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Intra & Inter-Regional Industry Shocks: A New Metric with an Application to Australasian Currency Union

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Abstract

We place regional industry structures at centre stage in currency union analysis, decomposing differences between regional and aggregate cycles into "industry structure" and "industry cycle" effects. The industry structure effect indicates whether a region's industry structure causes its cycle to deviate from the aggregate; the industry cycle effect indicates the importance of region-specific shocks in causing a deviation between cycles. We apply the methodology to Australasia. One region, ACT, has a material industry structure effect arising from its heavy central government concentration. No other region has a material industry structure effect; their cycles differ from the aggregate due to region-specific shocks.

JEL Classifications:
E32, E52, F36, R11

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1 Introduction

Symmetry of economic shocks is a key factor to be considered in assessing whether multiple countries or regions should form a currency union. For any given adjustment mechanisms within and between economies, the greater the similarity in shocks and cycles between regions, the more suitable is a single currency across those economies.

The aim of this paper is to extend the toolkit used for assessing such issues, and then to apply these tools to a specific currency union candidate, Australasia (Australia and New Zealand). Our methodology explicitly highlights the importance of differences in industrial structure across candidate regions in a currency union. Industrial structure is often referred to implicitly in such analyses; by contrast, the current study places this analysis at centre-stage.

Numerous papers make implicit use of industrial structure in explaining differences in regional cycles. For instance, Kouparitsas (2001, 2002) correlation analysis and vector autoregression (VAR) techniques to examine regional business cycle characteristics across US regions. He finds that common disturbances account for a large proportion of regional cycles, while region-specific disturbances cause regional cycles to differ from one another. Kouparitsas discusses the regional cycles with reference to regional characteristics, such as agricultural intensity, mining intensity and manufacturing intensity. These characteristics are used to interpret, rather to derive, the cycles. The finding that they are helpful in interpreting cycles implies that industrial information is relevant to understanding, and potentially deriving, regional disturbances and hence regional cycles.

Another example is the work of Owyang and Wall (2004) who examine differences in regional impacts of monetary policy across the US. Using regional VARs, they find material differences both in the magnitude and timing of recessions following a monetary contraction. Owyang and Wall interpret their results by noting that the differing monetary and credit cycle effects correspond to different regional industrial structures. Like Kouparitsas, however, they do not make use of these industrial structure differences directly in their estimates; the structures are used purely to partition regions into groups with different characteristics.

A third North American example is the study of Beine and Coulombe (2003) who examine whether individual Canadian provinces should share a common currency with the United States. They examine the size and significance of GDP gap and employment gap correlations between Canadian provinces and the US.[1] They find that some regions of Canada, but not others, are strong candidates for inclusion in a North American currency union. To interpret their results, Beine and Coulombe examine features of provincial industrial and trade structures. But like the studies already mentioned, this information is used outside the formal analytical process rather than within it.

A number of studies have examined shock asymmetry between Australia and New Zealand, focusing on synchronicity of cycles between the countries (Hall et al, 1998; Hargreaves and McDermott, 1999; Grimes et al, 2000; Haug, 2001; Bjorksten, 2001). Each finds a reasonable degree of business cycle synchronization, but also some differences. Differences, of course, are inevitable; no two economies evolve identically over time. Judgments have to be made as to how material are the differences. Without a fully specified structural model of both economies (and possibly even with one), it is difficult to judge from the aggregate evidence alone whether two economies are sufficiently similar to warrant sharing a single currency, given other existing institutional arrangements.

One avenue for addressing this problem is afforded by regional analyses, as in Beine and Coulombe, where one or more of the countries is broken into regions. Within Australia, Dixon and Shepherd (2001) have examined cyclical co-movement of unemployment rates across the country's six regions and two territories. Their analysis shows that the five largest Australian states share a common cycle and so respond similarly to common shocks, but the smallest state (Tasmania) and the two territories do not share the same cyclical properties. Bjorksten et al (2004) has examined appropriate Taylor-rule monetary policy

[1] Employment gaps are calculated in the same manner as GDP gaps. Beine and Coulombe use employment gaps when comparing Canadian provincial cycles with those of individual US states. They adopt three different measures for differentiating trend from cycle: a Hodrick and Prescott (1997) filter with λ=1600, an HP filter with λ=315, and the Baxter and King (1999) band-pass filter. The results are robust to use of all three methods.

settings across Australasia, where Australasia is divided into nine regions: New Zealand plus Australia's six states and two territories. They find that a single Taylor rule would have been as appropriate for New Zealand as for the other large Australasian regions in the 1990s. Each of these regional studies has considered economies at the overall industry level and so has been unable to ascertain whether cycle differences are due to industrial structure differences or to idiosyncratic regional shocks.

In many situations, including in Australasia, the potential for asymmetric shocks due to industry structure is an important consideration for currency union analysis. Within Australasia, there is virtually free mobility of labour between the countries, they are culturally and linguistically similar, share a comprehensive free trade agreement and are gradually harmonizing other economic institutions (Coleman, 1999; Grimes et al, 2000; Lloyd, 2002; Goddard, 2002). Australia is New Zealand's largest trading partner while New Zealand is one of Australia's top five trading partners. These institutional features suggest that currency union may be appropriate. However, apart from some automatic social security payments, there are no fiscal flows between the two countries. Traditional currency union analysis posits that fiscal flows are desirable between regions within a currency union to smooth effects of asymmetric shocks, or asymmetric responses to common shocks. This is especially important where asymmetries in shocks are large and where labour market flows in response to shocks are small and/or slow (Mundell, 1961). A frequently expressed concern in Australasia is the potential disruptive effect of an agriculturally-based economy (New Zealand) joining with a much larger economy that contains significant mineral wealth (especially in Western Australia, Queensland and Northern Territory).

In order to understand the sources of cyclical differences across regions, we incorporate information on regional industrial structure into the formal analysis. In section 2, we derive a method for decomposing regional cycles according to the impacts of industry cycles. In particular, we decompose the difference between regional and aggregate cycles as being due to industrial structure differences and industry cycle differences. Even where structure differs materially, the effects of these differences on the overall cycle need not be large; cycles could be highly correlated across industries, or groups of industries important to one region may have complementary cycles that together are correlated with those of an important industry in another region. Our methodology enables us to examine the importance of such effects. In section 3, we briefly describe our data covering the nine Australasian regions, and in section 4 we apply our methodology to the Australasian data. In doing so, we analyse whether cyclical differences across regions are chiefly due to differences in industry structure or not. Section 5 interprets the results, and the usefulness of the methodology, in light of a potential common currency for Australasia.

2 Cycle Decomposition

Given the potential importance of industry structure in determining a region's cycle, we develop a decomposition of the regional cycle in terms of industry cycles. The decomposition can be used to examine the nature of the cycle within a region and to compare the regional cycle with that in any other region or combination of regions. It highlights the importance of different industry structures and different industry cycles in explaining a region's cyclical position relative to the aggregate cycle.

Because of our application later in the paper, we refer here to cycles in "employment". The methodology can be applied equally to any other activity variable, such as GDP, if appropriate regional industry data are available.

For any region, i, in any quarter, total employment is given by:

$$E_{i,TOT} = \Sigma_j E_{i,j} \qquad (1)$$

where: $E_{i,TOT}$ is total actual employment in region i (i=1, …, m)

$E_{i,j}$ is region i's employment in industry j (j = 1, …, n).

Similarly, total trend employment ($H_{i,TOT}$)[2] is given by:

$$H_{i,TOT} = \Sigma_j H_{i,j} \qquad (2)$$

Dividing each side of (1) by $H_{i,TOT}$, multiplying each term on the RHS of the equation by the respective $H_{i,j}/H_{i,j}$, and denoting the trend share for industry j in region i ($H_{i,j}$ / $H_{i,TOT}$) as $S_{i,j}$, gives the decomposition of region i's overall employment gap, $G_{i,TOT}$ ($\equiv E_{i,TOT}/H_{i,TOT}$):

$$G_{i,TOT} = \Sigma_j G_{i,j} . S_{i,j} \qquad (3)$$

Equation (3) provides a natural way to decompose cycles within any region. They arise from industry specific cycles in that region ($G_{i,j}$), weighted by each industry's trend share in the regional economy.

A comparison of the cyclical position of two regions (i=x,y) at the overall industry level, can be obtained by comparing $G_{x,TOT}$ with $G_{y,TOT}$. The difference can be decomposed, by manipulating (3), to yield:

$$G_{x,TOT} - G_{y,TOT} = \{\Sigma_j(S_{x,j} - S_{y,j})[(G_{x,j}+G_{y,j})/2]\} + \{\Sigma_j(G_{x,j} - G_{y,j})[(S_{x,j} + S_{y,j})/2]\} \qquad (4)$$

We term the expression in the first set of braces of (4) the *industry structure effect*, being the sum of the differences between regional trend industry shares, weighted by the average industry cyclical positions in the two regions. The term in the second set of braces in (4) is called the *industry cycle effect*, being the sum of the differences between the regional cyclical positions (employment gaps)

[2] At this stage in the analysis, it does not matter how the trend is calculated. In our empirical application we use a Hodrick-Prescott filter.

in each industry, weighted by the average trend employment shares in the two regions.

We can use (4) to compare the cycle in each region with that of the aggregate of all regions under consideration (AGG) by defining x as the relevant region and y as AGG. Thus the idiosyncratic regional cycle (i.e. the deviation between the regional and the aggregate cycle) can be decomposed into the effect of different industry structures and of different cycles within each industry. In cases where the overall cycle[3] is identical in two regions, we can ascertain from (4) whether this is because each region has similar cyclical positions in each industry or whether offsetting cyclical and/or structure considerations are at work.[4]

3 Data

New Zealand and Australia together comprise Australasia. Australia comprises six states and two territories while New Zealand is a unitary state. We refer to each of the states, territories and New Zealand as "regions", denoted as:

ACT	Australian Capital Territory
NSW	New South Wales
NT	Northern Territory
NZ	New Zealand
QLD	Queensland
SA	South Australia
TAS	Tasmania
VIC	Victoria
WA	Western Australia
ANZ	Australasia (sum of the nine regions)

[3] To avoid confusion, we use the term ‘aggregate’ to refer to the aggregation across all regions, and the term ‘overall’ to refer to a specific region’s cycle at the all industry level.
[4] Grimes (2005) also calculates an "absolute industry cycle effect" which uses the absolute value of the deviation in employment gaps between two regions in place of the actual value in the second set of braces in (4). This measure calculates what the industry cycle effect would have been had there been no offsetting cyclical positions across industries. In practice, shocks will favor some industries at the expense of others. Thus the absolute industry cycle effect represents a reasonable upper bound over what might occur by way of industry cycle effects in most circumstances.

Consistent with Bjorksten et al (2004) and Beine and Coulombe (2003), we use quarterly employment data as the basis for calculating cyclical positions across each region.[5] These data are available on a disaggregated basis for each of nine industries (together comprising overall employment) in each region. Our industry decomposition is as follows:

AFF	Agriculture, Forestry, Fishing
BFS	Business and Financial Services
CON	Construction
EGW	Electricity, Gas, Water
MAN	Manufacturing
MIN	Mining
OTS	Other Services[6]
TSC	Transport, Storage and Communications
WRT	Wholesale and Retail Trade[7]
TOT	Total (sum of all nine industries)

Table 1 presents data on the average industrial structure of each region over our sample, 1985(4)-2002(4). It also includes the population of each region to indicate relative and absolute sizes of each region. The 'Industrial Structure Index' (ISI_i) in the table provides a measure of the similarity of the industrial structure in region i relative to ANZ. ISI_i is calculated as:

$$ISI_i = 100*\left[\Sigma_j \left| S_{i,j} - S_{ANZ,j} \right| /n\right] \qquad (5)$$

An ISI_i figure of 0 indicates perfect alignment of sectoral shares between region i and ANZ as a whole, while a figure of z indicates an average absolute deviation of sectoral shares of z percentage points. The two territories (ACT and NT) are clear structural outliers, while TAS and NZ are moderate outliers compared with the five large Australian states (NSW, VIC, QLD, WA, SA).

[5] Australian and New Zealand employment data are obtained from Australian Bureau of Statistics and Statistics New Zealand respectively. The data are described in Grimes (2004).

[6] I.e. Community, Social and Personal Services; many of which are provided and/or funded by government.

[7] Including Accommodation, Cafes, Restaurants

Table 1: Regional Trend Employment Shares: 1985(4) & 2002(4) Average*

	ANZ	ACT	NSW	NT	NZ	QLD	SA	TAS	VIC	WA
AFF	0.061	0.006	0.044	0.045	0.098	0.071	0.072	0.085	0.046	0.062
BFS	0.128	0.143	0.150	0.087	0.106	0.114	0.115	0.092	0.135	0.124
CON	0.073	0.073	0.072	0.083	0.067	0.080	0.067	0.064	0.072	0.079
EGW	0.013	0.007	0.015	0.007	0.008	0.012	0.014	0.022	0.015	0.013
MAN	0.150	0.034	0.145	0.044	0.181	0.115	0.157	0.128	0.178	0.110
MIN	0.011	0.001	0.010	0.037	0.003	0.016	0.010	0.013	0.003	0.039
OTS	0.264	0.514	0.247	0.408	0.267	0.260	0.277	0.294	0.257	0.264
TSC	0.069	0.039	0.076	0.075	0.067	0.074	0.060	0.065	0.068	0.062
WRT	0.234	0.185	0.243	0.217	0.206	0.262	0.232	0.238	0.229	0.248
ISI_i^+	**na**	**6.16**	**0.93**	**4.31**	**1.58**	**1.25**	**0.74**	**1.59**	**0.87**	**1.24**
Memorandum Item: Population (2002/03), million										
Pop.	23.694	0.317	6.628	0.198	3.942	3.747	1.514	0.472	4.926	1.950

*Data sources: Australian Bureau of Statistics & Statistics New Zealand; Grimes (2005a).
+The Industrial Structure Index (ISI_i) measures the average absolute % deviation of region i's industry shares relative to ANZ's industry shares; see equation (5) in the text.

Each of ACT, NT and TAS are "small" (population < 0.5 million) and so are more likely to have idiosyncratic industrial structures, relative to ANZ as a whole, than are larger regions. The two territories (ACT and NT) have particularly large government-related services (OTS) employment shares. NZ is a relatively "large" region (population of approximately 4 million); its moderately idiosyncratic industrial structure arises chiefly from its large agricultural (AFF) share. TAS also has a large AFF share. WA and NT each have large mining (MIN) shares relative to ANZ. At the aggregate (ANZ) level, the cycle in MIN has the largest standard deviation of all sectors, at 4.3%, (closely followed by construction at 4.0%).[8] Their large MIN exposure may therefore expose them to a sizeable industry structure effect. NZ (and, to a lesser extent, TAS) may be exposed to a sizeable industry structure effect by virtue of its large AFF share.

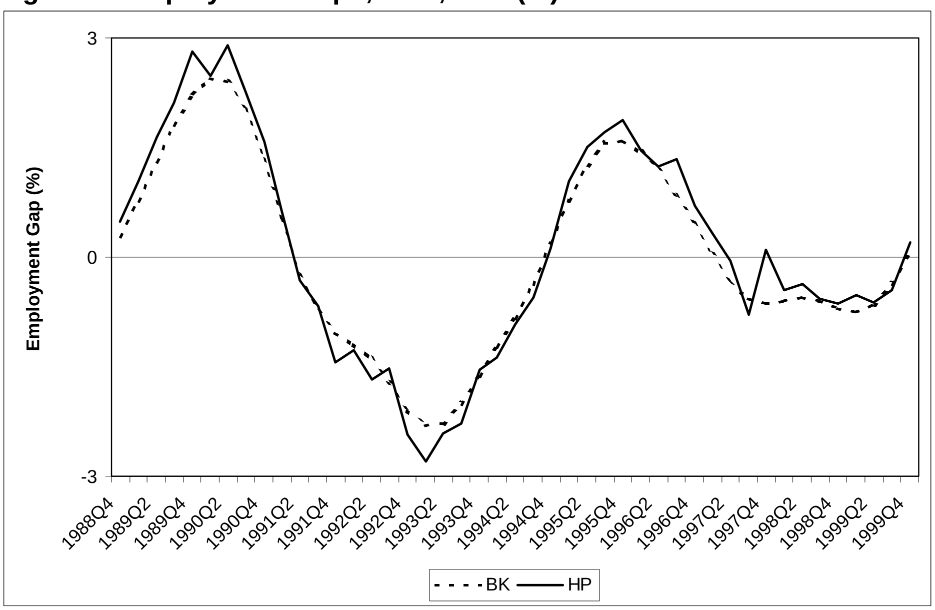
We calculate trend employment and employment shares for each industry in each region, and derive the cyclical position for each industry in each region. To separate trend from cyclical employment, we filter each regional industry employment series using an HP filter. An identical detrending method (with λ=1600) is used for each series given that the frequency and nature of the

[8] At the ANZ level, EGW also has a large cycle standard deviation (3.8%) but is a very small sector in every region and so is unlikely to have a material impact on any of the aggregate regional cycles. Other than OTS and WRT, all other cycle standard deviations range between 2.1% and 2.6%. The two large services sectors have lower cycle standard deviations (WRT at 1.4% and OTS at 1.0%).

data are identical. The "employment gap" or cycle series for each regional industry is calculated as seasonally adjusted employment as a ratio of trend employment. The mean of the employment gap for each series is almost exactly unity.

Use of the HP filter (with λ=1600) is consistent with the preferred method in Beine and Coulombe. Their use of alternative filters to decompose trend from cycle gave similar results to one another when employed in a similar application to ours. We have computed a Baxter-King (BK) band-pass filtered gap (assuming a cycle length of between 1.5 and 8 years) and compared it to the HP filtered gap on the overall Australasian cycle ($G_{ANZ,TOT}$). Figure 1 plots the resulting two gap series. The two series are almost identical; the correlation coefficient between the two series is 0.990. Given the almost identical nature of these series, we restrict ourselves henceforth solely to consideration of the HP filtered series.

Figure 1: Employment Gaps; ANZ, TOT (%): HP & BK Filters*

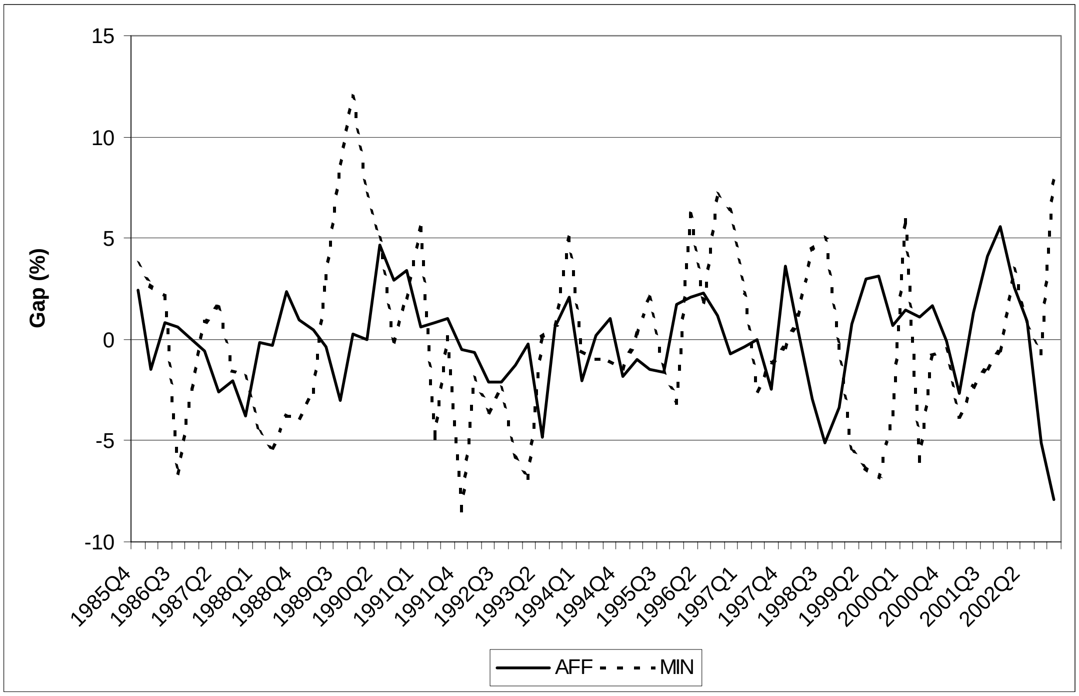


*Hodrick-Prescott & Baxter-King filters, each expressed as ($G_{ANZ,TOT}$ -1)*100

We use the HP filter to calculate each regional industry employment gap ($G_{i,j}$). For each region, the overall employment gap, $G_{i,TOT}$, is derived from the sum of trend employment and the sum of actual employment across the nine industries.[9] For each industry, the Australasian employment gap, $G_{ANZ,j}$, is derived from the sum of actual employment and the sum of trend employment across the nine regions. Figure 2 graphs $G_{ANZ,AFF}$ and $G_{ANZ,MIN}$, demonstrating how differently the cycles in two industries evolve over the sample, especially in the latter half of the sample. Regions with a heavy AFF exposure (NZ and TAS) may therefore experience quite different cycles from regions with a heavy MIN exposure (WA and NT).

[9] This overall regional employment gap is virtually identical to one calculated directly from a region's overall employment series; similarly for the aggregate of each industry across the nine regions and for ANZ. Thus the order of decomposition and detrending is immaterial.

Figure 2: ANZ, AFF & ANZ, MIN Employment Gaps (%) *



*Employment gaps expressed as $(G_{ANZ,j} - 1)*100$

4 Decomposition Of Australasian Cycles

Prior to decomposing the idiosyncratic regional cycle into industry structure and industry cycle effects, we examine the standard deviation of each region's idiosyncratic cycle so as to indicate which regions may have the largest industry structure and/or industry cycle effects. The first column of Table 2 presents this information. The measure indicates a core of five regions (NSW, VIC, QLD, SA, WA), each with a standard deviation of their idiosyncratic cycle of between 0.64% and 0.88%; thus each of these region's overall employment gap is normally within 1% of that of Australasia as a whole. TAS is moderately close to the aggregate cycle and NZ is a little further distant. ACT is a more substantial outlier and NT is a very clear outlier.[10]

[10] Grimes (2005) shows that, after 1991, NZ and TAS move to the fringes of the core, having similar gaps between their respective cycles and that of ANZ as does SA; ACT and NT remain outliers.

Table 2: Cyclical Differences Between Region & ANZ, 1985(4) - 2002(4)*

	$(G_{i,TOT} - G_{ANZ,TOT})$ Std Dev (%)	ISE_i Std Dev (%)	ICE_i Std Dev (%)	Corr. Coeff. between $_i$ ISE & $(G_{i,TOT} - G_{ANZ,TOT})$	Corr. Coeff. between ICE_i & $(G_{i,TOT} - G_{ANZ,TOT})$
ACT	1.83	1.51	2.40	-0.02	0.78
NSW	0.64	0.18	0.64	0.12	0.96
NT	3.87	1.36	4.12	-0.02	0.94
NZ	1.42	0.25	1.40	0.13	0.98
QLD	0.84	0.16	0.85	0.01	0.98
SA	0.88	0.16	0.89	0.04	0.98
TAS	1.22	0.26	1.24	0.05	0.98
VIC	0.87	0.16	0.90	-0.04	0.98
WA	0.81	0.23	0.86	-0.09	0.96

* $G_{i,TOT}$ is region i's overall cycle; $G_{ANZ,TOT}$ is Australasia's overall cycle. Thus $G_{i,TOT}$ - $G_{ANZ,TOT}$ is region i's idiosyncratic cycle (i.e. the deviation between the overall cycle in region i and the overall cycle in Australasia). ISE_i is region i's "industry structure effect", ICE_i is region i's "industry cycle effect"; each defined in equation (4) of the text.

Using (4), we decompose each region's idiosyncratic cycle into the industry structure effect and the industry cycle effect. In each case the mean of the relevant measure over the sample is approximately zero. To gain an understanding of the relative importance of the two effects we examine their respective standard deviations. We also examine each of their correlations with the region's idiosyncratic cycle. This information is also presented in Table 2.

In seven of the nine regions (i.e. all regions other than ACT and NT), the standard deviation of the industry structure effect is small both absolutely (<0.3%) and relative to that of the region's idiosyncratic cycle. In each region, there is little correlation between the industry structure effect and the region's idiosyncratic cycle.

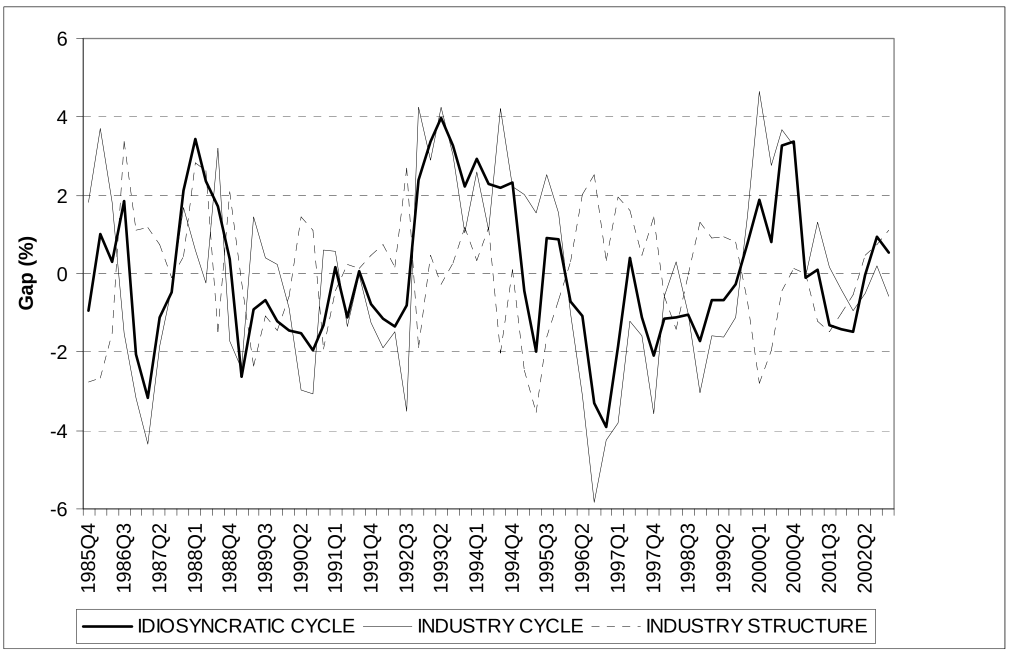
Apart from ACT and NT, each region's industry cycle effect almost completely explains the deviation between the regional employment gap and the ANZ employment gap: the correlation coefficient between the two series for these seven regions ranges from 0.96 (NSW and WA) to 0.98 (NZ, QLD, SA, TAS and VIC). In ACT's case, the correlation is considerably lower, at 0.78. Thus only 60% of the variance in ACT's cycle is explained by the industry cycle effect, compared with at least 92% for each of the seven largest regions.[11]

[11] NT has a corresponding correlation coefficient of 0.94 despite its large industry structure effect; the high correlation coefficient is chiefly explained by the very large industry cycle effect within

The implication of these findings is that differences in each of the seven largest region's cycles relative to the Australasian cycle have little to do with industrial structure effects. For instance, even though New Zealand is the most agriculturally intensive region, this feature of its industrial structure has not exposed it to a materially different cyclical position relative to other regions. Similarly, Western Australia's large minerals exposure has not caused its cycle to deviate markedly from that of ANZ as a whole.

By contrast, the two territories have material industry structure effects. We know also, from the ISI figure in Table 1, that these two regions have highly idiosyncratic industrial structures. Figure 3 plots ACT's idiosyncratic cycle, together with its industry cycle effect and its industry structure effect (the three series are labeled 'Idiosyncratic Cycle', 'Industry Cycle' and 'Industry Structure' respectively).[12] For comparison, Figure 4 plots the corresponding graph for NZ.

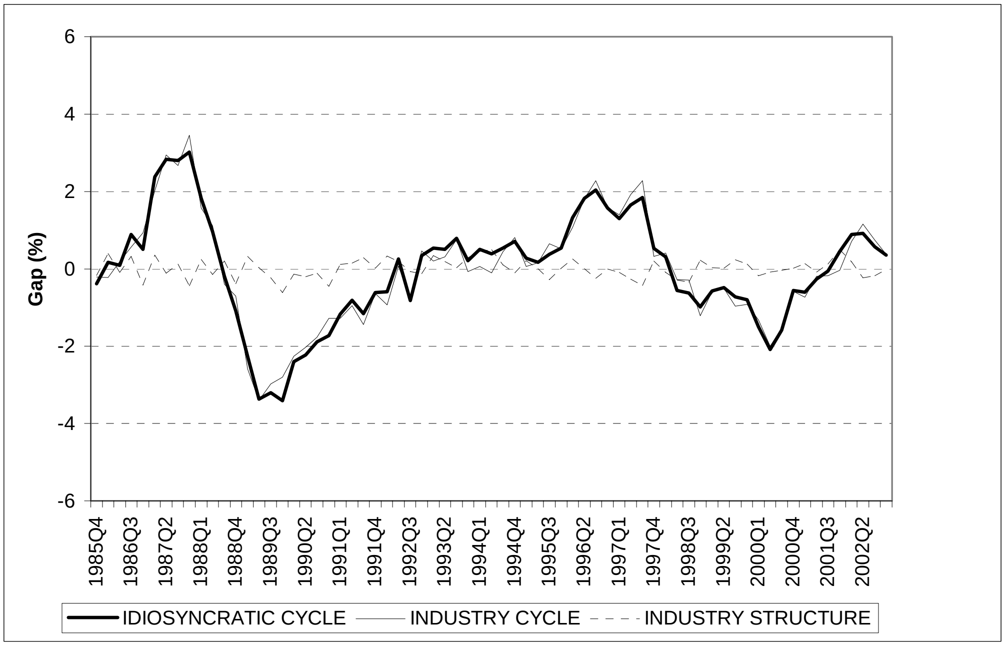
Figure 3: ACT Idiosyncratic Cycle, Industry Structure Effect & Industry Cycle Effect (%)



NT. The size of this latter effect is so large that it makes it difficult to compare NT with the other regions and, for this reason, it is relegated in importance in most of the discussion that follows.

[12] In each period, the industry structure and industry cycle effects sum to give the idiosyncratic cycle.

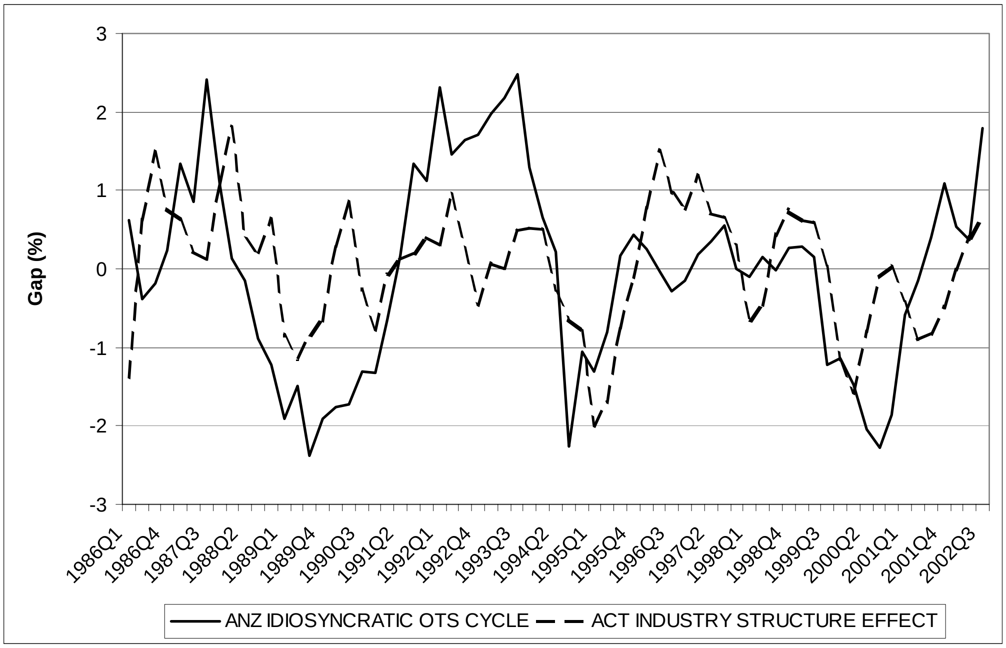
Figure 4: NZ Idiosyncratic Cycle, Industry Structure Effect & Industry Cycle Effect (%)



ACT's comparatively large industry structure effect is consistent with its outlying industrial structure shown in Table 1, especially its exposure to government-related services, OTS. The importance of this effect is illustrated in Figure 5. ACT's industrial structure effect is graphed along with ANZ's idiosyncratic OTS cycle, i.e. the deviation between the ANZ OTS cycle and ANZ's overall cycle ($G_{ANZ,OTS}$ - $G_{ANZ,TOT}$).[13] The correlation coefficient between the two series is 0.37; thus developments in ANZ-wide government-related services impact markedly on the overall ACT cycle relative to that of ANZ.

[13] The industry structure effect is a volatile series. In order to emphasize the correlation between the two series, we use a three quarter centered moving average of the industry structure effect in Figure 5 and in the correlation that we report in the text.

Figure 5: ACT Industry Structure Effect & ANZ Idiosyncratic OTS Cycle (%)*



*ACT Industry Structure Effect plotted as three quarter centered moving average.
ANZ Idiosyncratic OTS Cycle measured as ($G_{ANZ,OTS}$ - $G_{ANZ,TOT}$).

In general, however, the domination of the industry cycle effect over the industry structure effect indicates that, in most regions, industry structure is not important in explaining the different cyclical positions of each region relative to ANZ. Instead, idiosyncratic regional cycles are due almost entirely to region-specific shocks that impact on that region's industries. These shocks may stem from particular industry occurrences within a region. Alternatively, they may be due to a regional shock that impacts on that region's industries but not on other regions' industries (examples might include a localized climate shock or a regional fiscal shock). Except in ACT, broad industry composition (e.g. between mining, agriculture, manufacturing or services) across regions does not seem to be important in creating cycles that differ markedly from the aggregate experience.[14]

[14] A finer industry disaggregation may reveal a greater industry structure effect and a smaller industry cycle effect, since regions will be exposed to different industrial sub-sectors.

5 Conclusions

We have introduced a new methodology for decomposing cycles, and cycle differences, across regions. The methodology makes explicit the contribution of industrial structure differences across regions to idiosyncratic regional cyclical outcomes.

Our application of the methodology to the nine regions of Australasia, using a nine industry disaggregation of overall activity, reveals that industrial structure is important in explaining one region's overall cycle relative to that of Australasia as a whole. Specifically, ACT's large exposure to government-related services means that cycles in that industry can cause a material deviation in ACT's overall cycle relative to that of ANZ. However industrial structure is unimportant in explaining the deviation of other regions' cycles from that of ANZ.

The finding that industrial structure effects are unimportant for most regions, and especially for New Zealand, has implications for the issue of potential currency union between New Zealand and Australia. An often expressed concern about a potential Australasian currency union is that New Zealand's industrial structure is significantly different from that in Australia (and particularly from that in the mining states); and that this structural difference could expose New Zealand to materially different cycles from those in Australia.[15] In the absence of fiscal transfers between the two countries, the loss of monetary sovereignty could then impose large macroeconomic costs on the smaller country (New Zealand).

Our analysis suggests that industrial structure (at least as measured at the nine industry level) has not been a relevant factor in causing New Zealand's cycles to deviate from those of other Australasian regions. Instead, the dominance of the industry cycle effect for NZ indicates that it is region-specific factors, or unusual movements in NZ's cycles within industries, that drive disparities between NZ's cycle and that of Australasia as a whole. In the early part of our sample, NZ implemented a major reform programme (Evans et al, 1996), which created strong temporary divergences in NZ's cyclical position relative to that in Australia. The correlation coefficient between $G_{NZ,TOT}$ and $G_{AUS,TOT}$ (where the

[15] For example, see McCaw and McDermott (2000).

latter is the Australian overall cycle) was -0.42 between 1985(4) and 1991(3), whereas it stood at +0.69 between 1991(4) and 2002(4). Our analysis indicates that the divergence in cycles in the earlier sub-period was likely due to the effects of the NZ reform process impacting across all its industries and was not due to aggregate sectoral shocks.

The analysis therefore implies that sectoral differences between the two countries are not a major obstacle to consideration of an Australasian currency union. Two words of caution must, however, be interposed here. First, the analysis has been at the nine industry level rather than at a more detailed level. It is possible that greater industry disaggregation (e.g. within AFF between dairying, beef, pastoral, etc) could yield a more sizeable industry structure effect. Second, if there were again a need for a major economic upheaval (in either New Zealand or Australia) NZ's cycle could deviate markedly from that in the Australian regions. In either of these situations, a separate currency may be an important adjustment mechanism, so alleviating the resulting adjustment costs.

The advantage of the methodology outlined in this study is that it brings these issues to the fore. Providing suitable data are available, the methodology can be applied as easily with a more disaggregated industrial categorization as it has been here. If, as a result of such an analysis, NZ were then found to be in ACT's position of having a material industry structure effect, the differences in industrial structure would pose a greater challenge to currency union. If the industrial structure effect were to remain miniscule, attention turns to the issue of whether another major economic upheaval is possible in one or other country during the life of a prospective currency union.

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