0b), Boroondara VIC ($5.0b), Ku-ring-gai NSW ($4.4b), Blacktown NSW ($4.2b), Hornsby NSW ($3.9b), Baulkham Hills NSW ($3.7b), Stonnington VIC ($3.6b) and Warringah NSW ($3.5b). These are all LGAs with populations of 80 000 or more people.

The LGAs with the lowest ARTI in 2000–01 were Sandstone WA ($0.8 million), Menzies WA ($1.2m), Murchison WA ($1.3m), Croydon QLD ($2.5m), Diamantina QLD ($2.7m) and Isisford QLD ($2.8m). These are LGAs with low populations (all less than 500) and less than 100 taxable individuals.

In 2000–01, 45.0% of LGAs had an ARTI of less than $100 million compared to 51.5% in 1980–81. The number of LGAs with an ARTI of more than $1.5 billion increased from 34 in 1980–81 to 71 in 2000–01.

Growth in ARTI

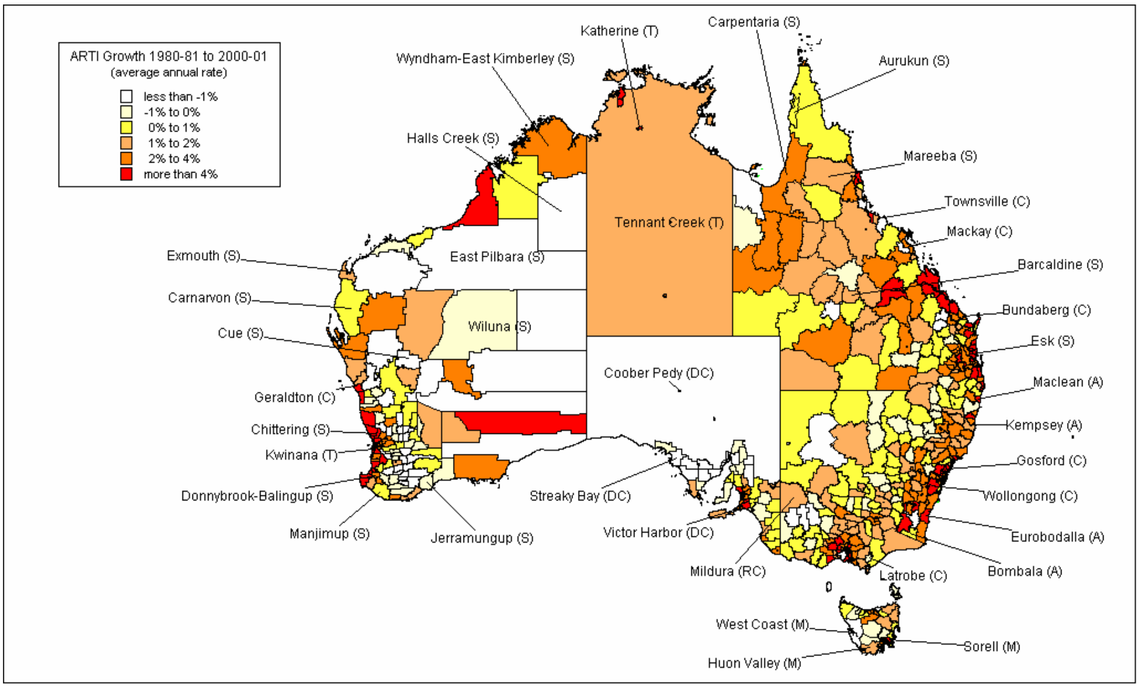
Most LGAs experienced positive growth in ARTI between 1980–81 and 2000–01 (78%). Growth in ARTI was mostly explained by growth in the number of taxable individuals. That is if the number of taxable individuals grew in a region then generally the ARTI also grew (correlation = 0.96). For two thirds of LGAs, growth in ARTI between 1980–81 and 2000–01 was below the national average of 2.4% per annum.

Of the 130 LGAs with declining ARTI between 1980–81 and 2000–01, 54 were in Western Australia. This represents 38% of Western Australia's 143 LGAs. South Australia (32%) and Tasmania (33%) also have relatively high proportions of LGAs with declining ARTI. The greatest annual average declines were in the very small remote areas of Menzies (–5.4%), Perenjori (–3.4%), Kent (–3.4%), Goomalling (–3.1%) and Laverton (–3.1%) in Western Australia; Peterborough (–4.4%) in South Australia; and West Coast (–2.9%) in Tasmania. All states except Victoria, the ACT and the NT were represented in the bottom 20 LGAs. By contrast, all the LGAs in the NT experienced relatively strong growth.

Figure 5.3 describes the average annual growth in ARTI between 1980–81 and 2000–01 for all LGAs. The greatest declines in ARTI were evident in remote and inland non-metropolitan areas, particularly areas with a relatively small number of inhabitants reliant on agriculture. Especially strong declines were evident in Western Australia's wheat-sheep belt and in western Victoria with a number falls of more than 1% per year. LGAs in this category include Buloke (–1.4%), Yarriambiack (–1.2%), Hindmarsh (–1.3%) and West Wimmera (–0.5%). Several LGAs surrounding these regions also experienced lesser declines. Declines in a number of remote mining regions such as Laverton, East Pilbara, Ashburton and Dundas are also prominent on the map.

Figure 5.3 also demonstrates the strong growth in ARTI in many coastal areas. A large number of coastal areas experienced growth of more than 4% per year over the twenty-year period. Examples include: Eurobodalla, Byron, Ballina, and Maclean in New South Wales; Surf Coast and Mornington Peninsula in Victoria; Cairns, Thuringowa, Hervey Bay, Noosa, Maroochy, Caloundra and the Gold Coast in Queensland; Mallala and Alexandrina in South Australia; and Augusta-Margaret River, Busselton, Capel, Harvey, Mandurah and Greenough in Western Australia. Interestingly these areas have not necessarily experienced corresponding increases in RIPT, indicating that the growth in ARTI is due to growth in the number of taxpayers (NTI) rather than increases in average income (see Figure 5.10). This is consistent with the "sea change" phenomenon, a large population drift to the coastal areas that has been described by Salt (2001).

FIGURE 5.3 AVERAGE ANNUAL GROWTH IN ARTI BY LGA, 1980–81 TO 2000–01

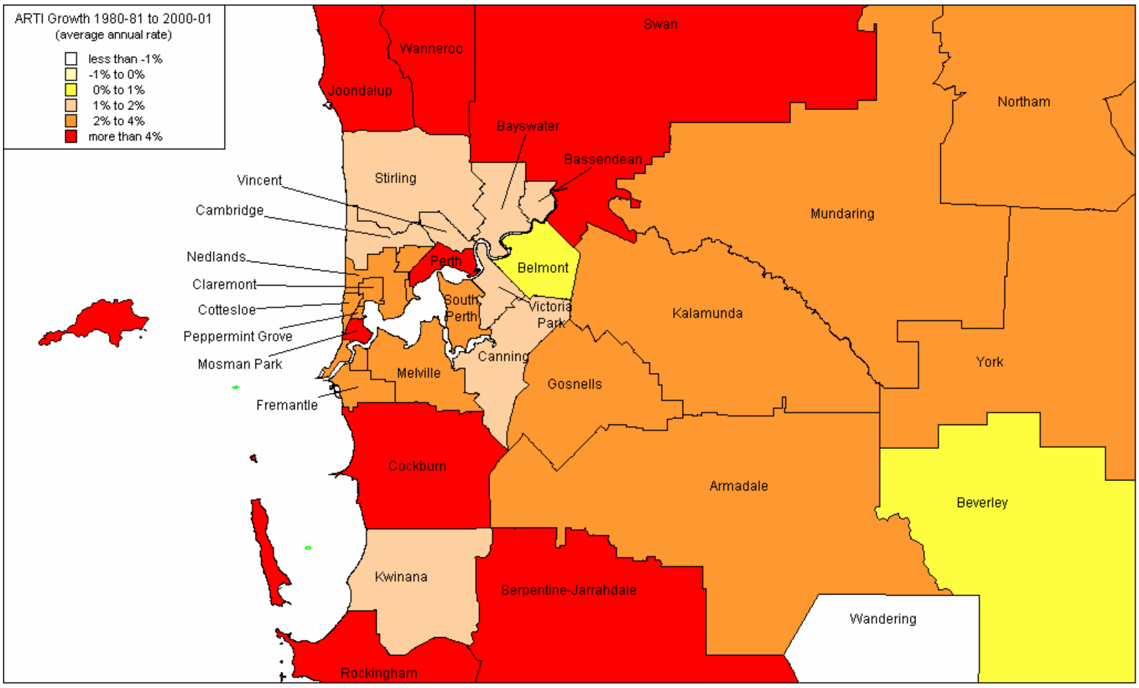


Source Produced by BTRE using Taxable Income Database and ABS C-DATA software.

Many fringe urban areas also experienced growth in ARTI over the period, reflecting NTI growth linked to increasing populations. Figure 5.4 is comparable to Figure 5.3, but focuses on the LGAs in and around Perth. All of the LGAs except for Belmont experienced average growth in ARTI of more than 1% per year between 1980–81 and 2000–01. Beverley and Wandering are more typical of the rural patterns of the adjacent wheat belt. The greatest growth in Perth is evident in the fringe areas of Joondalup, Wanneroo and Swan to the north and Cockburn, Rockingham and Serpentine-Jarrahdale to the south – each grew more than 4% per annum over the period. This strong growth on the fringe is complemented by similarly strong growth close to the CBD, separated by a ring of comparatively modest growth.

Similar ring like patterns of development are apparent in Adelaide, Melbourne Sydney and Brisbane, but as with Perth, the effect is not all encompassing. Areas of slower growth in established areas of Sydney are in the south and west (especially Canterbury, Bankstown, Auburn and Holroyd), whilst the northern suburbs have developed strongly. There was particularly strong growth in the outer fringe areas of Camden (6.5%), Wyong (4.8%), Wollondilly (4.7%), Baulkham Hills (4.2%), Hawkesbury (4.2%) and Gosford (4.2%). In Melbourne the "ring" of lower growth is more pronounced but growth at the centre is less pronounced. The strongest growth was in the outer fringe LGAs of Casey (6.9%), Wyndham (5.5%), Melton (5.5%), Nillumbik (4.5%), Moorabool (4.4%), and Mornington Peninsula (4.1%).

FIGURE 5.4 AVERAGE ANNUAL GROWTH IN ARTI BY LGA, PERTH, 1980–81 TO 2000–01



Source Produced by BTRE using Taxable Income Database and ABS C-DATA software.

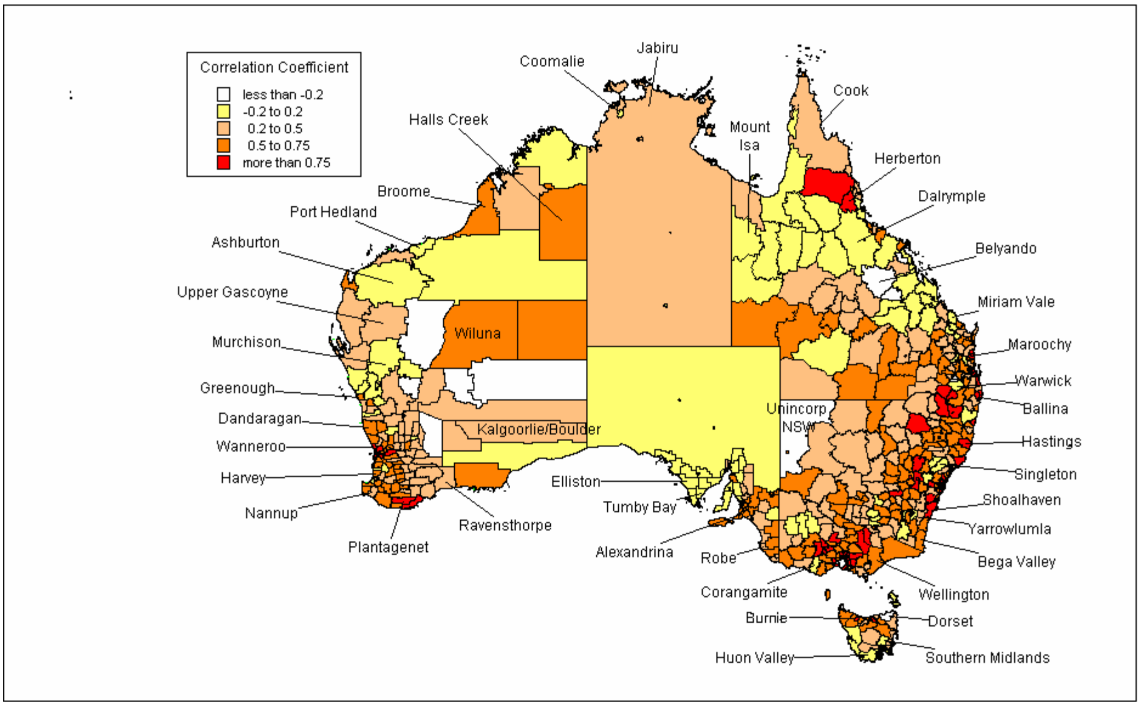
Whilst high growth rates on urban fringes are to be expected as new residents establish themselves in the area, the causes of the change patterns within the existing urban boundaries are less obvious, but probably reflect areas of formal urban redevelopment as well as the renewed popularity of inner city living.

Correlation to national growth in ARTI

As with the states and territories, growth in the ARTI of LGAs tends to be very closely linked to the national pattern of growth. When each LGA's annual growth in ARTI is correlated with national annual growth, most LGAs demonstrate a correlation, of more than 0.5 (53%). About 32% of LGAs had a high correlation of between 0.5 and 0.75 with the national, with a further 21% having a very high correlation of greater than 0.75. Twenty eight per cent (28%) had a correlation coefficient of between 0.2 and 0.5. A small number of LGAs (13 or 2%) had a correlation coefficient of less than –0.2 suggesting that growth in the LGA was countercyclical to national growth, while 16% of LGAs had minimal correlation (between –0.2 and 0.2).

Figure 5.5 maps the correlation of each LGA's annual growth in ARTI with national annual growth, while Table 5.3 demonstrates the differences in the level of correlation for metropolitan and non-metropolitan LGAs.

FIGURE 5.5 CORRELATION OF NATIONAL AND LGA GROWTH IN ARTI, 1980–81 TO 2000–01



Source Produced by BTRE using Taxable Income Database and ABS C-DATA software.

Of those LGAs with a very high correlation (more than 0.75), the overwhelming majority (73%) were in capital cities or other metropolitan areas, while 10% were in coastal non-metropolitan areas and 17% were in inland non-metropolitan areas.[30] Coastal areas with very high correlations included Ballina, Byron and Shoalhaven in New South Wales, Albany in Western Australia and Devonport in Tasmania. The group of inland non-metropolitan areas with very high correlations is dominated by the larger regional centres of NSW (Bathurst, Albury, Orange, Goulburn and Young) and Victoria (Ballarat, Greater Bendigo & Wangaratta).

The LGAs with a negative or minimal correlation (coefficient of less than 0.2) with the national pattern of growth were mainly concentrated in remote and inland areas in north and central Queensland, South Australia, Western Australia, Tasmania and the Northern Territory. One third are areas with a very small population base (less than 2000 people[31]), while 43% are in remote locations. Mining regions that had a negative correlation with the national pattern of growth are evident in Queensland and Western Australia. In fact, over three quarters of the LGAs where mining is the main employing industry

30 The terms “Capital Cities”, “Other metropolitan”, “Coastal”, “Inland” and “Remote” are used in line with the Region type classification provided in the BTRE *Industry Structure Database* (http://www.btre.gov.au/docs/infopapers/ip49/ip49.aspx).

31 2001 Census

had a negative or minimal correlation with the national pattern of growth. Comparison of year to year growth rates throughout the period indicates that these LGAs not only behave differently to the national trend, but are also much more volatile (with an average range of growth rates 80% higher than other non-metropolitan LGAs).

TABLE 5.3 CORRELATION OF LGAs TO NATIONAL ARTI GROWTH, 1980–81 TO 2000–01

Correlation Coefficient	*No. of LGAs*	*Typical Local Government Areas*
		Metropolitan
Less than –0.2	0	
–0.2 to 0.2	3	Unincorporated Vic, Clarence TAS, Palmerston NT
0.2 to 0.5	19	Port Stephens NSW, Tweed NSW, Caboolture QLD, Townsville QLD, Sorrell TAS, Perth WA, Darwin NT
0.5 to 0.75	31	Shellharbour NSW, Adelaide Hills SA, Vincent WA, Glenorchy TAS, Unincorporated ACT, Wollongong NSW, Newcastle NSW
More than 0.75	98	Woollahra NSW, Hume VIC, Noosa QLD, Manly NSW, Strathfield NSW, Greater Geelong VIC, Monash VIC, Gold Coast QLD, Prospect SA, Fremantle WA
		Non-metropolitan
Less than –0.2	13	Unincorporated NSW, Peak Downs QLD, Belyando QLD, Meekatharra WA, Laverton WA, Dorset TAS
–0.2 to 0.2	97	Singleton NSW, Emerald QLD, Coober Pedy SA, Carnamah WA, East Pilbara WA, Tasman TAS, Jabiru NT
0.2 to 0.5	159	Mildura VIC, Upper Gascoyne WA, Goondiwindi QLD, Walgett NSW, The Coorong SA, Katherine NT, Charters Towers QLD
0.5 to 0.75	162	Parkes NSW, Wentworth NSW, Roma QLD, Port Pirie SA, Exmouth WA, Circular Head TAS, Griffith NSW, Ararat VIC
More than 0.75	48	Greater Bendigo VIC, Goulburn NSW, Warrnambool VIC, Stanthorpe QLD, Mareeba QLD, Albany WA, West Tamar TAS

Source BTRE Taxable Income Database.

Note Metropolitan LGAs are those containing part of an urban centre with a population of 100 000 or more in 2001.

Persistence of growth in ARTI

This section examines the patterns of growth in ARTI across two time periods: 1980–81 to 1990–91 and 1990–91 to 2000–01.

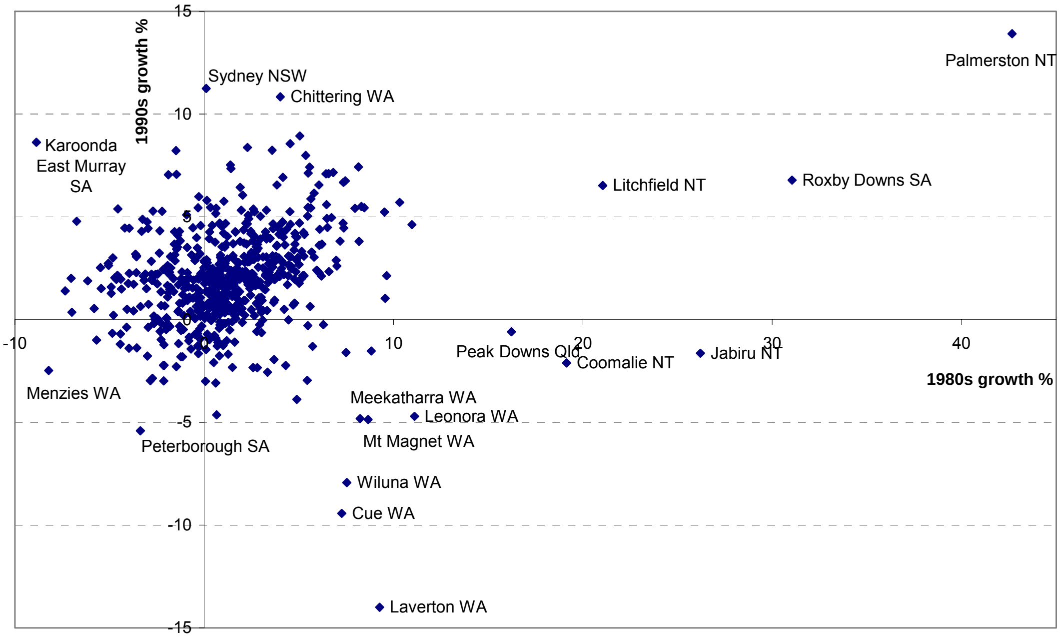
The pattern of growth in ARTI in the eighties was not necessarily reflected in the observed growth of the nineties (correlation coefficient of 0.15). Nationally, ARTI grew at a rate of 2.0% per year between 1980–81 and 2000–01 and 2.7% per year between 1990–91 and 2000–01. Despite this, only 59% of LGAs had higher growth in the 1990s than the 1980s, although 60% of LGAs experienced positive growth in ARTI across both time periods and 7% of LGAs experienced twin decline. Figure 5.6 shows the relationship between average annual growth of ARTI for LGAs in the eighties and the nineties.

The 47 LGAs which experienced decline in ARTI across both time periods were generally non-metropolitan areas with a small population base, and for many, agriculture was the main employing industry. However, some larger centres such as Broken Hill in New South Wales, Port Augusta and Whyalla in South Australia and Burnie in Tasmania also experienced continued decline.

Despite experiencing positive growth between 1980–81 and 1990–91, 55 LGAs experienced decline between 1990–91 and 2000–01. Again, these were mainly non-metropolitan LGAs with a relatively small population base and many reliant on agriculture. However, almost a third had mining as the main employing industry, including clusters of coal mining LGAs in Queensland (eg Belyando, Broadsound, Duaringa, Nebo, Peak Downs) and metal ore mining LGAs in Western Australia (eg East Pilbara, Wiluna, Meekathara, Cue, Yalgoo).

The outliers in Figure 5.6 are also of interest. Many reflect the variability of the mining industry, but others (eg Palmerston and Lichfield in the NT) are associated with urban expansion. Of particular note is the strong 1990s growth in Sydney (based on the Sydney CBD).

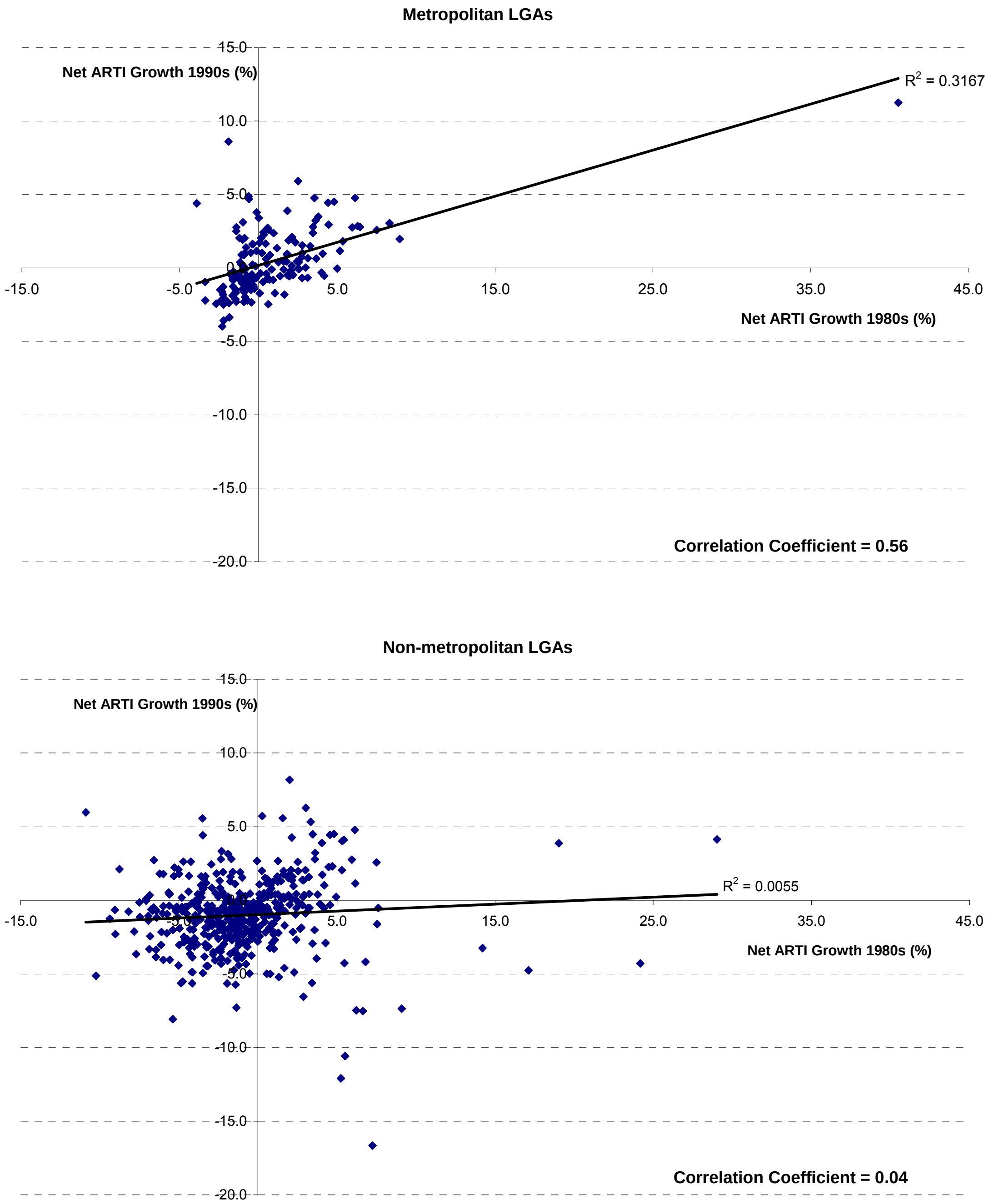
FIGURE 5.6 AVERAGE ANNUAL GROWTH IN ARTI IN THE 1980s AND THE 1990s



Source BTRE Taxable Income Database.

Figure 5.6 describes ARTI growth in absolute terms. However interregional comparisons are better understood once national effects are removed. That is, did the same LGAs that did better than the national trend in the 1980s also do better in the 1990s? When the national growth rate is subtracted from the LGA rate in each decade, the overall correlation between the resulting rates is positive but relatively modest (correlation coefficient 0.21). However, there is a significant metropolitan/non–metropolitan divide as shown in Figure 5.7.

FIGURE 5.7 NET ARTI GROWTH IN THE 1980s AND 1990s, METROPOLITAN AND NON-METROPOLITAN LGAs



Note “Net ARTI Growth” is calculated as the difference of the decade average annual growth rate for the LGA and the decade average annual growth rate for Australia as a whole.

Source BTRE Taxable Income Database.

In metropolitan Australia there is a strong positive correlation (0.57) whilst for non-metropolitan areas there is no significant correlation (0.04). This "decade based" result is supported by year on year analysis which yields correlation coefficients in metropolitan areas of between 0.28 and 0.76 in all but four of the 19 years that can be calculated. Non-metropolitan areas were much less predictable with only four correlation coefficients outside the –0.2 to 0.2 range.

These results have clear policy implications for the private and public sectors. Not only is ARTI growth higher in metropolitan areas, it is more predictable and so suggests these are more attractive investment areas for business and homebuyers alike. It also has implications for the potential for using the *Taxable Income Database* as a basis for generating regional forecasts. On face value, simple statistical forecasts based on previous year data would seem to be inherently quite reliable in metropolitan areas. Forecasting for non-metropolitan areas requires more sophisticated techniques.

5.4 ANALYSIS OF REAL INCOME PER TAXPAYER (RIPT)

Distribution of RIPT

In 2000–01, the Real Income per Taxpayer (RIPT) for all Australia was $40 865. Figure 5.8 presents a map of the distribution of RIPT across Australia in 2000–01 whilst Figure 5.10 presents a map of the distribution of RIPT across Sydney.

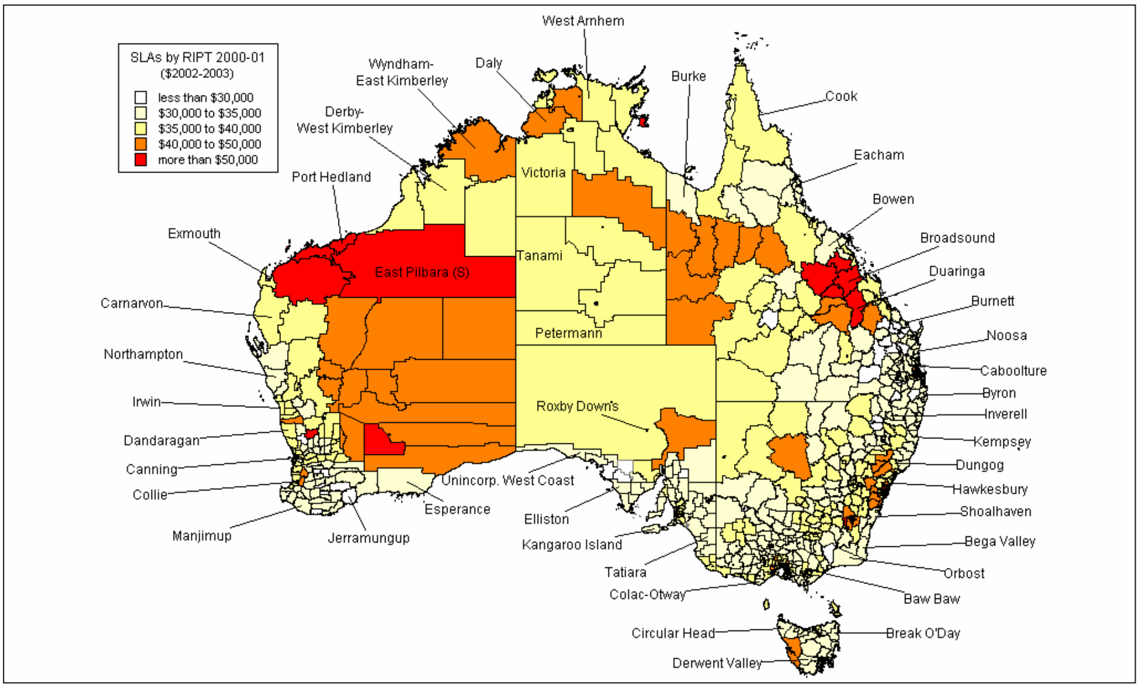
The LGAs with the lowest RIPTs were often found in rural areas, especially in Queensland, Western Australia and South Australia. By contrast, the LGAs with the highest RIPT tended to be in and around the capital cities, in particular Sydney, Melbourne, Brisbane and Perth.

Outside capital cities the highest RIPTs were mainly found in SLAs containing mining locations, such as: Broadsound, Peak Downs, Belyando, Duaringa and Nebo in Queensland; Wiluna, Ashburton and Leonora in Western Australia and Roxby Downs in South Australia. Figure 5.8 provides a pictorial confirmation of the remoteness class analysis described in Chapter 4.

Figure 5.9 plots the distribution of RIPT between LGAs in Australia in 1980–81, 1990–91 and 2000–01. What is apparent is a large increase in the range of LGA RIPTs, especially at the higher end with the highest RIPT increasing from $53 807 to $58 286 to $103 734 across the two decades. In addition, the lowest RIPT has declined and the distribution has become much flatter. What is also apparent is that the 1980s saw a fall in the national RIPT as well as a significant shift towards a less equitable distribution between LGAs – the distribution in 1990–91 is both flatter and distributed across a wider range than in 1980–81. The shift from 1990–91 to 2000–01 moves the distribution to the right but essentially maintains the relativities. The exception is that the LGAs with the very highest

RIPTs have significantly, creating a much longer upper tail to the distribution. That is to say, across the full range of LGAs in Australia, real income per taxpayer has become less equally spread over the period 1980–81 to 2000–01. In 1980–81, the range of income levels was quite small with the majority of Australia's regions earning between $30 000 and $40 000 per year. By 2000–01 the range was much larger, and while most of Australia still had an income between $30 000 and $40 000 in real terms, the top end of income had extended to $103 000 almost double the 1980–81 top.

FIGURE 5.8 RIPT BY SLA, AUSTRALIA, 2000–01

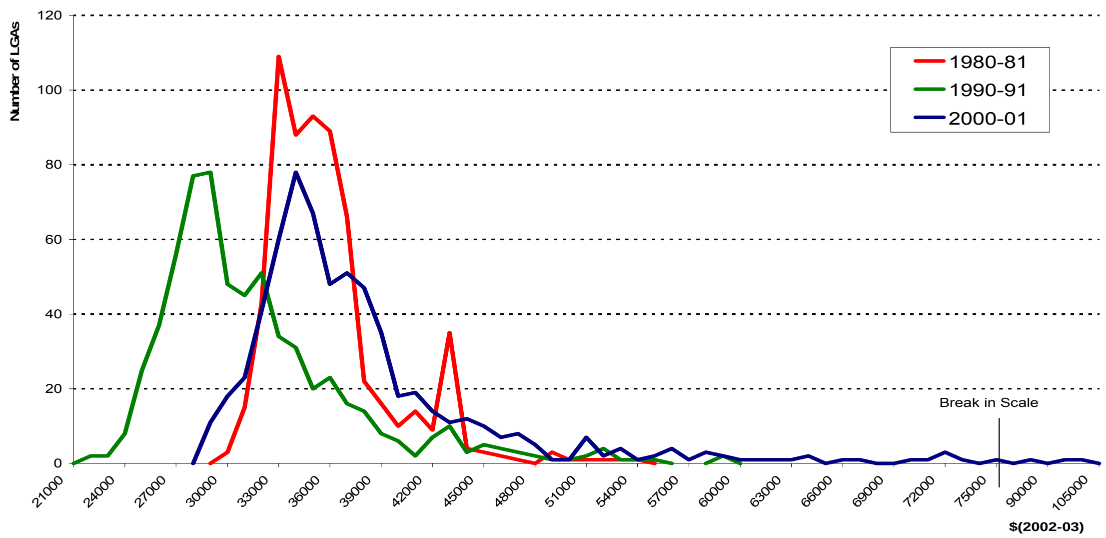


Source Produced by BTRE using Taxable Income Database and ABS C-DATA software.

Table 5.4 further illustrates the overall broadening of the distribution over the twenty years with increases in the percentage of LGAs in the higher (0.6% to 7.2%) and lower (0.5% to 4.6%) categories at the expense of the middle income categories. In 2000–01, the RIPT was most frequently between $30 000 and $35 000 (43% of LGAs). This was a significant decline from 1980–81, when 55% of LGAs fell into this category.

The distributions in Figure 5.9 suggest a significant change, with a movement to a less equal personal income distribution across Australia over the 1980s (and for the twenty years to 2000–01). This finding is interesting in the light of the conclusions of Cashin & Strappazzon (1997) who found a similar trend between the states in the 1976 and 1991 censuses, but not at the Statistical Division level within states. The issue of convergence and divergence of incomes is explored further in Chapter 6.3.

FIGURE 5.9 FREQUENCY DISTRIBUTION OF RIPT IN LGAs, 1980–81, 1990–91 & 2000–01



Source BTRE Taxable Income Database

TABLE 5.4 RIPT IN LGAs, 1980–81 AND 2000–01

RIPT	*No. of LGAs*		*Examples (2000–01)*
	1980–81	*2000–01*	
<$30 000	3 (0.5%)	29 (4.6%)	Kyogle NSW, Peterborough SA, Stanthorpe QLD, Streaky Bay SA, Jerramungup WA, Tasman TAS, Barraba NSW, Chinchilla QLD
$30 000–$35 000	348 (55.3%)	269 (42.8%)	Byron NSW, Glen Innes NSW, Swan Hill VIC, Hervey Bay QLD, Noosa QLD, Ipswich QLD, Ceduna SA, Esperance WA, Launceston TAS
$35 000–$40 000	202 (32.1%)	199 (31.6%)	Wagga Wagga NSW, Broken Hill NSW, Wodonga VIC, Queenscliffe VIC, Ipswich QLD, Whyalla SA, Bunbury WA, Burnie TAS, Palmerston NT
$40 000–$50 000	72 (11.4%)	87 (13.8%)	Newcastle NSW, Yarra VIC, Emerald QLD, Holdfast Bay SA, Fremantle WA, Collie WA, Hobart TAS, Jabiru NT, Unincorporated ACT
>$50 000	4 (0.6%)	45 (7.2%)	Lane Cove NSW, Baulkham Hills NSW, Port Phillip VIC, Broadsound QLD, Adelaide SA, Subiaco WA, Roxby Downs SA, Port Hedland WA

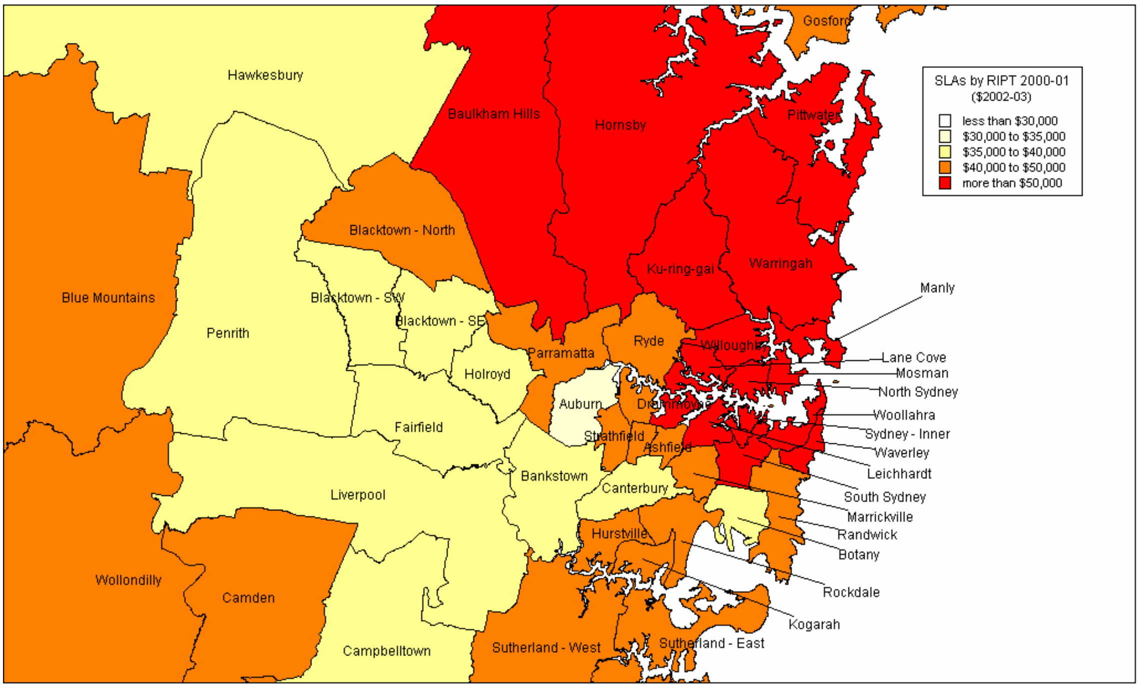
Source BTRE Taxable Income Database

Note Unincorporated Other Territories excluded

The situation for the 1990s is less clear. The existence of a trend to increased inequality over the 1990s in the general population distribution has been claimed by some, for example Harding and Greenwell (2001), although disputed by others (Parham et al 2000). The figures in our analysis suggest that changes in the distribution largely arise at the top end of the distribution of LGAs. This is not necessarily inconsistent with either conclusion suggested in the literature since internal migration could accentuate or mitigate the spatial effects of changes in income. However, if the patterns shown in Figure 5.9 are the result of internal migration rather than changes in the relative income levels of individuals, then it must be due to higher and lower income people congregating together spatially. That is, high income individuals are seeking high income "areas' and/or low income people seeking low income areas. In social terms, such a trend toward economic segregation may well be as concerning as increased inequality in individual incomes.

Figure 5.10 emphasises the strong spatial grouping of income levels in Sydney, although similar trends can be seen in the other major capitals. The city has the five LGAs with the highest RIPTs in Australia, namely Mosman, Woollahra, Hunter's Hill, Ku-ring-gai and North Sydney (see Table 5.4). The higher incomes are clumped around the city centre and the North Shore, with those on the harbour being particularly high. By contrast the outer Sydney LGAs such as Penrith, Blacktown, Liverpool, Campbelltown, Fairfield, Bankstown and Canterbury form a band of LGAs to the west and south with RIPTs below the national average. Auburn has the lowest RIPT in Sydney ($34 918). Beyond the lower income belt, LGAs on the very fringe of the city (e.g. Wollondilly, Blue Mountains, Camden) have higher RIPTs ($40 000 to $50 000) rivalling many LGAs close to the coast.

FIGURE 5.10 RIPT BY SLA, SYDNEY AND ENVIRONS, 2000–01



Source Produced by BTRE using Taxable Income Database and ABS C-DATA software.

Table 5.5 identifies the ten LGAs with the highest and lowest RIPT values in 2000–01, and shows their RIPT and ARTI growth since 1980–81. The LGA with the lowest average income was Jerramungup in Western Australia ($28 096). Interestingly, only four of the bottom ten (Streaky Bay, Monto, Jerramungup and Kent) were also in the bottom ten for RIPT growth and in fact some of the LGAs with the lowest RIPT values actually had positive ARTI growth over the period. This emphasises the dual roles of income level and migration on overall regional economic growth. The LGA with the highest RIPT was Mosman in New South Wales ($103 734) which also experienced the largest annual increase in RIPT (4.3%) of all LGAs since 1980–81. Seven of the top ten RIPT LGAs were also in the top ten of RIPT growth rates, suggesting that migration may be a less important variable at the top end of the scale.

TABLE 5.5 LGAs WITH HIGHEST AND LOWEST RIPT, 2000–01

LGA	*RIPT* 2000–01 *($2002–03)*	*Annual RIPT growth 1980–81 to* 2000–01 *(%)*	*Annual ARTI growth 1980–81 to* 2000–01 *(%)*
Lowest Real Income Per Taxpayer			
Jerramungup WA ∞	28 096	-1.1	-0.8
Kolan QLD ^	28 126	-0.8	3.7
Perry QLD^	28 130	-0.8	2.2
Kent WA ∞	28 199	-1.1	-3.4
Monto QLD ^	28 490	-1.2	-1.1
Streaky Bay SA ∞	28 541	-1.3	-1.3
Wickepin WA ^	28 584	-1.0	-1.2
Cuballing WA^	28 590	-1.0	-1.0
Tasman TAS^	28 729	-0.7	0.4
Clifton QLD§	28 769	-0.2	1.5
Highest Real Income Per Taxpayer			
Mosman NSW *	103 734	4.3	5.2
Woollahra NSW *	95 760	3.5	4.0
Hunter's Hill NSW *	86 461	3.6	4.3
Ku-ring-gai NSW *	78 531	2.4	3.0
North Sydney NSW *	75 552	3.1	4.0
Nedlands WA *	72 264	2.4	2.8
Stonnington VIC *	71 986	2.5	2.7
Peppermint Grove WA *	71 528	2.3	2.9
Cottesloe WA *	71 394	2.5	3.4
Mosman Park WA *	70 925	3.0	4.1

Source BTRE Taxable Income Database.

Note Incomes expressed in terms of 2002–03 dollars.
The symbol after the LGA name denotes the remoteness class accounting for the majority of the LGA's population (Major Cities = *; Inner Regional = §, Outer Regional = ^; Remote = ∞).

Only two of the LGAs that were in the top ten RIPT values in 2000–01 had also been in the top ten in 1980–81, namely Woollahra (7th in 1980–81) and Ku-ring-gai (5th in 1980–81). In 1980–81, the top ten list was dominated by remote mining communities (Belyando, Broadsound, Ashburton, East Pilbara) whereas in 2000–01 it was made up entirely of LGAs in Sydney, Perth and Melbourne.

Growth of RIPT

The level of RIPT growth in Australia (14%) over the twenty-years to 2000–01 is less than that observed for ARTI (59%), reflecting an overall increase in the number taxable individuals (NTI) which has grown by nearly 2.4 million or 40%. Whilst increased income is very much the junior partner contributing to regional growth, 63% of LGAs experienced growth in RIPT. However for 83% of LGAs , growth in RIPT was below the national average growth rate of 0.64%.

The size of the LGA (based on the level of ARTI) at the start of the period is correlated with the growth in RIPT of the LGA. That is, larger LGAs grow at a greater rate than smaller LGAs (correlation coefficient = 0.30). Whilst LGAs vary to the degree that they represent discreet units of economic activity, this result suggests that better defined regional "economies" (for example based on urban centres) may behave in a similar way.

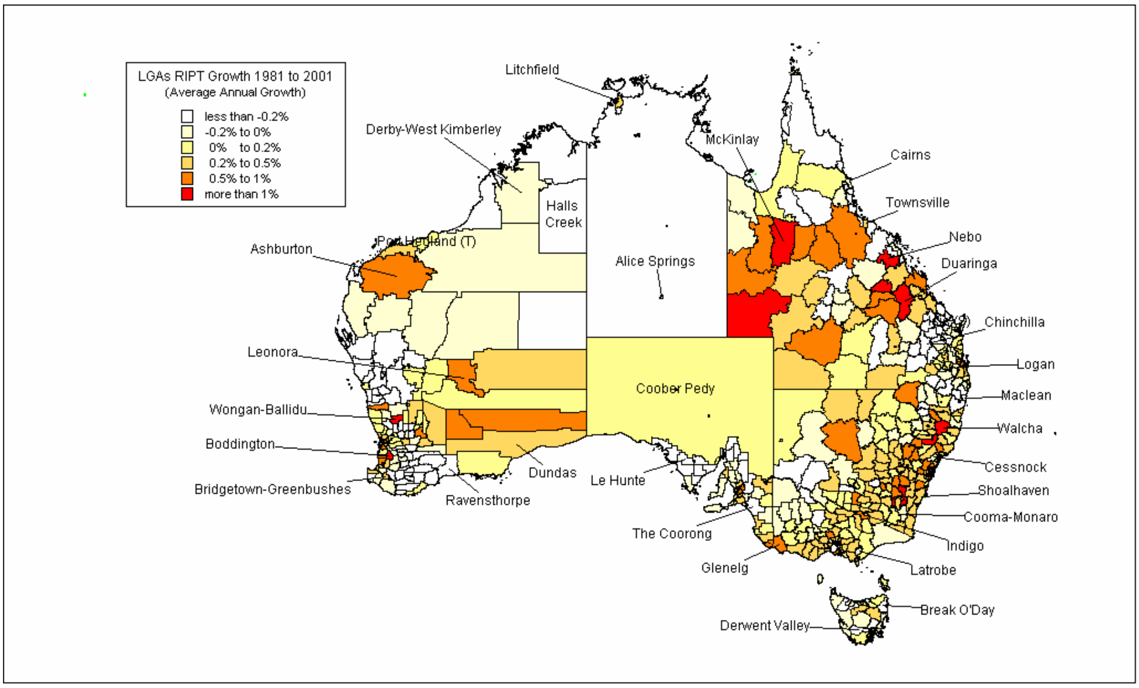
Of the 230 LGAs that had a decline in RIPT between 1980–81 and 2000–01, 69 were in Western Australia. This represents 48% of Western Australia's 143 LGAs. Tasmania, South Australia and Queensland also had high proportions of LGAs experiencing decline, at 59%, 45% and 50% respectively. The greatest declines were in less populated remote and inland non-metropolitan areas, such as: Perenjori (–1.7% per annum), Northampton (–1.3%), Chapman Valley (–1.2%), Kent (–1.1%), and Jerramungup (–1.1%) in Western Australia; Streaky Bay (–1.3%), Le Hunte (–1.2%) and Peterborough (–1.0%) in South Australia and Burdekin (–1.3%), Whitsunday (–1.2%), Monto (–1.2%) and Isis (–1.2%) in Queensland. In all these LGAs, the main employing industry is agriculture.

Figure 5.11 maps the average annual growth in RIPT between 1980–81 and 2000–01 for all LGAs. As is the case with ARTI, the greatest declines are generally evident in remote and inland non-metropolitan areas, particularly areas with relatively small populations and where agriculture is the main employing industry. Apart from York and Merredin, Western Australia's wheat belt has experienced relatively significant declines in RIPT, as have South Australia's York and Eyre Peninsulas, Western NSW and much of rural Queensland.

The cluster of LGAs experiencing strong declines on the Eyre Peninsula of South Australia, includes the LGAs of Streaky Bay (–1.3%), Le Hunte (–1.2%), Cleve (–1.0%), Elliston (–0.9%), and Franklin Harbour (–0.9%). However, Port Lincoln (a major centre on the Eyre Peninsula) experienced good growth in RIPT over the period (1.0%). This difference in RIPT of LGAs with an additional (non-agricultural) industry base, in this case fishing/aquaculture, is relatively common. Most often the alternate industry is mining related as in Cobar NSW (0.6%), Leonora WA (0.8%), Peak Downs QLD (2.2%) or Roxby Downs SA (2.0%).

An arc of LGAs experiencing strong declines is evident around the Brisbane - Gold Coast - Sunshine Coast urban conglomerate, from the Wide Bay Burnett region in Queensland, to Maclean in northern NSW. This band includes the LGAs of Monto (–1.2%), Isis (–1.2%), Mundubbera (–1.0%), Perry (–0.8%), and Biggenden (–0.7%) in Queensland and MacLean (-0.4%), Grafton (-0.2%) and Tenterfield (-0.2%) in NSW. The continuity of this arc suggests spatial growth patterns are not constrained by state borders.

FIGURE 5.11 AVERAGE ANNUAL GROWTH IN RIPT BY LGA, 1980–81 TO 2000–01



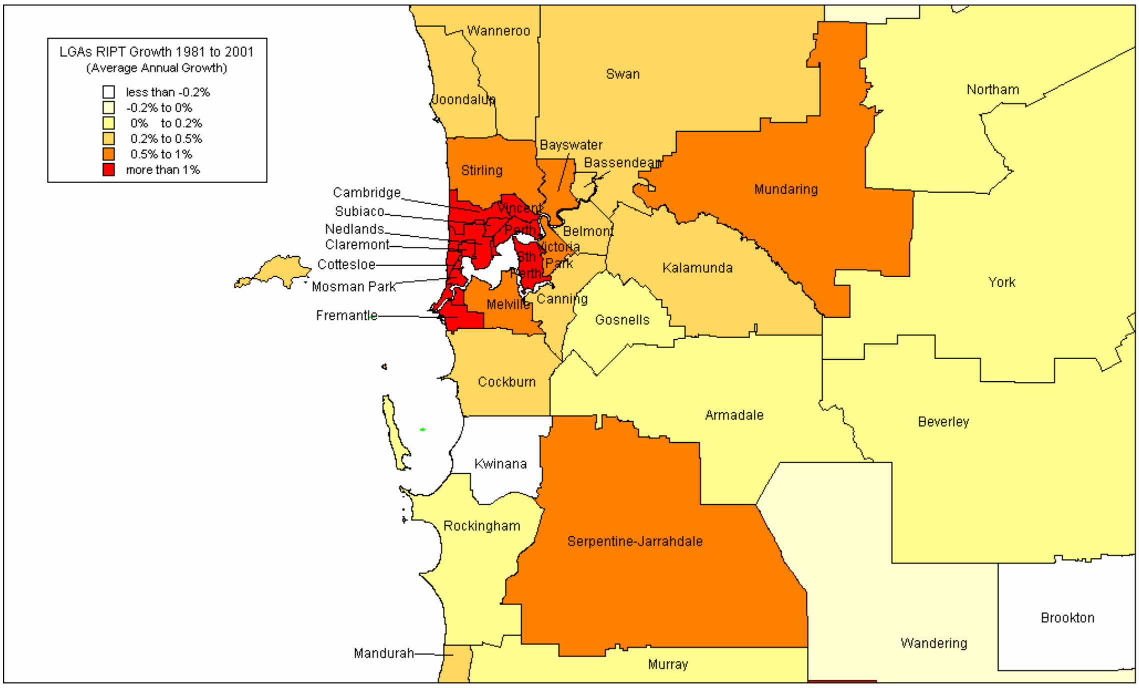
Source Produced by BTRE using Taxable Income Database and ABS C-DATA software.

The strongest growth in RIPT over the period was experienced in and around capital cities, particularly: Mosman, Hunter's Hill, Woollahra and North Sydney in New South Wales; Claremont, Mosman Park, Nedlands and Cottesloe in Western Australia and Stonnington in Victoria. These are all areas with already very high average incomes. Of interest is that these areas generally had a much lower ranking in terms of ARTI growth, with most outside the top one hundred. This refects their status as established urban LGAs not undergoing redevelopment nor gaining large increases in the number of taxable individuals (NTI). Typically these LGAs have small annual average increases in NTI of around 1% or less per annum. Increases in ARTI in these LGAs are due to increases in RIPT rather than higher taxpayer numbers.

For comparable reasons, many of the coastal areas that experienced strong growth in ARTI did not experience corresponding increases in RIPT, with a number actually experiencing decreases. Examples include Maclean NSW (ARTI 4.1% per annum, RIPT –0.4%, NTI 4.5%), Whitsunday (3.4%, –1.2%, 4.7%), Douglas (3.7%, –1.0%, 4.8%), Mallala (4.1%, –0.2%, 4.3%), Augusta-Margaret River (5.9%, –0.3%, 6.2%) and Broome (6.3%, –0.3%, 6.6%).

Figure 5.12 is comparable to Figure 5.11, but focuses on the 30 LGAs in and around Perth. Strong growth (more than 1% per year) is apparent in the LGAs closest to and including Perth itself. Moving away from the city centre, the LGAs of Victoria Park, Melville, Stirling and Bayswater all had average annual growth above 0.5%, with Swan, Wanneroo, Joondalup, Bassendean, Belmont, Canning, Kalamunda and Cockburn having growth in the 0.2–0.5% range. With increased distance from the city centre, RIPT growth is even smaller, for example in Gosnells, Armadale and Rockingham. The “concentric rings” pattern of declining growth does not hold universally however, with Mundaring and Serpentine-Jarrahdale representing areas of higher growth whilst Kwinana has lower growth than all surrounding areas. Despite experiencing strong growth in ARTI, the fringe LGAs of Joondalup, Wanneroo and Rockingham experienced relatively small growth in RIPT, suggesting NTI increases driven by population growth are the growth driver in these areas. By contrast, the RIPT of areas such as Nedlands, Peppermint Grove, Cottesloe and Claremont has been increasing without increases in population.

FIGURE 5.12 AVERAGE ANNUAL GROWTH IN RIPT BY LGA, PERTH, 1980–81 TO 2000–01



Source Produced by BTRE using Taxable Income Database and ABS C-DATA software.

Correlation with national growth in RIPT

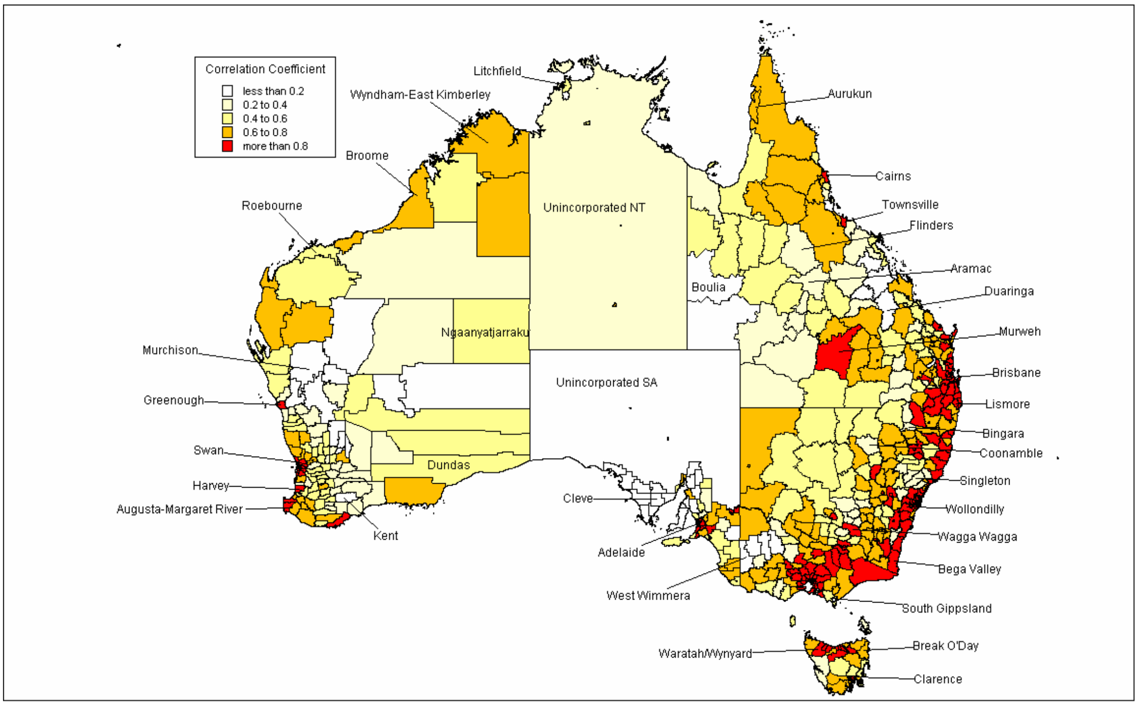
Growth in the RIPT of LGAs tends to be closely linked to the national pattern of growth. When each LGA's annual growth in RIPT over twenty years is compared to the national annual growth, most LGAs demonstrate a strong correlation. One hundred and seventy two (27%) LGAs had a correlation of between 0.6 and 0.8 with the national average, with a further 204 (32%) having a correlation of more than 0.8. Only 46 (7%) LGAs had a correlation of less than 0.2 and no LGA had a correlation coefficient of less than –0.2. Figure 5.13 maps the correlation of each LGA's average annual growth with national RIPT. There are more areas of moderate to high correlation than is observed for the correlation of growth for ARTI (Figure 5.5). RIPT growth is less likely to vary significantly within a LGA over time, reflecting the reduced sensitivity of this variable to population migration when compared to ARTI.

As with the correlation of ARTI growth with national trends, the major cities and areas immediately adjacent to them are more likely to be strongly correlated with national trends.

Of those LGAs with a very high correlation coefficient (between 0.8 and 1.0), the majority (59%) were in capital cities or other metropolitan areas, 21% were in coastal non-metropolitan areas and 20% in inland non-metropolitan or remote areas. Coastal areas with very high correlations included Shoalhaven and Bega Valley in New South Wales, Bunbury and Harvey in Western Australia, and Devonport in Tasmania. Inland non-metropolitan areas with very high correlations were regional centres with a large population base such as Bathurst, Wagga Wagga, Albury, Orange, Dubbo and Goulburn in New South Wales, Wangaratta, Bendigo and Ballarat in Victoria and Launceston in Tasmania.

The LGAs with minimal correlation with the national pattern of growth (correlation coefficients of less than 0.2) were all located in non-metropolitan areas, particularly of South Australia, Western Australia and Queensland. Over half were areas with a very small population base (less than 2 000 people), with many in remote locations. Some of these areas have mining as the main source of employment (such as Broadsound and Nebo in Queensland and Laverton and Leonora in Western Australia) with high RIPTs and greater year to year fluctuations than is observed nationally. However the majority of LGAs with minimal correlation had predominantly rural economies.

FIGURE 5.13 CORRELATION OF NATIONAL AND LGA ANNUAL GROWTH IN RIPT, 1980–81 TO 2000–01



Source Produced by BTRE using Taxable Income Database and ABS C-DATA software.

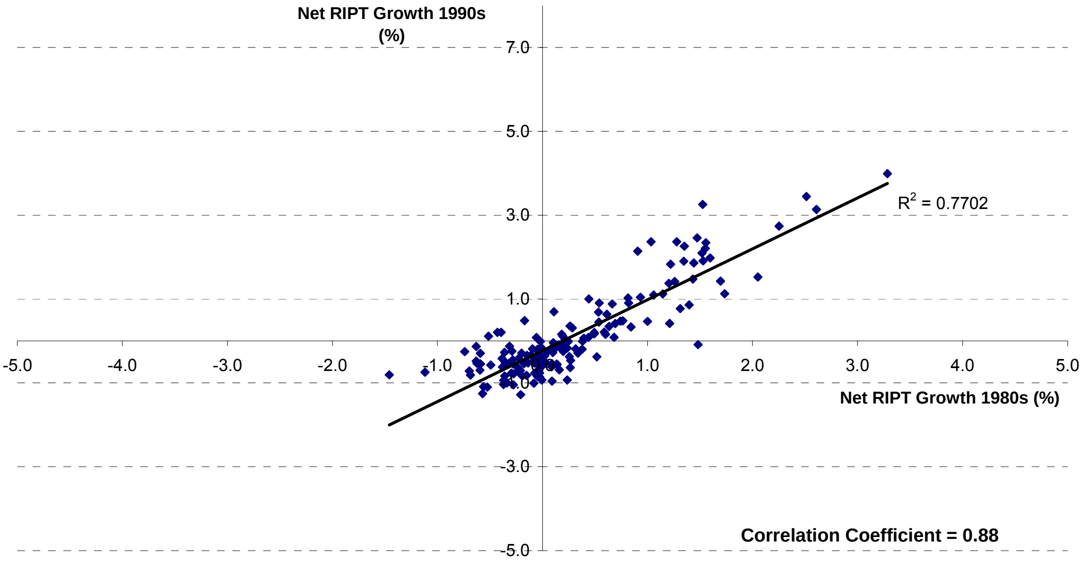
Persistence of growth in RIPT

For Australia as a whole, the pattern of growth in RIPT in the 1980s was not a good predictor of growth in the 1990s. Nationally, RIPT declined at a rate of about 0.7% per year between 1980–81 and 1990–91 but increased by 2.0% per year between 1990–91 and 1999–00. This "decline then growth" pattern in RIPT was reflected across most LGAs with 90% declining in the 1980s but only 2% falling in the 1990s.

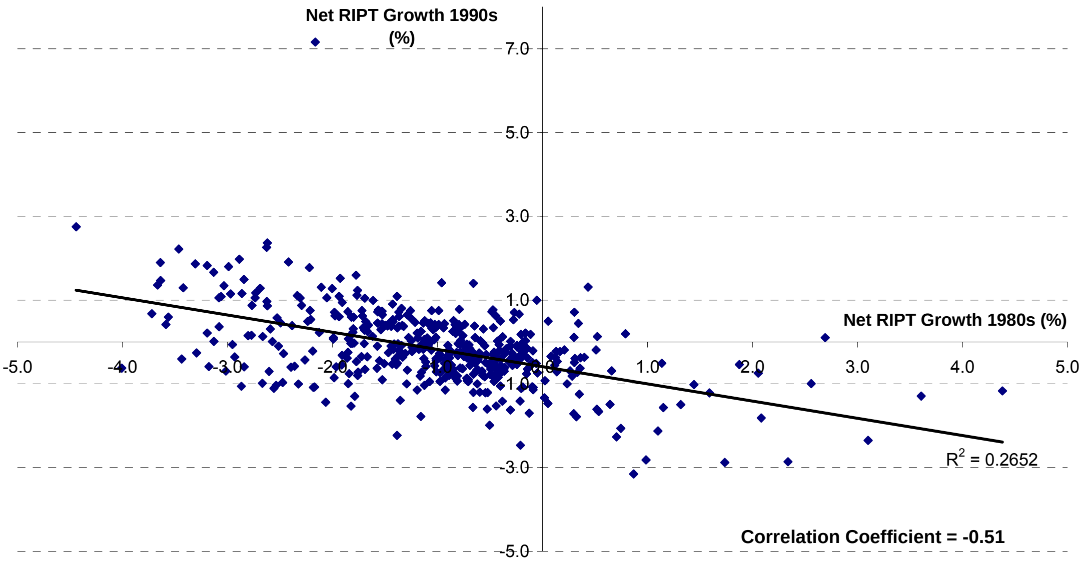
In absolute growth terms, there is little relationship between the patterns of the 1980s and the 1990s. However of more interest is the comparison of RIPT growth in the LGAs between the two periods once national effects (and hence the impact of national and international events) are removed. That is, is doing better than the national average in the 1980s a good predictor of doing better than the national average in the 1990s? Comparison of growth in all the LGAs on this basis yields a correlation coefficient of –0.13. However, this seeming lack of relationship masks two strong but opposing trends that are revealed if the same calculation is made separately for metropolitan and non-metropolitan LGAs. Figure 5.14 shows the extent of these two trends. In metropolitan areas, a strong positive relationship (correlation coefficient 0.88) is found, whilst in non-metropolitan LGAs there is a strong negative relationship (–0.51).

FIGURE 5.14 NET RIPT GROWTH IN THE 1980s AND 1990s, METROPOLITAN AND NON-METROPOLITAN LGAs

Metropolitan LGAs



Non-metropolitan LGAs



Note "Net RIPT Growth" is calculated as the difference of the decade average annual growth rate for the LGA and the decade average annual growth rate for Australia as a whole.

Source BTRE Taxable Income Database.

The metropolitan result of successive decades of similar growth is in line with our earlier observations regarding the distribution of RIPT which suggested an increase in inequality (see Table 5.4). That is the high income LGAs in the metropolitan areas have incomes increasing still further whilst the lower income LGAs have only small increases in RIPT or have falls. However the negative relationship in non-metropolitan Australia suggests there are factors working against ever increasing inequality. In this paper we only have time to speculate on what the reasons might be for this, but the possibilities include relatively random factors such as cyclical changes in commodity prices or mineral discoveries. On the other hand there may be more systematic processes at work such as deliberate government action promoting regional development or inter–regional migration in response to changes in regional labour prices and living costs. In practice there are likely to be a range of factors which impact on any one LGA. Whatever the underlying mechanisms, the phenomenon will provide a fertile subject for further study.

In summary

Whilst most LGAs experienced positive growth in ARTI between 1980–81 and 2000–01, there was an overwhelming dominance of the major cities in terms of the total amount of ARTI, ARTI growth and correlation of ARTI with national trends. Strong growth in ARTI was also evident in a large number of coastal areas and outer fringe urban areas where growth in population was the driving force. LGAs experiencing decline in ARTI were generally in remote and inland non-metropolitan areas, particularly agricultural areas with a relatively small population base. Metropolitan areas also tended to be more predictable in terms of ARTI growth, whereas growth in non-metropolitan areas was a poor predictor of future growth in either the short (year by year) or medium term (decade by decade).

In 1980–81 the highest RIPTs were in remote mining locations with only two other LGAs in the top ten. By 2000–01 the top ten list only contained LGAs from Sydney, Perth and Melbourne. In both years the lowest incomes were generally experienced in remote agricultural LGAs of Australia. Most LGAs had RIPTs of between $30 000 and $40 000, however the number of LGAs with very high incomes and very low incomes increased markedly between 1980–81 and 2000–01. Capital city and remote mining LGAs of Australia also tended to experience the greatest growth in RIPT, while inland and remote agricultural LGAs experienced the greatest declines.

For most LGAs, growth in both ARTI and RIPT tended to be very closely linked to the national pattern of growth. However, metropolitan LGAs tended to be more closely aligned with the national pattern of growth than non-metropolitan LGAs. As with ARTI, the current growth of RIPT seems only to be a good predictor of future growth in the metropolitan areas.

CHAPTER 6 USING THE DATABASE: SPATIAL INSIGHTS FROM CROSS–REGIONAL APPLICATIONS

This chapter explores some of the potential applications of the BTRE *Taxable Income Database*.[32]

6.1 UNDERSTANDING THE ECONOMIC AND SOCIAL DRIVERS OF REGIONAL ECONOMIC GROWTH

Identifying the drivers of regional growth is a fundamental question of regional policy. The BTRE's *Taxable Income Database* provides a time series measure of economic growth which can be linked with other sources of regional information, in order to gain a richer understanding of the factors influencing regional growth and decline. In a similar manner, the database can be used to explore the factors influencing differences in average incomes across regions.

Australian research into the determinants of regional growth (e.g. Garnaut et al 2001, Bradley and Gans 1998, Lawson and Dwyer 2002) has typically been based on measures of population and/or employment growth. The significance and accuracy of these factors were discussed in Chapter 2 above. However, there are other relevant factors affecting regional growth. Two earlier reports in the *Focus on Regions* series illustrate how the BTRE's *Taxable Income Database* can be used to explore the relationship between socio-economic conditions (such as industry structure or qualifications) and economic growth in Australia's regions. Both reports analysed the relationship between their subject area and ARTI growth between 1990–91 and 1999–00 for a set of 425 labour market regions.

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32 It is not, of course, possible to demonstrate all the potential applications or present analysis for the multitude of Australia's regions. The BTRE invites researchers and regional development practitioners to use the database for their own projects and in their own regions, and thereby test its validity. Comments are welcome and should be addressed to Mr Geoff Frost, BTRE, PO Box 501, Canberra ACT 2601.

Focus on Regions No. 1: Industry structure concluded that the industry structure of employment plays a statistically significant, but not dominant, role in explaining regional differences in economic growth (BTRE 2004a). While a high share of employment in the Property and business services or Construction industries was associated with stronger economic growth for regions during the 1990s, different industries may be associated with economic growth over the next decade. No prescriptive conclusions can be drawn as to whether industry structure can be changed to improve economic performance. Rather, strategies for regional development need to build upon comparative advantage, and capitalise on region-specific resources, knowledge and location.

Regions with a highly diverse industry structure were found to experience more stable economic performance than other regions. However, the analysis does not support the claim that a highly diverse industry structure is associated with greater regional growth prospects. Increases in diversity work to insulate regional economies from the effect of both positive and negative shocks, and tend to be associated with less volatile growth paths.

Focus on Regions No. 2: Education, skills and qualifications identified a positive relationship between high shares of university–educated residents and growth in ARTI (BTRE 2004b). However, the regions with the fastest income growth over the 1990s did not have the highest 1991 shares of university educated residents, suggesting a limit to the relationship between education and income growth. There is also some evidence of an over–supply of highly educated residents in Major Cities, indicating a saturation point for labour market integration of highly qualified individuals. While highly qualified workers and highly skilled occupations are important for a region's development, they do not need to dominate the labour market for income growth to occur.

6.2 A CASE STUDY: THE SPATIAL IMPACTS OF THE EARLY 1990'S RECESSION

In 1990 the Australian economy slid into recession. GDP decline in 1990–91 was followed by growth of only 0.3% over 1991–92, and was associated with a rapid increase in the unemployment rate, which peaked at 11.9% in February 1993. While the national effects of this recession are well known, little is available about its sub-national spatial impacts.

The BTRE's *Taxable Income Database* provides a means of investigating questions such as:

- Was the national decline in economic activity reflected fairly consistently throughout Australia's regions?

- Which regions suffered the largest declines in economic activity over this period?
- Did some regions experience economic growth, despite the recession? If so, what were the characteristics of these regions?
- Are there any implications with regard to the spatial impacts of future economic downturns?

ARTI

This analysis uses LGA taxable income data for the 1988–89 (pre–recession) to 1991–92 (pre–recovery) period.[33] The national experience of the recession is reflected in the fact that between 1988–89 and 1991–92, Australian ARTI declined from $281 billion to $260 billion, a decline of 7.4%. While ARTI declined in all three years, the largest decline (–4.7%) occurred in 1990–91.

At a sub-national level, all States experienced a decline in ARTI over the three year period, with the decline most marked in Victoria (11.3%) and Western Australia (10.2%). In contrast, Queensland's decline in economic activity was relatively modest (2.0%). For the Northern Territory and the Australian Capital Territory, ARTI in 1991–92 was marginally higher than in 1988–89, although both experienced declines earlier in the period.

The national decline in economic activity between 1988–89 and 1991–92 was reflected in the majority of LGAs. Figure 6.1 shows the number which experienced different rates of growth/decline in ARTI between 1988–89 and 1991–92. Twenty three per cent of LGAs actually experienced an increase, however 139 LGAs experienced a decline of more than 20%. The most common outcome for LGAs was a decline in ARTI of between 10% and 20% or between 5% and 10%.

However, there was considerable variation in the extent to which economic activity declined across LGAs, and a significant minority of LGAs experienced growth, despite the national recession. Correlation analysis suggests that smaller LGAs, on the whole, tended to experience a greater decline than larger LGAs.

Figure 6.2 maps the ARTI ratio for all LGAs over the recession period. Particularly strong declines in ARTI were experienced by a cluster of LGAs in inland south-west and mid-west WA. However, this result largely reflects the

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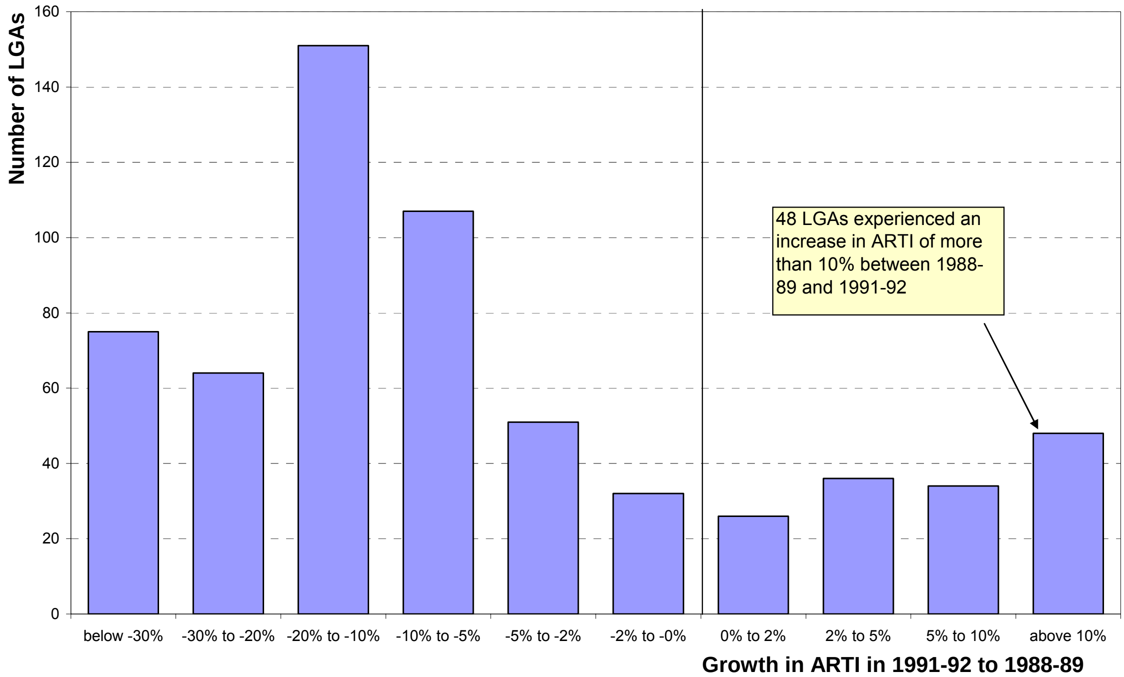
33 Specifically, the indicator used is the ratio of ARTI in 1991–92 to ARTI in 1988–89. Changes in ARTI for LGAs over this period are likely to reflect a range of local, national and global factors, and cannot simply be attributed to the national recession.

situation of the wheat and wool export markets over this period, rather than the impact of the recession.

FIGURE 6.1 EXTENT OF ARTI GROWTH IN AUSTRALIAN LGAs, 1988–89 TO 1991–92



Source BTRE Taxable Income Database.

Table 6.1 shows that a fall in the wheat price in 1990–91 and a drop in production in 1991–92, meant that the value of the Australian wheat crop fell by approximately 30% between 1988–89 and 1991–92. Average Australian auction prices for greasy wool declined from 647.3 cents per kilogram in 1988–89 to 358.8 cents per kilogram in 1991–92.[34] Most of the LGAs in Western Australia's wheat–sheep belt experienced an ARTI decline of more than 30% over the period.[35] The impact in the wheat–sheep regions in eastern South Australia; western Victoria; mid–western NSW and southern Queensland was real but not so severe.

34 ABARE (2003) also shows that the Eastern market indicator for clean wool fell from 1091.7 cents per kilogram to 592.6 cents per kilogram over the period.

35 Section 6.4 explores the link between taxable income and the wool and wheat markets for the Katanning, Kojonup, Tambellup and Wagin LGAs in Western Australia.

TABLE 6.1 WHEAT PRODUCTION AND UNIT VALUE, AUSTRALIA, 1988–89 TO 1991–92

Year	*Production volume (kt)*	*Unit value ($/t)*	*Value ($b)*
1988–89	14 061	211.6	2.98
1989–90	14 214	195.2	2.77
1990–91	15 066	132.0	1.99
1991–92	10 557	198.6	2.10

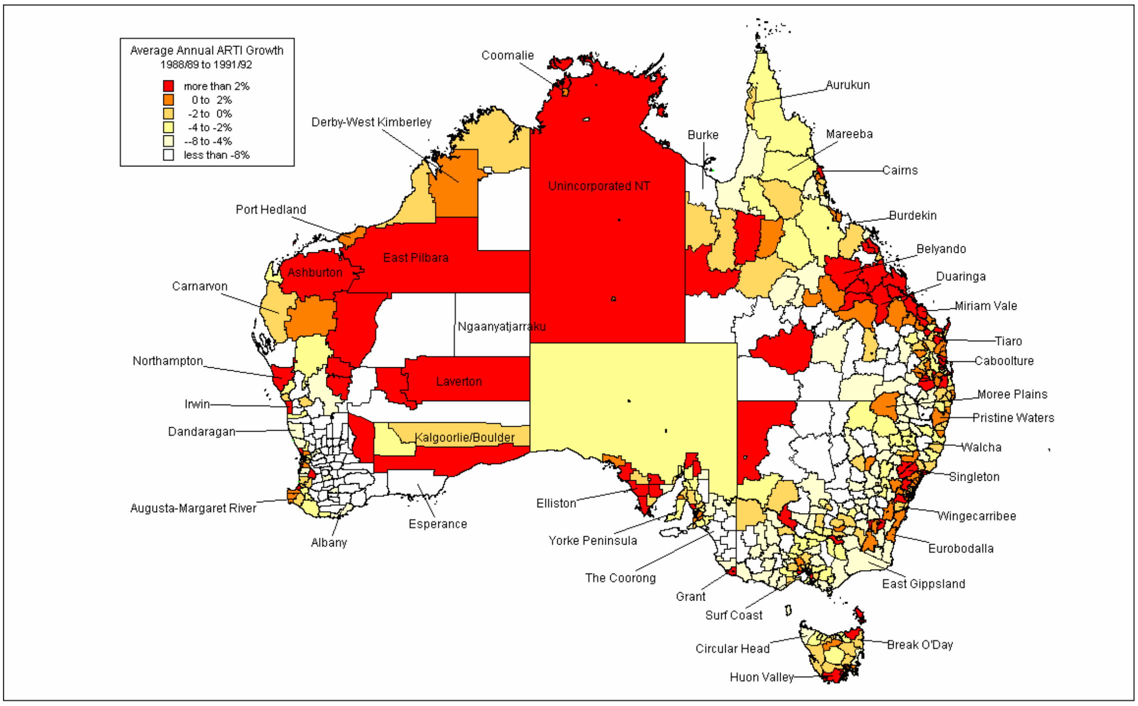
Source ABARE Australian Commodity Statistics 2003 p216.

Counter to this trend are the relatively high ARTI growth rates in the classic wheat–sheep regions of the Eyre and Yorke Peninsulas of South Australia. However, inspection of the rainfall records for the Western Agricultural Rainfall District that covers the Eyre Peninsula reveals that rainfall was less than 70% of normal in the critical June to November growing period in 1987 and 1988 but exceeded the average in the following five years (Bureau of Meteorology 2002). Thus, the ARTI growth rates for these regions in Figure 6.2 are based on a year which was experiencing it second successive drought season. Consequently, growth rates for subsequent years are deceptively high. In fact, conditions on the peninsulas over that period were extremely difficult as the drought years were followed by depressed prices. Further, 1988–89 was marked by the expansion of the Olympic Dam uranium project at Roxby Downs. ARTI at Roxby Downs itself increased almost ninefold in that year. We understand that in these early years a significant proportion of the labour force for this development comprised Eyre Peninsula farmers, who had missed crucial sowing deadlines due to poor rainfall. By supplementing their income by temporarily travelling to the mine site but maintaining their permanent residency on farm, these farmers maintained the ARTI on the Peninsula with work at Roxby. This is a case of ARTI not reflecting the physical production in a region, although it does pick up the production of long term residents.

Many of the regions which experienced growth in ARTI between 1988–89 and 1991–92 have mining as a major industry. Regions where the single largest employing industry was coal mining were particularly likely to experience growth (e.g. Duaringa QLD, Peak Downs QLD, Muswellbrook NSW, Greater Lithgow NSW, Singleton NSW). A cluster of growth LGAs is evident in central Queensland.[36] This cluster includes several LGAs in which coal mining is a major employer (e.g. Emerald, Broadsound), plus the larger regional service centres of Gladstone and Rockhampton.

36 This Queensland cluster is also evident in Figure 15, which illustrates the extent to which regional activity is correlated with national activity over 20 years.

FIGURE 6.2 SPATIAL DISTRIBUTION OF ARTI GROWTH, AUSTRALIAN LGAs, 1988–89 TO 1991–92



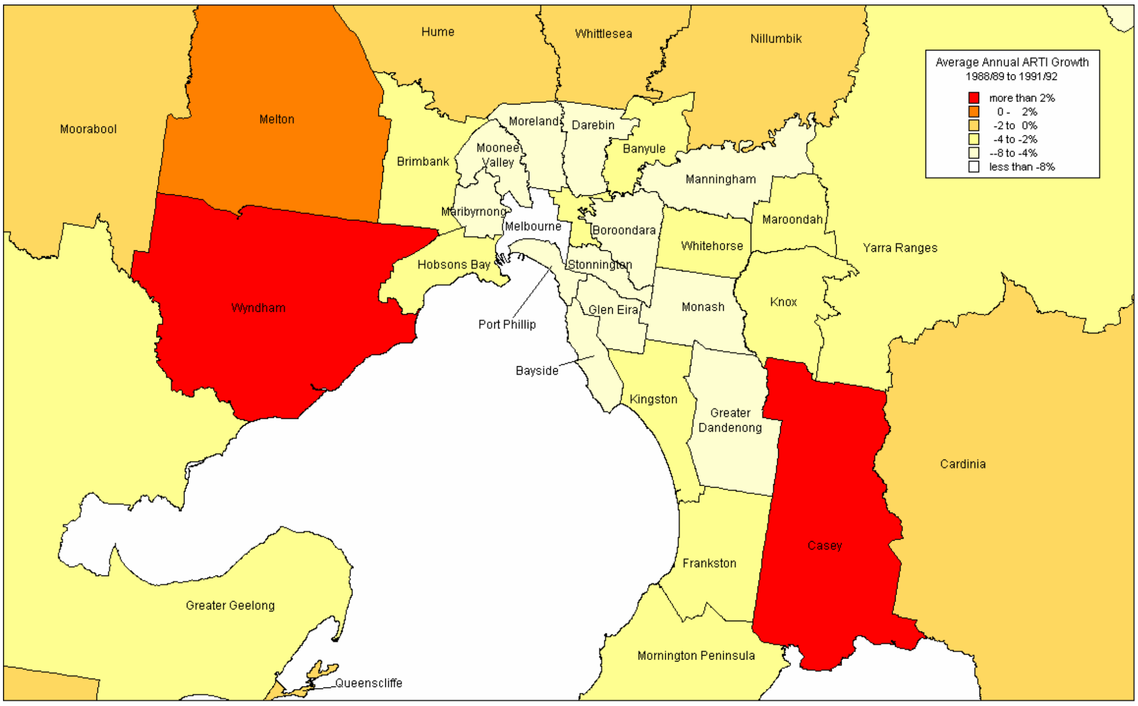
Source Produced by BTRE using Taxable Income Database and ABS C-DATA software.

Many urban fringe areas also experienced growth over the period, reflecting continued localised population growth. Figure 6.3 is comparable to Figure 6.2, but focuses on the LGAs in and around Melbourne. Of these LGAs, only the City of Melbourne experienced an annual decline in ARTI of more than 8% during the recession. Circling the city, and stretching out into the eastern suburbs, was a set of twelve LGAs which experienced a decline of between 4% and 8%per annum. Further out, in LGAs such as Frankston, Knox and Hobson's Bay, the decline was more modest (less than 4%). However, the fringe urban LGAs of Casey, Wyndham and Melton experienced growth in ARTI over the three year period. Each of these LGAs experienced a modest decline in RIPT over the period. The growth in ARTI was due to strong growth in the number of taxpayers outweighing the decline in RIPT.

A similar pattern was evident for Sydney, Perth and Adelaide[37]. That is, the LGA containing the central business district experienced the largest decline in ARTI, followed by inner suburban LGAs. Surrounding each city, there were a number of urban fringe LGAs which experienced growth in ARTI between 1988–89 and 1991–92, as a result of continued growth in population and the number of taxpayers.

37 Since the City of Brisbane LGA dominates the whole Brisbane region, it is not appropriate to compare Brisbane to the other major cities.

FIGURE 6.3 AVERAGE ANNUAL GROWTH IN ARTI FOR MELBOURNE LGAs, 1988–89 TO 1991–92



Source Produced by BTRE using Taxable Income Database and ABS C-DATA software.

To answer the question of the relative impact of the recession on regions, we need to compare each region's rate of growth with its long term trend. Figure 6.4 is a frequency distribution of the deviation of each LGAs growth during the recession from the average growth rate five years before and five years after the recession period. The distributions are presented for all LGAs as well as for the metropolitan, coastal, inland and remote regions[38].

Three hundred and thirty four (334) LGAs were more affected than Australia as a whole. Slightly fewer (295) were less impacted. Many inland non-metropolitan LGAs had poor growth during the period (161 out of a total 241 inland LGAs were worse affected than Australia as a whole). However, as suggested above, this may owe more to the effects of world rural commodity prices than the domestic recession. This may also apply to the regional distributions shown in Figure 6.1. The metropolitan distribution mimics the national trend whereas the remote and, to a lesser degree coastal areas, act more independently. However, the known coincidence of the wool and wheat downturn and the recession makes interpretation of the inland result much more difficult.

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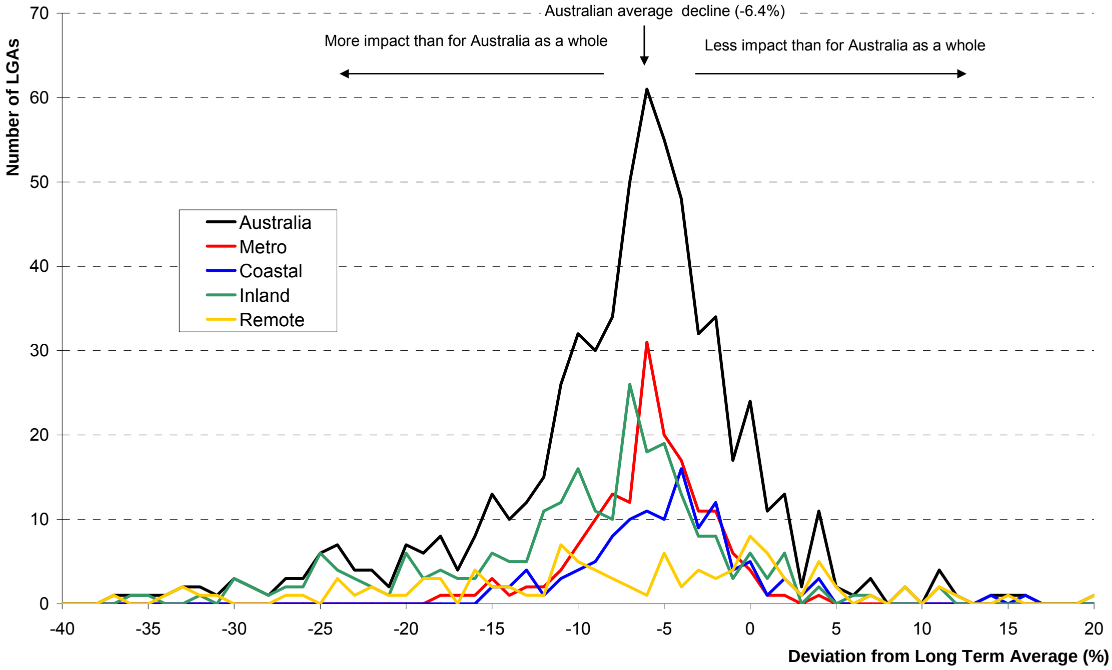
38 These categories are used to classify LGAs according to the region types presented in BTRE 2004a "Industry Structure Database" which itself was based on a classification used in the 2001 ABARE report "Country Australia: Influences on Employment and Population Growth" (Garnaut *et al* 2001).

FIGURE 6.4 DEVIATION OF ARTI GROWTH IN 1988–89 TO 1991–92 FROM LONG TERM AVERAGE GROWTH, DISTRIBUTION OF AUSTRALIAN LGAs



Source BTRE Taxable Income Database using ABARE/BTRE regional classifications 2001

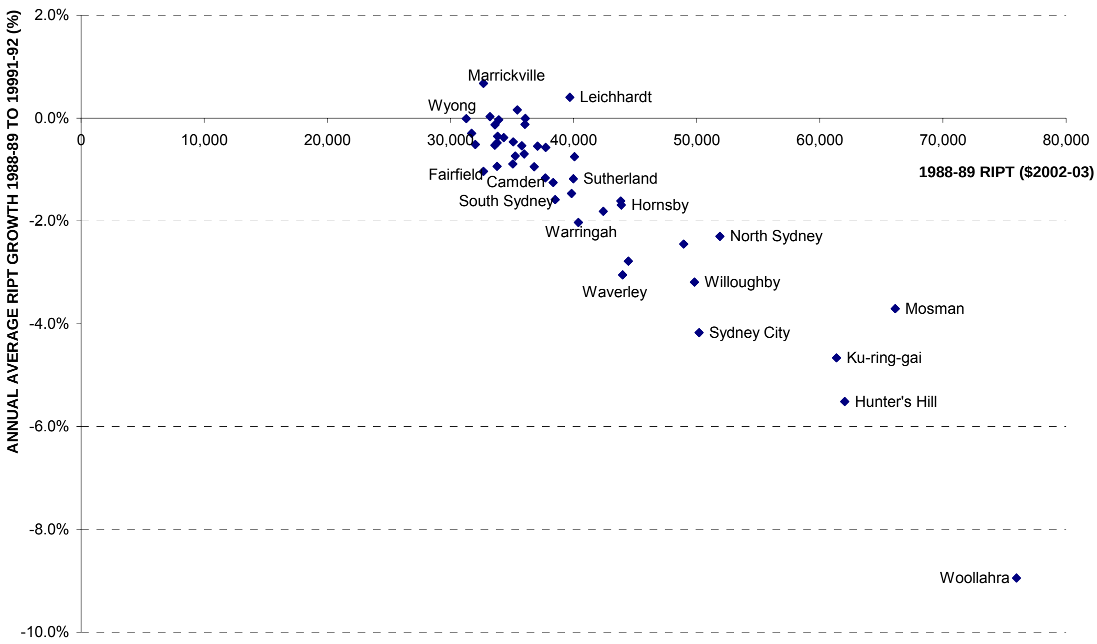
RIPT

The national decline in RIPT between 1988–89 and 1991–92 was 4.5%. Compared to the rate of growth in ARTI, the growth in RIPT displayed relatively little variation across LGAs. Only 11% of LGAs experienced an increase, while 74% of LGAs experienced a decline of less than 20%. The overwhelming majority of regions with a major decline in RIPT were located in inland WA.

Correlation analysis suggests that LGAs with a higher RIPT in 1988–89 tended to experience a greater decline in RIPT over the following three years (correlation coefficient 0.26). However the correlation is much more marked in metropolitan areas (correlation coefficient 0.72) than in non-metropolitan regions (0.36). Figure 6.5 shows the relationship for Sydney LGAs, but a similar pattern was also evident in Melbourne, Perth and Adelaide. Within Sydney, Woollahra had the highest average income in 1988–89 and experienced the greatest fall in average income over the recession period. Other high income LGAs (e.g. Hunter's Hill, Ku-ring-gai) also experienced falls in average income of more than 4% per annum. Lower income LGAs generally experienced a more modest decline, and some even experienced slight growth (e.g. Marrickville and Leichhardt). This latter phenomenon could result from the relocation to these areas of young upwardly mobile professionals who replaced the traditional working class inhabitants.

While high income LGAs such as Mosman NSW, Stonnington VIC and Cottesloe WA tended to experience substantial declines in RIPT between 1988–89 and 1991–92, they also recovered strongly after 1991–92. The explanation may lie with high income LGAs being more reliant on non-wage sources of income (investment and business income), which tend to be more responsive to economic fluctuations in the short-term than wage income. Interest income, in particular, would have fallen during the period from 1988–89 to 1991–92 as interest rates tumbled. The rate for 90 day bank bills slipped from a high of 18.36 per cent in October 1989 to 6.24 per cent by June 1992 (RBA 2004b).

FIGURE 6.5 CHANGE IN RIPT 1988–89 TO 1991–92 IN SYDNEY LGAs AS A FUNCTION OF INITIAL VALUE



Source BTRE Taxable Income Database.

Note Incomes expressed in terms of 2002–03 dollars.

In summary, several conclusions can be drawn regarding the spatial impacts of the early 1990s recession:

- Metropolitan LGAs tended to be most affected by the recession. For rural and remote LGAs, which often have economies which are highly dependent on particular agricultural or mining commodities typically destined for export markets, the effects of the national recession were dominated by market conditions for the relevant commodity. The slump in the value of the Australian wheat crop in the early 1990s, the decline in wool prices, and continued strong demand for mining output is likely to be as important drivers of economic circumstances as recession-induced effect for such regions.

- Some urban fringe LGAs experienced growth in ARTI over the recession period, simply because continued development and population growth in these LGAs outweighed the recession-induced decline in RIPT.
- Despite these exceptions, the national decline in economic activity was reflected in the majority of Australia's LGAs. The decline in RIPT was quite homogenous across regions, with two thirds of LGAs experiencing a decline in RIPT of less than 5% per annum between 1988–89 and 1991–92.
- Metropolitan LGAs with a high RIPT tended to experience a greater proportional income decline over the recession period. This pattern may reflect a greater reliance on non-wage sources of income.

6.3 REGIONAL PATTERNS OF INCOME CONVERGENCE AND DIVERGENCE

The question of whether per capita incomes are converging across countries or regions has been widely examined in the economics literature. A key implication of the neoclassical growth model is that in the long term, per capita incomes tend to equalise (or converge) across economies. The convergence literature addresses the question of whether "poor" regions/countries display faster growth in per capita income than "rich" regions/countries.

In the United States, the literature on regional income convergence has been quite extensive, and has involved a range of empirical approaches. Historical studies have consistently found strong and persistent convergence of state per capita incomes, but in the 1980s the general consensus is that this trend was interrupted and replaced with divergence (Sherwood-Call 1996).

In the Australian context, Cashin and Strappazzon (1997) found divergence of incomes across States between 1976 and 1991, but no evidence of either convergence or divergence at the Statistical Division (SD) level. In contrast, Smith (2002) found evidence of “catch-up” in terms of rates of income growth between low and high income SDs over the 1976 to 2001 period, but this catch-up was of insufficient speed and magnitude to reduce interregional inequalities. O'Hagan (2001) found that taxable incomes for non-metropolitan Victorian SDs converged between 1980 and 1998, but towards income levels that were persistently lower than the State mean.

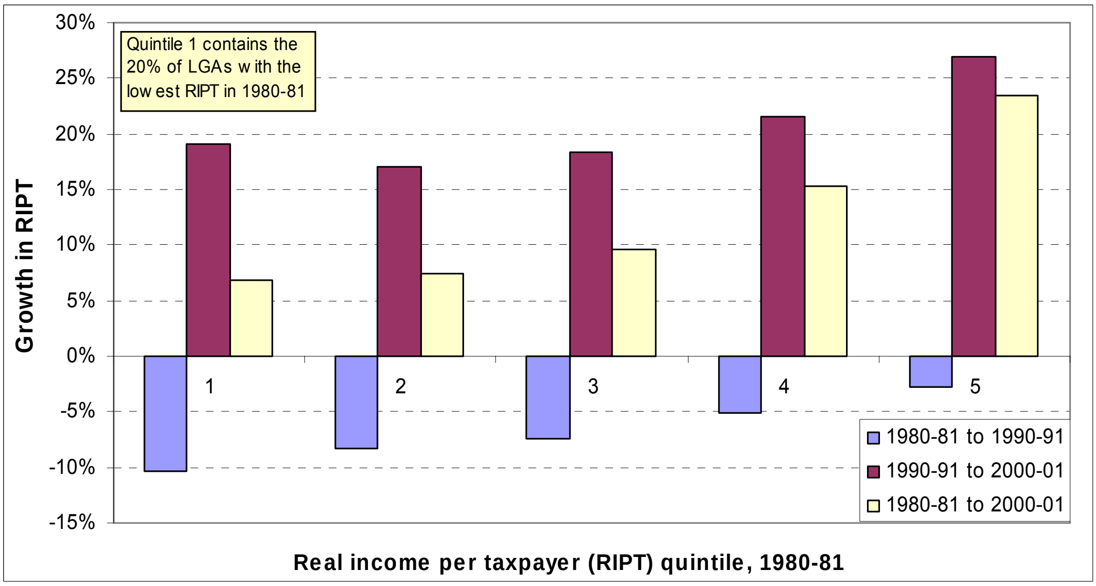
The BTRE's *Taxable Income Database* provides a useful tool for investigating whether incomes are converging or diverging across Australia's regions. Simple measures of the dispersion of RIPT across Australia's LGAs clearly show a widening of the gap between the highest and lowest income regions between 1980–81 and 2000–01. To illustrate:

- the standard deviation of RIPT across LGAs more than doubled; and

- in 1980–81, the income ratio of the highest income LGA to the lowest income LGA was just 1.8, but this had risen to 3.7 by 2000–01.

Figure 6.6 groups Australia's LGAs into quintiles based on the LGA's level of RIPT in 1980–81. It shows that the lowest income quintile experienced less income growth than the other quintiles between 1980–81 and 2000–01. The rate of income growth rose across the quintiles. The chart provides evidence of divergence in regional per capita incomes between 1980–81 and 2000–01, with high income LGAs growing much more rapidly than low income LGAs. The first sub-period (1980–81 to 1990–91) was marked by negative growth for all quintiles, while the second sub-period (1990–91 to 2000–01) reflected positive growth in all quintiles. Despite these differences, both sub-periods showed some evidence of diverging per capita incomes.

FIGURE 6.6 RIPT QUINTILES FOR LGAs IN 1980–81 & SUBSEQUENT GROWTH RATES



Source BTRE Taxable Income Database.

Table 6.2 provides examples of LGAs which have exhibited particular patterns of convergence or divergence between 1980–81 and 2000–01. The table focuses on relatively extreme movements, rather than providing an overall perspective. Inner-suburban LGAs and mining LGAs feature amongst the set of LGAs which moved from the middle to the top of the income distribution. Agriculture-dependent LGAs feature amongst the set of LGAs which have shifted from the middle to the bottom of the income distribution. Shifts of LGAs between the bottom and middle of the income distribution are more common than shifts between the middle and top of the distribution.

TABLE 6.2 EXAMPLES OF LGAs EXHIBITING CONVERGENCE/ DIVERGENCE OF RIPT, 1980–81 TO 2000–01

Pattern	*No.*	*Examples of LGAs*
Converging to middle of distribution		
from low RIPT in 1980–81	23	Great Lakes NSW, Young NSW, Corangamite VIC, Port Adelaide-Enfield SA, Crow's Nest QLD, Busselton WA, Wanneroo WA, Meander Valley TAS
from high RIPT in 1980–81	12	George Town TAS, Carnamah WA, Halls Creek WA, Burdekin QLD, Sarina QLD, Tennant Creek NT
Diverging from middle of distribution		
to low RIPT in 2000–01	27	Maclean NSW, Wentworth NSW, Kolan QLD, Biggenden QLD, Ceduna SA, Mid Murray SA, Tambellup WA, Ravensthorpe WA, Katanning WA
to high RIPT in 2000–01	14	Randwick NSW, South Sydney NSW, Yarra VIC, Duaringa QLD, Peak Downs QLD, Perth WA, Jabiru NT

Source BTRE Taxable Income Database.

Note "Middle of distribution" refers to between the 25th and 75th percentile of the distribution of RIPT across LGAs, "Low income" refers to bottom 10% of distribution and "High income" to top 10% of distribution.

A standard test of income convergence across regions involves undertaking a cross-section regression of the following form:

$$\ln (RIPT_{i,2000-01}/RIPT_{i,1980-81}) = \alpha + \beta \ln (RIPT_{i,1980-81}) + e_i$$

where $RIPT_{i,1980-81}$ is real income per taxpayer in region *i* in 1980–81, α and β are parameters to be estimated, e_i is a stochastic error term, and ln is the natural logarithm. A negative estimate for β can be interpreted as support for the convergence hypothesis, since it suggests that growth rates in average incomes over the period were negatively correlated with starting incomes.

Estimating this equation across 629 LGAs[39] for the 1980–81 to 2000–01 period finds evidence of divergence in RIPT, since β is positively signed and statistically significant. However, the low explanatory power suggests other factors are more important in explaining RIPT growth of LGAs.

$$\ln (RIPT_{i,2000-01}/RIPT_{i,1980-81}) = -1.91 \mathbf{+ 0.19} \ln (RIPT_{i,1980-81}) + e_i$$

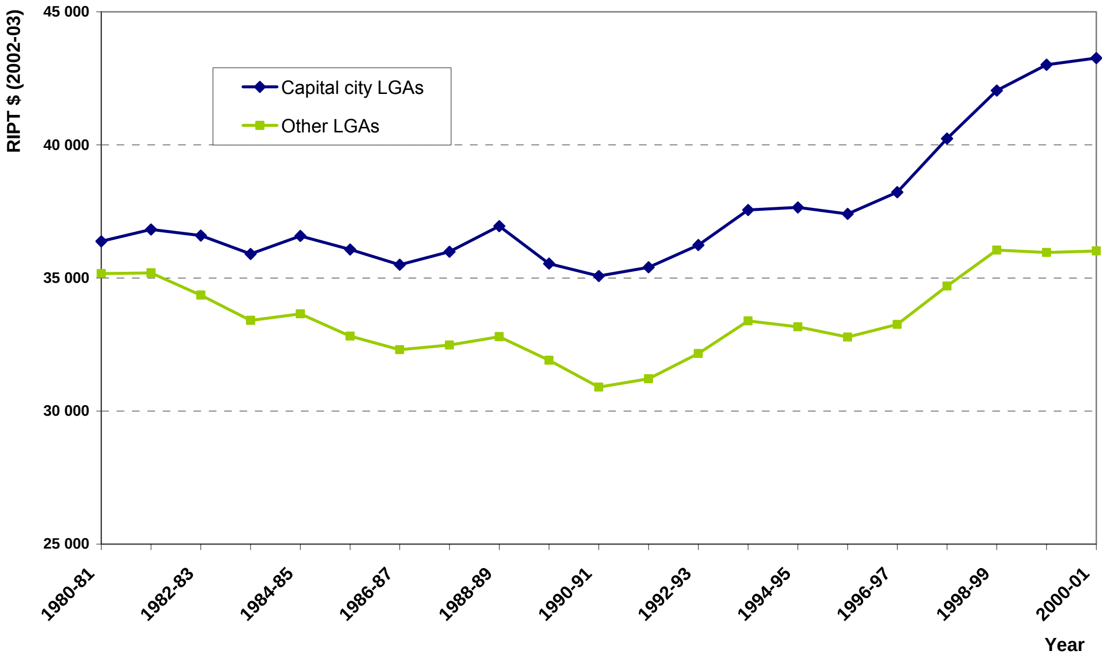
R-squared= 1.6% (t = –3.1) **(t = 3.2)**

The results from Table 6.2 suggest that patterns of income convergence/ divergence may differ between capital city and other LGAs. Figure 6.7 shows that RIPT has grown more rapidly for the capital cities than for the rest of Australia over the twenty year period. In 1980–81, average RIPT in the capital cities was just 3.5% higher than average RIPT in the rest of Australia, but by

39 Unincorporated WA, TAS, QLD and Other Territories were excluded from the analysis, as data was not available for the entire period.

2000–01 this gap had widened to 20.1%. The gap remained relatively constant through the early and mid 1990s, but began to widen again late in the decade.

FIGURE 6.7 RIPT FOR CAPITAL CITIES AND REST OF AUSTRALIA, 1980–81 TO 2000–01



Source BTRE Taxable Income Database.

Note Incomes expressed in terms of 2002–03 dollars.

Table 6.3 repeats the quintile analysis from Figure 6.6, but separately examines capital city LGAs and other LGAs. It shows a clear pattern of divergence amongst capital city LGAs, with the highest income quintile experiencing income growth of 38% compared to growth of between 8% and 21% for the other quintiles. No such pattern is evident for LGAs located outside the capital cities, where the top income quintile actually experiences a lower growth rate than any of the other quintiles.

TABLE 6.3 GROWTH RATES OF RIPT QUINTILES FOR CAPITAL CITY AND OTHER LGAs, 1980–81 TO 2000–01

	Growth rate of RIPT, 1980–81 to 2000–01		
Quintile	*Capital city LGAs*	*Other LGAs*	*All LGAs*
1	8%	5%	7%
2	12%	4%	7%
3	16%	5%	10%
4	21%	4%	15%
5	38%	0%	23%

Source BTRE Taxable Income Database.

Note LGAs were ranked according to RIPT in 1980–81, and then grouped into quintiles. This process was undertaken separately for the 143 capital city LGAs and for the 486 other LGAs.

To further investigate this issue, the cross-section regression was separately estimated for capital city LGAs and other LGAs.

Capital city LGAs

$$\ln(RIPT_{i,2000\text{–}01}/RIPT_{i,1980\text{–}81}) = -11.9 \mathbf{+ 1.15} \ln(RIPT_{i,1980\text{–}81}) + e_i$$

R-squared = 37.6% (t = –9.1) **(t = 9.2)**

Other LGAs

$$\ln(RIPT_{i,2000\text{–}01}/RIPT_{i,1980\text{–}81}) = 2.50 - \mathbf{0.24} \ln(RIPT_{i,1980\text{–}81}) + e_i$$

R-squared = 5.0% (t = 5.0) **(t = –5.0)**

The results provide strong and statistically significant evidence of divergence amongst capital city LGAs, consistent with the pattern observed in Table 6.3. For other LGAs, there is evidence of convergence of RIPT between 1980–81 and 2000–01, although this model has low explanatory power.[40] The results suggests a continuation of the pattern identified by Maxwell and Hite (1992), who found upward divergence of per capita incomes for capital city SDs and downward convergence in predominantly agricultural SDs between 1976 and 1986.

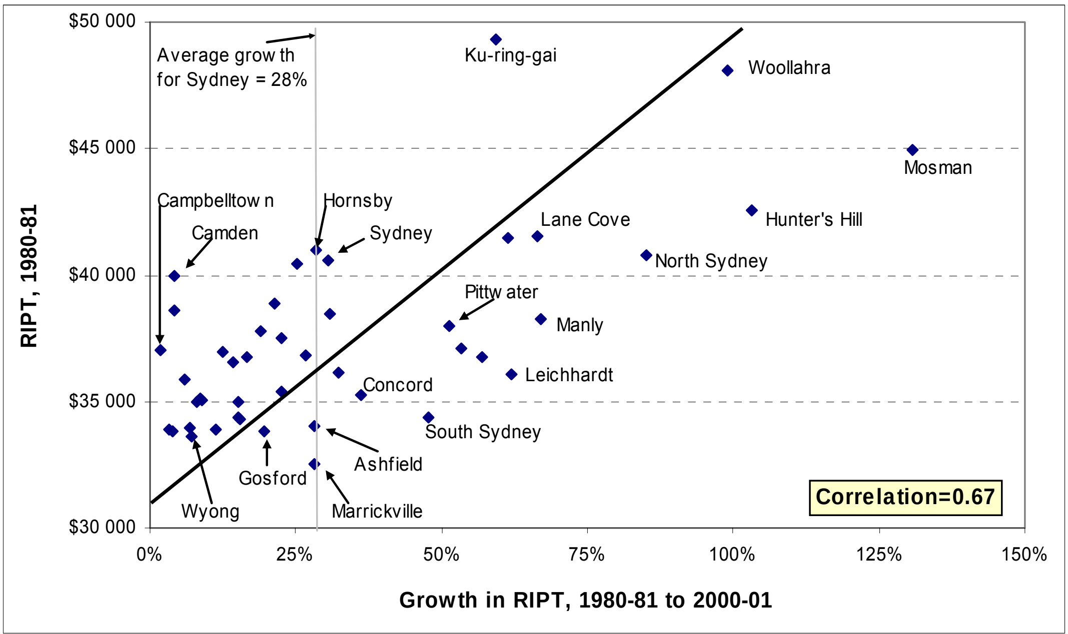
The regression exercise was also repeated separately for each of the five major capital cities. Statistically significant divergence in RIPT was identified for LGAs in each of Sydney, Melbourne, Adelaide and Perth.[41] The pace of divergence amongst LGAs was strongest within Sydney, but was also relatively

40 To test the robustness of the results, additional explanatory variables relating to State, region type and main industry were added to the regressions. The key conclusions (i.e. convergence of capital city LGAs and divergence of other LGAs) remained unchanged.

41 The coefficient in the Brisbane regression was positively signed (i.e. in accordance with divergence) but statistically insignificant. This may be due to the high level of aggregation of Brisbane data, which contains only 8 LGAs compared to between 19 and 45 LGAs across the other major cities.

strong within Perth. Focusing on Sydney LGAs, Figure 6.8 illustrates a positive relationship between RIPT in 1980–81 and subsequent growth rates, and so provides evidence of income divergence within Sydney. Some particularly affluent LGAs (e.g. Woollahra, Hunter's Hill, Mosman) experienced very high rates of growth in RIPT between 1980–81 and 2000–01, and made a major contribution to the finding of divergence for Sydney.

FIGURE 6.8 DIVERGENCE OF RIPT ACROSS LGAs, SYDNEY, 1980–81 TO 2000–01



Source BTRE Taxable Income Database.
Note Incomes expressed in terms of 2002–03 dollars.

In summary, even this preliminary analysis of the BTRE *Taxable Income Database* suggests the following patterns are evident for the 1980–81 to 2000–01 period:

- The gap between RIPT in capital cities and the rest of Australia has widened considerably;
- Amongst capital city LGAs, there has been considerable divergence in RIPT, due largely to the especially high income growth experienced by LGAs which already had the highest incomes at the start of the period; and
- Outside of the capital cities, there is some evidence of convergence in RIPT across LGAs.

Note that the BTRE's *Taxable Income Database* cannot address the important question of whether individual incomes in Australia are becoming more or less equally distributed over time.[42] That requires analysis of the distribution of income across individuals or households, rather than the distribution of income across regions.[43] However, as already noted Chapter 5, if the patterns of convergence found here result from internal migration rather than changes in the relative income levels of individuals, it would signal a trend toward spatial segregation of high and low income populations that itself would be grounds for concern.

42 Divergence of average incomes (ie RIPT) across Australia's LGAs is not necessarily associated with greater individual income inequality for Australia as a whole.

43 There is, however, considerable research on this issue in the Australian context (e.g. ABS 2003e, Harding and Greenwell 2001, 2002).

CHAPTER 7 USING THE DATABASE: APPLICATIONS IN SMALLER REGIONS

7.1 INTRODUCTION

One of the most valuable aspects of the *BTRE Taxable Income Database* is the ability to look at changes in ARTI and RIPT for a particular region over time. This section provides analysis of some different case study regions over the twenty years covered by the database to demonstrate how it can be used to examine trends in economic activity and examine regional responses to shocks.

A note of caution is necessary however. When looking at ARTI or RIPT time series, it is natural to look for the impact of known shocks. Whilst these can sometimes be identified, as in the selected case studies below, the impacts may be muted and/or delayed. There are a number of reasons why this might occur.

Firstly, when considering local shocks, it is easy to overstate the size of the shock compared to the size of the overall economy. So whilst the loss of an industry and 50 high profile jobs from a regional economy may be regarded (and may well be) a major disaster for a regional economy, in an economy of 5000 jobs the impact will only be in the order of 1%. In addition, if the actual loss of jobs occurs over more than one financial year, the effects will be spread and not so noticeable.

Secondly, impacts will be offset by a number of factors if the individuals concerned remain in the region. Laid off employees may receive redundancy packages, access superannuation, receive unemployment or other welfare benefits or live on savings for a period. As these funds are drawings from across the wider national economy, they effectively are a compensating import to the region.

Sometimes shocks will have counter intuitive effects, be delayed or spread across a number of time periods. For example, in the case of drought in a livestock dependent area, forced sales of livestock during the drought may actually increase farmer "income"[44] in the drought year. Of course in subsequent years income will need to be redirected to the rebuilding of stock numbers.

Finally, secondary impacts of a shock will often take time to filter through to other parts of the regional economy. For example, newly unemployed families may not reduce spending immediately, or may take time to move to another region. Even when people do move, it may take some time before the dependent services adjust. So teacher or hospital staffing numbers may not be altered until the following year and retailers may be slow in adjusting their businesses.

7.2 RIPT TRENDS IN SYDNEY: IDENTIFYING AREAS OF AFFLUENCE OR POVERTY

Throughout this paper a number of Sydney LGAs have been identified as having very high RIPTs and strong growth. This case study examines what most would call the "exclusive" or "affluent" areas of Sydney – Mosman, Woollahra, Hunter's Hill, Ku-ring-gai, North Sydney, Lane Cove, Willoughby and Manly. These LGAs all had RIPTs greater than $60 000 in 2000–01, ranging from 56% above the Australian average ($40 865) in Manly to 154% above in Mosman.

Figure 7.1 presents RIPTs for these selected LGAs for the period 1980–81 to 2000–01. The RIPT for Australia and Sydney is included for comparison.

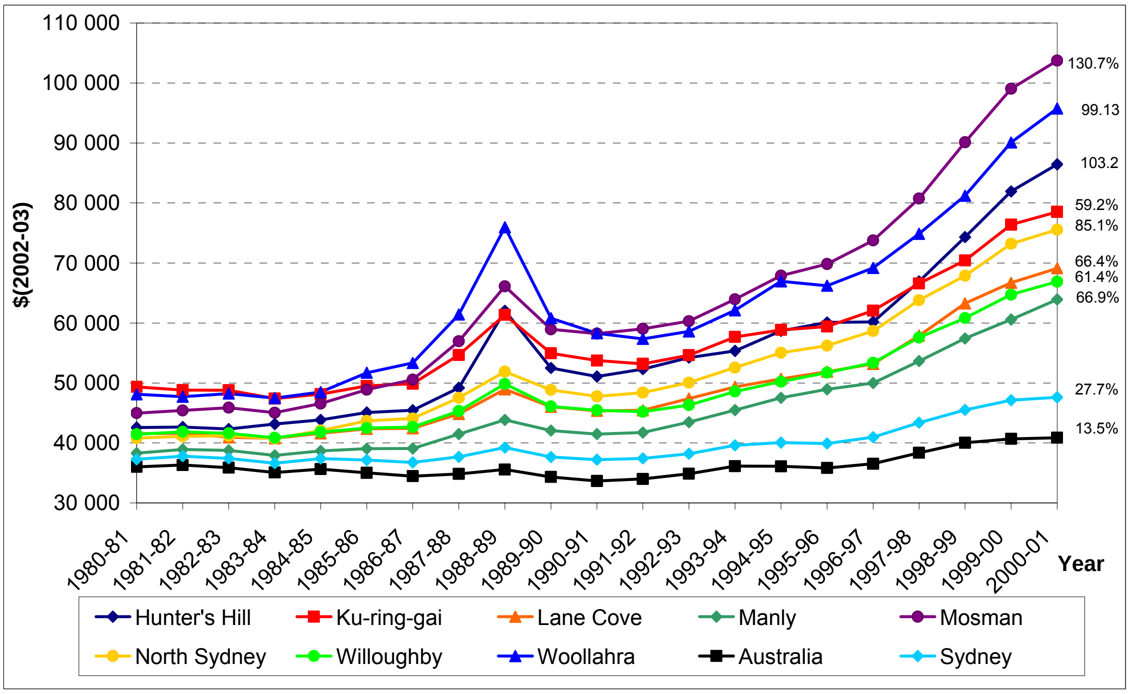
The high RIPTs in these selected LGAs is not a recent occurrence, although the growth since 1980–81 has been substantial. All the selected LGAs had RIPTs above that of Australia and Sydney as a whole at the start of the period, ranging from just 6% above the Australian average ($36 001) in Manly to 37% above in Ku-ring-gai – 3% and 32% above the Sydney average ($37 276) respectively.

An interesting feature in all the selected LGAs is the peak that occurs in RIPT in 1988–89 and subsequent drop in 1989–90 and 1990–91. As noted in the analysis of the spatial impact of the early 1990s recession, higher ARTI LGAs generally experienced the greatest fall in RIPT over the recession period. The impact of the recession is not as pronounced for Australia or Sydney as a whole suggesting that incomes in the selected LGAs are qualitatively different. A possible explanation is a higher dependence on returns from capital investment and profit linked remuneration in these areas. Despite the decline in RIPT over

44 Whilst sales of livestock are largely treated as income under Australian tax law, in practice, livestock that are part of the farm capital are often sold in drought times. Therefore, the sale of this livestock will increase ARTI, but will leave the farm with a reduced level of capital that will need to be replaced before production levels can be restored after the drought.

the recession period, growth for these LGAs since 1980–81 has been remarkable. The RIPT of Mosman has grown by over 130% from $44 969 in 1980–81 to $103 734 in 2000–01, while for Hunter's Hill it has grown by 103% and for Woollahra by 99%. This compares to growth for Sydney as a whole of 28% and for Australia of less than 14%.

FIGURE 7.1 RIPT FOR SELECTED SYDNEY LGAs, 1980–81 TO 2000–01



Source BTRE Taxable Income Database.

Note Incomes expressed in terms of 2002–03 dollars.

A similar pattern is observed in the Melbourne LGA of Stonnington which includes the suburbs of Toorak, South Yarra, Armadale, Malvern and Prahran and the Perth LGAs of Nedlands, Cottesloe, Peppermint Grove, Claremont and Mosman Park.

7.3 1989 PILOTS' STRIKE – PORT DOUGLAS AND CAIRNS: MEASURING REGIONAL ECONOMIC IMPACTS

This case study looks at the Far North Queensland region including the LGAs of Cairns and Douglas (which includes the popular tourist destination of Port Douglas), and investigates the impact of the 1989 pilots' strike on tourism in these areas.

On 17 August 1989, pilots engaged by Australia's major domestic airlines commenced industrial action in support of a pay claim. By 24 August it had deteriorated into a total cessation of services. The disruption to domestic airline services had a substantial effect on the tourism industry (Faulkner & Poole 1989).

The dispute has been conservatively estimated to have cost the Australian economy well over a billion dollars and resulted in the loss of many thousands of jobs associated with the demise of the many businesses indirectly affected (Patterson 2003).[45] The strike proved devastating for the North Queensland resort destinations, which have a high dependence on tourists arriving by air and are relatively inaccessible by alternative modes of transport (Spearritt 2001, Faulkner & Poole 1989).

The economy of Douglas is based largely on tourism and agriculture. Cairns has a more diverse economic base. Almost 30% of employment in the Douglas LGA is in the Accommodation, Cafes and Restaurants industry. For Cairns the proportion is about 11%. Tourism in these areas is highly dependent on air services through Cairns Airport. Figure 7.2 presents the ARTI for Douglas from 1980–81 to 2000–01 along with the number of passengers travelling into and out of Cairns Airport.[46] The data illustrates the impact a shock in a key industry on which tourism flows depend can have on the economy of a region.

Douglas experienced strong growth during the 1980s as investors saw the tourist potential in the region and poured money into building holiday resorts at Port Douglas. With the opening of the Sheraton Mirage in 1988 it became extremely popular as a resort town. Between 1980–81 and 1988–89 (prior to the pilots' strike) the ARTI for Douglas increased by 56.2%. For Cairns the increase was 62.3%. Growth in the number of passengers during this time was double the rate of growth in ARTI.

The impact of the pilots' strike is evident in Figure 7.2. Between 1988–89 and 1989–90 the number of passengers into and out of Cairns Airport decreased by 20.2% from 1 053 661 to 840 392.[47] ARTI for Douglas immediately decreased by 5.6%. Passenger numbers recovered the following year and increased by 53.3% to 1 288 000 – eclipsing all earlier years and regaining the growth trend rate by

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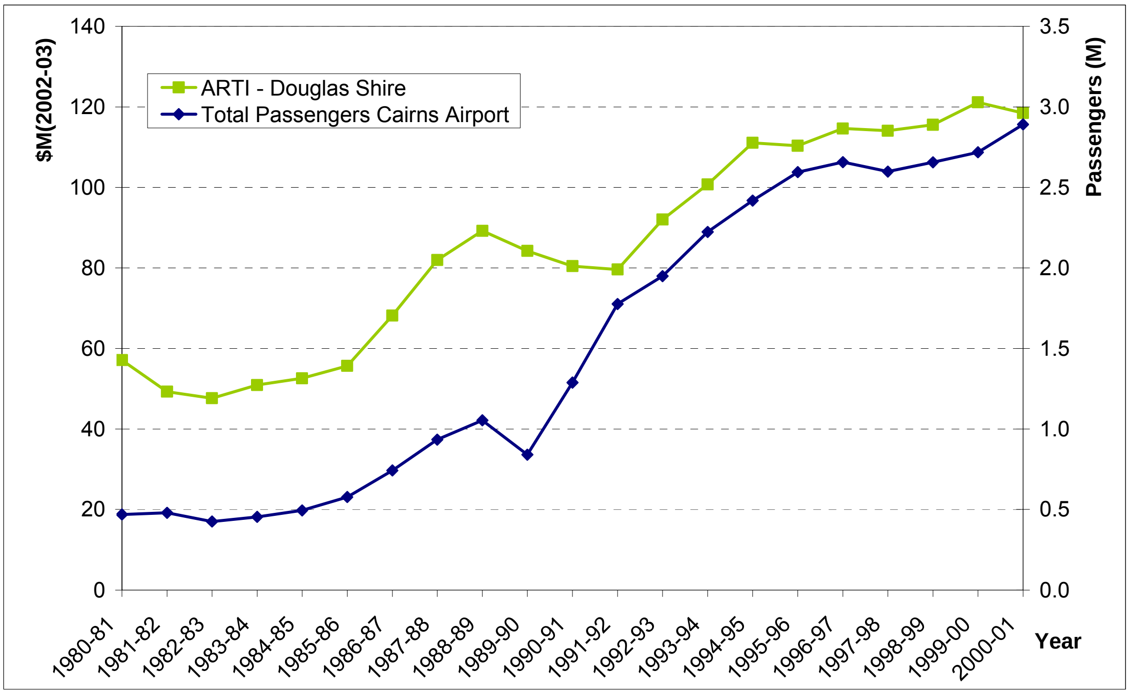
45 Some commentators have put the cost of the dispute to the Australian economy as high as $4 billion (Patterson 2003).

46 Passengers are revenue passengers carried on scheduled Regular Public Transport flights. Passengers on charter and any other non-scheduled flights are not included. The number includes passengers travelling on international, domestic and regional airlines. For the major domestic airlines, a revenue passenger is one paying any fare. For the regional and international airlines the definition is anyone paying 25% or more of the standard economy fare.

47 The decrease was solely in the domestic sector. International airline passengers increased by 26.8% and regional airline passengers by 78.5% between 1988–89 and 1989–90.

1991–92. Despite the sharp recovery in passenger numbers, ARTI continued to fall and did not start to recover until 1992–93. The total decrease over the period was 10.7%. Growth since 1991–92 has been strong (52.1%) and with patterns reflecting passenger numbers.

FIGURE 7.2 ARTI FOR DOUGLAS LGA AND PASSENGER NUMBERS INTO AND OUT OF CAIRNS AIRPORT, 1980–81 TO 2000–01



Source BTRE Taxable Income Database.

Note Incomes expressed in terms of 2002–03 dollars.

Cairns suffered a similar decrease in ARTI to Port Douglas between 1988–89 and 1989–90 (5.3%), but almost returned to its previous level in the following year (4.9% increase between 1989–90 and 1990–91). This is not surprising given its more diverse industry structure relying less on the tourism industry. Regions with a highly diverse industry structure tend to experience more stable economic performance as diversity works to insulate regional economies from the effects of both positive and negative shocks (BTRE 2004a).

7.4 LOWER MURRAY-DARLING BASIN: IDENTIFYING ECONOMIC IMPACTS OF ALTERNATE GOVERNMENT POLICIES

Comparing Regions

The BTRE Working Paper 58: *Investment Trends in the Lower Murray-Darling Basin* used the *Taxable Income Database* along with labour force and population data to gain insight into the economic performance of the Sunraysia, Riverland and Central Murray irrigation regions (BTRE 2003a). Table 7.1 is taken from Working Paper 58 and shows how taxation based data can add to the overall picture of economic activity in regions.

TABLE 7.1 SUMMARY OF PERFORMANCE IN MURRAY RIVER REGIONS

	NSW Central Murray	*Vic Central Murray*	*NSW Sunraysia*	*Vic Sunraysia*	*Riverland*
Population (persons, 2001)	31 220	132 591	7 078	49 283	33 546
Area (km^2)	26 187	22 652	26 273	22 082	20 952
Irrigated area 2001 (km^2)	3 394	3 774	93	244	337
ARTI 99–00 ($M2001–02)	**399.3**	**1757.3**	**80.6**	**621.5**	**457.2**
RIPT Growth (90–91 to 99–00)	**2.3%**	**2.4%**	**1.1%**	**4.8%**	**3.8%**
Unemployment Rate 01–02	3.9%	5.5%	9.0%	7.7%	6.7%
Agricultural/mining employment (persons, 2001)	3 877	10 747	904	3 677	4 168
Manufacturing employment (persons, 2001)	936	7 396	223	1 911	1 734
Infrastructure employment (persons, 2001)	1 361	5 970	310	2 288	1 269
Services employment (persons, 2001)	6 350	28 585	1 385	11 607	7 029
Total employment (persons, 2001)	12 524	52 698	2 822	19 483	14 200
Irrigation water use (ML, 2001)	2 455 603	2 217 828	70 619	182 796	274 785
Irrigation water use per person (ML/person, 2001)	78.7	16.7	10.0	3.7	8.2
Agricultural value of production ($M, 2001)	648.85	1522.45	138.29	524.92	682.36
Change in agricultural value of production ($M, 1996–2001)	142.32	410.54	37.08	197.29	301.96
Agricultural capital stock ($M, 2001)	999	1 818	200	565	778
Agricultural capital stock per water used ($/ML, 2001)	407	820	2833	3092	2831
Change in agricultural capital stock ($M, 1997–2001)	190	166	69	136	261
Manufacturing capital stock ($M, 2001)	174	1 495	47	384	384
Manufacturing capital stock per water used ($/ML, 2001)	71	674	671	2102	1397
Change in manufacturing capital stock ($M, 1997–2001)	56	650	29	184	147

Source BTRE Working Paper 58: *Investment Trends in the Lower Murray-Darling Basin (2003)*

The information in the table allowed the authors to relate the way in which water is managed and provided to agricultural and manufacturing investment and employment levels in the regions and then use ARTI and RIPT to relate these factors to the economic health of the communities involved.

ARTI and RIPT data[48] provided a better understanding than that provided by traditional unemployment and population change indicators, and provided a sound basis for inter-regional comparisons over time. In particular ARTI and RIPT were found to very ably to demonstrate the significant regional economic impacts of the different water supply regimes of NSW, South Australia and Victoria.

Patterns of Development

As a corollary to the main thrust of this project, the taxation data also identified differences in impacts between the SLAs within each region and pointed to the structure of local economic activity. An example was the consideration of the Sunraysia region, covering the SLAs of Wentworth Shire in New South Wales, and Mildura – Pt A (essentially the city of Mildura) and Mildura – Pt B (the hinterland to the south) in Victoria.

Whilst the level of economic activity (measured by ARTI) in the two more rural areas remained relatively stable in the period 1990–91 to 1999–00 (average growth of 0% in Mildura – Pt B and 1.1% Wentworth Shire), Mildura itself increased by 5.3%. Australia's growth rate in this period was 3.0%. Clearly, there was a significant difference between the recent experiences of the three sub-regions.

Some of Mildura – Pt A's growth could be attributed to increased population (average 1.5% growth per annum 1991–2001), at least partially due to migration from surrounding areas. Mildura – Pt B and Wentworth experienced 2.1% and 0.3% respectively annual declines in population between 1991 and 2001.

The appearance of a regional centre booming, to the detriment of surrounding rural areas (the "sponge city" phenomenon identified by geographers), was supported by qualitative local information. This indicated that most of the migration from smaller towns and rural parts of the region was towards the urban area of Mildura or outlying areas close to the city.

RIPT was also used to compare the three regions. RIPT growth over time was broadly similar (with the two rural areas being more variable) and in line with that of Australia. However, the level of RIPT was significantly different.

48 Data in this section is based on the BTRE Taxable Income Database as at July 2003.

Mildura itself consistently had a RIPT approximately $500 to $4 000 more than the surrounding areas (in 1999–00, Mildura was $31 399, Mildura – Pt B $29 968 and Wentworth Shire $27 859). These higher income levels, and an unemployment rate generally lower than Wentworth (although not Mildura – Pt B), provides an incentive for migration into Mildura City, although the availability of services was also a likely factor.

7.5 TOWNSVILLE-THURINGOWA: IDENTIFYING KEY DEVELOPMENT DRIVERS

A case study of the key development drivers operating in the Townsville-Thuringowa region[49] was included in *Government Interventions in Pursuit of Regional Development* (BTRE 2003b). The Townsville-Thuringowa region was chosen as the case study because of its consistent economic growth over the 1990s, and the fact that it was a community that had not fallen behind in the face of globalisation and other adjustment pressures.

Today, Townsville is primarily a service centre and port hub for northern Queensland that continues to build upon its traditional mineral processing, cargo and defence foundations, and in recent years has shown strong growth in the retail trade, education and health and community service sectors.

Figure 7.3 illustrates the consistent growth in ARTI in the region over the last two decades. Between 1980–81 and 1999–00, ARTI increased by 84% for Townsville-Thuringowa, compared to 98% for Queensland and 59% for Australia.

Figure 7.4 focuses on RIPT. It shows that Townsville-Thuringowa followed national patterns of growth and decline reasonably closely, except that it didn't share in the 1988–89 spike and experienced a decline in RIPT between 1998–99 and 2000–01 that was atypical of Australia as a whole.

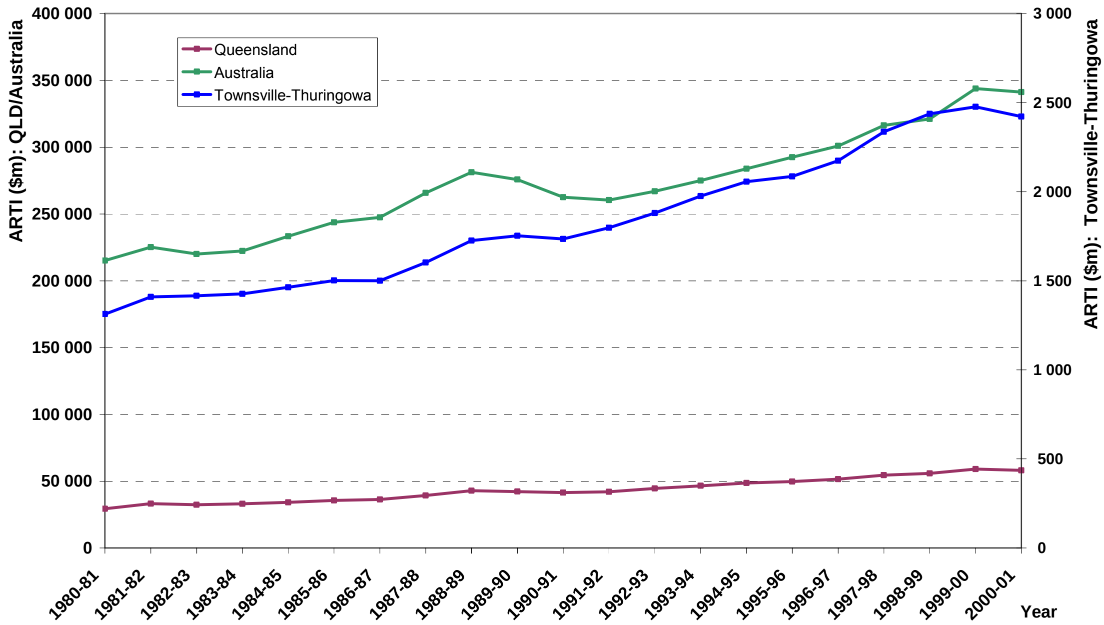
Between 1980–81 and 2000–01, while growth in RIPT was similar for Townsville-Thuringowa (4% increase) and Queensland (5% increase), both grew at a significantly lesser rate than Australia (14% increase). When this is compared to the growth rate of ARTI, it becomes clear that Townsville's economic growth over the 20 year period has been driven by an increase in the number of taxpayers and population growth rather than increases in RIPT. Historically, the population of Townsville-Thuringowa has grown steadily by between 1.2% and 2.9% per annum.

BTRE (2003b) identifies the following factors as playing key roles in Townsville's development:

49 Defined as the Townsville and Thuringowa LGAs.

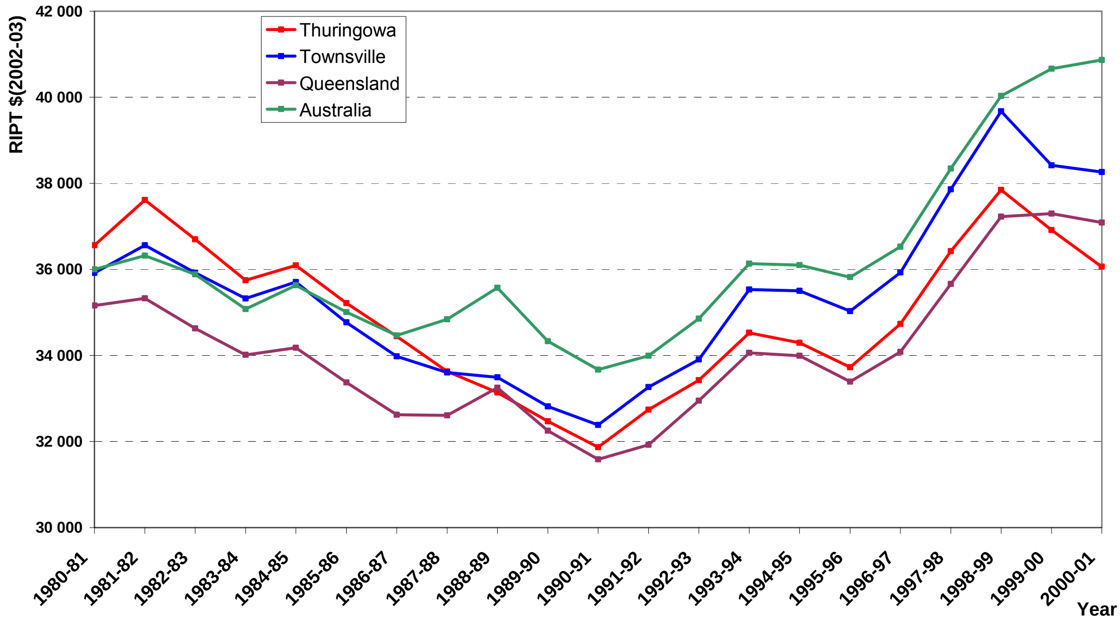
- Long term cumulative growth;
- Sustained government interventions which complemented private investment;
- Diverse economy;
- Well developed infrastructure, including port, rail, road and air links, as well as hospitals, dams and a university;
- Knowledge clusters;
- Skilled labour force;
- Administrative decentralisation;
- Multi-tier regional statutory authorities; and
- Better Cities Initiative.

FIGURE 7.3 ARTI FOR TOWNSVILLE-THURINGOWA, QUEENSLAND AND AUSTRALIA, 1980–81 TO 2000–01



Source BTRE Taxable Income Database
Note Incomes expressed in 2002–03 dollars.

FIGURE 7.4 RIPT FOR TOWNSVILLE-THURINGOWA, QUEENSLAND AND AUSTRALIA, 1980–81 TO 2000–01



Source BTRE Taxable Income Database
Note Incomes expressed in terms of 2002–03 dollars.

The case study highlights the role of government policy in influencing regional economic growth, and the positive impact of the combined effect of numerous Commonwealth and state government interventions over a sustained period. This example also illustrates how the BTRE *Taxable Income Database* can be used, in conjunction with other information, to explore the regional impact of government policies and programmes.

7.6 WESTERN AUSTRALIA'S WHEATBELT: THE POTENTIAL FOR SIMPLE REGIONAL MODELS OF REGIONAL ECONOMIES

The examples to this point have concentrated on tracking the impact of specific events on small regions. However more general modelling of regional economies is a potential application which, if viable, will provide an ongoing boon to economic mangers at all levels. Using historical data for establishing regional models of ARTI against indicators underpinning key industries would potentially provide:

- insight into the extent of the importance of industries and other factors in regional economic health; and
- a potential methodology for estimating the impacts on regions of changes in industry fortunes.

This case study tries to explore some of the potential for this type of modelling using the *BTRE Taxable Income Database* by establishing some simple models of a number of regional economies using multiple regression analysis.

About the Regions

The study focuses on a number of inland LGAs in southern Western Australia, namely Katanning, Kojonup, Tambellup and Wagin to the south east of Perth, Northam (town and shire)[50] and Merredin to the east and Moora to the north.[51] Of the eight LGAs, Northam (T) is the largest centre with an estimated resident population of 6 573 in 2001 in the municipality (with an additional 3 670 residents in the surrounding Northam Shire), compared to 4 683 for Katanning, 3 768 for Merredin, 2 694 for Moora, 2 298 for Kojonup, 1 871 for Wagin, and 732 for Tambellup (ABS 2002b).

Table 7.2 shows that agriculture is the largest industry in the five smallest LGAs and in Northam Shire. Northam, Katanning and to some extent Merredin have significant industry outside agriculture. Katanning and Northam act as regional service centres, and have a more diverse economy than the other LGAs. Whilst agriculture is still the dominant industry in Merredin, the proportion is much less than the smaller centres reflecting its additional roles as a regional and highway service centre.

From Table 7.3 it can be deduced that wheat is an important industry in the economies of all except Kojonup. Similarly, wool is important in all bar Merredin. The overall agricultural dependence suggests that total production in all areas would be greatly dependent on local weather patterns. Finally, as noted throughout this paper, the key characteristic of most regions studied is their similarity to (and dependence on) activity in the wider Australian economy. Therefore it is likely that Australian GDP will be one of the key parameters for most, if not all, Australian regions.

The key question is whether these factors are, in fact, reflected in the ARTI of these regions over time and to what extent.

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50 The Northam region comprises two LGAs in classic “donut” configuration. Northam town itself is governed by Northam Town Council which is encircled by Northam Shire Council. The two LGAs are labelled Northam (T) and Northam (S) respectively.

51 The transformation of taxable income data from postcode to LGA level involved no estimation for these LGAs, meaning the data should be relatively reliable, despite the small size of some of the LGAs.

TABLE 7.2 MAJOR EMPLOYING INDUSTRIES IN SELECTED WESTERN AUSTRALIAN WHEATBELT CENTRES, 1996

LGA	*Major employing industry (employment share)*	*2nd top employing industry (employment share)*	*3rd top employing industry (employment share)*
Northam (T)	Education (10%)	Food retailing (9%)	Health (6%)
Northam (S)	Agriculture (20%)	Food & beverage manufacturing (11%)	Accommodation, cafes & restaurants (5%)
All Northam	Education (9%)	Agriculture (8%)	Food & beverage manufacturing (6%)
Katanning	Food & beverage manufacturing (13%)	Agriculture (13%)	Education (7%)
Merredin	Agriculture (16%)	Education (8%)	Food retailing (6%)
Moora	Agriculture (30%)	Education (11%)	Services to agric (6%)
Kojonup	Agriculture (48%)	Education (6%)	Health (5%)
Wagin	Agriculture (33%)	Services to agric (7%)	Health services (6%)
Tambellup	Agriculture (61%)	Services to agric (10%)	Education (6%)

Source BTRE Industry Structure Database.
Note Based on ANZSIC industry subdivisions.

TABLE 7.3 SHARE OF VALUE OF AGRICULTURAL PRODUCTION IN SELECTED WESTERN AUSTRALIAN WHEATBELT CENTRES, 1996

	Wool	*Meat*	*Wheat*	*Wool & Meat*	*All Cereals*	*Other*
Northam (T)	na	na	na	na	na	na
Northam (S)	21.3%	19.7%	40.5%	41.0%	45.9%	13.2%
Katanning (S)	23.1%	12.7%	36.6%	35.8%	53.4%	10.8%
Merredin (S)	8.0%	7.9%	74.3%	15.9%	78.3%	5.8%
Moora (S)	15.8%	8.1%	57.8%	23.9%	62.5%	13.6%
Kojonup (S)	45.8%	22.4%	3.9%	68.2%	19.5%	12.3%
Wagin (S)	26.3%	11.5%	39.2%	37.8%	55.8%	6.4%
Tambellup (S)	25.5%	17.5%	28.5%	42.9%	49.1%	7.9%

Source ABS Agricultural Census 1996
Note Cereals includes wheat, barley, oats etc

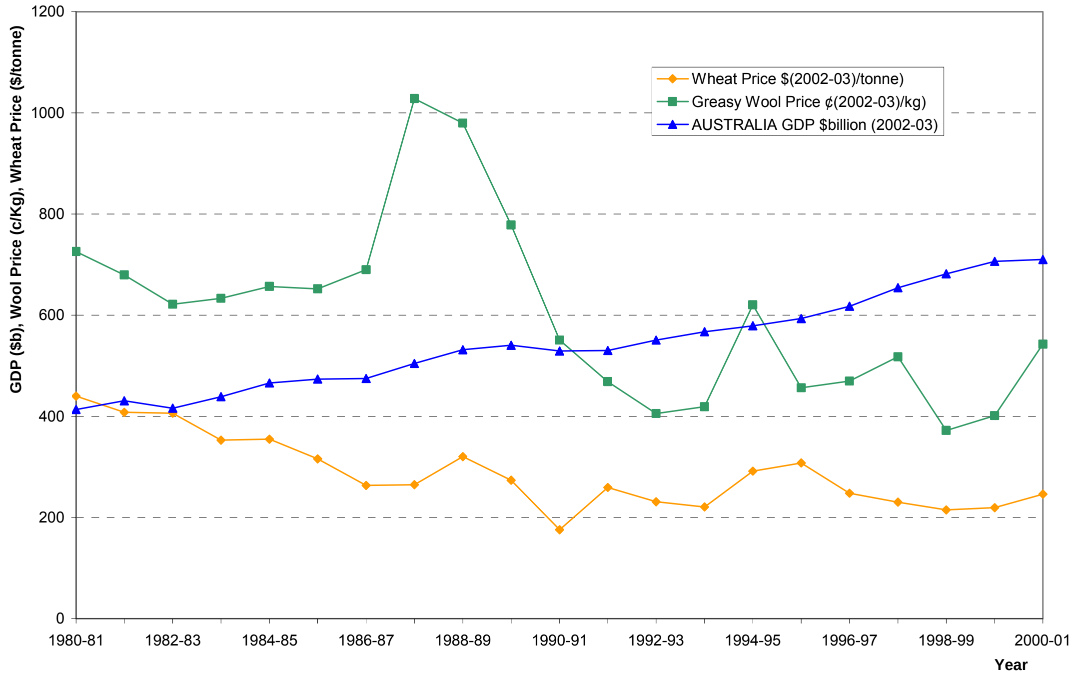
Trends in key parameters over the period

Figure 7.5 sets out the trends in wool and wheat prices and Australian GDP over the period. The wool and wheat prices are expressed in 2002–03 dollars to facilitate easy comparison with GDP and to reflect the changes to the real buying power of income received.

From the graph, spikes in the wool price occur in the late 1980s and the mid 1990s with slumps in the early to mid 1980s, the early 1990s and late 1990s. Wheat prices are more stable, but also show a long term decline over the period. By contrast, Australian GDP shows a relatively steady increase over the period.

Drought years cannot be shown in Figure 7.5 due to differences in the patterns across the eight regions studied, but were identified for each LGA using rainfall in the May to October growing period for the main centre[52]. "Drought" is defined as those years where rainfall was less than 210 mm in the growing season[53]. The rainfall figures for the period are provided in Table 7.5. The cells marked in red are those with rainfall of less than 210mm.

FIGURE 7.5 GDP, WOOL AND WHEAT PRICES 1980–81 TO 2000–01



Source BTRE Taxable Income Database and ABARE Australian Commodity Statistics 2003.

Note While average prices for clean wool were higher than greasy wool, the pattern of change was very similar.

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[52] This period was chosen to reflect the growing season. It is of course a relatively crude measure which no doubt could be improved in the light of better knowledge of local weather and agronomy and changes in technology over time.

[53] There is much debate on how to define drought. Historically the Australian Government has defined drought using the "most extreme years" concept. This is based on the assumption that agricultural practice in any region is adapted to the rainfall and therefore drought is best defined as variation from the expected norm rather than as a specific cut-off point. However in dryer areas this can be misleading as agricultural and financial systems are adapted to minimum crop requirements not being met every year (ie not getting a crop in any particular year is relatively normal event which is expected and allowed for). For our purposes we are concerned about the impacts on income and hence on whether a crop is grown or not. Consequently, we have used a standard rainfall amount on the premise that there is a basic minimum rainfall for crop and pasture growth which is independent of the region.

The Model

Table 7.5 shows the results of a series of multiple regressions that relate changes in the regional ARTI for each of the eight regions to changes in the wheat and wool price, economic conditions in Australia as a whole (using changes in Australian GDP) and to unfavourable weather conditions. The latter is incorporated as a dummy variable[54].

For each region the regressions are of the form:

$$\text{Regional ARTI}_t = \alpha + \beta(\text{drought})_t + \gamma(\text{GDP})_t + \delta(\text{wheat price})_t + \varepsilon\,(\text{wool price})_t + e$$

where:

t = time period, e = error term, and drought is a dummy variable. All other figures are expressed in terms of the percentage change from the previous year.

TABLE 7.4 RAINFALL IN WESTERN AUSTRALIAN WHEATBELT CENTRES, MAY TO OCTOBER, 1980 –2000, MILLIMETRES

Year	Katanning	Kojonup	Tambellup	Wagin	Merredin	Northam	Moora
1980	302	380	277	286	**154**	252	274
1981	328	378	292	296	251	223	260
1982	234	277	**196**	221	**185**	285	329
1983	330	401	244	328	**193**	238	**187**
1984	242	315	301	233	214	266	236
1985	326	312	234	**135**	**154**	249	287
1986	280	293	263	235	235	221	**200**
1987	211	**206**	**170**	**117**	**197**	309	396
1988	422	276	273	**208**	262	323	318
1989	328	338	336	303	**205**	276	296
1990	**209**	261	215	**170**	**181**	**185**	309
1991	299	318	338	288	**190**	**159**	272
1992	309	334	323	315	275	225	316
1993	342	357	283	231	255	281	304
1994	233	342	283	289	**164**	**181**	267
1995	334	394	312	342	257	378	333
1996	270	266	257	236	248	**207**	248
1997	344	319	304	250	**208**	268	274
1998	**187**	**190**	254	248	234	297	262
1999	338	406	320	328	304	341	392
2000	253	266	240	234	**124**	**162**	216

Source Bureau of Meteorology "Australian Monthly Rainfall".

The R-squared values for the regressions in Table 7.5 are consistently good, explaining between 48 and 68 per cent of the variation in regional ARTI. This is

54 The variable has a value of "1 "in drought years and a value of "0" in non-drought years.

an excellent result, particularly given the relatively crude national parameters modelled and the simplicity of the regressions. The coefficients in the table in general meet expectations. The Australian GDP, wheat price and wool price coefficients are at least notionally positive for all regions except for wool in Katanning (and this coefficient does not differ significantly from zero). Similarly all the drought coefficients are negative except for Wagin.[55]

TABLE 7.5 RESULTS OF MULTIPLE REGRESSIONS OF CHANGE IN REGIONAL ARTI AGAINST CHANGE IN VARIOUS FACTORS

	R-squared	*Intercept*	*Drought*	*GDP*	*Wheat Price*	*Wool Price*
Katanning (S)	0.58	-1.72 (0.43)	-13.67 (0.02)	0.92 (0.11)	0.14 (0.11)	-0.02 (0.83)
Kojonup (S)	0.68	-8.12 (0.04)	-2.54 (0.77)	3.19 (0.01)	0.06 (0.67)	0.41 (0.00)
Tambellup (S)	0.54	-4.02 (0.40)	-3.38 (0.75)	1.21 (0.32)	0.15 (0.39)	0.45 (0.01)
Wagin (S)	0.60	-8.38 (0.04)	6.73 (0.29)	2.45 (0.02)	0.34 (0.03)	0.19 (0.15)
Merredin (S)	0.48	5.81 (0.16)	-11.67 (0.01)	0.28 (0.71)	0.14 (0.18)	0.08 (0.42)
Northam (T)	0.49	-0.81 (0.61)	-3.42 (0.14)	0.31 (0.41)	0.08 (0.10)	0.08 (0.08)
Northam (S)	0.48	0.66 (0.84)	-4.59 (0.34)	1.35 (0.09)	0.17 (0.12)	0.09 (0.32)
Northam Combined	0.54	-0.24 (0.90)	-3.77 (0.17)	0.63 (0.16)	0.12 (0.06)	0.08 (0.14)
Moora (S)	0.48	-2.65 (0.34)	-6.57 (0.31)	1.39 (0.07)	0.19 (0.11)	0.09 (0.33)

Source BTRE Taxable Income Database and ABARE Australian Commodity Statistics 2003.

Note The main entries represent the estimated coefficient for each parameter. The figure in brackets is the p-value for the coefficient. A p-value is greater than 0.10 suggests that the data does not preclude the co-efficient being significantly different from zero.

The results for all individual LGAs could no doubt be improved by using local knowledge of regional prices and production figures that better target industries relevant to the LGA and by using local agronomic knowledge to better model climate impacts. In addition, the simple regression associations revealed in Table 7.5 may be approximating for more complex relationships.

Notwithstanding the limitations of this analysis, it is clear is that the regressions broadly reflect reality and provide some insight into the nature of the local

[55] Katanning-wool and Wagin-drought have relatively large p-values suggesting that the coefficients do not significantly differ from zero and so can be dismissed as anomalous.

economies. Table 7.6 brings together some statistics from earlier tables for ease of comparison. The industry percentages are derived from Tables 7.1 and 7.2[56].

TABLE 7.6 MULTIPLE REGRESSION COEFFICIENTS AND INDUSTRY SHARE

	R-squared	*% Wool*	*Wool Co eff*	*% Cereals*	*Wheat Co eff*	*% Other Industry*	*GDP Co eff*
Katanning (S)	**0.58**	3%	-0.02	9%	0.14	88%	0.92
Kojonup (S)	**0.68**	22%	0.41	14%	0.06	64%	3.19
Tambellup (S)	**0.54**	15%	0.45	35%	0.15	50%	1.21
Wagin (S)	**0.60**	9%	0.19	19%	0.34	72%	2.45
Merredin (S)	**0.48**	1%	0.08	14%	0.14	85%	0.28
Northam (T)	**0.49**	1%	0.08	0%	0.08	99%	0.31
Northam (S)	**0.48**	4%	0.09	11%	0.17	85%	1.35
Northam Combined	**0.54**	3%	0.08	3%	0.12	94%	0.63
Moora (S)	**0.48**	5%	0.09	22%	0.19	73%	1.39

Source BTRE Taxable Income Database, ABARE Australian Commodity Statistics 2003 and the ABS Agricultural Census 1996.

From Tables 7.5 and 7.6, it can be seen that:

- In Kojonup and Tambellup where wool is the most dominant agricultural industry, the coefficients for wool price are relatively high (a 1% increase in wool price grows Kojonup's economy by 0.41% and Tambellup's by 0.45%). In the other regions, where wool is less important, the coefficients are correspondingly smaller and only Northam (T) is statistically different from zero.

- Northam and Wagin have significant responses to wheat prices. However, other centres (for example, Katanning and Moora) could well show a significant relationship given more data and/or more sophisticated parameters or models.

- The low but statistically significant coefficient for Northam town is what would be expected of an urban area reliant on the surrounding wheat filled hinterland.

The drought coefficients are interesting although not easily interpreted. Most regions do not show a significant drought impact. Significant impacts are found in the larger LGAs of Katanning and Merredin, both with highly negative impacts and very low p-values. The smaller wool based centres are not (statistically) significantly impacted using this technique.

[56] Strictly, Tables 7.1 and 7.2 cannot be combined as Table 7.1 is based on industry employment and Table 7.2 on value of production. The combined percentages in Table 7.6 should therefore be regarded as indicative only.

Overall this, rather crude and cursory analysis of Western Australian wheat belt towns suggests that ARTI has the potential for the development of more sophisticated economic models for small regions. However, the relationship of ARTI to different industries and centres is complex and improved models will draw heavily on local and industry knowledge both in development and interpretation of the results.

Regional models will contribute significantly to our understanding of local economies and are likely to provide a means of studying the real impacts of natural and economic events such as drought, flood and commodity crashes. In addition, they will allow spatial interpretations of industry forecasts. In particular, this type of model could provide a mechanism for the identification of the wider regional impacts of the annual ABARE industry and commodity forecasts.

Summary

Taxation statistics provide a useful tool for analysing economies at the local and small region level, often providing a straightforward yet powerful tool to explain economic change. Simply tracing the history of RIPT in individual suburbs shows the size and pattern of the growth of individual incomes (and by implication) wealth in the well-to-do suburbs of northern Sydney. Similarly, uncomplicated historical plots of ARTI and airport passenger throughput graphically show the dependence of Port Douglas on tourism and the longer term impacts of even short disruptions.

In Townsville–Thuringowa a more complex analysis was used to show that growth patterns identified and quantified using taxation statistics could provide a basis for further exploration of the drivers and shapers of growth.

ARTI, ARTI growth and RIPT in the regions close to the Murray River provided the necessary background measures of economic health and progress against which the analysis of investment and water use patterns were undertaken. This allowed differences in water provision regimes to be related directly to the ongoing economic health of individual communities.

Finally, even a relatively unsophisticated analysis of the long term growth of shires in the Western Australian wheat belt showed the possibility of using regional ARTI as the basis for modelling of regional economies. Such models have potential not only as predictive tools for regions, but also as a means of analysing and understanding change in regional businesses and communities.

CHAPTER 8 CONCLUSION

This information paper has provided an overview of economic activity in Australia and it's regions. The paper introduces the BTRE's *Taxable Income Database* and has examined its potential for use as an indicator of regional economic activity over time. The paper has provided information on growth and decline of ARTI and RIPT at the national and regional levels over the twenty years to 2000–01 and has demonstrated some potential applications of the database for regional analysis.

Overall, ARTI appears to be a superior indicator of changes in economic activity for regions compared to either of the often used proxies of economic activity: population or employment numbers. At the national and state levels, ARTI is also more closely related to Gross Domestic Product (GDP) and Gross State Product (GSP) than either of these indicators. Historically, movements in GDP, GSP and ARTI in Australia are closely aligned.

The economic activity of Australia's regions tends to be very closely linked to the national pattern of growth, with growth in most regions highly correlated with national growth. However, metropolitan regions tend to be more closely aligned with national trends, than non-metropolitan regions.

Most of Australia's regions have experienced positive economic growth over the last twenty years, although some regions have performed better than others. One in three regions experienced stronger economic growth than the national average, while about one in four experienced income decline. Remote and inland non-metropolitan regions have generally not fared as well as coastal or larger metropolitan and capital city areas. Strong growth was evident in a large number of coastal areas and urban fringe areas, which is mainly attributed to growth in population rather than growth in average incomes. Economic decline was most common among agricultural regions with a relatively small population base.

ARTI and RIPT provide useful time series indicators for analysis of economic activity at the regional level and used in conjunction with other regional information, can provide:

- powerful resources for profiling the socio-economic conditions of regions;

- a richer understanding of the factors influencing regional growth and decline;
- tools for exploring the regional impact of government policies and programmes;
- considerable potential for policy-relevant research into the factors influencing the resilience of regional economies in the face of external shocks; and
- a potential basis for the development of regional economic models.

The BTRE invites researchers and regional development practitioners to test the database for their own regions, as a full knowledge of its strengths and weaknesses will only come through verification of the database by those with on the ground experience.

APPENDIX I CONSTRUCTION OF THE TAXABLE INCOME DATABASE

This chapter provides information on the scope and contents of the BTRE *Taxable Income Database* and the methodology used to develop the database, including explanations of the estimation process and the application of geographic concordances. Advice on using the database and details of future updates is also provided.

DATA SOURCES

Australian Taxation Office

The basis of the BTRE *Taxable Income Database* is data sourced from the ATO annual publication *Taxation Statistics*. The data has been published in various forms:

- 1980–81 to 1982–83, Australian Taxation Office, *Taxation Statistics Parliamentary Papers,* Australian Government Publishing Service, Canberra.

- 1983–84 to 1997–98, Australian Taxation Office, *Taxation Statistics* series, Australian Government Publishing Service, Canberra.

- 1998–99, Australian Taxation Office, *Taxation Statistics 1998–99*, <http://www.ato.gov.au/content.asp?doc=/content/corporate/taxstats9899.htm>.

- 1999–90, Australian Taxation Office, *Taxation Statistics 1999–2000*, <http://www.ato.gov.au/content.asp?doc=/content/Businesses/19759.htm>, plus special tabulation from ATO.

- 2000–01, Australian Taxation Office, *Taxation Statistics 2000–01,* <http://www.ato.gov.au/taxprofessionals/content.asp?doc=/content/37484.htm>.

SCOPE

The BTRE *Taxable Income Database* is based on data published by the Australian Taxation Office (ATO) in its annual publication *Taxation Statistics* from 1980–81 until 2000–01. The BTRE Database only includes results for tax returns processed before 31 October of each year (about 95% of all returns). Data is only included for tax returns for *individuals*. Individual taxpayers mostly receive their income from salary and wages, Australian Government pensions and benefits, or investments. They may also have business income, business loss or deductions. The ATO also collects data from income tax return forms for companies, funds, trusts and partnerships and the fringe benefits tax annual return form. This is *not* included in the BTRE Database.

In order to determine their tax liability, individual taxpayers report their income, profit, allowable deductions, expenses, tax offsets, rebate claims and other items in their annual income tax return. *Assessable income* for individuals includes that derived from salary and wages, net business income (or loss), distributions from partnerships or trusts, non-business income such as interest and dividends, eligible termination payments, government pensions and allowances, superannuation payments and reportable fringe benefits amounts.

Taxable income (to which tax rates are applied) is derived by subtracting *allowable deductions*, such as work-related car, travel or self-education expenses, uniforms or gifts and donations, from the *assessable (total) income*. Deductions comprised about 5.3% of assessable income in 2000–01.

Over 10.3 million individuals lodged tax returns in 2000–01, accounting for 52% of the total Australian population as at 30 June 2001 (ATO 2003). Approximately 81% of individuals lodging a tax return were *taxable* — that is, net tax (gross tax plus Medicare levy less rebates and credits) was charged. Most individual taxpayers (72%) were classified as "salary and wage earners" in 2000–01.[57] A further 17% were recipients of investment income (rent interest and dividends), with the remaining 11% as earning income primarily from business involvement in industry. The largest individual industry was primary production (3%).

In terms of sources of income, 74% of individual taxpayer earnings came from salary and wages on group certificates, with almost 20% coming from business related earnings such as net business income or loss, partnership and trust distributions, capital gains and imputation credits. Table A.1 provides a breakdown of the main sources of income for individuals in 1999–00. The

57 'Salary and wage earners' refers to individual taxpayers who reported income only from salary and wages or reported salary and wages together with non-business net income or loss of less than $1 000 in their return form.

relative importance of interest income has tended to decline as interest rates declined over the last decade, while the importance of net business income, imputation credits and net capital gains has tended to be volatile over time.

TABLE A.1 SOURCES OF INCOME FOR INDIVIDUAL TAXPAYERS, 2000–01

Sources of income	*Taxpayers*	*Income*	
	No.	$M	%
Salary & wages on group certificates	8 010 612	259 393	74.1
Net partnerships & trusts distribution[1]	2 359 699	23 626	6.8
Net business income	787 045	9 821	2.8
Gross dividends	3 229 429	9 520	2.7
Other pensions (non-government)	516 298	8 731	2.5
Commonwealth payments[2]	1 704 368	6 629	1.9
Gross Interest	4 327 631	6361	1.8
Net capital gains	1 386 477	5 747	1.6
Eligible termination payments	314 702	4 960	1.4
Allowances, benefits, earnings & tips	1 972 127	4651	1.3
Primary Imputation Credits	3 137 811	4 497	1.3
Other	2 511 457	4 609	1.3
Total	10 273 479[3]	349 824	100.0[4]

Source ATO 2002.
Note 1. From primary and non-primary industry sources.
2. Includes Commonwealth benefits, payments, pensions and allowances.
3. Column not additive as many taxpayers have income from more than one source.
4. Error due to rounding.

The BTRE has derived data for Statistical Local Areas (SLAs) and Local Government Areas (LGAs) based on the residential postcode as it is described on the tax return provided to the ATO by individuals. The Database includes for each SLA and LGA:

- the number of non-taxable individuals (from 1982–83 only)
- the number of taxable individuals (NTI)
- the aggregate real taxable income in $(2002–03) (ARTI)
- the real income per taxpayer in $(2002–03) (RIPT)
- the aggregate real net tax paid in $(2002–03) (ARNT)

RIPT is calculated by dividing the ARTI in a region by the NTI of the region. The ARTI, RIPT and ARNT have been adjusted for changes in prices (i.e. for inflation) using the national Consumer Price Index (CPI) and are reported in 2002–03 dollars.

It must be noted that taxation data does not include the income available to all individuals within Australia. A significant number of low income earners, such as pensioners and other persons who derive their income from government benefits and allowances, are not required to submit a tax return.

The data is also restricted to taxpayers who are required to pay tax after taking account of deductions, the tax-free threshold, credits and rebates. Consequently, many low-income earners (those who earned below the tax-free threshold) will have been excluded from the data set. Minor changes to the level of the tax-free threshold over the twenty-year time series may also have affected the comparability over time (Table A.2). Consequently, the coverage of ARTI as an indicator of total economic activity may also vary in the future – for example, if there is a strong trend towards increased corporatisation of businesses or major changes in the method of calculating taxable income.

TABLE A.2 CHANGES IN THE TAX-FREE THRESHOLD, 1980–81 TO 2000–01

Year	*Tax free threshold ($)*
1980–81	4 041
1981–82	4 195
1982–83	4 462
1983–84 to 1985–86	4 595
1986–87	4 890
1987–88 to 1989–90	5 100
1990–91	5 250
1991–92 to 1999–00	5 400
2000–01	6 000

Source Australian Taxation Office Taxation Statistics, various years.

The BTRE Database is unable to count income derived through the "underground economy". That is, income concealed by individuals in order to evade paying income tax. This can include income from criminal activity, moonlighting, welfare fraud, failure to declare interest payments, transfer pricing arrangements within corporations and barter (Bajada 1997).

There is no reason to believe that this is likely to be more prevalent in one year compared to another, nor that there are specific regional differences. However, it has been suggested by some that individual taxpayers who also run businesses have more opportunity to avoid paying tax than Pay As You Go (PAYG) taxpayers. In particular, rural businesses are often singled out as potential areas for tax avoidance. If true, this would have spatial implications.

Whilst there are no doubt some anomalies due to tax avoidance, it should also be remembered that the information as a whole is collected under Government legislation where there are significant penalties for inaccuracy and the ATO has an objective to ensure compliance. In addition, taxpayers are assisted by a professional body of accountants and taxation lawyers to accurately compute and report income based on documentary evidence. Consequently, this data is likely to be more reliable than income data from other sources, even the Census which relies on uncorroborated self-reporting.

ESTIMATION

The ATO publishes *Taxation Statistics* on an annual basis and data is not necessarily presented in a consistent way from year to year. In order to develop a consistent time series of data, the BTRE has had to develop estimates to overcome some inconsistencies in the way the ATO has treated the presentation of financial figures and dealt with confidentiality issues over time.

Financial figures

There are a number of inconsistencies in the presentation of financial figures in *Taxation Statistics* between 1980–81 and 2000–01:

- For 1980–81 to 1987–88 figures for total taxable income[58] per postcode and total net tax per postcode were rounded to the nearest $1 000.
- For 1989–90 to 1990–91 figures for total taxable income per postcode and total net tax per postcode were rounded to the nearest million dollars. The BTRE derived a better estimate (i.e. an estimate with a smaller rounding error) from using the additional figures for "mean taxable income for the postcode" and "mean net tax for the postcode" presented by the ATO in these years. To derive an estimate for total taxable income for each postcode, the number of taxable individuals was multiplied by the published "mean taxable income for the postcode". Similarly, to derive an estimate for total net tax for the postcode, the number of taxable individuals was multiplied by the published "mean net tax for the postcode".
- From 1989–90 the ATO started to publish separate figures for "net tax" and "total imputation credit". These two data items were added together in order to get an estimate of total net tax consistent with previous years.
- For 1991–92 to 1994–95, financial figures were again presented to the nearest $1 000. The best estimate of total taxable income for a postcode was derived either by multiplying the number of taxable individuals by

58 Whilst this is essentially ARTI, we have maintained the term "total taxable income" when referring to the original data to remain consistent with the ATO's nomenclature.

the "mean taxable income" (as described above) or using the published figure, depending on which method provided the smallest range of possible values. If the number of taxable individuals for a postcode was less than 1 000 then the estimation method described previously was used. If the number of taxable individuals for a postcode was greater than 1 000 then the printed figure was used. A similar method was used for calculating the total net tax paid, but due to the complexities arising from the rounding of the two component figures ("net tax" and "imputation credit"), the maximum error was 1 000 taxables, rather than 500 taxables.

- From 1995–96 the ATO has published financial figures to the nearest dollar, so no further estimation of this nature has been required.

Confidentialisation issues

To avoid the identification of individuals, the ATO suppresses the results for small postcodes. The way the ATO has chosen to do this has differed over time. From 1980–81 to 1989–90 the ATO did not publish figures for postcodes with less than 1 000 returns. Postcodes where the number of taxable individuals plus the number of non-taxable individuals was less than 1 000 were combined into an "Others" category for an electorate (up to 1987–88) or State/Territory (for 1988–89 and 1989–90). Since 1990–91 the ATO has reduced this limit to less than 100 returns. Postcodes where the number of taxable individuals plus the number of non-taxable individuals is less than 100 are combined into an "Others" category for each State/Territory.

In order to convert postcode data to LGAs and SLAs it was necessary for the BTRE to develop estimates for the postcodes that were suppressed by the ATO. This was complicated by the different methods of presentation of the data by the ATO over the twenty-year period:

- For 1980–81 to 1987–88, postcode data was published within Commonwealth Electoral Divisions, with small postcodes (less than 1 000 returns) combined into an "Others" category for each electorate. Postcodes that fell into more than one electorate were allocated to whichever electorate covered most people from that postcode based on population census counts.

- For 1988–89 to 1989–90, postcode and electorate data were published in separate tables with small postcodes (less than *1 000* returns) combined into an "Others" category for each State/Territory.

- For 1990–91 to 1992–93, postcode and electorate data were published in separate tables with small postcodes (less than *100* returns) combined into an "Others" category for each State/Territory.

- From 1993–94, postcode data was published in a single table with small postcodes (less than 100 returns) combined into an "Others" category for each State/Territory. Publication of electorate data was discontinued.

Due to these differences in the presentation of the source data over time, the BTRE has adopted different methods of estimation accordingly.

Estimation for postcodes with less than 1 000 returns

This section describes the estimation for postcodes with less than 1 000 returns that was applied for the years 1980–81 through to 1989–90. Estimation was based on information derived from ABS census counts for the years 1981, 1986 and 1991. The process is described in four stages and is depicted in Table A.3. Numbers 1 through 4 presented in Table A.3 relate to the four stages described below.

1. Identification of residual postcodes

In order to determine which postcodes were contributing to the "Others" category for each electoral division, postcodes published by the ATO were compared with the complete list of postcodes that comprise each Commonwealth Electoral Division derived from census counts by the ABS.

Postcodes that did not appear in the published ATO data but were considered to belong to a particular electorate by the ABS were assumed to be residual and required estimation.

2. Determination of population counts for residual postcodes

ABS census counts for Census Postal Areas were used to determine the population for each residual postcode. Census counts for 1981 were used for estimating data for residual postcodes from 1980–81 to 1982–83. As electoral division boundaries changed in 1984, counts of population by postcode from the next available census, 1986, were used for estimating data from 1983–84 to 1989–90. This may have had the effect of overestimating the population in some postcodes for the years before the census, and underestimating the population in some postcodes for the years after the census. Despite this, 1981 census counts appeared to provide the best match for allocating postcodes to electorates prior to 1984, and 1986 census counts appeared to provide the best match for allocating postcodes to electorates after 1984. As there was a major overhaul of postcodes in the Northern Territory in 1988, Northern Territory estimates for 1988–89 and 1989–90 were based on 1991 census counts. The 1991 census counts did not provide a better match for estimating data in the later years for the other jurisdictions.

3. Derivation of a conversion factor

The population of each individual postcode was divided by the total population for all residual postcodes within an electorate to derive a conversion factor. This gives an estimate of the size each postcode contributes to the total population of residuals and therefore the proportion of the "Others" category that should be attributed to each postcode.

TABLE A.3 EXAMPLE OF ESTIMATION OF "OTHERS" CATEGORY FOR POSTCODES WITH LESS THAN 1000 RETURNS

Electorate	*ATO published postcode*	*No. of taxable individuals*	*1. Residual postcodes*	*2. Population*	*3. Conversion factor*	*4. No. of taxable individuals (final)*
			Based on census	Based on census	Population of postcode divided by total population for residual postcodes	
Berowra	2073	7 226				7 226
	2076	10 009				10 009
	2077	9 118				9 118
	2078	1 413				1 413
	2079	1 814				1 814
	2081	1 515				1 515
	2082	1 794				1 794
	2119	5 395				5 395
	2120	11 816				11 816
	2158	1 865				1 865
	2159	1 581				1 581
	Others	1 426	2080	2 584	0.6	918
			2252	481	0.1	171
			2253	949	0.2	337
				4 014	1.0	1 426

4. Estimation of indicators

The total for the "Others" category within each electorate was multiplied by the conversion factor to give the number of non-taxable individuals, the number of taxable individuals, the total taxable income and the total net tax paid. The same assignment factor was used for each indicator.

The BTRE found that the assignment of postcodes within electorates by the ATO did not always match the ABS assignment. For example, postcode 2158 was assigned to the Berowra electorate by the ATO, but to the Mitchell electorate by the ABS. Where such discrepancies occurred, the ATO had assigned a postcode to an electorate adjacent to the one that the ABS had assigned. This is likely to reflect the judgement by the ATO as to which electorate the greatest number of people for a particular postcode fell. The number of misallocations ranged from 10 in 1980–81 to 43 in 1984–85. The greater number in 1984–85 was presumably due to the changes in electoral division boundaries in 1984. Estimates closest to the census years are likely to be more accurate than those that are further away.

A complicating factor for estimating data for 1988–89 and 1989–90 was that the ATO published separate electorate and postcode tables, with the "Others" category only available at the State level rather than at the electorate level. The method of estimation for these years was similar to that described above. However, firstly the "Others" category for each State/Territory was distributed across the electorates within the State/Territory on the basis of the distribution and allocation of postcodes to electorates published by the ATO in 1987–88. It was assumed that the distribution would be similar across the three time periods. The derived "Others" categories were then distributed across postcodes within each electorate as described above.

Estimation for postcodes with less than 100 returns

This section describes the estimation for postcodes with less than 100 returns that was applied for the years 1990–91 through to 2000–01. The suppression (i.e. grouping into an "Others" category for the State/Territory) of these small postcodes by the ATO had a major impact on some very small SLAs and LGAs, particularly when the number of returns dropped below 100 in one year and then exceeded 100 in the next year. Estimation for these small postcodes was based on the surrounding values — that is, the number of taxable individuals in the year before or the year after the missing value (if available) or on trends observed in a similar or neighbouring postcode. These postcodes were chosen on the basis of geographic proximity and/or similarity of size and known attributes (for example, rural with rural, military post with military post etc). No estimate has been made for small postcodes that have not appeared in the ATO data in any year, although they may be valid in terms of Australia Post postcodes.

Each postcode was first assessed to see whether it might have been affected by suppression in any one year. That is, dropping out in one year and then reappearing the next, dropping out and not reappearing even though the postcode is still valid, or starting later in the series than when the postcode was actually introduced by Australia Post.

In the *first instance*, the number of taxable individuals and the number of non-taxable individuals was estimated as the average of surrounding (i.e. earlier and later year) values. Where postcodes began or ended (as shown in Australia Post records) within the time period (1989–90 to 1999–00), the value for the year before a postcode was introduced or the year after it ceased was assumed to be zero. The intervening years were interpolated based on endpoints.

In the *second instance*, if there was no earlier or later value available to calculate an average, then estimation was based on values in a neighbouring or similar postcode. These were adjusted proportionally on the basis of the relative values of the closest year where the values of both postcodes were known, i.e.

$$\text{No. of taxables/non-taxables} = \frac{\text{Last known value for target postcode}}{\text{Corresponding period value for neighbouring postcode}} \times \text{Value for neighbouring postcode for year to be estimated}$$

If the calculated values of the total number of returns (that is the number of taxable individuals plus the number of non-taxable individuals) exceeded 99 (it could not equal or be greater than 100 otherwise it should have been published by the ATO) then a decision was made as to the likely cause:

- If the surrounding numbers were close to 99 (or there was a suggestive trend), then it was assumed that the number of taxable individuals plus the number of non-taxable individuals totalled 99. The proportion of the number of taxable individuals to the number of non-taxable individuals in a neighbouring or similar postcode was used as the basis for distributing the 99.
- If the surrounding numbers were not close to 99 (e.g. they were larger than 150, depending on series trend), then it was assumed that this was due to an error or changes in methodology by the ATO, and the calculated average figure was allowed to stand.

If a postcode was known to exist but ATO did not publish any data for the postcode over the twenty-year period then that postcode was ignored (i.e. all values were assumed to be zero).

In both the *first and second instance,* dollar amounts for total taxable income and total net tax were estimated through multiplication of the estimate for the number of taxables for the target postcode by the average taxable income/net tax in a neighbouring or similar postcode for the year of estimation, i.e.

$$\text{\$Value} = \text{Estimated number of taxable individuals for target postcode} \times \frac{\text{Taxable income/net tax for neighbouring postcode}}{\text{Number of taxable individuals for neighbouring postcode}}$$

The "Others" category in each State/Territory was adjusted to reflect the new estimates. That is, the total number of taxable individuals estimated for a particular State/Territory was subtracted from the total for the "Others" category for that State/Territory. Similarly, the total number of non-taxable individuals, total taxable income and total net tax estimated for a particular State/Territory was subtracted from the total for the "Others" category for that State/Territory. Unfortunately it was not possible to reassign the whole "Others" category to individual postcodes. The remainder is likely to reflect "invalid" postcodes (due to incorrect reporting or processing errors).

Once all figures for the "Others" categories had been allocated across individual postcodes, the postcode data was converted to LGAs and SLAs using concordances developed by the ABS as discussed in the following section.

CONCORDANCES

To enable the conversion of data from one type of geographic region to another, the BTRE engaged the Australian Bureau of Statistics to develop geographic concordances. These geographic concordances are used to convert data for "non-standard" areas such as postcodes to data for standard areas used by the ABS such as SLAs (ABS 2001c). These concordances are expressed as conversion factors based on population.

The BTRE has used a modified version of these conversion factors to convert the ATO postcode data to estimates at the SLA and LGA level. The concordances were based on the estimated resident population, for each year in the time series, and were calculated on SLA and LGA boundaries as at 1 July 2001 (see ABS 2001a).

An example taken from ABS (2001c) shows how the concordances were applied to derive an estimate or the Bellarine-Inner SLA in Victoria.

Postcode	*No. of wage and salary earners*	*Conversion factor*	*SLA share*
3219	7 308	0.6247	4 565
3221	2 579	0.2726	703
3224	2 859	1.0000	2 859
SLA total			8 127

SLA 22751 Bellarine-Inner in Victoria covers three postcode areas; all of postcode 3224 and parts of postcodes 3219 and 3221. Based on the estimated resident population distribution in 1996–97, the concordances are 62.74% of postcode 3219, 27.26% of postcode 3221 and 100% of postcode 3224. By applying these factors to the relevant population for each postcode, in this case the total number of wage and salary earners, an estimate of 8 127 for Bellarine-Inner is derived for 1996–97.

BTRE modifications to ABS concordances

BTRE has modified the ABS concordances to include official postcodes such as PO Boxes that do not correspond to official residential areas, postcodes which are no longer used by Australia Post but are still being used by people submitting tax returns and postcodes for Christmas Island or Cocos (Keeling) Islands. The ABS assigns these postcodes to an “unknown” category for each State and Territory, or for Australia where the State or Territory is not known

Despite the ATO using the current home address field to report the postcode, the BTRE identified about 70 postcodes in the ATO data that referred to PO boxes, shopping and business centres, universities and hospitals (about 20 000 taxable individuals in 1999–00). Although this equates to only about 0.2% of taxable returns for Australia as a whole, it is about 3.3% of returns in the Northern Territory and can impact on individual LGAs and SLAs substantially. Rather than assign data for these postcodes to an “unknown” category, the BTRE has chosen to modify the ABS concordances to include these.

It is not possible to derive a concordance for these postcodes based on population. Instead, the BTRE has assumed that the residential location of the people reporting PO boxes would be similarly distributed to the residential location of the people who report the postcode where the PO Box is physically located. That is, it is likely that people who report a Shepparton PO box reside in Shepparton.

A postcode can be assigned 100% to an SLA or can be distributed across several SLAs. For example, the North Sydney postcode (2060) is assigned 100% to the North Sydney SLA. Therefore the North Sydney PO boxes (postcode 2059) were also assigned 100% to the North Sydney SLA. By contrast, the Ballarat postcode (3350) was distributed across three SLAs, 74.23% to Ballarat (C) – Central, 10.76% to Ballarat (C) - Inner North and 15.01% to Ballarat (C) – South for 1999–00. The Ballarat PO Boxes (3353) were assigned in the same way with the same concordance values. Postcodes referring to a university, hospital, or shopping/business centre were assigned to the same SLA/LGA as their physical location.

Where a postcode referred to Christmas Island or Cocos (Keeling) Islands they were assigned 100% to their respective SLAs. A postcode for Norfolk Island was included in the ATO data, but as Norfolk Island does not appear in the ASGC it cannot be assigned to an SLA. Instead it was assigned to the unknown category for New South Wales.

A concordance for postcodes which are no longer used by Australia Post, but are still being used by people submitting tax returns, was based on the last available concordance for that postcode in the ABS concordances.

Data for "invalid" postcodes (due to incorrect reporting or processing errors) have been included in an "unknown" category for each State and Territory or for Australia where the State or Territory was not known.

Limitations of postcodes and concorded data

There are a number of limitations of concorded data that should be taken into account when using the BTRE *Taxable Income Database*. The issues stem from the limitation of using postcodes as a spatial unit in the first instance and the difference between postcodes and ABS postal areas on which the concordances are based in the second instance.

- Postcodes are not spatial units. They were designed by Australia Post solely to facilitate mail delivery, not as units of spatial analysis. Each year, existing postcode boundaries are redefined, new postcodes are added and old postcodes are removed.

- Postcode boundaries are non-contiguous and do not necessarily correspond to locations. Postcodes do not cover all of Australia, and one postcode can be scattered across several discrete locations. States are progressively aligning postcode boundaries with localities where one postcode would equate to a single, entire suburb. This should improve their accuracy in the future.

- The ABS Postcode Areas data set which is used to derive the concordances is only an approximation of Australia Post postcodes. Postcode boundaries do not align with ABS ASGC boundaries. Postcode boundaries are placed on the backs of blocks while ABS boundaries are placed on the centre lines of streets, railways or rivers.

- Concordances assume that the particular characteristics of any data item are uniformly distributed across a postcode. Therefore concorded data may not truly reflect the distribution of the characteristics of the population at the small area level. In some cases where the same postcode is split across two or more LGAs or SLAs and there are no other contributing postcodes, distinct numerical estimates will be derived but rates or averages will be identical for each LGA/SLA (as these will be equivalent to the original rate or average of the contributing postcode). This is particularly evident in Western Australia, Queensland and the Australian Capital Territory, where in many instances the individual postcodes are larger than the SLA/LGA.

These limitations are considered to be relatively minor factors which do not limit the overall use of the data for the broad purposes intended, and in the absence of an alternative indicator of regional economic activity, the benefits should far outweigh the possible limitations. Concordances are likely to be less accurate for minority groups, as the characteristics of the majority of the population are applied. However, as individuals lodging tax returns account for 53% of the total Australian population the accuracy of concordances for this indicator is expected to be good.

USING THE DATABASE

There are a number of points to remember when using the *Taxable Income Database*:

- Analysis of taxable income for large regions (i.e. those with a greater number of taxpayers) will generally be more reliable than analysis for small regions which tend to be more volatile and can be highly affected by minimal changes in the number of taxpayers.

- In the earlier half of the series (i.e. from 1980–81 to 1989–90), data for some LGAs is based entirely on the estimation procedures described previously. Analysis of data for these LGAs should be undertaken with care. The database includes a separate table setting out the proportion of each LGA which was estimated in each year from 1980–81 to 1989–90. Individuals should use their discretion when choosing individual LGAs for analysis — data for LGAs that do not rely heavily on estimation is preferable and is likely to be most accurate.

- Higher levels of regional aggregation — such as Statistical Division, Statistical Subdivision or LGA, rather than SLA level — is generally advised for analysis of regions in the Australian Capital Territory, Western Australia and Queensland, where in many instances individual postcodes are larger than the SLA/LGA.

- Postcodes relating to Post Office Boxes have not been reported consistently across the time series by the ATO. In order to maintain consistency, the BTRE has estimated these for a number of years (generally from 1990–91 to 1993–94). This is likely to have the greatest impact in the Northern Territory, where tax returns with PO Box postcodes represent a relatively large proportion of returns.

- Data from 1990–91 onwards is likely to be most reliable, as there has been minimal estimation. However, data for small SLAs/LGAs should still be analysed with caution.

- It is advisable that users focus analysis on trends over the whole period, rather than period-to-period movements, especially at points where the methodology changed, for example between 1989–90 and 1990–91.

- LGAs and SLAs are based on where the individuals submitting the tax return live, not necessarily where they work or earn their income. Similarly, the LGAs and SLAs do not necessarily represent where the income is spent.

- Income doesn’t reflect all economic activity in a region and its share of total economic activity may differ across regions or over time.

UPDATES

It is envisaged that the BTRE *Taxable Income Database* will be updated annually. However, there is generally a one to two year delay between the end of the financial year and the ATO release of *Taxation Statistics*. This will impact on the availability of updates to the Database accordingly.

Despite the limitations noted above, this information paper has demonstrated that the BTRE *Taxable Income Database* provides a useful indicator for regional analysis of taxable income and economic activity more generally. Used in conjunction with regional population and employment numbers, as well as newly available regional data on industry structure and education, skills and qualifications, the *Taxable Income Database* should provide a powerful resource for profiling the socioeconomic conditions of regions and for understanding the factors influencing regional growth and decline.

APPENDIX II COMPARISON OF ARTI, POPULATION & EMPLOYMENT WITH RESPECT TO MEASUREMENT, AVAILABILITY & GEOGRAPHY

Measurement Issues

Population Data

The ABS estimates population figures for Statistical Local Areas (SLA) at 30 June each year. In census years, estimated residential populations (ERPs) are based on usual residence census counts adjusted for known net census undercounts and the timing of the census. For non-census years, ERPs are calculated using a mathematical model informed by local knowledge, and advice from local governments. The mathematical model varies across and within states but draws on parameters such as dwelling approvals, electricity connections, Medicare enrolments and drivers licenses (ABS 1995).

Employment Numbers

Regional employment figures are less reliable. They are estimated at SLA level by the Department of Employment and Workplace Relations (DEWR) whilst calculating the quarterly Small Area Labour Markets estimates. The estimates are based on the ABS' Labour Force Survey estimates for ABS Labour Market Regions (see ABS 2001b for more detail on the survey). However, the methodology used is designed only to determine regional unemployment rates and the Department itself warns against using them for estimating employment numbers for SLAs (DEWR 2003). Therefore, regionally based annual employment numbers should only be sourced at the much larger ABS Labour Market Region level.

Taxable Income Data

Taxable income data is based on measured totals from the Australian Taxation Office (ATO) rather than estimates from surveys of part of the population. Whilst there is a strong incentive for individuals to minimise their reporting, the ATO has considerable legislative and administrative powers available to it to ensure accuracy. The issues bearing on the accuracy of the database are discussed elsewhere in the paper, but as essentially a census style measurement of all (taxable) income rather than an extrapolation from a smaller sample, the accuracy of the original data is likely to be good.

More problematic is the concordance to standard LGA and SLA boundaries and the need to estimate the series in areas where privacy concerns prevent the ATO from providing all the data. Whilst these issues point to potential sources of error, in practice we believe the data is sound as long as the limitations of the process are understood. A fuller account of the application of concordances and the estimation techniques employed is provided in Appendix I.

A further practical difficulty is the time lag to publication of the data. This is generally in the order of two years from the end of the financial year in question. This is in part due to the time taken for individuals to lodge their tax returns (the standard procedure to publication allows one year to do this) and then the time required for the ATO to compile and publish the collective results whilst complying with privacy and other safeguards.

Availability and Geography

Annual population statistics at SLA level are published by the ABS in "Regional Population Growth, Australia and New Zealand" (Cat No. 3218.0). Unfortunately, individual issues only provide the most recent two years and a figure from five years earlier using the Australian Standard Geographical Classification (ASGC) for the latest year published. Only the latest two years are available electronically. In order to create a meaningful time series, back issues need to be obtained covering the period in question and adjustments made to allow for changes in the ASGC over the period. Alternatively, the figures can be obtained from the ABS through its consultants for a fee.

Employment figures can be obtained through the Department of Employment and Workplace Relations (DEWR). However, as noted above, the figures are not regarded by the department as being reliable below the level of "Labour Market Regions" (effectively SD or SSD level). Hence annual figures at SLA level, whilst available, are not reliable enough for analysis.

Given these difficulties, in practical terms the ARTI and other taxation based statistics which are presented using standard ASGC (2001) geography would seem to be the best practical as well as theoretical alternative for those needing time series data.

Comparisons with ABS Census and Labour Force Survey data

Whilst there are difficulties obtaining annual data on regional economic parameters, the Census provides an accurate snapshot of both population and employment every five years. It also collects figures on personal income but unfortunately in a form that requires some estimation to obtain specific figures for regions. Notwithstanding this, these census figures are another source of figures relating to regional income. The ABS Labour Force Survey on the other hand is collected frequently, but only published at Statistical Sub Division level in the major cities and at Statistical Division or higher levels in non-urban areas.

The ABS has recognised the need for more frequent regional statistics than provided by the census and so has investigated the possibility of using taxation and other administrative data sets to meet this need with a view to providing annual data on an SLA basis from 1996. As part of its investigation, the ABS has used ATO data to construct experimental estimates of wage and salary earnings for small areas and compared them with data from the Census and the Labour Force Survey (ABS 2001c). The paper concluded that the ATO based data was generally consistent with the ABS based data sets, noting differences in definitions, coverage and reference periods. As a result of these findings the ABS plans to release these estimates for subsequent years on a regular basis and expand the range of potential indicators based on taxation statistics.

In early 2005, the ABS released a new series that combined personal income data from the ATO and data on income support payments from the Australian Government Department of Family and Community Services. *Information Paper; Experimental Estimates of Personal Income for Small Areas, Taxation and Income Support Data, 1995-96 to 2000-01* (ABS cat. no. 6524.0) provides estimates of total gross income from Wages and salaries, Own unincorporated business, Investment, Superannuation and annuity, Government cash benefit and Other income, for LGAs. Data for SLAs was also released as accompanying spreadsheets. The ABS plans to continue to expand on and release these estimates for subsequent years.

APPENDIX III FURTHER ASPECTS OF THE ARTI/GDP RELATIONSHIP

AGGREGATE REAL TAXABLE INCOME (ARTI) AND THE CALCULATION OF GROSS DOMESTIC PRODUCT (GDP)

Whilst not proof of regional accuracy, if taxable income is to be a useful indicator of changes in economic activity for regional areas, it is reasonable to expect it to be consistent with GDP movements at the national level. In this context it is useful to explore the extent to which the two series measure the same or similar components of the economy.

GDP is the national accounting measure of production occurring in a whole economy during a year. The level of production is important because it largely determines how much a country can afford to consume.

Annual GDP is based on the concept of value added, and includes the unduplicated value of goods and services produced by all resident producers in a year. GDP can be derived from income and expenditure flows as well as from direct measures of production. GDP is the source of income for the factors of production (labour and capital). Total factor income can therefore be derived by summing factor incomes by adding:

- compensation of employees;
- gross operating surplus and
- gross mixed income.

Adding taxes less subsidies on production to total factor income gives GDP at purchasers' (or market) prices. GDP can also be derived as the sum of all final expenditures on goods and services (ABS 2000).

If we consider the factor income approach, then it would be expected that ARTI would include elements of (but not all of) compensation of employees, gross operating surplus and gross mixed income.

It would be expected that ARTI would include the majority of the compensation of employees (defined as the remuneration of employees by employers). However, the level of compensation of employees in ARTI will be reduced by any tax deductions claimed and by the extent to which any other losses are written off against wage and salary income.

Gross operating surplus is a measure of returns to capital. It measures the surplus accruing from processes of production before deducting any explicit or implicit interest charges, land rent or other property incomes payable on the financial assets, land or other tangible non-produced assets required to carry on the production. ARTI includes deductions for these items and so will incorporate a lesser value for these components. Further, depending on the institutional organisation of the firm, only the amount of a firm's surplus that is actually returned to its owners is counted in ARTI – retained profits will not be included. In recent years even this figure has been depleted as much of the return to shareholders is distributed as franked dividends that do not attract individual tax.

Gross mixed income reflects the returns accruing to unincorporated enterprises from processes of production, and so is a combination of returns to capital and returns for the proprietor's own labour.

The upshot is that taxable income and GDP are different mixtures of the same or similar components. They can therefore be expected to often move in the same way, but not always.

THE POTENTIAL FOR USING POPULATION AND EMPLOYMENT AS AN ADJUNCT TO ARTI AT THE NATIONAL LEVEL.

In Chapter 3.3 we used regression analysis to compare ARTI, employment numbers and population as indicators of GDP. The regression parameters from Table 3.2 are reproduced below.

TABLE IIIA CORRELATION COEFFICIENTS AND R-SQUARED VALUES OF REGRESSION OF GDP AGAINST THREE ALTERNATE INDICATORS, AUSTRALIA, 1960–61 TO 2000–01

	ARTI	Population	Employment
Correlation Coefficient (Raw Data)	0.991	0.995	0.990
Correlation Coefficient (% Change)	0.657	0.189	0.215
Regression R^2 (Raw Data)	0.982	0.990	0.980
Regression R^2 (% Change)	0.431	0.046	0.036

Source BTRE calculations based on data from the Australian Taxation Office Taxation Statistics, 1960–61 to 2000–01 as well as ABS 1986, ABS 2003c and ABS 2003d.

Note Employment data relates to 1966–67 to 2000–01 period.

The important R^2 values for the regressions of percentage change (the bottom line of the table) strongly support the view that changes in ARTI better reflect changes in GDP than the other series.

However, this statistical superiority of ARTI as an explanatory variable for GDP using simple regression does not preclude significant contributions from the other series in a multiple regression. To test the extent of any contribution, a multiple regression was constructed using all three alternate indicators. The computer output for this regression is reproduced below.

TABLE IIIB COMPUTER OUTPUT FROM MULTIPLE REGRESSION OF ARTI, EMPLOYMENT AND POPULATION AGAINST GDP (1967/68 – 2000/01)

Regression Statistics	
Multiple R	0.61
R Square	0.38
Adjusted R Square	0.31
Standard Error	2.34
Observations	33.00

ANOVA

	df	*SS*	*MS*	*F*	*Signif F*
Regression	3.00	96.13	32.04	5.86	0.0029
Residual	29.00	158.45	5.46		
Total	32.00	254.58			

	Coeff	*Std Error*	*t Stat*	*P-value*	*Lower 95%*	*Upper 95%*	*Lower 90%*	*Upper 90%*
Intercept	1.48	1.16	1.28	0.21	-0.89	3.86	-0.49	3.46
Change in ARTI	0.42	0.11	3.97	0.00	0.21	0.64	0.24	0.61
Change in Employment	0.04	0.25	0.17	0.87	-0.46	0.55	-0.38	0.46
Change in Population	0.21	0.74	0.28	0.78	-1.31	1.73	-1.05	1.47

The R^2 for this regression is 0.378, only marginally greater than for ARTI alone (0.375)[59]. The t–statistics for the population and employment coefficients are 0.280 and 0.170 respectively, meaning that neither is statistically significant. An F–test was used to determine the joint significance of the population and employment coefficients in the regression. The calculated F–statistic for this test was $F_{2,29} = 0.068$, meaning that the null hypothesis that the coefficients equal zero cannot be rejected.

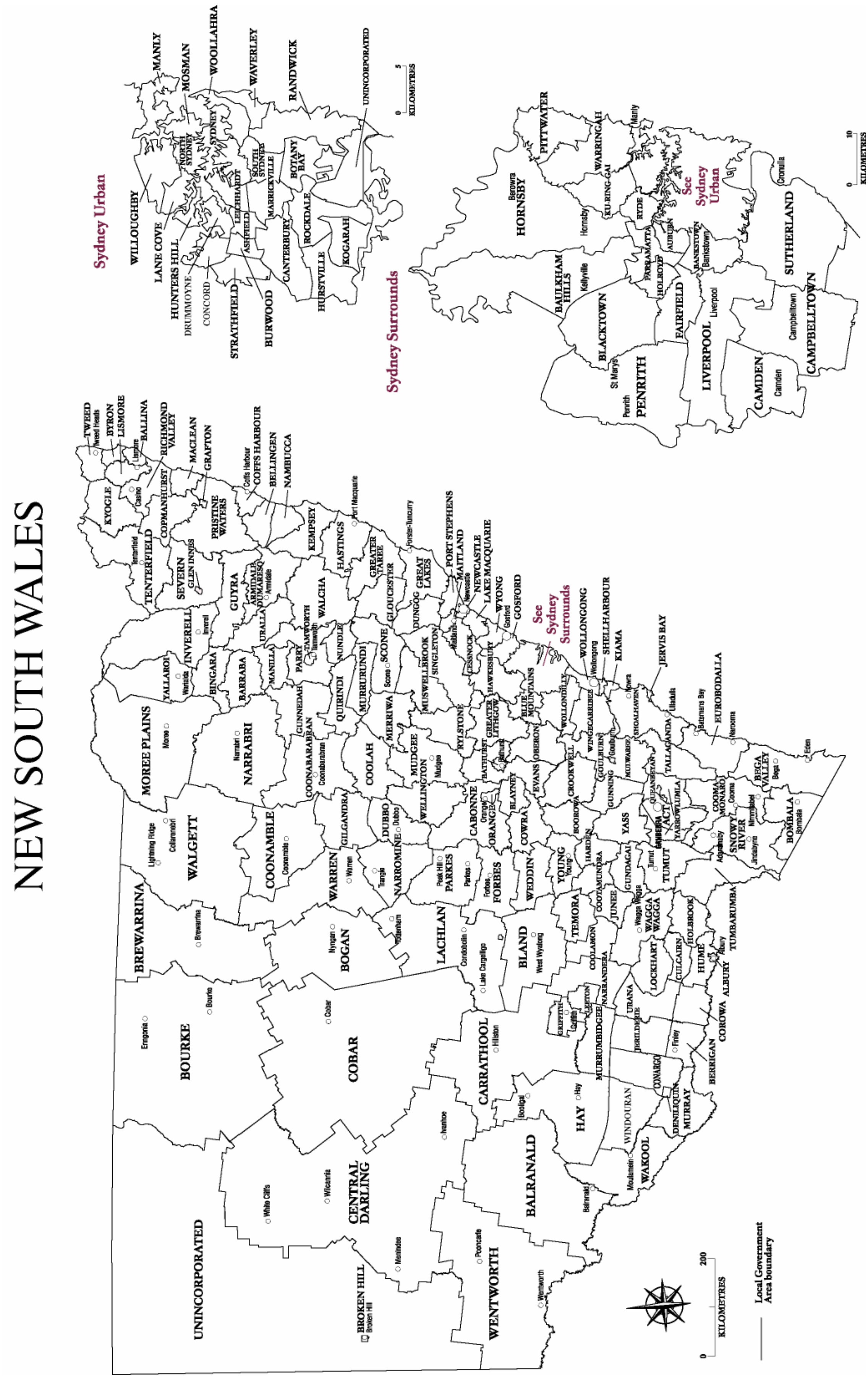
59 This figure was derived using 33 observations for ARTI (equivalent to the available data for employment) and is consequently less than the 0.431 figure quoted in Chapter 3 (41 observations).

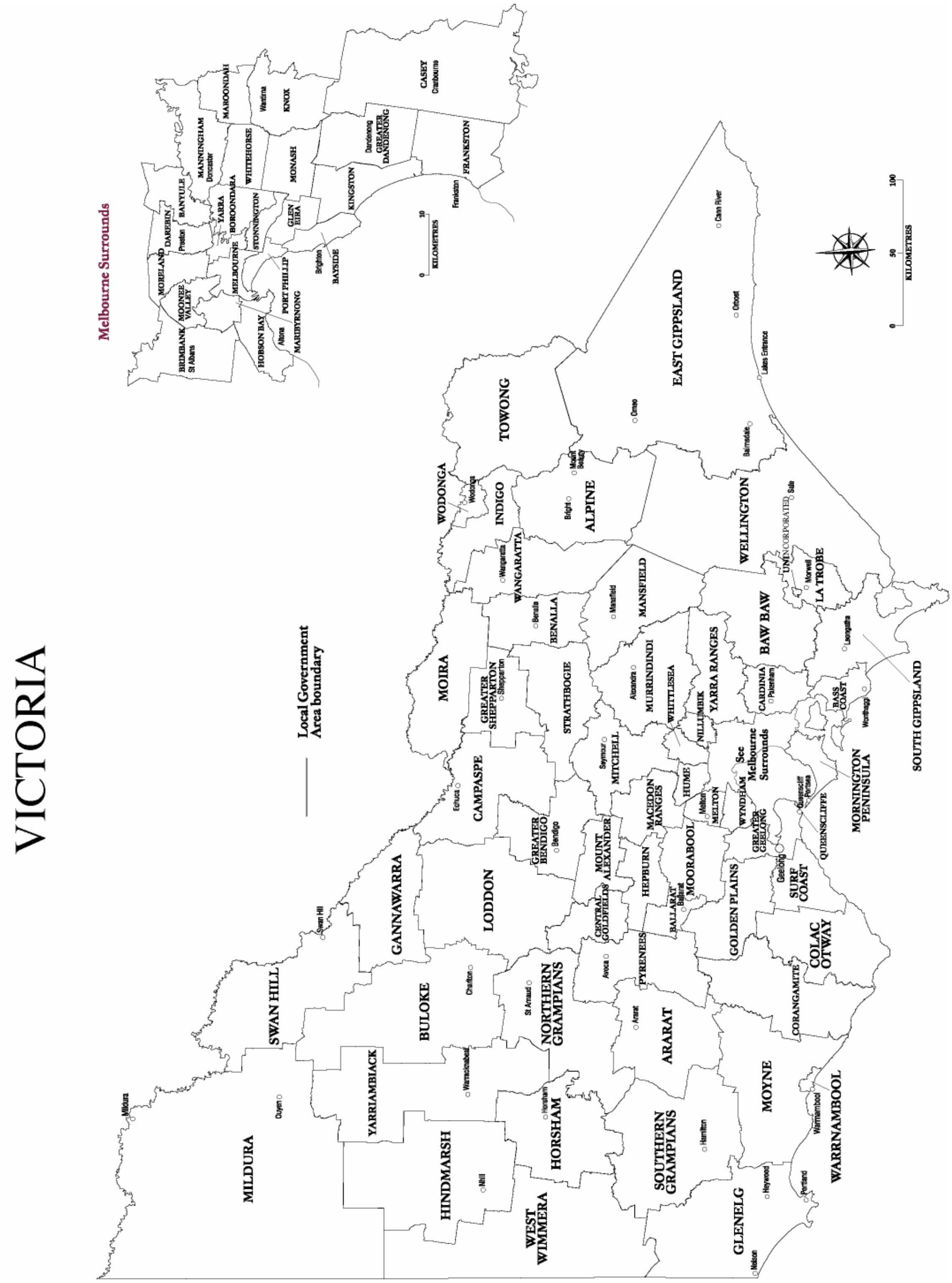
Therefore, it was concluded that neither the population nor employment series are shown to make a significant additional contribution to the regression. This further strengthens the case for ARTI as the indicator which is most aligned with GDP at the national level.

APPENDIX IV LOCAL GOVERNMENT AREA MAPS

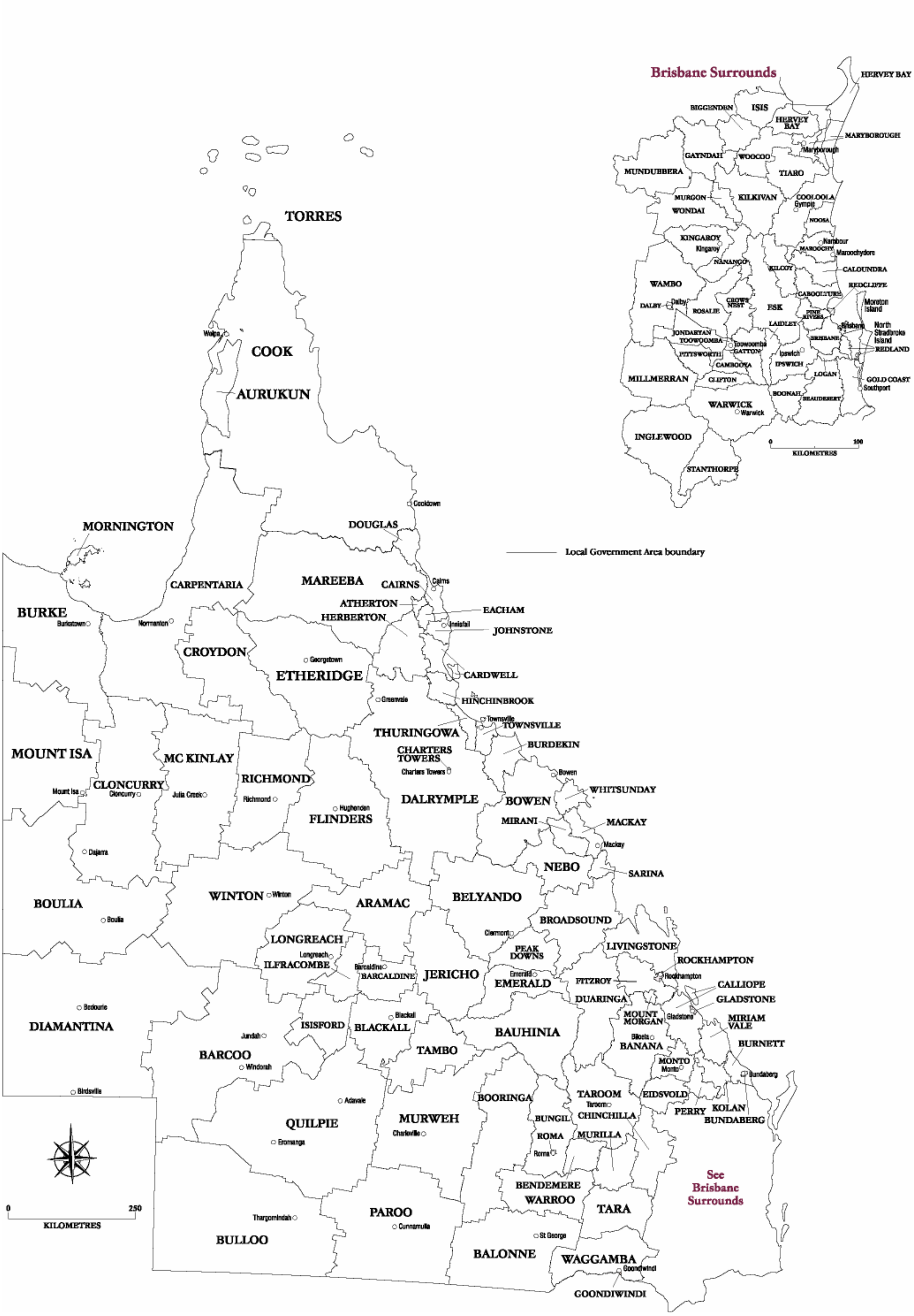
This appendix provides maps illustrating the 624 Local Government Areas (LGAs) and 7 of the 9 unincorporated areas (Unincorporated Other Territories and Unincorporated ACT are not separately mapped). The maps reflect 2001 LGA boundaries.

These LGAs form the basis of the regional analysis of taxable income presented throughout this paper.

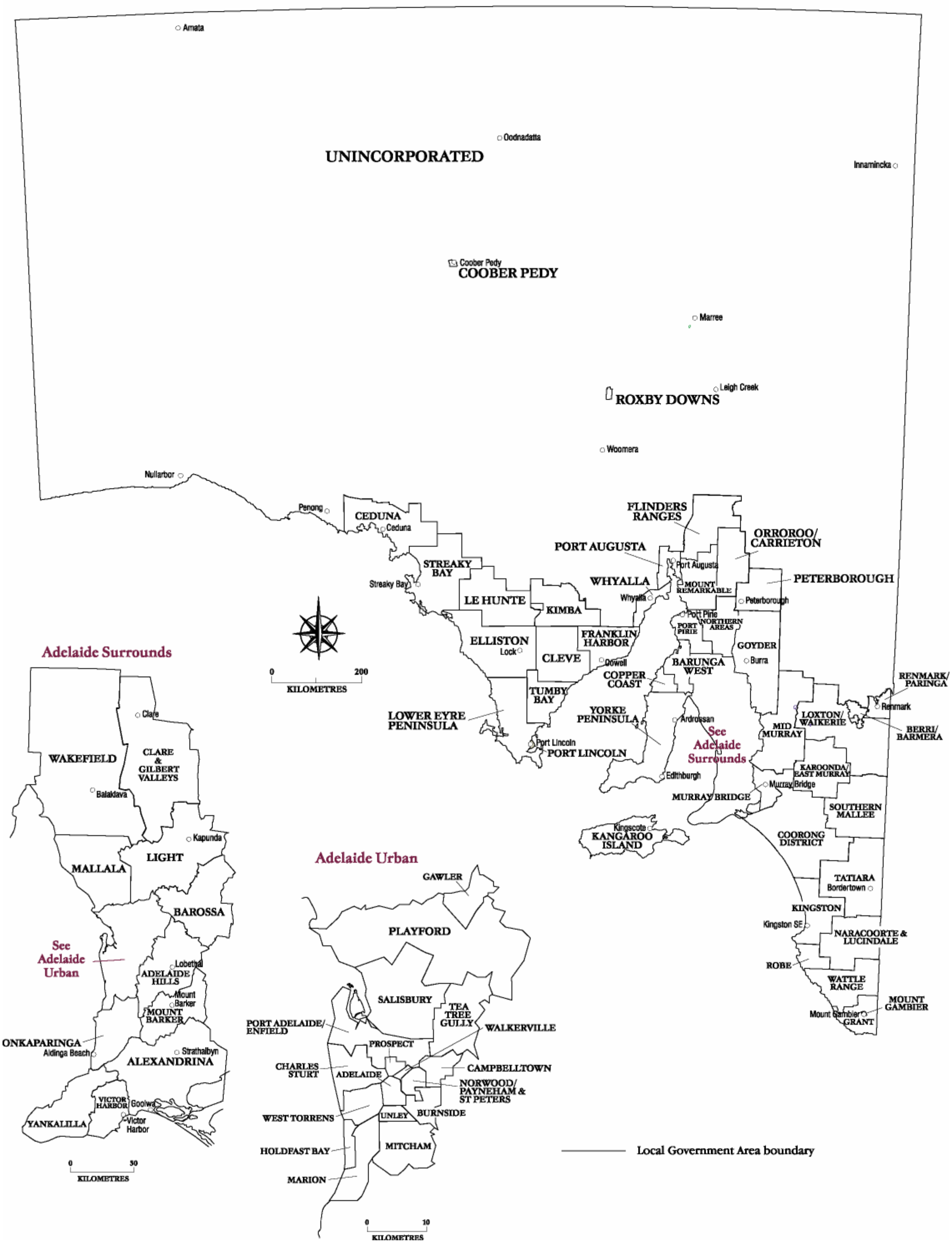

NEW SOUTH WALES
Sydney Urban
Sydney Surrounds
See Sydney Surrounds
See Sydney Urban
UNINCORPORATED
BROKEN HILL
WENTWORTH
CENTRAL DARLING
BOURKE
COBAR
BREWARRINA
WALGETT
MOREE PLAINS
NARRABRI
COONAMBLE
BOGAN
LACHLAN
CARRATHOOL
BALRANALD
HAY
WAKOOL
BLAND
FORBES
PARKES
WARREN
GILGANDRA
DUBBO
NARROMINE
COOLAH
MUDGEE
WELLINGTON
CABONNE
ORANGE
COWRA
WEDDIN
YOUNG
TEMORA
JUNEE
WAGGA WAGGA
LOCKHART
HUME
ALBURY
COROWA
BERRIGAN
MURRAY
TUMUT
TUMBARUMBA
YASS
ACT
BEGA VALLEY
BOMBALA
EUROBODALLA
JERVIS BAY
KIAMA
SHELLHARBOUR
WOLLONGONG
GOSFORD
WYONG
LAKE MACQUARIE
NEWCASTLE
MAITLAND
PORT STEPHENS
GREAT LAKES
GREATER TAREE
HASTINGS
KEMPSEY
NAMBUCCA
BELLINGEN
COFFS HARBOUR
GRAFTON
MACLEAN
RICHMOND VALLEY
BALLINA
LISMORE
BYRON
TWEED
KYOGLE
TENTERFIELD
SEVERN
INVERELL
GUYRA
WALCHA
TAMWORTH
GUNNEDAH
MURRURUNDI
SCONE
MERRIWA
MUSWELLBROOK
SINGLETON
CESSNOCK
HAWKESBURY
BLUE MOUNTAINS
GREATER LITHGOW
OBERON
EVANS
BATHURST
GOULBURN
MANLY
MOSMAN
WOOLLAHRA
WAVERLEY
RANDWICK
UNINCORPORATED
WILLOUGHBY
LANE COVE
HUNTERS HILL
DRUMMOYNE
CONCORD
STRATHFIELD
BURWOOD
CANTERBURY
ROCKDALE
HURSTVILLE
KOGARAH
BOTANY BAY
MARRICKVILLE
LEICHHARDT
ASHFIELD
PITTWATER
WARRINGAH
HORNSBY
KU-RING-GAI
RYDE
BAULKHAM HILLS
BLACKTOWN
PENRITH
FAIRFIELD
LIVERPOOL
CAMDEN
CAMPBELLTOWN
SUTHERLAND
KILOMETRES
Local Government Area boundary


VICTORIA
Local Government Area boundary
Melbourne Surrounds
MILDURA
SWAN HILL
YARRIAMBIACK
HINDMARSH
WEST WIMMERA
BULOKE
GANNAWARRA
LODDON
HORSHAM
NORTHERN GRAMPIANS
SOUTHERN GRAMPIANS
GLENELG
ARARAT
MOYNE
WARRNAMBOOL
CORANGAMITE
COLAC OTWAY
GOLDEN PLAINS
SURF COAST
PYRENEES
CENTRAL GOLDFIELDS
MOUNT ALEXANDER
GREATER BENDIGO
CAMPASPE
HEPBURN
BALLARAT
MOORABOOL
MACEDON RANGES
MITCHELL
STRATHBOGIE
GREATER SHEPPARTON
MOIRA
BENALLA
WANGARATTA
INDIGO
WODONGA
TOWONG
ALPINE
MANSFIELD
MURRINDINDI
EAST GIPPSLAND
WELLINGTON
BAW BAW
LA TROBE
YARRA RANGES
CARDINIA
BASS COAST
SOUTH GIPPSLAND
MORNINGTON PENINSULA
QUEENSCLIFFE
GREATER GEELONG
WYNDHAM
MELTON
HUME
WHITTLESEA
NILLUMBIK
See Melbourne Surrounds
UNINCORPORATED
CASEY
KNOX
MAROONDAH
MANNINGHAM
WHITEHORSE
MONASH
GREATER DANDENONG
FRANKSTON
KINGSTON
GLEN EIRA
BAYSIDE
PORT PHILLIP
MARIBYRNONG
HOBSONS BAY
BRIMBANK
MOONEE VALLEY
MORELAND
DAREBIN
BANYULE
YARRA
BOROONDARA
STONNINGTON
MELBOURNE
KILOMETRES

QUEENSLAND


Brisbane Surrounds
HERVEY BAY
BIGGENDEN
ISIS
MARYBOROUGH
GAYNDAH
WOOCOO
MUNDUBBERA
TIARO
MURGON
KILKIVAN
COOLOOLA
WONDAI
KINGAROY
WAMBO
DALBY
ROSALIE
CROWS NEST
ESK
CALOUNDRA
REDCLIFFE
PINE RIVERS
LAIDLEY
JONDARYAN
TOOWOOMBA
PITTSWORTH
GATTON
BRISBANE
REDLAND
CAMBOOYA
IPSWICH
LOGAN
MILLMERRAN
CLIFTON
GOLD COAST
BOONAH
BEAUDESERT
WARWICK
INGLEWOOD
STANTHORPE
KILOMETRES
TORRES
COOK
AURUKUN
MORNINGTON
DOUGLAS
Local Government Area boundary
CARPENTARIA
MAREEBA
CAIRNS
ATHERTON
EACHAM
BURKE
HERBERTON
JOHNSTONE
CROYDON
ETHERIDGE
CARDWELL
HINCHINBROOK
TOWNSVILLE
THURINGOWA
BURDEKIN
CHARTERS TOWERS
MOUNT ISA
MC KINLAY
RICHMOND
CLONCURRY
WHITSUNDAY
DALRYMPLE
BOWEN
FLINDERS
MIRANI
MACKAY
NEBO
SARINA
BOULIA
WINTON
ARAMAC
BELYANDO
BROADSOUND
LONGREACH
PEAK DOWNS
LIVINGSTONE
ILFRACOMBE
ROCKHAMPTON
BARCALDINE
JERICHO
EMERALD
FITZROY
CALLIOPE
DUARINGA
GLADSTONE
MOUNT MORGAN
MIRIAM VALE
DIAMANTINA
ISISFORD
BLACKALL
BAUHINIA
BANANA
BURNETT
BARCOO
TAMBO
MONTO
BOORINGA
TAROOM
EIDSVOLD
PERRY
KOLAN
BUNDABERG
QUILPIE
MURWEH
BUNGIL
CHINCHILLA
ROMA
MURILLA
See Brisbane Surrounds
BENDEMERE
WARROO
TARA
PAROO
BULLOO
BALONNE
WAGGAMBA
GOONDIWINDI
0
250
KILOMETRES

SOUTH AUSTRALIA




WESTERN AUSTRALIA
Perth Surrounds
Perth Urban
See Perth Urban
See Perth Surrounds
Local Government Area boundary
KILOMETRES
WYNDHAM-EAST KIMBERLEY
DERBY-WEST KIMBERLEY
HALLS CREEK
BROOME
PORT HEDLAND
ROEBOURNE
EAST PILBARA
ASHBURTON
EXMOUTH
CARNARVON
UPPER GASCOYNE
MEEKATHARRA
WILUNA
NGAANYATJARRAKU
MURCHISON
SHARK BAY
CUE
SANDSTONE
LEONORA
LAVERTON
MENZIES
KALGOORLIE/BOULDER
COOLGARDIE
DUNDAS
ESPERANCE
RAVENSTHORPE
JERRAMUNGUP
ALBANY
DENMARK
NANNUP
AUGUSTA-MARGARET RIVER
KENT
LAKE GRACE
KONDININ
KULIN
YILGARN
WESTONIA
MOUNT MARSHALL
DALWALLINU
COOROW
CARNAMAH
NORTHAMPTON
CHAPMAN VALLEY
GERALDTON
GREENOUGH
IRWIN
MINGENEW
YALGOO
MORAWA
MOUNT MAGNET
PERENJORI
MERREDIN
NAREMBEEN
GNOWANGERUP
CRANBROOK
MANJIMUP
PLANTAGENET
STIRLING
BASSENDEAN
BAYSWATER
BELMONT
VINCENT
PERTH
CAMBRIDGE
SUBIACO
NEDLANDS
CLAREMONT
COTTESLOE
PEPPERMINT GROVE
MOSMAN PARK
EAST FREMANTLE
FREMANTLE
MELVILLE
CANNING
SOUTH PERTH
VICTORIA PARK
DANDARAGAN
MOORA
GINGIN
VICTORIA PLAINS
CHITTERING
TOODYAY
NORTHAM
YORK
BEVERLEY
BROOKTON
WANDERING
BODDINGTON
WILLIAMS
MURRAY
WAROONA
HARVEY
COLLIE
WEST ARTHUR
WAGIN
DUMBLEYUNG
BUNBURY
DARDANUP
CAPEL
BUSSELTON
DONNYBROOK-BALINGUP
BRIDGETOWN-GREENBUSHES
BOYUP BROOK
KOJONUP
KATANNING
BROOMEHILL
TAMBELLUP
WANNEROO
MUNDARING
JOONDALUP
KALAMUNDA
GOSNELLS
COCKBURN
KWINANA
ROCKINGHAM
SERPENTINE-JARRAHDALE
MANDURAH
SWAN
ARMADALE
CORRIGIN
PINGELLY
CUBALLING
NARROGIN
WICKEPIN
QUAIRADING
BRUCE ROCK
KELLERBERRIN
TAMMIN
CUNDERDIN
GOOMALLING
DOWERIN
WYALKATCHEM
TRAYNING
NUNGARIN
KOORDA
MUKINBUDIN
WONGAN-BALLIDU

TASMANIA


Local Government Area boundary
KING ISLAND
Currie
FLINDERS ISLAND
Whitemark
Stanley
Smithton
Marrawah
Wynyard
Burnie
CIRCULAR HEAD
DEVONPORT
GEORGE TOWN
Georgetown
Bridport
DORSET
Scottsdale
Ulverstone
Devonport
Beaconsfield
BURNIE
CENTRAL COAST
LATROBE
WEST TAMAR
Legana
LAUNCESTON
Launceston
St Helens
BREAK O'DAY
WARATAH/WYNYARD
KENTISH
Deloraine
MEANDER VALLEY
Longford
Cressy
St Marys
Rosebery
NORTHERN MIDLANDS
Zeehan
Campbell Town
GLAMORGAN SPRING BAY
Queenstown
Derwent Bridge
Swansea
Strahan
CENTRAL HIGHLANDS
WEST COAST
Tarraleah
Oatlands
Bothwell
SOUTHERN MIDLANDS
Triabunna
BRIGHTON
Strathgordon
New Norfolk
Sorell
SORELL
DERWENT VALLEY
GLENORCHY
HOBART
CLARENCE
Huonville
TASMAN
Nubeena
Port Arthur
Geeveston
HUON VALLEY
KINGBOROUGH
Southport
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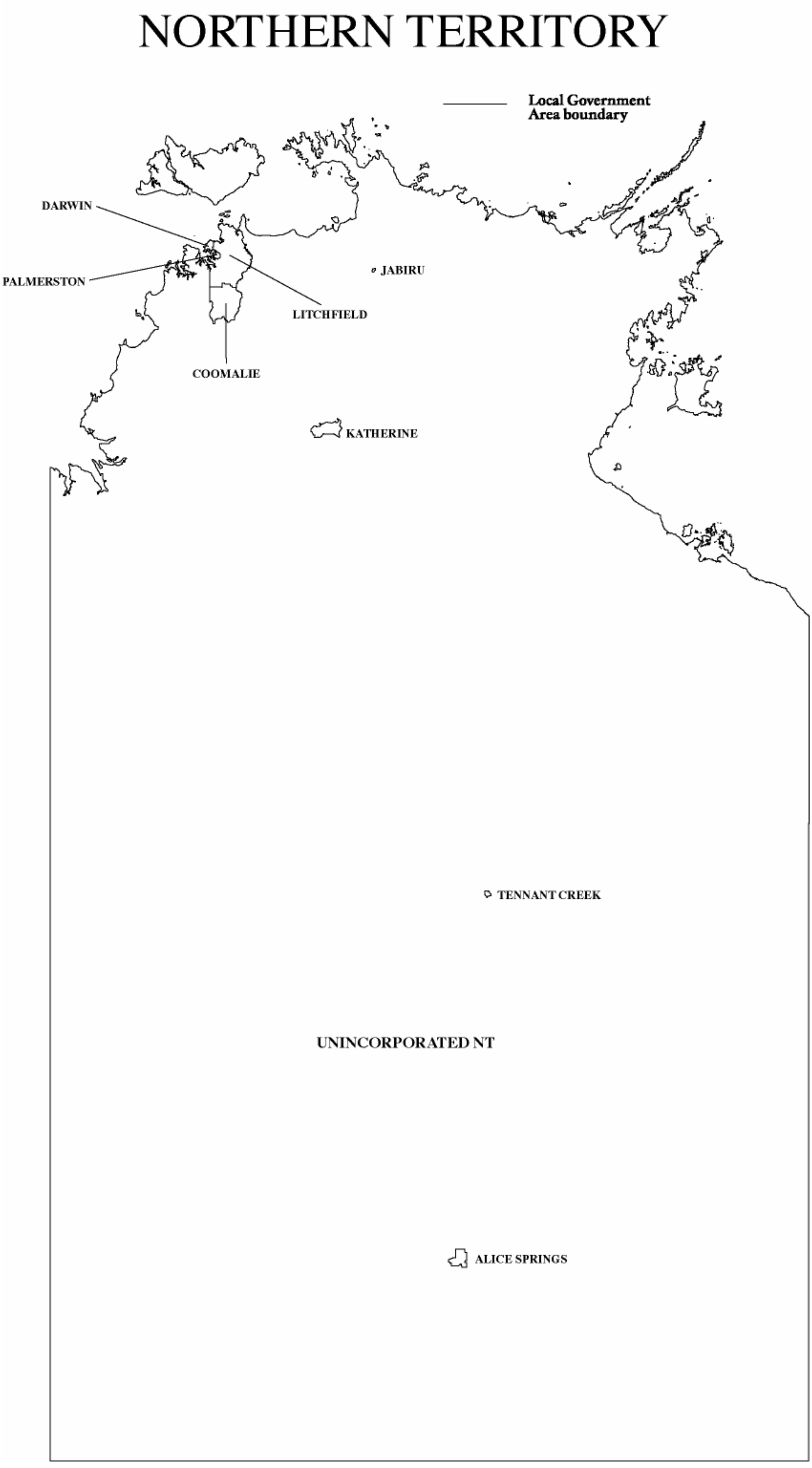
KILOMETRES


NORTHERN TERRITORY
Local Government
Area boundary
DARWIN
PALMERSTON
JABIRU
LITCHFIELD
COOMALIE
KATHERINE
TENNANT CREEK
UNINCORPORATED NT
ALICE SPRINGS

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ABBREVIATIONS AND ACRONYMS

ABS	Australian Bureau of Statistics
ACT	Australian Capital Territory
ANZSIC	Australian and New Zealand Standard Industrial Classification
ARNT	Aggregate Real Net Tax
ARTI	Aggregate Real Taxable Income
ASGC	Australian Standard Geographical Classification
ATO	Australian Taxation Office
B	Billion ($)
BTRE	Bureau of Transport and Regional Economics
Cat.	Catalogue
CCD	Census Collection District
Cf	Compare (Latin)
CPI	Consumer Price Index
DEWR	Department of Employment and Workplace Relations
ERP	Estimated Resident Population
GDP	Gross Domestic Product
GRP	Gross Regional Product
GSP	Gross State Product
LFS	Labour Force Survey
LGA	Local Government Area
Ln	Natural logarithm
M	Million ($)
No.	Number
NSW	New South Wales
NT	Northern Territory

NTI	Number of Taxable Individuals
OECD	Organisation of Economic Co-operation and Development
PAYG	Pay As You Go
PO	Post Office
PPP	Purchasing Power Parity
QLD	Queensland
RIPT	Real Income Per Taxpayer
RRSNC	Rural and Regional Statistics National Centre
SA	South Australia
SD	Statistical Division
SLA	Statistical Local Area
TAS	Tasmania
TI	Taxable income
UK	United Kingdom
US	United States
VIC	Victoria
Vol.	Volume
WA	Western Australia