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UNCOVERING THE SOURCES OF SECTORAL EMPLOYMENT FLUCTUATIONS

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2 The views expressed in this paper are those of the authors and do not necessarily reflect those of The Australian Treasury or the Australian Government.

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ABSTRACT

This paper explores the sources of fluctuations in sectoral employment growth rates across the Australian economy over three different periods: the pre-terms of trade boom period; the pre-GFC phase of the terms of trade boom; and the GFC and post-GFC phase. We find that common cyclical fluctuations, not just sector specific shocks, can and do have an important effect on sectoral growth rate dispersion across the full sample. We also find that there is evidence of accelerated structural change in the latter phase of the terms of trade boom.

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1. INTRODUCTION

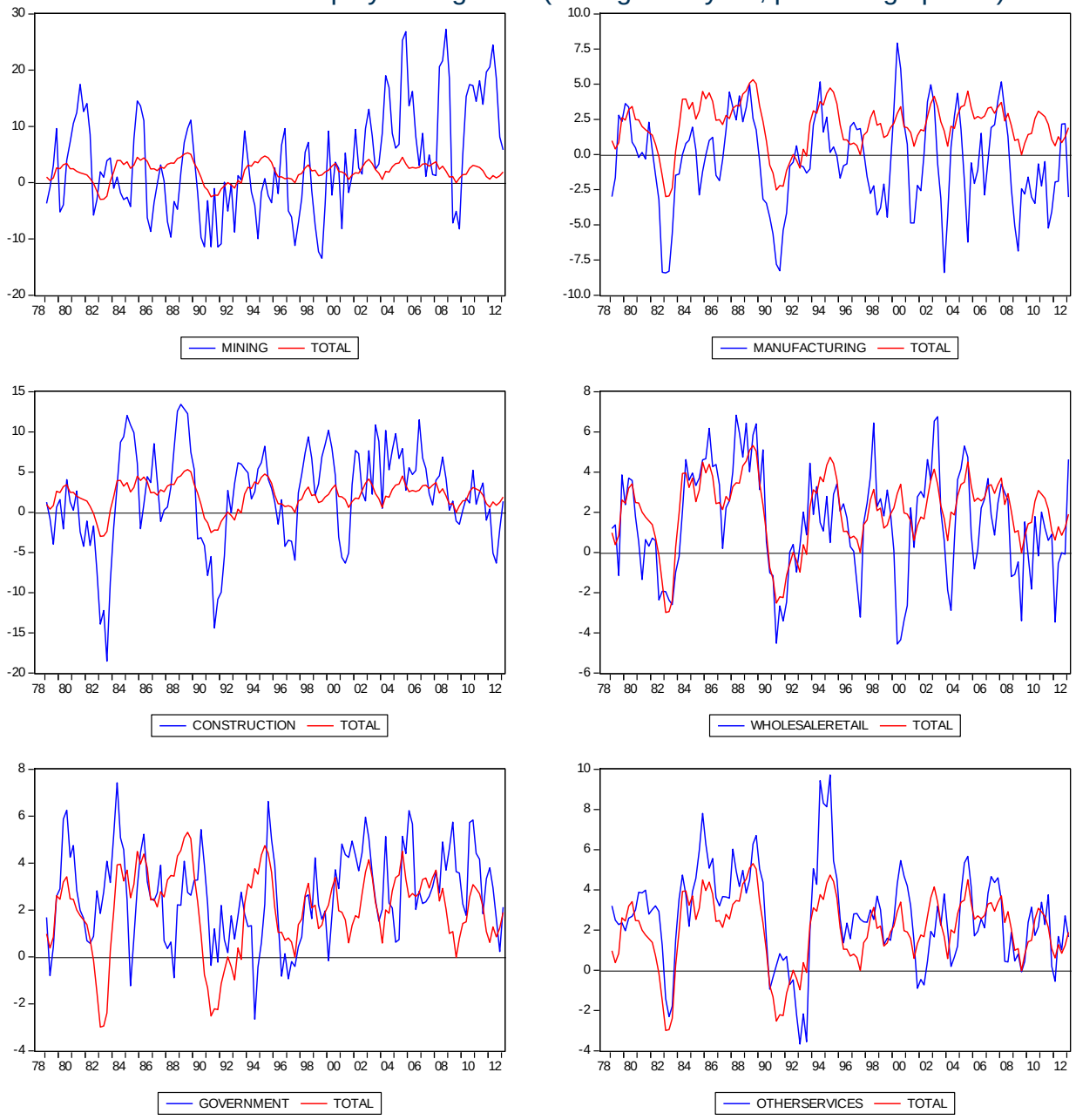
Australian employment data reveal significant sectoral dispersion in employment growth over the last 35 years (see Chart 1). For example, the data reveal some coherence between aggregate and sectoral fluctuations over the first half of the data sample, with manufacturing, construction, wholesale/retail trade and other-services employment growth moving roughly in line with aggregate employment growth. However, these correlations are far from perfect, which suggests sectors are subject to significant sector-specific shocks, possibly in the form of different sensitivity to the aggregate cycle. These data point to greater dispersion in the second half of the sample (i.e., a shift towards sector-specific factors) marked by employment growth rates in all sectors resting above or below the aggregate growth rate.

In this paper, we explore the sources of fluctuations in sectoral employment growth rates across the Australian economy over three different periods: the pre-terms of trade boom period before 2000Q1; 2000Q1 to 2008Q2 to capture the effects on sectoral employment from the pre-GFC phase of the terms of trade boom; and the GFC and post-GFC phase from 2008Q3 to the end of the sample to capture the effects of the sustained high exchange rate and relatively weak world economy. Our work adds to a large empirical literature devoted to decomposing cyclical fluctuations in employment data, which largely stems from the work of Abraham and Katz (1986). Their research, like ours, focuses on whether fluctuations in observed sectoral employment growth rates are due to shifts in trend growth rates (structural change) or temporary cyclical fluctuations. We find, as did Abraham and Katz that common cyclical fluctuations, not just sector specific shocks, can and do have an important effect on sectoral growth rate dispersion and that there is evidence of accelerated structural change in the latter phase of the terms of trade boom.

Abraham and Katz's empirical methodology has been refined by a number of researchers including Rissman (1997) who employed more sophisticated unobserved component techniques (state-space modelling) to decompose fluctuations in sectoral employment growth into their trend and common cyclical components. Our analysis extends the work of Rissman (1997) by following the modelling strategy of Kouparitsas (2002), developed in his work decomposing US regional economic growth, which allows for the cycle to be further decomposed into common and sector-specific components. This approach, when compared to Rissman's, delivers a relatively parsimonious framework that identifies both permanent and temporary sector-specific factors in employment growth.

The remainder of this paper is organised as follows: Section 2 describes in detail the structural model of sectoral employment growth; section 3 describes the data sources and definitions used in the analysis; section 4 discusses the econometric method and reports parameter estimates, including the estimated unobserved components; and section 5 concludes with a summary of the findings of the paper and a brief outline of plans for future research.

Chart 1: Sectoral employment growth (through-the-year, percentage points)



Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

2. THEORY

A structural model of sectoral employment growth

Abraham and Katz (1986) pointed out that changes in the aggregate business cycle have disproportionate impacts on different sectors – the typical example being that the durable goods producing manufacturing sector will tend to experience more severe downturns (and upswings) than

service sector counterparts. As such, what appears to be a structural shift towards services in a recession may be more accurately attributed to differing sectoral sensitivities to the common cycle.

Building on the ideas of Abraham and Katz, Rissman (1997) derived an unobserved component model decomposing fluctuations in sectoral employment growth into their trend and cyclical components. The trend component captures permanent (structural) change in the economy. Temporary fluctuations around this trend are captured by the cyclical component. We extend the work of Rissman (1997) by following the modelling strategy of Kouparitsas (2002), developed in his work decomposing US regional economic growth, which allows for the cycle to be further decomposed into a common cycle and sector-specific economic cycle. This approach allows for permanent and temporary sector-specific factors in employment growth.

Unobserved component model

While we ultimately model through-the-year employment growth, we begin by developing a framework regarding the log-level of employment. We assume that the log of employment in each sector i at time t (n_{it}) can be decomposed into two basic components – a trend (τ_{it}) and cyclical component (c_{it}):

$$n_{i,t} = \tau_{i,t} + c_{i,t} \tag{1}$$

The trend component is specific to each sector and is assumed to be a unit root with drift:

$$\tau_{i,t} = \delta_i + \tau_{i,t-1} + \varepsilon_{i,t} \tag{2}$$

where δ_i captures average employment growth in sector i, while ε_{it} captures shocks to the trend component which is distributed with a zero mean and a standard deviation of $\sigma_{\varepsilon i}$

The cycle is composed of a common cycle (x_t) and a sector-specific or own cyclical component (x_{it}):

$$c_{i,t} = \gamma_i x_t + x_{i,t} \tag{3}$$

where γ_i measures the coherence with the common cycle; with γ_i =0 indicating no relationship with the common cycle, γ_i >1 indicating relatively large amplitudes, γ_i <1 indicating relatively smaller amplitudes, and γ_i<0 indicating that the sector is counter-cyclical.

The common cycle is assumed to have a stationary second order autoregressive (AR(2)) structure:

$$x_t = \phi_1 x_{t-1} + \phi_2 x_{t-2} + \mu_t \tag{4}$$

where shocks to the common cyclical component of employment are captured by μ_t, which is distributed with a zero mean and standard deviation of σ_μ. To ensure stationarity $1<\phi_1,\phi_2<0$, $|\phi_1+\phi_2|<1$.

Identification of the sector specific cycle requires a simpler time-series relationship, with these components assumed to have a first order autoregressive (AR(1)) structure:

$$x_{i,t} = \rho_i x_{i,t-1} + \mu_{i,t} \tag{5}$$

where shocks to the sector specific cyclical component of employment are captured by μ_{it}, which is distributed with a zero mean and standard deviation of $\sigma_{\mu i}$. To ensure stationarity $|\rho_i|<1$.

Finally, identification demands that shocks to all three unobserved components and across sectors are orthogonal.

These components are then used to decompose sectoral employment growth into its trend, common cycle and sector-specific cycle components:

$$n_{i,t} - n_{i,t-4} = (\tau_{i,t} - \tau_{i,t-4}) + \gamma_i (x_t - x_{t-4}) + (x_{i,t} - x_{i,t-4}) \quad (6)$$

3. DATA

Sources and definitions

Data on employment disaggregated on an industry basis are published in the Australian Bureau of Statistics' (ABS) Labour Force Detailed release (Cat. No. 6291.0.55.003). These data are reported on a quarterly basis from November 1984 for the mid-month of each quarter (i.e., February, May, August and November). Seasonally adjusted data are used for our analysis. The Labour Force Historical Timeseries release (ABS Cat. No. 6204.0.55.001) contains employment in original terms disaggregated on an industry basis from February 1978 to November 1984. These data are seasonally adjusted using X12. For the period from November 1984 the level of employment in each sector is taken from the Labour Force Detailed release, while prior to November 1984 the level of employment is interpolated back to February 1978 according to the growth rates derived from the seasonally adjusted Labour Force Historical Timeseries release.

Summary statistics

We divide these data into six sectors – the mining, manufacturing, construction, wholesale and retail trade, government-related, and a residual other-services sector[3]. This disaggregation allows us to isolate the effect of the resources boom on the resources and related engineering construction sectors via the observed changes in mining and construction employment growth, and other trade-exposed sectors via the observed changes in manufacturing and wholesale/retail employment growth. We further divide the data into the period from 2000Q1 to 2008Q2 to capture the effects on sectoral employment from the pre-GFC phase of the terms of trade boom (hereafter phase 1); and the GFC and post-GFC phase from 2008Q3 to the end of the sample to capture the effects of the sustained high exchange rate and relatively weak world economy (hereafter phase 2). We refer to the period before 2000Q1 as pre-boom.

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3 Prior to November 1984, the government-related sector is defined as the electricity, gas and water, public administration and defence, and community services sectors. From November 1984 onwards, government related is the summation of the electricity, gas, water and waste services, public administration and safety, education and training, and health care and social assistance sectors.

Sectoral growth rates

Total employment recorded an average through-the-year (tty) growth rate of 2.0 per cent over the full sample, from 1978 to 2012. Underlying this estimate is slightly lower average through-the-year growth of around 1.8 per cent over the pre-boom period and 1.6 per cent during phase 2 and significantly higher average growth of around 2.6 per cent during phase 1 (see Table 1).

Table 1: Employment growth (through-the-year)

Sector	Sample	Average	Correlation with other-services	Standard deviation
Mining	Full sample	3.63	0.01	9.26
	Pre-boom	-0.07	0.21	7.26
	Phase 1	7.58	-0.12	7.79
	Phase 2	12.92	0.14	10.46
Manufacturing	Full sample	-0.55	0.38	3.29
	Pre-boom	-0.56	0.51	3.14
	Phase 1	0.39	0.06	3.77
	Phase 2	-2.19	0.05	2.39
Construction	Full sample	2.07	0.35	5.94
	Pre-boom	1.36	0.47	6.59
	Phase 1	4.59	-0.14	4.61
	Phase 2	0.68	0.20	3.22
Wholesale & retail	Full sample	1.51	0.37	2.65
	Pre-boom	1.78	0.51	2.61
	Phase 1	1.60	-0.15	2.91
	Phase 2	0.15	0.26	1.97
Government	Full sample	2.65	-0.11	1.91
	Pre-boom	2.19	0.01	1.97
	Phase 1	3.33	-0.29	1.59
	Phase 2	3.49	-0.34	1.56
Other-services	Full sample	2.68	1.00	2.36
	Pre-boom	2.95	1.00	2.66
	Phase 1	2.64	1.00	1.85
	Phase 2	1.55	1.00	1.23
Total	Full sample	2.00	0.74	1.72
	Pre-boom	1.83	0.81	2.03
	Phase 1	2.61	0.52	0.93
	Phase 2	1.64	0.56	0.89

Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

Table 1 reveals that the relatively high aggregate employment growth during phase 1 reflects relatively strong employment growth in the mining, construction, manufacturing and government-related sectors. In the case of the mining and manufacturing sectors this period represented a significant

change in direction, with mining experiencing roughly no growth and manufacturing steadily declining in the pre-boom period. While aggregate average employment growth returned to around its pre-boom average growth rate in phase 2, the period was marked by significantly higher or lower average growth rates for sectors when compared to their average growth rates of the pre-boom period. Specifically, average employment growth in the mining and government sectors was significantly higher than in the pre-boom while average employment growth in manufacturing, construction, wholesale/retail trade and other-services well below those of the pre-boom phase.

Sectoral comovement

With the exception of the mining and government sectors, the correlation of sectoral growth rates has declined over time. In particular, the pairwise correlations of the employment growth rates of manufacturing, construction and wholesale/retail trade with the employment growth rate of the other-services sector were around 0.5 in the pre-boom period, which is significantly higher than the same statistic over the full sample or boom periods. This suggests that sectors were subject to greater common shocks in the pre-boom, which implies sector-specific shocks were relatively more important in the latter part of the sample.

The correlation statistics for mining and the government sectors reveal little to no correlation with the rest of the economy over the full sample or any of the sub-periods.

Sectoral volatility

The volatility of employment growth has remained constant or declined for all sectors except mining over the boom period. For example, the other-services sector (which is also largest sector by employment) recorded a standard deviation of growth of 2.7 per cent in the pre-boom period, which compares with a standard deviation of 1.8 per cent over phase 1 and an even lower standard deviation of 1.2 per cent over phase 2. Mining, in contrast, displayed much greater volatility towards the end of the sample, with a phase 1 standard deviation of mining employment growth around 7.8 per cent (which is roughly on par with the pre-boom volatility of 7.3 per cent) and a phase 2 standard deviation of employment growth of around 10.5 per cent. Given the earlier observation on declining sectoral employment growth correlations over the boom periods, this fall in volatility suggests there has been a shift to more sector-specific factors in the boom period that display little change in volatility over the sample.

4. RESULTS

Econometric method

The model described by equations 1 to 5 is a variant of Watson and Engle's (1983) general dynamic multiple indicator-multiple cause (DYMIMIC) model. This framework allows unobserved variables to be dynamic in nature, as well as being associated with observed variables. DYMIMIC models are typically estimated using maximum likelihood. In this setting, the likelihood function is evaluated using the Kalman filter on the model's state space representation. One of the requirements of maximum likelihood is that the data used in the estimation must be stationary. Augmented Dickey-Fuller unit root

tests applied to the log-levels and log-first-differences of employment for the 6 sectors suggest that the null of a unit root cannot be rejected for any of the level data series at the 5 per cent level of significance. However, the null of a unit root is rejected for the first-difference data at the same level of significance. In light of this, we specify and estimate the model using the log-first-differences of employment, which gives the following state-space representation of the model:

Measurement equation:

$$n_{i,t} - n_{i,t-1} = \delta_i + \gamma_i (x_t - x_{t-1}) + (x_{i,t} - x_{i,t-1}) + \varepsilon_{i,t} \quad (7)$$

Transition equations:

$$x_t = \phi_1 x_{t-1} + \phi_2 x_{t-2} + \mu_t \quad (8)$$

$$x_{i,t} = \rho_{i,1} x_{i,t-1} + \mu_{i,t} \quad (9)$$

Identification of the model parameters requires one γ_i to be normalised to 1. We use the other-services sector as the reference sector. As a result, the γ_i for other sectors refer to the sensitivity of employment growth in sector i to the common cycle relative to the other-services sector.

The data analysis of section 3 suggests there was a significant change in the trend growth rate of some sectors around 2000. We examine this further by allowing for a trend break to δ_i in 2000 and 2008. This implies the following measurement equation:

$$n_{i,t} - n_{i,t-1} = \delta_{i,0} + D_1 \delta_{i,1} + D_2 \delta_{i,2} + \gamma_i (x_t - x_{t-1}) + (x_{i,t} - x_{i,t-1}) + \varepsilon_{i,t} \quad (10)$$

where D_1 is a dummy variable set equal to 0 prior to February 2000, and 1 thereafter, D_2 is a dummy variable set equal to 0 prior to August 2008, and 1 thereafter, δ_{i0} is the trend quarterly growth rate for sector i prior to February 2000, $\delta_{i0}+\delta_{i1}$ is the trend quarterly growth rate for sector i from February 2000 to July 2008, and $\delta_{i0}+\delta_{i1}+\delta_{i2}$ is the trend quarterly growth rate for sector i from August 2008 onwards.

Parameter estimates were then obtained using the state-space estimation module in EViews version 7.2 (see Eviews Users Guide, chapter 33).

Estimation results

Sectoral trends

Estimates of the parameters that govern the trend components of sectoral employment are reported in Table 2. It is difficult to identify significant trend parameters without imposing zero and other constraints. We identified a number of patterns in trend growth that were supported by the data. The period before the resources boom was characterised by ongoing structural change in which employment in service oriented sectors (government and other-services) grew at a rate above the aggregate growth rate and employment in industrial sectors (mining and manufacturing) grew at a rate well-below the aggregate growth rate. In the case of manufacturing, this ongoing structural change took the form of declining sectoral employment.

Table 2: Trend parameters (annualised)

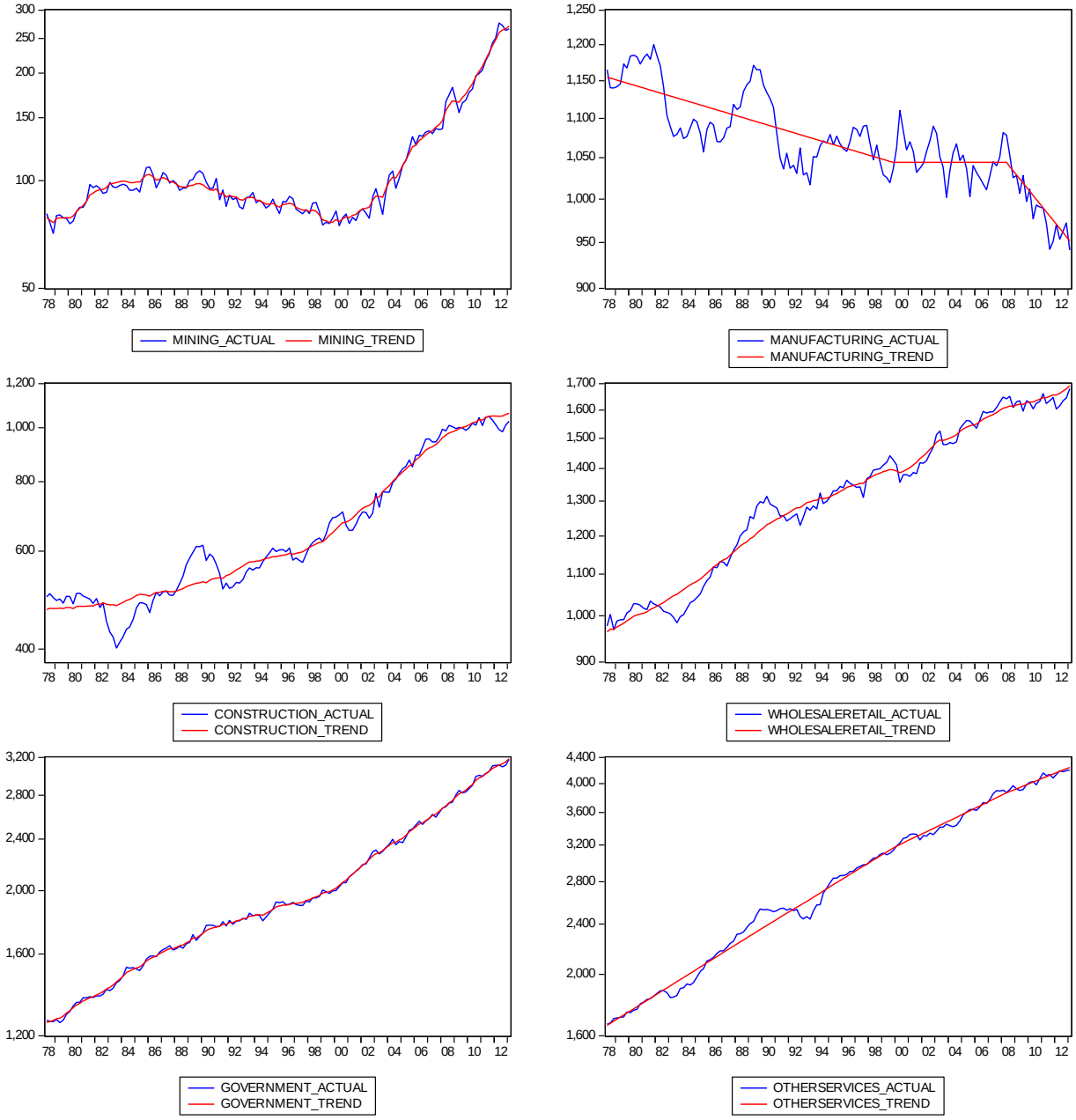
	δ_0		δ_1		δ_2		σ_3
	Coefficient	**SE**	**Coefficient**	**SE**	**Coefficient**	**SE**	
Mining	0.00	-	8.37	1.597	0.00	-	10.9
Manufacturing	-0.47	0.126	0.47	0.126	-1.95	0.573	0.0
Construction	1.47	0.570	3.30	1.149	-3.30	1.149	3.9
Wholesale & retail	1.70	0.245	0.00	-	0.00	-	2.0
Government	2.22	0.271	1.31	0.505	0.00	-	2.2
Other	2.99	0.235	-0.64	0.622	-0.41	0.959	0.6

Source: Authors calculations based on data from ABS Cat. 6291 and 6204. Note: SE denotes standard error.

This pattern is estimated to have changed during phase 1, with both statistically and economically significant increases in the trend growth rates of employment growth in the mining, manufacturing, construction and government-related sectors. According to these estimates, the ongoing decline in manufacturing employment was arrested during this period, while mining, construction and government accelerated to growth rates that were respectively 8.4, 3.3 and 1.3 per cent above their pre-boom estimates. This is also demonstrated in Chart 2 with the gradual slopes of the earlier period shifting to be significantly higher during phase 1. For mining this growth spurt led to a doubling of its work force.

This chart also captures the reversal of this change for manufacturing and construction during phase 2, over which time the trend decline in employment growth in the manufacturing sector is estimated to have accelerated from 0.5 in the pre-boom to around 2.4 per cent, while construction is estimated to have returned to its pre-boom trend growth rate of 1.5 per cent. On the other hand, mining and government-related employment experienced no significant change in their trend growth rates during phase 2, which is highlighted in Chart 2 by the continuing upward trend in the actual data and estimated trend lines.

Chart 2: Employment trend (number, log-scale)



Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

Common cycle

We find that sectoral employment has a common cycle. In other words, there is a tendency for Australian sectors to expand and contract their employment at the same time. This cycle is described by an AR(2) process with a first lag coefficient of 1.79 and second lag coefficient of -0.83, which suggests the cycle has relatively large amplitudes and that the response to a common employment shock is quite persistent (see Table 3). The standard deviation of the shock to the common cycle is around 0.2 per cent of other-services employment, which implies a standard deviation of the common cycle of around 1 per cent of other-services employment.

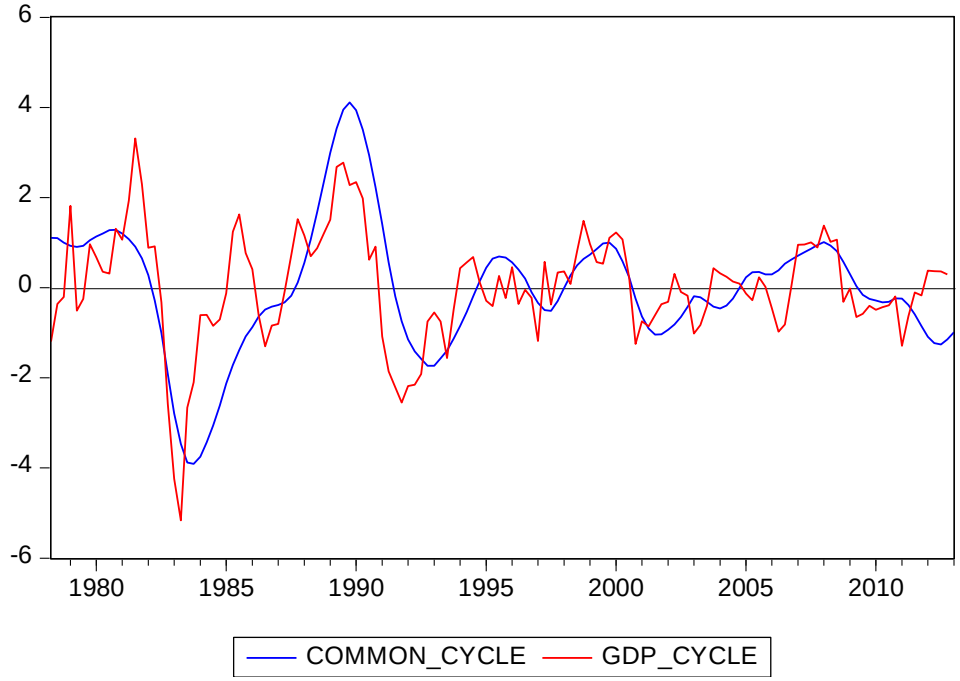
Table 3: Common cycle parameters

	Coefficient	Standard error
ϕ_1	1.79	0.107
ϕ_2	-0.83	0.109
σ_μ	0.188	0.090

Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

Chart 3 plots the common cycle against the gross domestic product (GDP) cycle estimated using a Hodrick-Prescott filter. The common employment cycle has turning points that are similar to the GDP cycle albeit with a lag of roughly 6-12 months year. The common employment cycle also has similar amplitudes to the GDP cycle, especially during the downturns of the early 1980s and 1990s. Since the mid-1990s the fluctuation in the common employment cycle have mirrored the dampened GDP cycle, which reflects relatively stable economic conditions over this period, both domestically and internationally (see Stock and Watson, 2003, for details and references therein).

Chart 3: Common cycle versus GDP cycle (per cent deviation from trend)



Source: Authors calculations based on data from ABS Cat. 6291, 6204 and 5204.

Sensitivity to the common cycle

Table 4 reports estimates of γ_i, which reveal the relative sensitivity of sectoral employment to the common cycle, where the benchmark is the other-services sector. Employment in the construction, manufacturing and wholesale/retail trade sectors are more sensitive to fluctuations in the common cycle than the other-services sector. For example, employment in the construction sector is the most sensitive with an estimated coefficient of 3.6, which implies it is 3.6 times more sensitive to the common cycle than the other-services sector. This estimate likely reflects the fact that construction

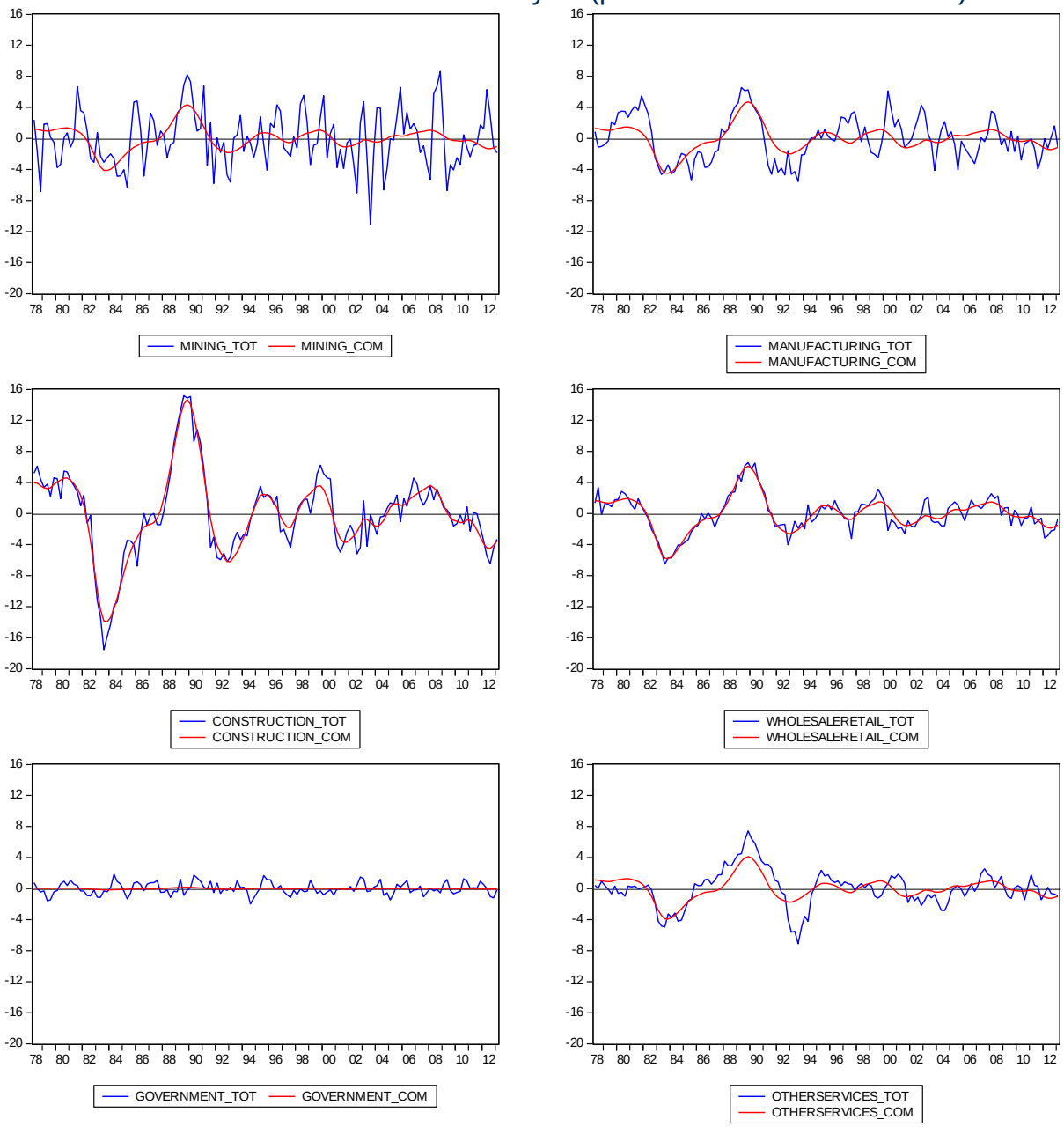
goods are lumpy with a long time to build. At the other end of spectrum we find that employment in the mining and government sectors have statistically insignificant relationships with the common cycle.

Table 4: Sensitivity to common cycle

	Coefficient	**Standard error**
Mining(γ_i)	1.06	1.393
Manufacturing(γ_i)	1.15	0.605
Construction(γ_i)	3.57	1.359
Wholesale &retail(γ_i)	1.49	0.579
Government(γ_i)	0.04	0.267
Other(γ_i)	1.00	-

Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

Chart 4: Total versus common cycle (per cent deviation from trend)



Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

Sector-specific cycles

We find evidence of statistically significant sector-specific employment cycles. The coefficients describing the persistence of the sector-specific AR(1) cycles (ρ) were found to be statistically significant for the manufacturing, construction, government and other-services sectors. The sector specific cycles are generally less persistent than the common cycle, but the standard deviation of the sector-specific shocks tend to be larger than the common-cycle shock. In light of the statistics reported in Table 1, this suggests the common and sector specific cycles account for roughly similar shares of the variance of employment over the full sample.

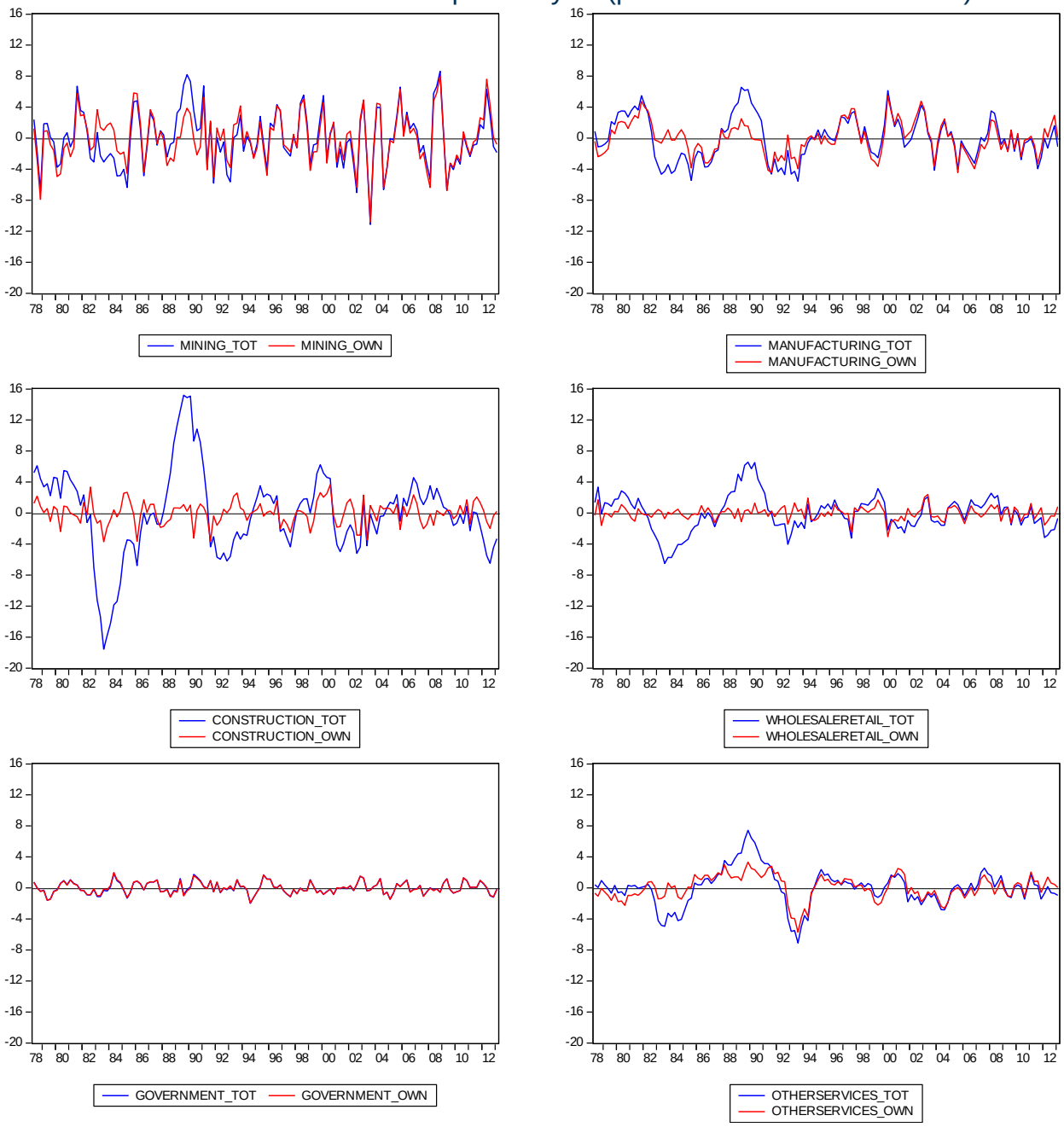
Table 5: Sector-specific cycle parameters

	Coefficient	Standard error
Mining (ρ)	0.49	0.265
Mining (σ_{μ_i})	3.87	0.814
Manufacturing (ρ)	0.76	0.105
Manufacturing (σ_{μ_i})	1.52	0.145
Construction (ρ)	0.51	0.259
Construction (σ_{μ_i})	1.73	0.402
Wholesale & retail (ρ)	0.33	0.221
Wholesale &retail (σ_{μ_i})	0.99	0.163
Government-related (ρ)	0.59	0.242
Government-related (σ_{μ_i})	0.82	0.167
Other (ρ)	0.87	0.124
Other (σ_{μ_i})	0.89	0.174

Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

We explore this idea further in Chart 5 by plotting the sector-specific cycle against the total sectoral employment cycle. This chart shows that sector-specific cycles explain a significantly greater proportion of the variation in sectoral employment in the period following the mid-1990s. It also reveals that, in contrast to the declining volatility of the common cycle, the volatility of sector-specific cycles has been constant over the sample (the obvious exception is mining, which has somewhat larger own-cycle fluctuations in the resource boom period of phases 1 and 2). Combining these observations, we conclude that the observed decline in the volatility of employment growth is entirely due to the decline in the volatility of common cycle.

Chart 5: Total versus sector-specific cycle (per cent deviation from trend)



Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

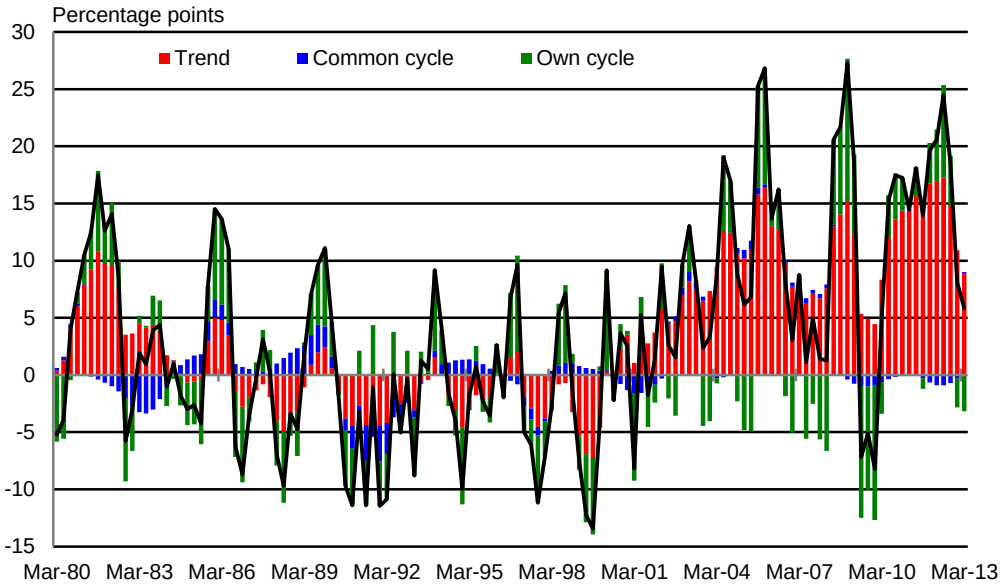
Sectoral growth rate decompositions

Mining

Variation in the mining sector employment growth is driven almost entirely by fluctuations in its trend and sector-specific cycle (see Chart 6). Shocks to the trend were relatively large over the pre-boom period. Since then the trend growth of mining employment has increased, which combined with rising volatility of the sector-specific cycle, has caused a significant rise in the volatility of growth rate of mining employment. Mining sector output is largely driven by foreign demand (at least 60 per cent of value-added is due to exports) which causes the sector to be relatively insensitive to Australian

economic cycles and far more sensitive to world economic cycles. In light of this observation, a possible explanation for the changing relative importance of the common cycle is that in the pre-boom phase these foreign demand cycles were driven by advanced economics with economic cycles that were similar to Australia's, while in phase1 and 2 there was a significant shift of demand to emerging markets (e.g., China) with somewhat different economic cycles.

Chart 6: Decomposition of mining employment growth (tty)

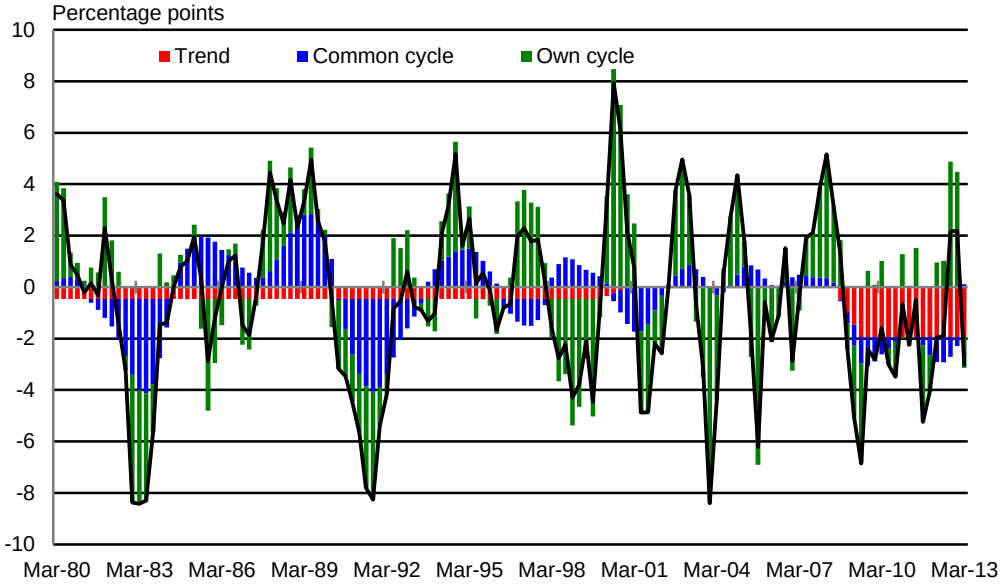


Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

Manufacturing

Fluctuations in the common and sector-specific cycles appear to be equally important sources of variation in manufacturing employment growth over the pre-boom period (see Chart 7).The weight on these components shifted in phase 1 of the resources boom to sector-specific cyclical factors, which was complemented in phase 2 by a significant shift in the trend growth rate of manufacturing employment. This latter shift was likely due to the sustained high exchange rate.

Chart 7: Decomposition of manufacturing employment growth (tty)

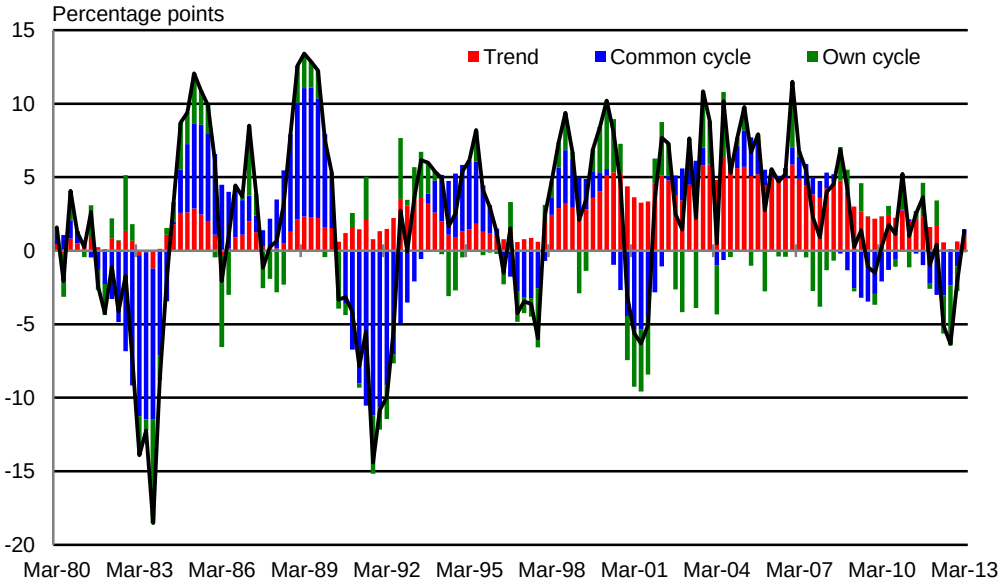


Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

Construction

Prior to 2000, fluctuations in construction sector employment growth were largely driven by the common cycle (see Chart 8), possibly reflecting the strong cycles in residential and non-residential construction that were typical of that period. Since 2000, there has been a significant decline in the amplitude of construction cycles, with a significant share of the level and volatility of construction employment growth driven by fluctuations in the sector-specific trend.

Chart 8: Decomposition of construction employment growth (tty)

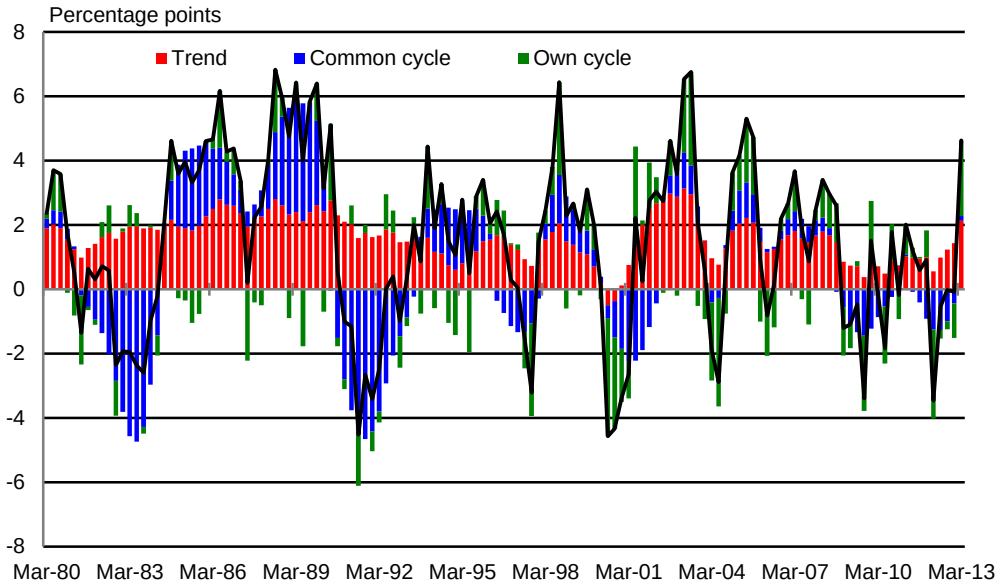


Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

Wholesale and retail trade

Variation in the growth rate of employment in the retail trade sector appears to be driven by its trend component and the common cycle during the pre-boom period (see Chart 9). The relative importance of the common and sector-specific cycles shifted in phases 1 and 2, with fluctuations in the trend and sector-specific cycle explaining virtually all of the variation in growth over this period.

Chart 9: Decomposition of wholesale and retail trade employment growth (tty)

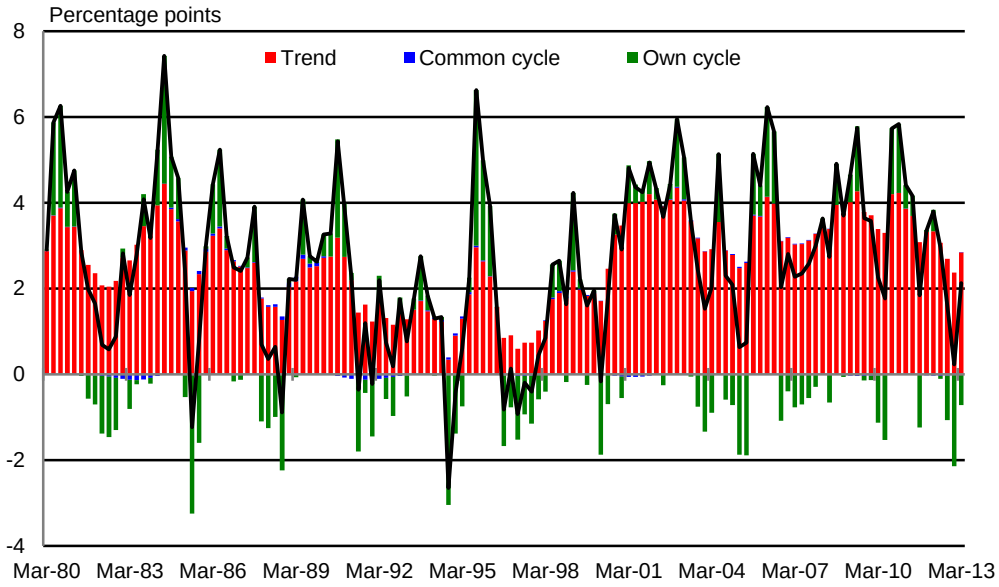


Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

Government-related

Fluctuations in government-related employment growth are largely driven by fluctuations in the trend component (see Chart 10). Similarly, the significant shift in the rate of employment growth over the boom period rate is also due entirely to a shift in the trend growth rate.

Chart 10: Decomposition of government-related employment growth (tty)

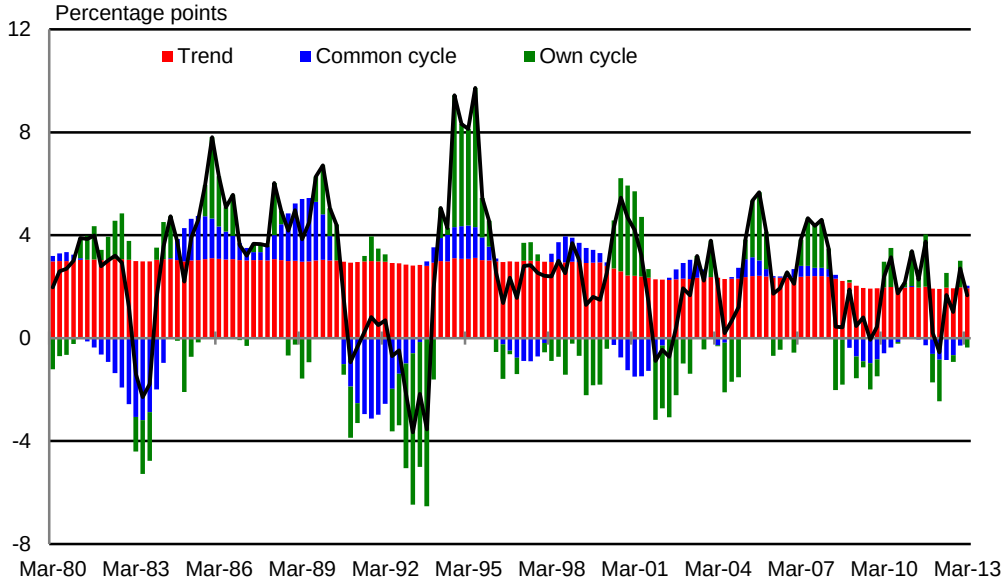


Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

Other-services

Volatility in the growth rate of employment in the other-services sector has fallen steadily over the full sample period. This appears to be largely driven the declining volatility of the common cycle and the sector's own-cycle, which was quite volatile in the mid-1990s (see Chart 11).

Chart 11: Decomposition of other-services employment growth (tty)



Source: Authors calculations based on data from ABS Cat. 6291 and 6204.

5. CONCLUSION

In this paper, we explore the sources of fluctuations in sectoral employment growth rates across the Australian economy over three different periods: the pre-terms of trade boom period before 2000Q1; 2000Q1 to 2008Q2 to capture the effects on sectoral employment from the pre-GFC phase of the terms of trade boom; and the GFC and post-GFC phase from 2008Q3 to the end of the sample to capture the effects of the sustained high exchange rate and relatively weak world economy.

We find that the main sectors of the Australian economy share a common cycle. In other words, there is a tendency for Australian sectors to expand and contract their employment at the same time. The common employment cycle has turning points that are similar to the GDP cycle, albeit with a lag of roughly 6 to 12 months year. The common employment cycle also has similar amplitudes to the GDP cycle, especially during the downturns of the early 1980s and 1990s. Since the mid-1990s the fluctuation in the common employment cycle have mirrored the dampened GDP cycle, which reflects relatively stable economic conditions over this period, both domestically and internationally.

We also find evidence of statistically significant sector-specific employment cycles. For example, mining sector output is largely driven by foreign demand (at least 60 per cent of value-added is due to exports) which causes the sector to be relatively insensitive to Australian economic cycles and far more sensitive to world economic cycles.

Manufacturing, construction, wholesale/retail and other-services appear to be jointly influenced by the common cycle and the sector-specific cycle over the full sample, while cyclical fluctuations in the mining and government sectors are largely driven by sector specific shocks over the full sample. This pattern shifts over time, with sector-specific cycles explaining a significantly greater proportion of the variation in sectoral employment in the period following the mid-1990s. These findings lead us to argue that the observed decline in the volatility of aggregate sectoral employment growth is entirely due to the decline in the volatility of common cycle.

In the future, the results of this paper will be used to derive measures of frictional and structural unemployment in the economy using the methodology outlined by Lilien (1982).

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APPENDIX A: DATA

Data sources

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