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Development of Economic Resilience Indicators for Australia's Regions: An Application to Rural NSW

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Contributed presentation at the 61st AARES Annual Conference,
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The logo for the University of New England (UNE) features the lowercase letters 'une' in a bold, green, sans-serif font.

University of
New England

Development of Economic Resilience Indicators for Australia's Regions: An Application to Rural NSW

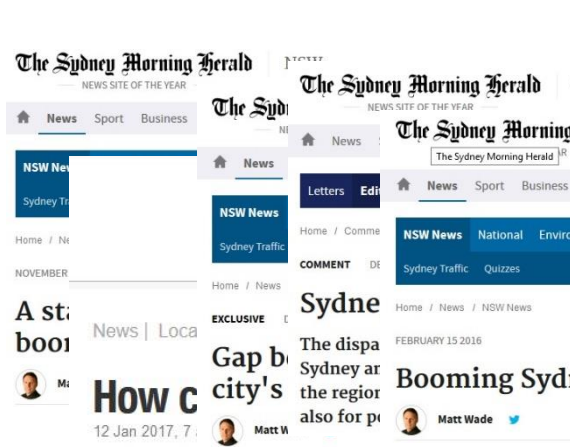
61st Annual AARES Conference, Brisbane, 8th February 2017
Ed Lefley, Dr. Shawn Leu and Prof. Derek Baker
UNE Centre for Agribusiness, University of New England,
Armidale

Outline

- Background and Motivation
- Research Questions
- Methodology
- Results:
 - What's driving 29 regions
 - 5 yearly average snapshot of how each region fairs on each of these component
 - How does the 5 year index work?
 - Two principal components that capture the salient information
 - Projects the resilience of the region over the 5 years.
 - There is a time component for each region
 - We take away the time variation across the region; we project the incremental change onto the principal component
- Concluding Comments

Background and Motivation

- Regional Economies are well known to perform at a different pace to the capital cities



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Research Question

- Can an indicator be developed?
 - Who has already developed one?
 - Ron Martin (2012, 2015) in the UK
 - Oregon Regional Economic Indicator
 - Why do we need one?

What is our definition of economic resilience?

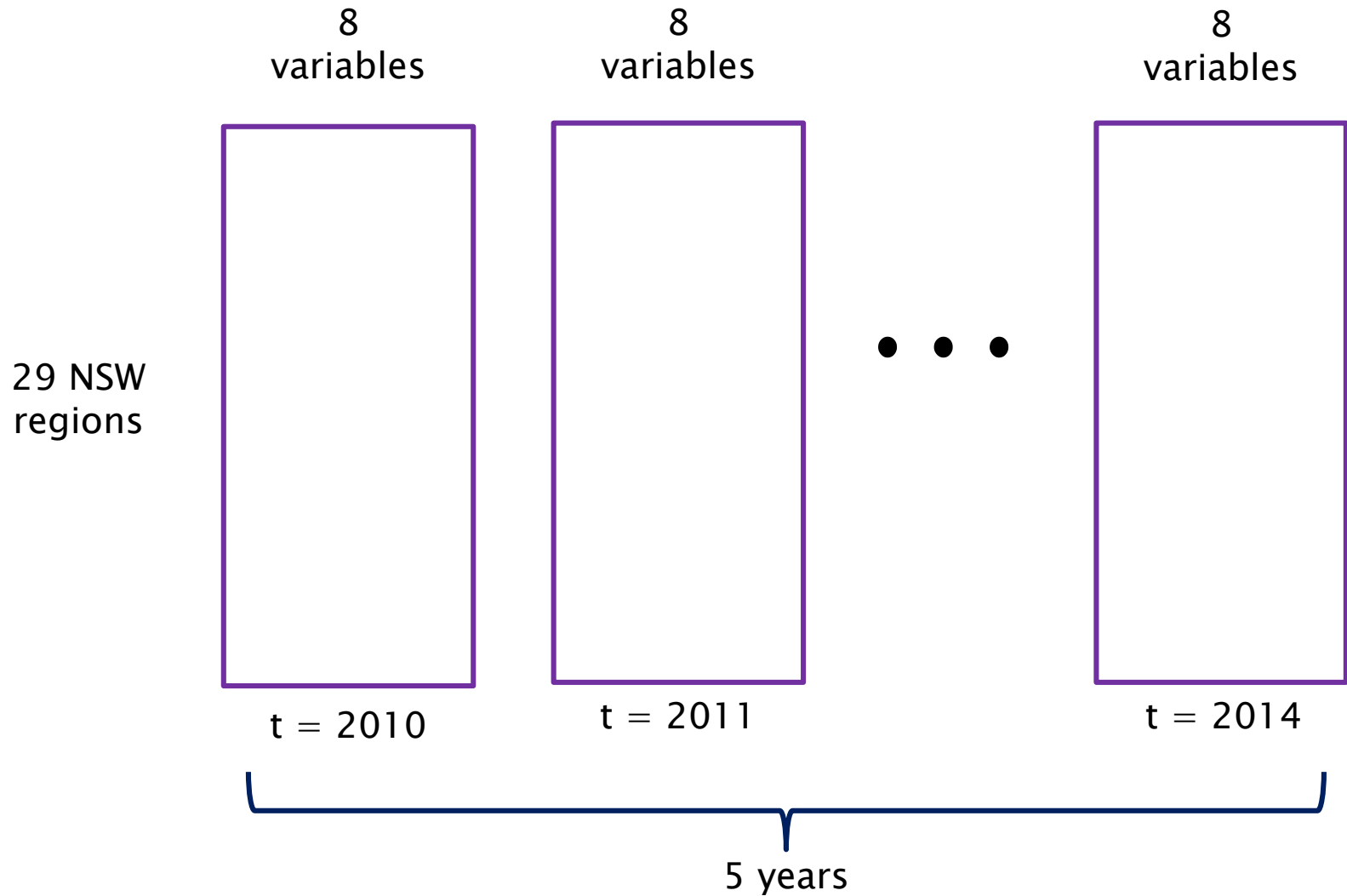
- **Economic Resilience**
 - Martin (2012, 2015)
 - Developing countries (micro level panel data at household level)
 - Economic Geography
- Resilience through more dimensions

Data

- Annual data extracted from ABS for 29 regions in NSW
 - 8 variables over 5 years (2010–2014)
 - Building Approvals
 - Estimated Resident Population
 - Net Regional Migration
 - Patent Applications
 - Trademark Applications
 - Employment Rate
 - Unemployment Rate
 - Participation Rate
 - Data only available from 2010 onwards due to change to the ASGS areas
-
- ```
graph LR; A[Building Approvals] --- B[Regional characteristics]; C[Estimated Resident Population] --- B; D[Net Regional Migration] --- B; E[Patent Applications] --- B; F[Trademark Applications] --- B; G[Employment Rate] --- H[Labour Characteristics]; I[Unemployment Rate] --- H; J[Participation Rate] --- H;
```



# Panel Data



# Three-way Anova

| Effect                     | SS              | %             |
|----------------------------|-----------------|---------------|
| Regions                    | 63.304          | 5.56          |
| Variables                  | 366.333         | 32.20         |
| Time                       | 1.723           | 0.15          |
| <b>Regions × Variables</b> | 635.211         | <b>55.84</b>  |
| Regions × Time             | 8.081           | 0.71          |
| Variables × Time           | 8.825           | 0.78          |
| Regions × Variables × Time | 54.094          | 4.76          |
| <b>Total SS</b>            | <b>1137.571</b> | <b>100.00</b> |

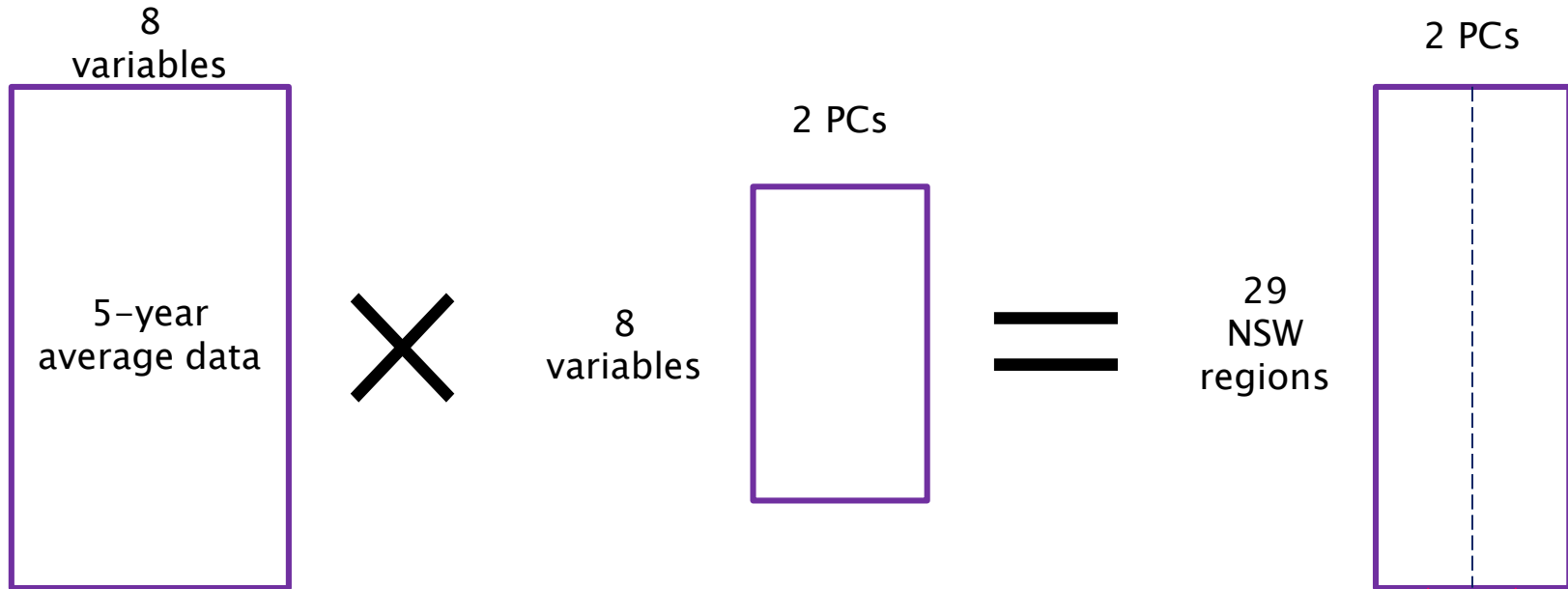
- Most of the interaction is in (Regions × Variables) that carries 55.84% of the variance in the data
  - lack of interaction with time is possibly due to the short span
- Hence we start by averaging the data across Time and extract the principal components

## 2 Principal Components

|                               | Regional Characteristics | Labour Market |
|-------------------------------|--------------------------|---------------|
| Building Approvals            | <b>0.471</b>             | -0.156        |
| Estimated Resident Population | <b>0.418</b>             | 0.193         |
| Net Regional Migration        | <b>-0.409</b>            | 0.159         |
| Patent Applications           | <b>0.447</b>             | 0.099         |
| Trademark Applications        | <b>0.477</b>             | 0.045         |
| Employment Rate               | 0.024                    | <b>0.578</b>  |
| Unemployment Rate             | 0.085                    | <b>-0.504</b> |
| Participation Rate            | 0.038                    | <b>0.560</b>  |

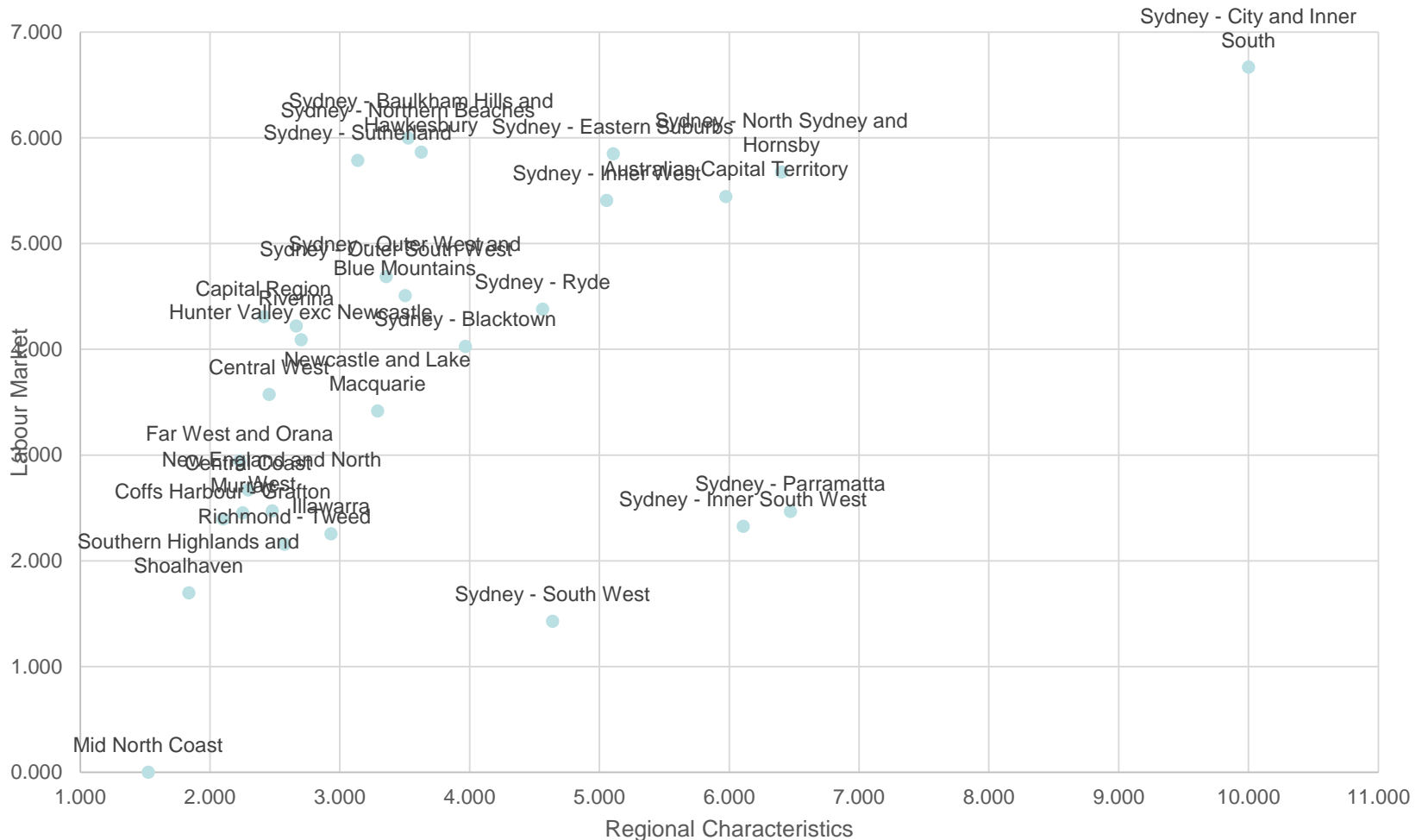
- Eigenvalues indicate 2 principal components (using the Kaiser–Guttman rule)
  - explains 78.7% of the variance
- After varimax rotation, we focus on (absolute) values of loadings  $> 0.3$
- This gives a clear split between Labour and Regional Characteristics components

# Cross-Sectional Regional Index

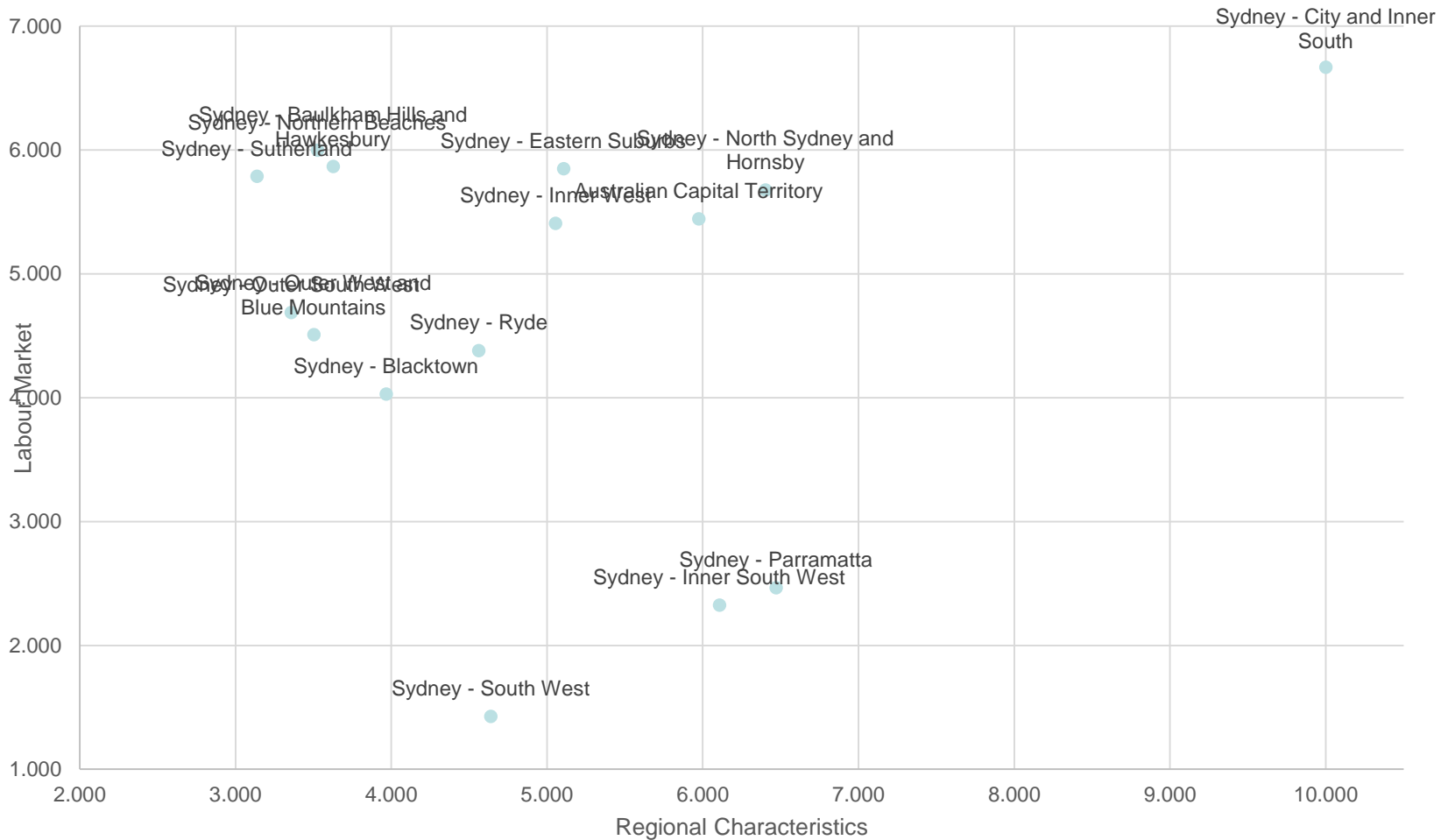


- We can derive an (5-year average) index on how each region scores on
  - the regional characteristics component
  - the labour market component
- Rescaled to between 0 and 10

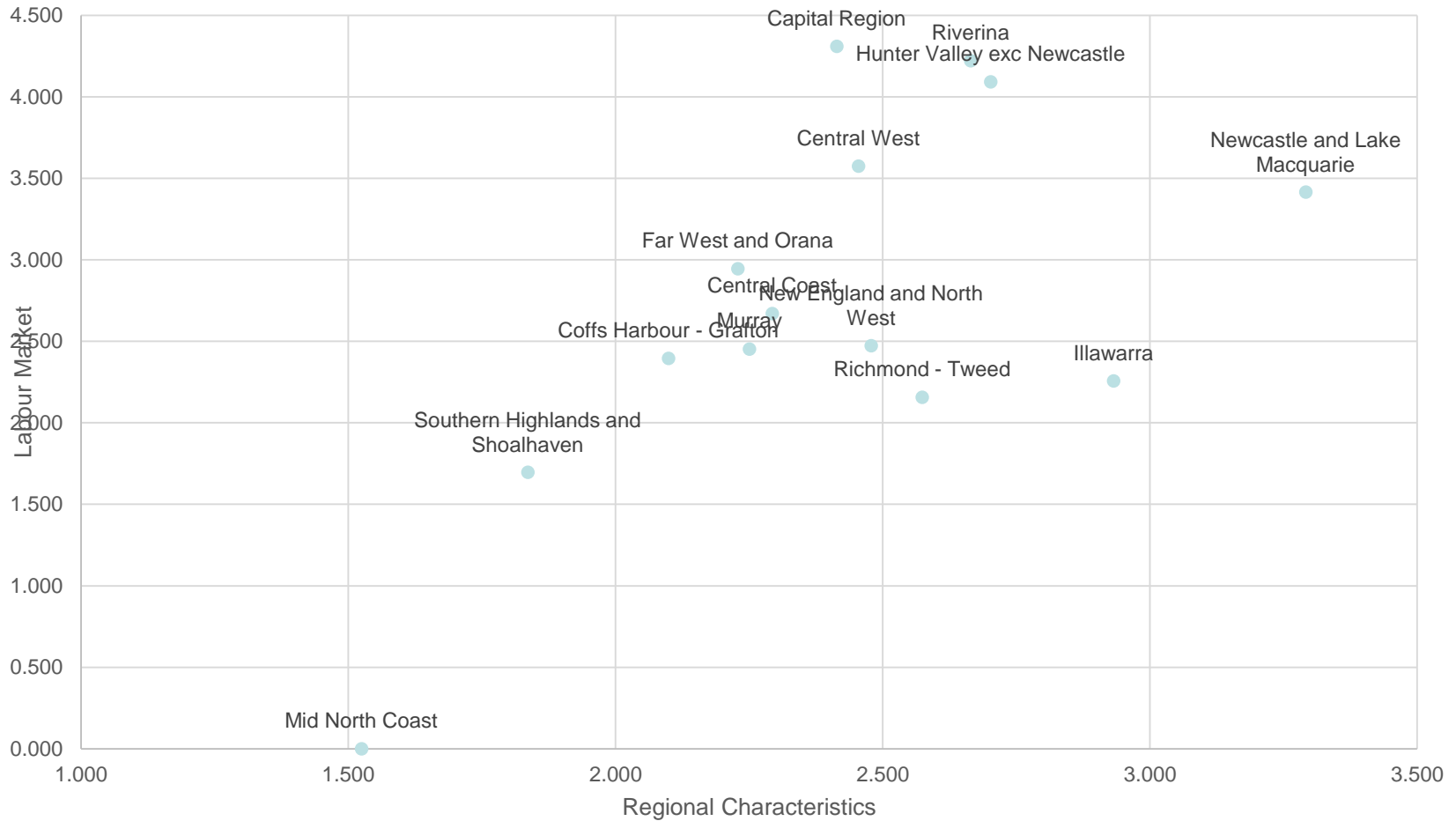
# Regional Scores



# Regional Scores: Sydney Regions

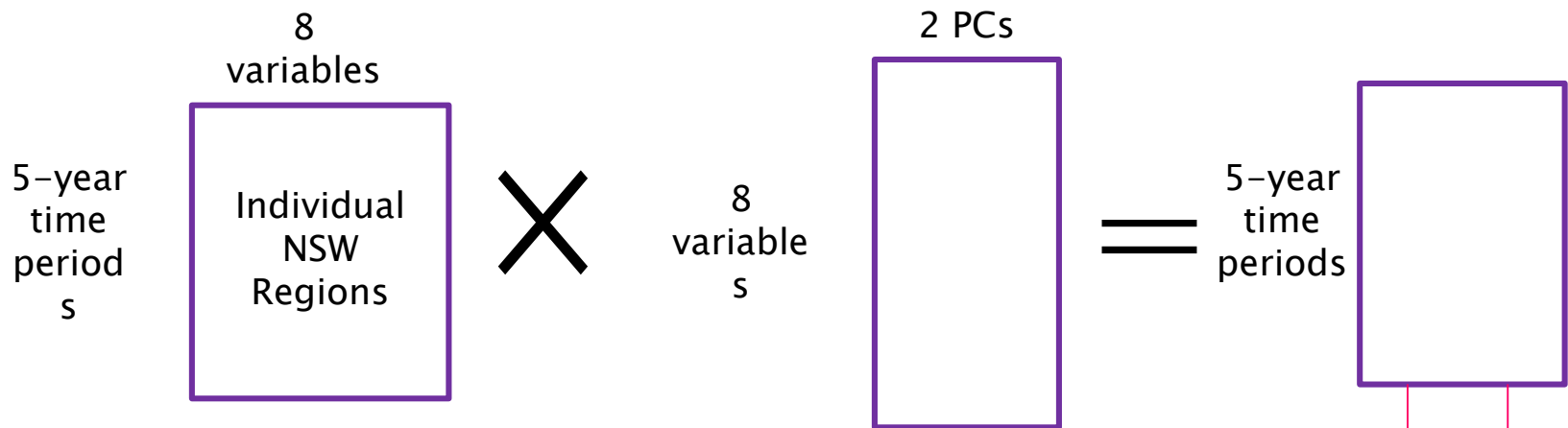


# Regional Scores: Rest of NSW



# Regional Resilience Index

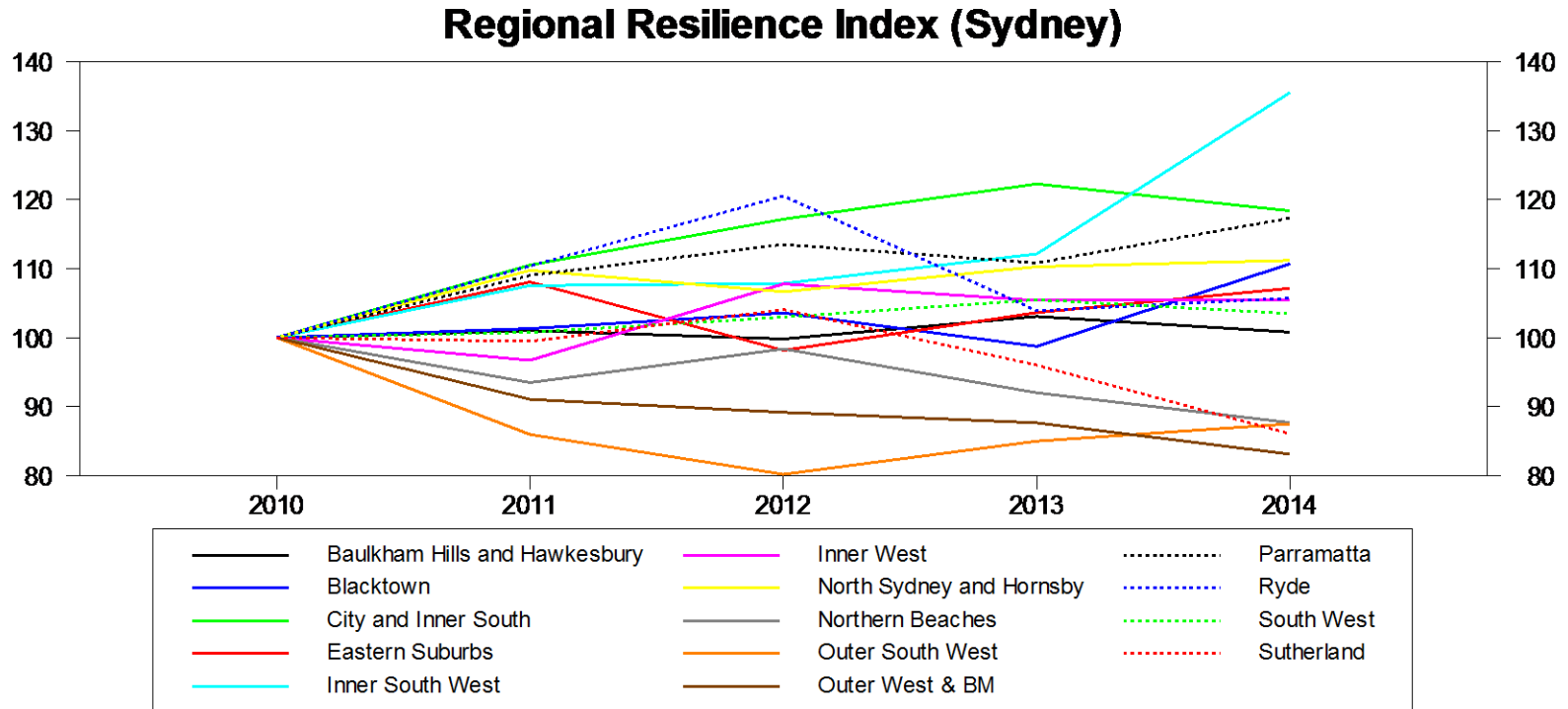
- An alternative way of exploring the original panel data is to look at each individual NSW region and its interaction with time
- More specifically, the differential dynamic for each NSW region is projected onto the PC space:



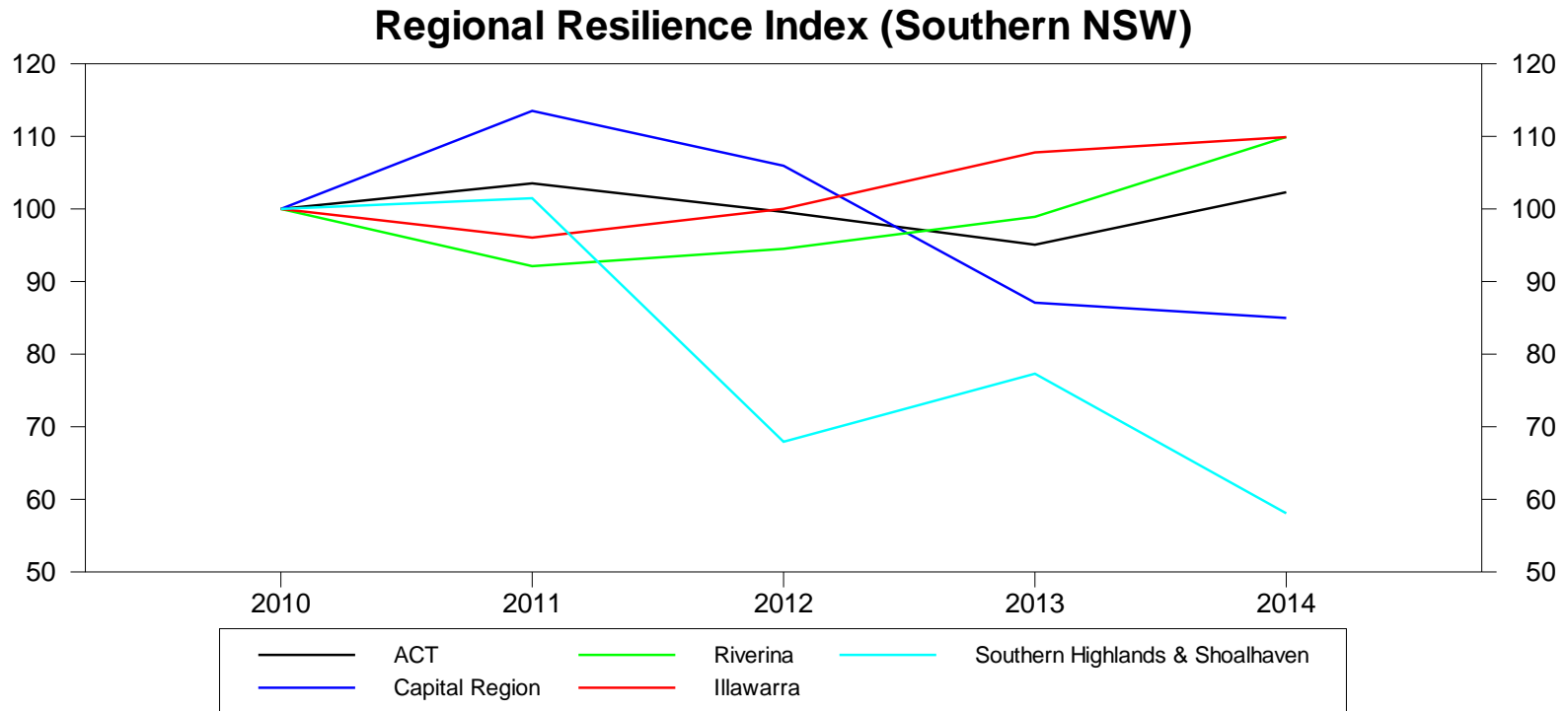
- Resilience Index in year  $t$  for each NSW region  
=  $\Sigma$  (proportion explained  $\times$  PC)
- Year 2010 set to 100 as the base year



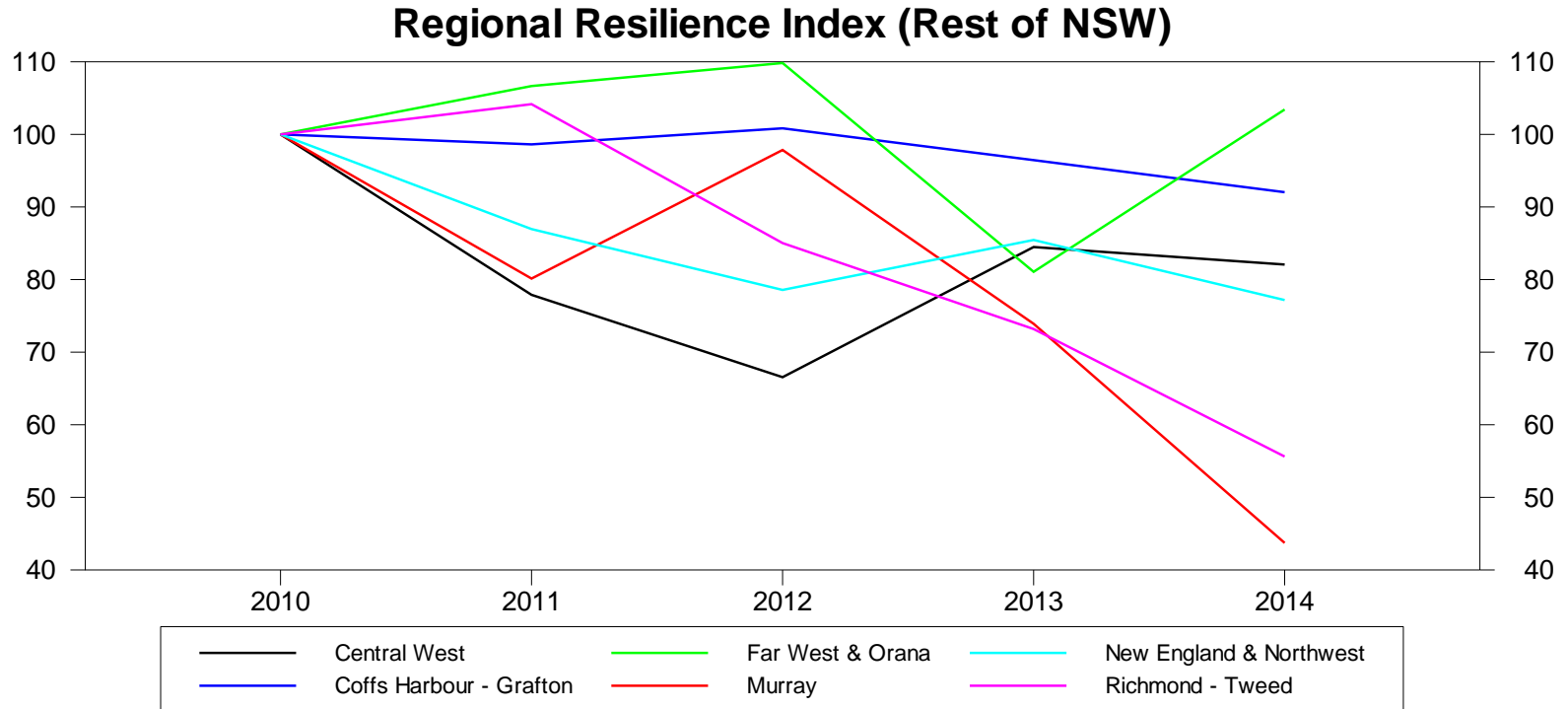
# Regional Resilience Index (Sydney)



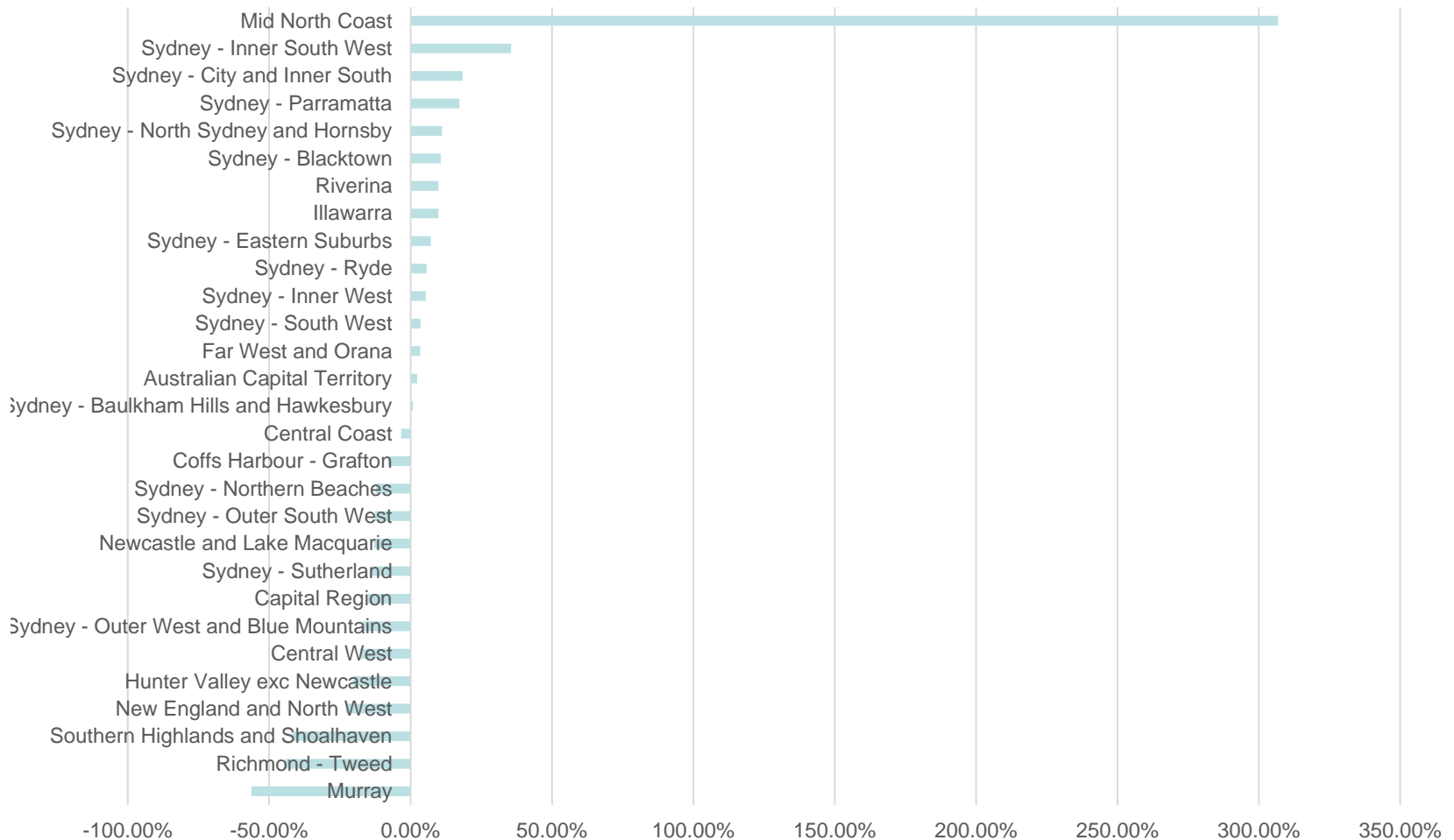
# Regional Resilience Index (Southern NSW)



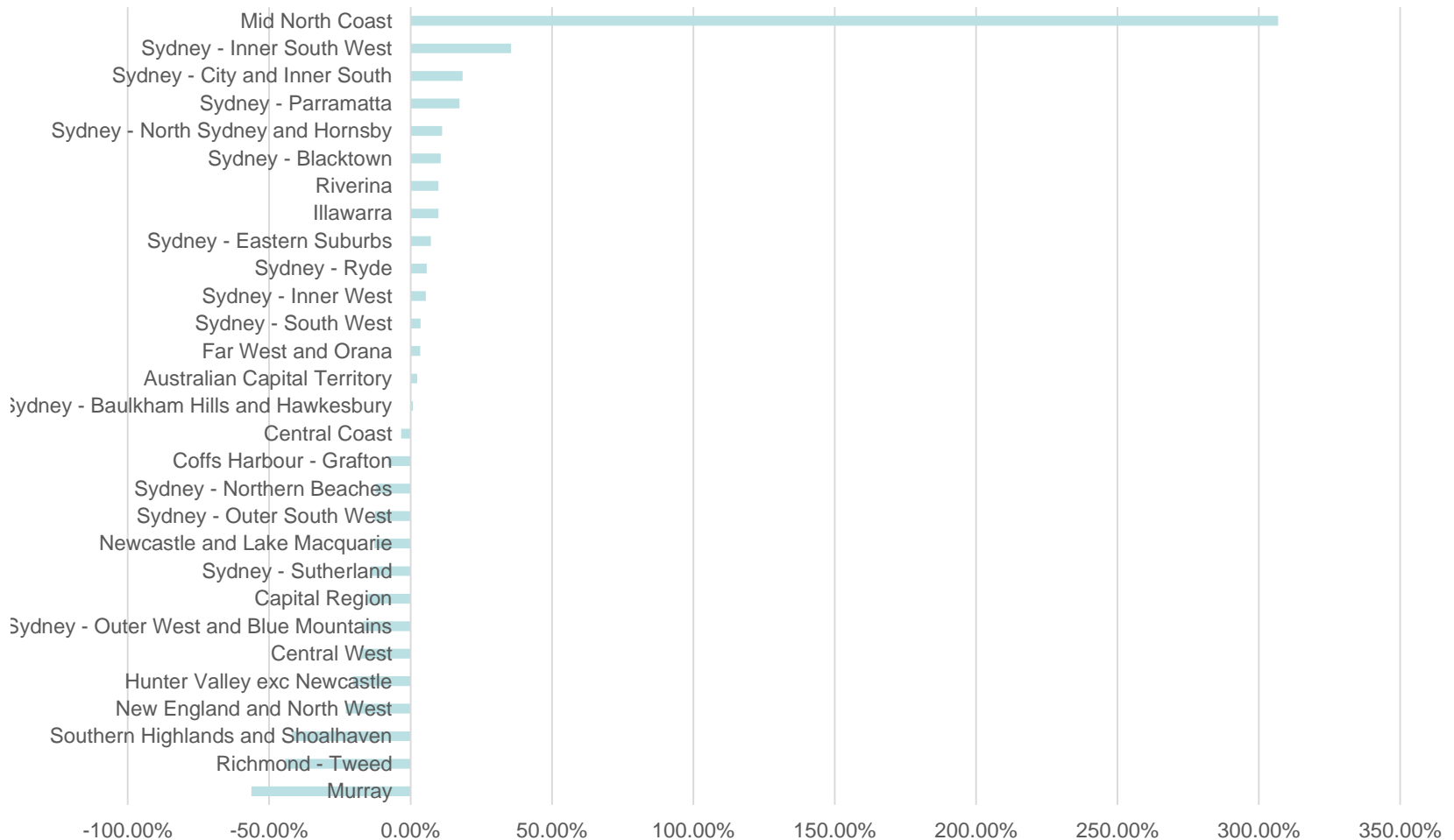
# Regional Resilience Index (Rest of NSW)



# 5 Year Percentage Change in Resilience Index



# 5 Year Percentage Change in Resilience Index



# What value to the discussions does this add?

- Clear, concise composite indicator based on a number of different factors
  - Able to produce a health check on regional economies
- Scope to include proximity (ARIA+ index)

# Data Sources

- ABS Hierarchical Regional Data
  - Regional Statistics by ASGS: The National Regional Profile (NRP) <http://stat.data.abs.gov.au/>, accessed 30/11/2016
  - Employment statistics: Labour Force, Australia, Detailed – Electronic Delivery, catalogue number 6291.0.55.001  
<http://abs.gov.au/AUSSTATS/abs@.nsf/DetailsPage/6291.0.55.001Nov%202016?OpenDocument>  
accessed 29/12/2016