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# Trends in regional specialisation in Australia

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**Trends in regional specialisation in Australia**

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## INTRODUCTION

In this paper we look at differences in the industrial composition of employment across states and territories in Australia over the period 1985 – 2006. Surprisingly, given the attention to this topic in relation to the US and Europe, we are not aware of any previous study of these issues for Australia and yet, as will be seen, there are some quite instructive aspects of the Australian experience. Our aims are: To see which regions are most (least) like each other and to determine if regional structures are becoming more alike or less alike over time; To see if the direction of movement for manufacturing alone is a good indictor of the direction of movement for all industries; To explain the changes we observe and, in particular, to evaluate the hypothesis (usually attributed to Krugman) that there will be a tendency for greater specialisation over time - especially once deregulation and lower trade barriers and/or transport costs come into play.

We begin with a discussion of the measure of regional specialisation to be used in this paper.

## MEASURES OF REGIONAL SPECIALISATION

A popular measure of the degree to which industry structures differ between regions is that introduced by Paul Krugman.[1] Suppose we want to compare the industry composition of (say) employment in two regions, region A and region B. The Krugman Index for A compared with B would be calculated as:

$$KI_{AB} = \sum_i \left| \left( X_{ir_A} / X_{r_A} \right) - \left( X_{ir_B} / X_{r_B} \right) \right| \qquad (1)$$

[1] See KRUGMAN (1991, p 75f) and KRUGMAN (1993, p 250f). Recent papers using the Krugman Index include BELKE & HEINE (2006), COMBES & OVERMAN (2004), KIM (1995, 1998), LIANG & XU (2004), MARELLI (2004), OVERMAN ET AL (2003), SUEDEKUM (2006) and TRAISTARU ET AL (2003).

where employment in industry *i* in region A is $X_{irA}$, employment in the same industry in region B is $X_{irB}$, total employment in all industries in region A is $X_{rA}$ and total employment in all industries in region B is $X_{rB}$.

Essentially we are comparing two distributions and summing the vertical differences between them. The Krugman Index will always lie between the values of 0 (indicating that the two distributions are the same) and 2 (where the two distributions have nothing in common). Because the index is higher the more dissimilar are the two distributions, the measure is sometimes said to be an "Index of Dissimilarity". If the index is falling (rising) over time it indicates that the two regions are becoming more (less) alike.

The Krugman Index is a simple transformation of a measure which pre-dates it and which has a long history in regional studies, the Coefficient of Regional Specialisation.[2] Supposing again that we want to compare the industry composition of employment in two regions, A and B, the Coefficient of Regional Specialisation for A compared with B would be calculated as:

$$CRS_{AB} = 1/2 \sum_i \left| \left( X_{ir_A} / X_{r_A} \right) - \left( X_{ir_B} / X_{r_B} \right) \right| \qquad (2)$$

where the variables are defined as before.

If the value of the *CRS* is 0 it indicates that the pattern of activities is the same in both regions and so there is no (relative) specialisation. The other extreme would be where one region specialises in only one activity and the other region has no one employed in that activity, in which case the *CRS* will have a value of 1. If the CRS is falling (rising) over time it indicates that the two region's industrial structures are becoming more (less) alike. In other words, a fall in the CRS indicates increasing similarity or de-specialisation.

The *CRS* has a very simple and intuitively appealing interpretation. Its value is equal to the proportion of regional employment which would have to be reallocated (in other words, "move between industries") in order for one region to have the same pattern of employment across industries as another region.[3]

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[2] The Coefficient of Regional Specialisation is discussed in HOOVER (1948), LESER (1949a & b), ISARD (1960), DIXON & THIRLWALL (1975) and in HOOVER & GIARRATANI (1984). Recent papers using the Coefficient of Regional Specialisation include EZCURRA ET AL (2006), ROBSON (2007) and SOFIOS & ARABATZIS (2006).

[3] This can be inferred in a fairly straight-forward way from equation (2) but an arithmetic example may help. Imagine two regions (A and B) each of which has people employed in only two industries (1 and 2).

There seems to be a presumption, stemming principally from the work of Krugman, that over time (and especially following a lowering of trade barriers and/or transport costs), there will be increasing regional specialisation. However, such evidence as we have to date for the US and Europe does not provide unambiguous support for the Krugman hypothesis. One of the earliest studies by KIM (1995), found that the degree of regional specialization in the US had "fallen substantially and continuously since the 1930s" (ibid, p 903). Most studies for Europe have tended to either find a clear tendency towards decreasing regional specialisation (especially for regions in 'old Europe') or to find mixed results with some regions showing decreasing specialisation while others show little change in either direction or evidence of increasing specialisation.[4] Unfortunately (no doubt due to data limitations) some of the published studies cover only a short time period while others cover only a limited range of sectors or, even if they do cover the whole economy, they use a very coarse level of aggregation. Also, and more importantly from the point of view of this paper, many studies do not examine the evolution of specialisation over successive time periods but rather involve comparisons between two dates, typically 5 or more years apart. This is a concern if there are variations in industry structure associated with the business cycle and the dates being compared are not cyclically comparable.

This paper takes advantage of a data set based on the large, regular survey undertaken in Australia by the Federal Government's statistical agency, the Australian Bureau of Statistics. This comprehensive survey yields high quality time series data on employment across 53 industries covering all sectors of the economy (so the data set is not confined to manufacturing) for each of the six states and two territories which make up the Australian Commonwealth.[5] The data is available for each year over the period 1985 – 2006.[6]

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Imagine that industry 1 makes up 20% of total employment in region A and 45% of total employment in region B, while industry 2 makes up 80% of total employment in region A and 55% of total employment in region B. Applying equation (2) the sum of the absolute differences between the industry shares in region A and region B will be 0.25 + 0.25 = 0.50. If we halve that figure we get the value of the CRS of 0.25. In the text we say that the CRS is equal to the proportion of the regional employment which would have to be 'reallocated' in order for the two regions to have the same pattern of activity. If we subtract 0.25 from the share of industry 2 in Region A and add 0.25 to the share of industry 1 in region A then region A will have exactly the same structure of employment as region B.

[4] For studies of all EU regions or of the regions in a single European country see for example COMBES & OVERMAN (2004), EZCURRA ET AL (2006), HALLET (2000), MARELLI (2004), MOLLE (1997), PALUZIE ET AL (2001), ROBSON (2007) and SUEDEKUM (2006).

[5] The states and territories are: New South Wales (NSW); Victoria (VIC); Queensland (QLD); South Australia (SA), Western Australia (WA); Tasmania (TAS); Northern Territory (NT) and Australian Capital Territory (ACT).

Besides advantages derived from the availability of a high quality time series data set which is not confined to manufacturing, there is also the advantage that the data covers a period of significant reductions in both internal and (especially) external trade barriers and a consequential rise in international trade (whether measured as exports alone or as the sum of exports plus imports relative to GDP).

In equations (1) and (2) above the Coefficient of Regional Specialisation and the Krugman Index were presented in the context of making comparisons between two regions. For ease of computation and analysis it is often preferable to compare the pattern of activity in a region with the corresponding pattern of activity for the nation (or some other aggregate of which the region is a member - such as the EU taken as a whole). Unfortunately, any measure that compares regional indices with an aggregate of which the region is a part suffers from the fact that if a region is 'large' relative to the aggregate then that, by itself, will mean that figures for the region will tend to be close to those for the nation (see SHEPHERD & DIXON (2002) for further discussion of this issue in the context of econometric work on the 'cyclical sensitivity' of unemployment rates). Because the states and territories in Australia differ markedly in size (two states, New South Wales and Victoria between them account for more than one-half of the national labour force) it is not sensible to compute indices of specialisation by comparing state and territory figures with national figures. Instead, in this paper indices for each year and for each state and territory have been computed where the benchmark is 'the rest of the nation' (i.e. 'all *other* regions taken together' rather than 'all regions taken together').[7] Also, since there is nothing gained in reporting both the Krugman Index and the Coefficient of Regional Specialisation, we only report the latter. We have chosen to work with that measure because of its long history in regional studies and also because, as we have seen, it has a very simple and intuitively appealing interpretation.

[TABLE 1 NEAR HERE]

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[6] The data is taken from the Australian Bureau of Statistics' Labour Force Statistics folder in the DX Database, Tables LQE1209 - LQE1909 and refers to the number of employed persons by industry. Details of the 53 industries are given in an appendix.

[7] EZCURRA ET AL (2006) and LIANG & XU (2004) also compare the figures for each region with those for *all other regions* taken together, rather than with those for *all regions*. In our econometric work we obtain similar results for the trend in specialisation whether we work with a CRS measure calculated by comparing each region with the rest of the nation (i.e. "all other regions") or with a CRS measure calculated by comparing each region with "the nation".

Table 1 shows the (weighted) mean CRS for the Australian states and territories for each year over the period 1985-2006, together with information on the size of the region (the region's population in 1995/6 and the region's share of the national population in 1995/96 – the mid-point of our sample period).[8]

Clearly there are marked differences between regions[9] in the level of the CRS, that is in the level of specialisation or 'dis-similarity'. In particular, the Australian Capital Territory and the Northern Territory have markedly different and far more specialised industrial structures to that found in all of the other regions. In the case of the Australian Capital Territory this is largely because it is the location of the federal capital city and so, like (say) Washington DC, it is a region which is essentially made up of a single city with a relatively high proportion of its labour force employed in government departments and with very little manufacturing or primary industry. It has the second smallest population of all of the Australian states and territories and, unlike all the others, is land-locked. The Northern Territory is the second most highly specialised region. It is the smallest region in terms of population and, like the Australian Capital Territory, has a relatively high proportion of its labour force employed in the public sector and a relatively low proportion employed in agriculture and manufacturing.[10]

The size of the CRS appears to be inversely related to the size of the region's population. The average value for the CRS is largest in the Australian Capital Territory, the Northern Territory was the next largest, followed by Tasmania, South Australia, Queensland, Western Australia, Victoria and New South Wales, in that order. In 1995-96, the mid-year of our data set, New South Wales had the largest population, Victoria was the next largest, followed by Queensland, Western Australia, South Australia, Tasmania, Australian Capital Territory and the Northern Territory. (Indeed these were the rankings in every single year over the period 1985 – 2006.) While it is beyond the scope of this paper to explore this apparent inverse relationship between population size and the CRS in any detail,[11] it is conjectured that the CRS is related to the geographic and geological diversity of the region, its land fertility, its population and especially the size of its urban centres and the 'completeness' of its urban hierarchy.

[8] In computing the mean CRS the value for each region is weighted by that region's share of total national employment. In practice the unweighted mean behaves in a very similar fashion to the weighted mean.
[9] In what follows we will use the term "region" as shorthand for "states and territories".
[10] However unlike the ACT the NT has a sizeable minerals sector.
[11] We have too few regions and too little data on the relevant factors. Besides, the focus of this paper is on changes over time.

We turn now to examine in some detail the evolution of the level of specialisation over time.

## TRENDS IN REGIONAL SPECIALISATION IN AUSTRALIA

A summary indicator of the trend in the level of regional specialisation over time can be obtained by looking at the (weighted) average of each of the regional coefficients for each year. Figure 1 shows the time series for the weighted average of the eight CRS series for each year over the period 1985 - 2006.[12] The solid line shows the computed weighted averages for each year while the broken line shows a 5-year moving average of the series. Clearly, the level of regional specialisation in Australia has fallen over the period.[13] In other words, regional industrial structures as measured by the industrial composition of employment are becoming more alike.

[FIGURE 1 NEAR HERE]

In the absence of any single accepted model of regional specialisation and its dynamics we will adopt a time series approach to explore the evolution of the level of specialisation over time. Specifically, we pool data for each of the regions while allowing for region specific effects - both in relation to the average level but also for systematic departures of the regional CRS from the common trend (the common shocks) - and time dependent common shocks. The main advantage is that by so doing, we gain sufficient degrees of freedom to estimate the direction and size of any common shocks for each year for which we have data. This allows us to avoid the assumption that any common shocks are once-and-for-all or that they follow a particular and smooth function.

The equation we estimate is of the following form:[14]

$$CRS_{it} = \sum_i \alpha_i SD_i + \sum_t \tau_t TD_t + e_{it} \qquad (3)$$

where $CRS_{it}$ indicates the size of the Coefficient of Regional Specialisation in region *i* in period t; $\alpha_i$ is a region-specific fixed effect; $SD_i$ is a region dummy variable to allow for

[12] The weights used are the proportions of total national employment in all industries taken together. This time series is essentially the same as the one we obtain if we take the average of all the bi-lateral values for the CRS for each region relative to every other region.

[13] The reduction is non-trivial. For example if we simply compare the first and last values of the moving average series the CRS has fallen from 0.090 in 1987 to 0.080 in 2004, a reduction of 0.01. This is a fall equivalent to 1% of total employment.

[14] The set-up of the model owes much to BORSCH-SUPAN (1991) and especially to WALL & ZOEGA (2002).

differences in the average level of the regions CRS; $\tau_\tau$ is a coefficient on a time dummy; $TD_t$ is a time dummy variable (one dummy for each year) and $e_{it}$ is the error term for region *i* at time *t*.

Set out in the left-hand columns of Table 2 are the results obtained when we estimate equation (3) for annual data over the period 1985 – 2006. (For future reference the reader should note that in this case we are using as the dependent variable a measure of the CRS which includes all industries, not solely manufacturing.) To avoid collinearity the time dummy for 1985 was excluded, as a result the estimated coefficients on the time dummies show the position of the CRS relative to that of 1985. As would be expected given the presence of both region and time dummies in the model, there is no evidence of any residual across-regions or across-time correlation.

The main aim of the present study is to see if there is a common trend in the CRS and to see in which direction the common trend is moving. The advantage of having enough degrees of freedom through pooling is that we do not have to impose a particular trend equation on the data. The time coefficients can be freely estimated and then inspected to recover the implied path of the trend. Figure 2 shows the values of the (point-estimates) of the coefficients on the year dummies for each year over the period 1985 - 2006. The solid line shows the point-estimates of the coefficients given in Table 2 for each year while the broken line shows a 5-year moving average of the series. Clearly, there is a common trend and it is downwards over the period.

The obvious question which now arises is the following: Why are regional industrial structures becoming more alike? It is especially puzzling that we should observe this over such a long period during which there has been a marked rise in population and employment (the Australian population rose by one-third over the period we are interested in while the number employed rose by around one-half), in ‘the size of the economy’ (real GDP doubled over the period) and during a period of sustained financial and economic de-regulation and increased openness of the Australian economy (the ratio of trade - exports overseas plus imports from overseas - to national GDP roughly between the beginning and end of our sample period (1985 and 2006).

[TABLE 2 AND FIGURE 2 NEAR HERE]

## REASONS FOR THE DECLINE IN SPECIALISATION OVER THE PERIOD

One advantage of the CRS measure of specialisation is that, because it is additive, it can be decomposed into various sectoral components, such as (say) primary, secondary and tertiary or some other scheme. Taking this approach not only provides a guide to the explanation for the increasing similarity we have observed, but also it allows us to see if the direction of movement for manufacturing alone is a good indicator of the direction of movement for all industries. This last issue is important because many studies of regional specialisation look only at the manufacturing sector.

Experimenting with various industry groupings reveals that virtually all of the reduction in the aggregate level of the CRS in Australian regions over the period can be explained by a reduction in specialisation within the manufacturing component - that is, by increasing similarity in the structure of manufacturing industry across the regions.[15] Figure 3 shows the (weighted) means of the contribution to the aggregate CRS in each year by manufacturing industries taken alone (broken line) and all of the non-manufacturing industries combined (solid line). (The vertical sum of the values of each series for each year will equal the raw values for the aggregate CRS plotted in Figure 1.)

[FIGURE 3 NEAR HERE]

Econometric tests for stationarity and for the presence of trends in various sub-components of the aggregate CRS all support the information displayed in Figure 3 namely, that pretty well all of the reduction in the CRS in Australia over the period 1985-2006 is due to de-specialisation in manufacturing. To check this we fitted equation (3) to the data for the manufacturing component of the CRS alone. The results are reported in the two right-hand columns of Table 2. Again, the advantage of having enough degrees of freedom through pooling is that we do not have to impose a particular trend equation on the data and so the time coefficients can be freely estimated and then inspected to recover the implied path of the trend. Figure 4 shows the values of the (point-estimates) of the coefficients on the year dummies for the manufacturing component of the CRS for each year over the period 1985 - 2006. The solid line shows the point-estimates of the coefficients given in the two right-hand columns of Table 2 for each year while the broken line shows a 5-year moving average of the series. Clearly, there is a common trend and it is tending downwards over the period.

[15] Nine of the industries in our data set are classified as manufacturing – see the Appendix for details.

[FIGURE 4 NEAR HERE]

A comparison of Figures 2 and 4 also demonstrate that it is the increasing similarity of the components within manufacturing that explains the fall in the aggregate CRS over the period we are interested in. The correlation between the two sets of time dummies is (r =) 0.95 and the extent of the fall from the beginning of the period to the end is almost exactly the same – approx 0.04.

But this, in turn, only raises another question: Why should de-specialisation be occurring over this period in manufacturing industries in Australia? Inspection of the details for each individual manufacturing industry shows that the fall in the CRS is in the main confined to three industries, Textile, clothing, footwear & leather; Machinery & equipment; and Metal products – and it is the first of these which is the dominant factor. These were (and still are) are the most localised of all manufacturing industry – indeed, calculation of Location Quotients shows that Textile, clothing, footwear & leather is easily the most highly localised of all the manufacturing industries in our data set. Employment in the three industries is heavily concentrated in two states - Victoria (in the case of Textile, clothing, footwear & leather and Machinery & equipment) and/or NSW (in the case of Metal products).[16]

All three industries experienced a decline in the number employed in them, even relative to manufacturing as whole, over the period. Between 1985 and 2006 total manufacturing employment in Australia fell by around 6%. The number employed in Textile, clothing, footwear & leather fell by over 50%, the number employed in Machinery & equipment and in Metal products both fell by around 12%. Why did employment in those industries – and especially in Textile, clothing, footwear & leather - fall so dramatically over the period we are interested in? It is the result of the significant reductions in trade barriers which occurred over the period.[17]

In recent decades in Australia there has been a dramatic decline in assistance to manufacturing, largely due to the abolition of import quotas and progressive reductions in tariffs (Lloyd (2006) provides a good overview). The largest tariff reductions have been

[16] Machinery and equipment also makes up a relatively high proportion of total employment in SA, but the number of people employed in that industry in SA fell very little compared with NSW and VIC. This was due to government intervention in South Australia to provide financial support to vehicle manufacturers in that state.

[17] These changes (and their regional implications) are well documented in EPAC (1986) and PRODUCTIVITY COMMISSION (1998).

in the industries where tariffs (and thus the lack of international competitiveness) were initially the highest, Textiles clothing and footwear, Transport equipment, Motor vehicles & parts and (to a lesser extent) Fabricated metal products.[18] It is the dramatic reduction in employment in these highly localised manufacturing industries following the tariff reductions that accounts for the fall in the degree of specialisation in both the manufacturing sector and for all industries taken together, over the period. As an aside, however, we note that this process must run its course soon. Tariff levels are now down to 5 or 10% in nominal values and well likely either disappear entirely or remain at these relatively low levels for some time. Only then may we see other factors, perhaps resulting from globalisation per se, come into play.

Clearly, government interference in market allocations in the form of tariffs or other restrictions on international and interstate trade may distort patterns of specialisation and result in a pattern of employment – and a highly localised pattern of employment - which is not sustainable when restrictions are reduced. Specifically, and in the context of this paper, it would appear that once trade restrictions are removed the industry structure became less, not more specialised. This finding is not confined to Australia alone. In a study of specialisation in the European Union, Amiti (1999, p 579) noted that, "A plausible explanation for a fall in specialisation [with the formation of the EU] is that before joining the EU, countries may have had high trade barriers protecting industries in which they did not have a comparative advantage". More generally, we posit that as a result of the mechanisms we have identified above, it is quite possible for there to be increasing national or country specialisation vis a vis the rest of the world while at the same time there is decreasing regional specialisation. This may also be the reason why researchers looking at European countries and regions find that regional specialisation is falling while country specialisation is rising (COMBES & OVERMAN (2003)).

## CONCLUDING REMARKS

We have seen that the level of regional specialisation in Australia - as measured by the Coefficient of Regional Specialisation - has fallen over the last twenty years. In other words, the industrial composition of employment in Australian states and territories have

[18] Details may be found in LLOYD (2006), PRODUCTIVITY COMMISSION (2002) and more recent years, INDUSTRY COMMISSION (1995a and 1995b).

been becoming more alike over time. Almost all of the reduction in the Coefficient of Regional Specialisation in Australia over the period is due to de-specialisation in manufacturing and this, in turn, is a result of substantial tariff reductions in certain very highly localised manufacturing industries. Our view of the process of regional structural change may be contrasted to that of Krugman. Increasing trade accompanied by lower trade barriers may result in increased similarity in regional industrial structures not reduced similarity, in increasing de-specialisation, not increasing specialisation. As a result we may observe increasing specialisation when we compare countries at the same time as we observe decreasing specialisation when we compare regions.

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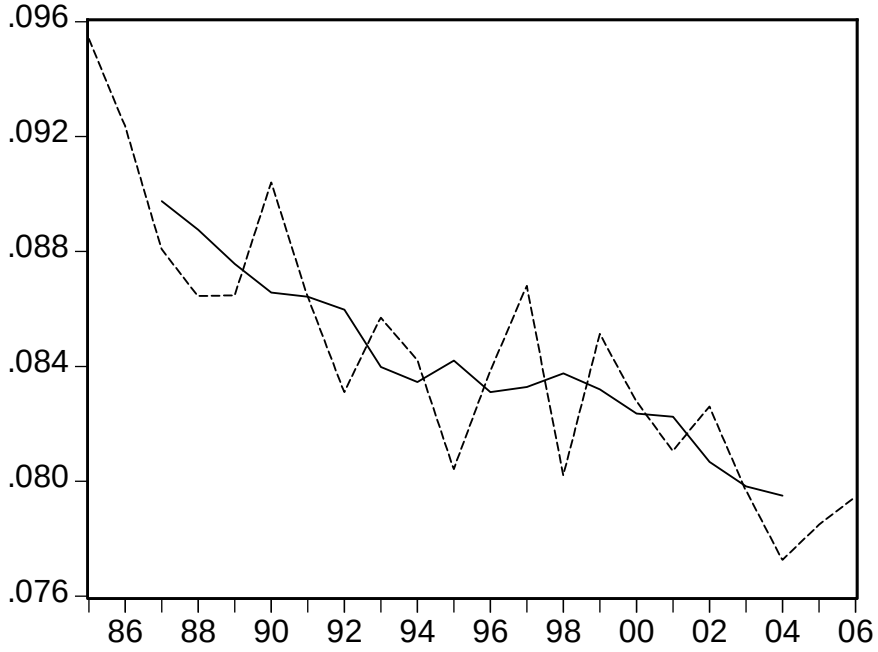


*Fig. 1. Weighted means of the Coefficient of Regional Specialisation 1985 – 2006. Actual values (broken line) and 5-period moving average (solid line).*

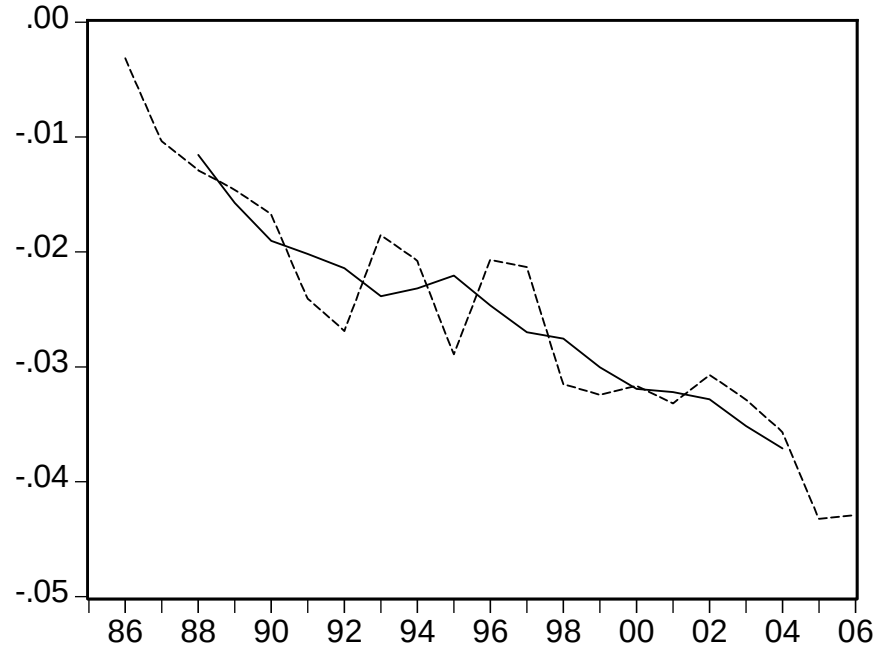


*Fig. 2. Estimated coefficients on year dummies (solid line) and a 5-period moving average (broken line)*

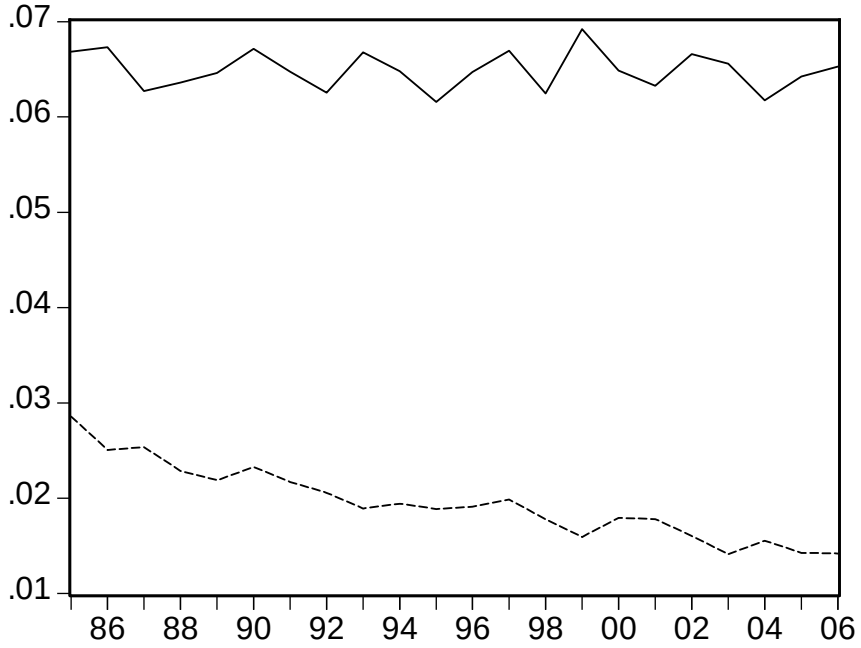


*Fig. 3. Weighted means of the Coefficient of Regional Specialisation 1985 – 2006. Manufacturing (broken line) and Non-Manufacturing (solid line).*

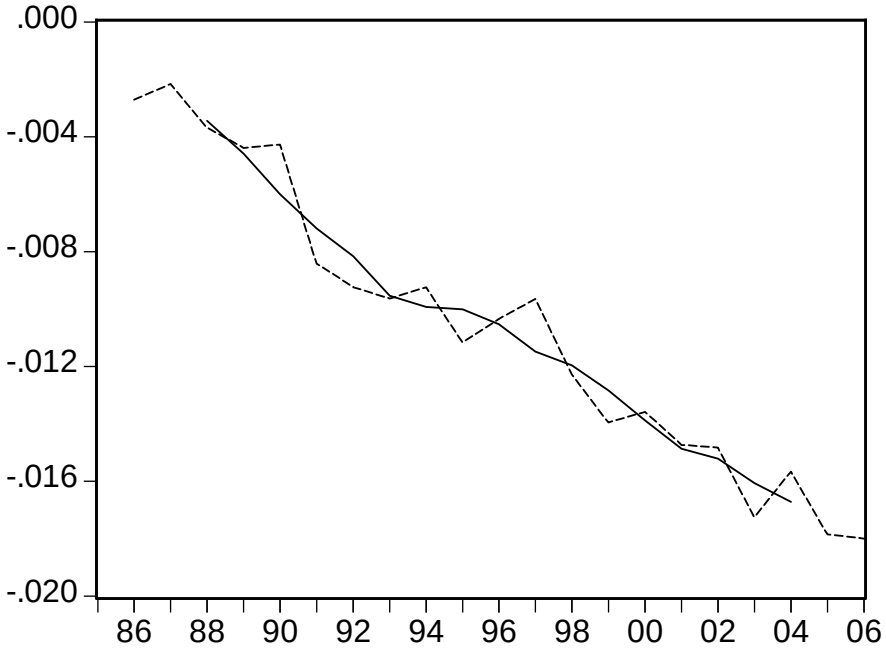


*Fig. 4. Estimated coefficients on year dummies (solid line) and a 5-period moving average (broken line) – manufacturing alone*

*Table 1. Mean CRS 1985-2006, Population and share of national population in 1995/96*

| Region | Mean CRS | Population | Population share |
|---|---|---|---|
| NSW | 0.0690 | 6,204,728 | 0.3389 |
| VIC | 0.0761 | 4,560,155 | 0.2490 |
| QLD | 0.0868 | 3,338,690 | 0.1823 |
| SA | 0.0881 | 1,474,253 | 0.0805 |
| WA | 0.0831 | 1,765,256 | 0.0964 |
| TAS | 0.1346 | 474,443 | 0.0259 |
| NT | 0.2284 | 181,843 | 0.0099 |
| ACT | 0.2901 | 308,251 | 0.0168 |

*Table 2. Results obtained from estimating equation (3)*

| | *All industries included* | | *Manufacturing industries alone* | |
|---|---|---|---|---|
| Explanatory Variables | Coefficient | p-value | Coefficient | p-value |
| NSWD | 0.0856 | 0.0000 | 0.0211 | 0.0000 |
| VICD | 0.0926 | 0.0000 | 0.0355 | 0.0000 |
| QLDD | 0.1033 | 0.0000 | 0.0309 | 0.0000 |
| SAD | 0.1047 | 0.0000 | 0.0283 | 0.0000 |
| WAD | 0.0996 | 0.0000 | 0.0297 | 0.0000 |
| TASD | 0.1512 | 0.0000 | 0.0437 | 0.0000 |
| NTD | 0.2440 | 0.0000 | 0.0581 | 0.0000 |
| ACTD | 0.3066 | 0.0000 | 0.0618 | 0.0000 |
| T1986 | -0.0024 | 0.7023 | -0.0027 | 0.2029 |
| T1987 | -0.0089 | 0.1598 | -0.0023 | 0.3110 |
| T1988 | -0.0107 | 0.0915 | -0.0037 | 0.0841 |
| T1989 | -0.0117 | 0.0658 | -0.0044 | 0.0399 |
| T1990 | -0.0131 | 0.0398 | -0.0043 | 0.0456 |
| T1991 | -0.0197 | 0.0022 | -0.0084 | 0.0001 |
| T1992 | -0.0218 | 0.0007 | -0.0092 | 0.0000 |
| T1993 | -0.0127 | 0.0460 | -0.0096 | 0.0000 |
| T1994 | -0.0142 | 0.0260 | -0.0092 | 0.0000 |
| T1995 | -0.0216 | 0.0008 | -0.0112 | 0.0000 |
| T1996 | -0.0126 | 0.0467 | -0.0103 | 0.0000 |
| T1997 | -0.0125 | 0.0486 | -0.0097 | 0.0000 |
| T1998 | -0.0219 | 0.0006 | -0.0123 | 0.0000 |
| T1999 | -0.0222 | 0.0006 | -0.0139 | 0.0000 |
| T2000 | -0.0207 | 0.0013 | -0.0136 | 0.0000 |
| T2001 | -0.0215 | 0.0009 | -0.0147 | 0.0000 |
| T2002 | -0.0182 | 0.0044 | -0.0148 | 0.0000 |
| T2003 | -0.0197 | 0.0022 | -0.0172 | 0.0000 |
| T2004 | -0.0217 | 0.0007 | -0.0157 | 0.0000 |
| T2005 | -0.0285 | 0.0000 | -0.0178 | 0.0000 |
| T2006 | -0.0275 | 0.0000 | -0.0180 | 0.0000 |
| R-squared | 0.978 | | 0.935 | |
| S.E. of regression | 0.023 | | 0.004 | |
| Log likelihood | 535.97 | | 727.51 | |
| Included observations | 176 | | 176 | |

**APPENDIX: INDUSTRY CLASSIFICATION (MANUFACTURING IN ITALICS)**

01: Agriculture; 02: Services to agriculture, hunting & trapping; 03: Forestry & logging; 04: Commercial fishing; 11: Coal mining; 12: Oil & gas extraction; 13: Metal ore mining; 14: Other mining; 15: Services to mining; *21: Food, beverages & tobacco; 22: Textile, clothing, footwear & leather; 23: Wood & paper products; 24: Printing, publishing & recorded media; 25: Petroleum, coal, chemical & associated products; 26: Non-metallic mineral products; 27: Metal products; 28: Machinery & equipment; 29: Other Manufacturing;* 36: Electricity & gas supply; 37: Water supply, sewerage & drainage services; 41: General construction; 42: Construction trade services; 45: Basic material wholesaling; 46: Machinery & motor vehicles; 47: Personal & household goods; 51: Food; 52: Personal & household goods; 53: Motor vehicle & services; 57: Accommodation, cafes & restaurants; 61: Road transport; 62: Rail transport; 63: Water transport; 64: Air & space transport; 65: Other transport; 66: Services to transport; 67: Storage; 71: Communication services; 73: Finance; 74: Insurance; 75: Services to finance & insurance; 77: Property services; 78: Business services; 81: Government administration; 82: Defence; 84: Education; 86: Health services; 87: Community services; 91: Motion picture, radio & tv services; 92: Libraries, museums & the arts; 93: Sport & recreation; 95: Personal services; 96: Other services; 97: Private households employing staff.

Source: Australian Bureau of Statistics, *Labour Force Statistics*. Canberra, Australian Bureau of Statistics, various dates.