Labour Market Matching Efficiency in Australian Regions

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Topic

- Examine matching functions of Australian regions.
- Account for potential endogeneity in the matching function.
  - Method developed by Borowczyk-Martins, Jolivet, & Postel-Vinay (2013)
- Examine short and long-run dynamics.
- Examine factors influencing the matching process including possible impacts form COVID-19 related policies.

Motivation

- Why examine the matching process?
  1. A measure of labour market performance.
  2. Measure the strength of the relationship between vacancies and the stock of unemployed.
  3. What factors influence aggregate matches, including policies during the pandemic.
  4. Do assumptions about the model hold in practice?

Motivation

- Why on a regional basis?
    1. Because labour markets are heterogeneous—particularly in Australia.
    2. Practitioners need more disaggregated data to improve the accuracy of models.

Matching Model

- We utilize the commonly used Cobb-Douglas form of the matching function:

$$1)\ M = A \cdot U^{\alpha} \cdot V^{(1-\alpha)}$$

- A key assumption of this model is constant returns to scales, backed by empirical literature and some theoretical literature.
- The assumption of constant returns allows for the following:

$$2)\ F = A \cdot \theta^{(1-\alpha)}$$

- Where F is the matching rate (M/U) and θ is labour market tightness (V/U).

Endogeneity

- Endogeneity enters the matching function through the free entry (of posting vacancies) assumption (Borowczyk-Martins *et al.*, 2013).
- If entry is free, firms will post vacancies until the cost (C) of doing so equal its expected revenue, which is the product of the (random) chance of filling the vacancy (M/V) and the benefit of a filled vacancy (Π).
- As a result, tightness (θ) is a function of matching technology (A):

$$3)\ \theta = \left(\frac{A}{C}\Pi\right)^{\frac{1}{\alpha}}$$

→ Endogeneity in the matching function.

How to Deal with Endogeneity

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- Borowczyk-Martins *et al.* (2013) deal with this issue by breaking efficiency into three components in the standard log-linear model:
  - Constant efficiency (μ);
  - Seasonal component (τ);
  - Shock component assumed to follow an ARMA process (ϵ).
- Because the shock component follows an ARMA process it can be substituted by lags of all other variables which results in an Autoregressive-Distributed Lag model (ARDL).
  - The log-linear and ARDL models featured in Borowczyk-Martins *et al.* (2013) are shown on the following slide.

Following Borowczyk-Martins *et al.* (2013)

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$$4)\ \ln(F_t) = \mu\ +\ (1-\alpha)\cdot\ln(\theta_t) +\ \tau_t + \epsilon_t$$

$$5)\ \ln(F_t) = \gamma + \sum_{l=1}^{p}\beta_l \ln(F_{t-l}) + (1-\alpha)\cdot\theta_t - \sum_{l=1}^{p}\lambda_l \ln(\theta_{t-l}) + \tau_t - \sum_{l=1}^{p} x_l \tau_{t-l} + \sum_{l=1}^{q} w_l \omega_{t-l} \mid p, q \geq 1$$

- They implement this model on U.S. national data.
- We seek to implement a similar model on Australian regional data.

Data

- The ABS does a good job of providing monthly labour force estimates that include some characteristics, such as:
  - Age
  - Sex
  - Part-time employment
  - Not in labour force
  - Average weeks searching for employment
- This data is available on an SA4 (2011) basis going back to 1998.

Data

- The ABS does not provide data on unemployment-employment flows below the State level.
- This data is necessary to produce the matching data.
- To overcome this issue, we apply state matching rates to the local labour force, which localises the data to an extent.

Data

- Finally, the ABS does not produce vacancy data below the state level.
- An even bigger hurdle as there is no way to localise state level vacancy data with less aggregate data.
- The alternative is to use the National Skills Commission's Internet Vacancy Index (IVI) data.
- This data does not represent all vacancies but is sufficiently representative for our purposes.
- However, the IVI is aggregated on a non-standard geographic basis.

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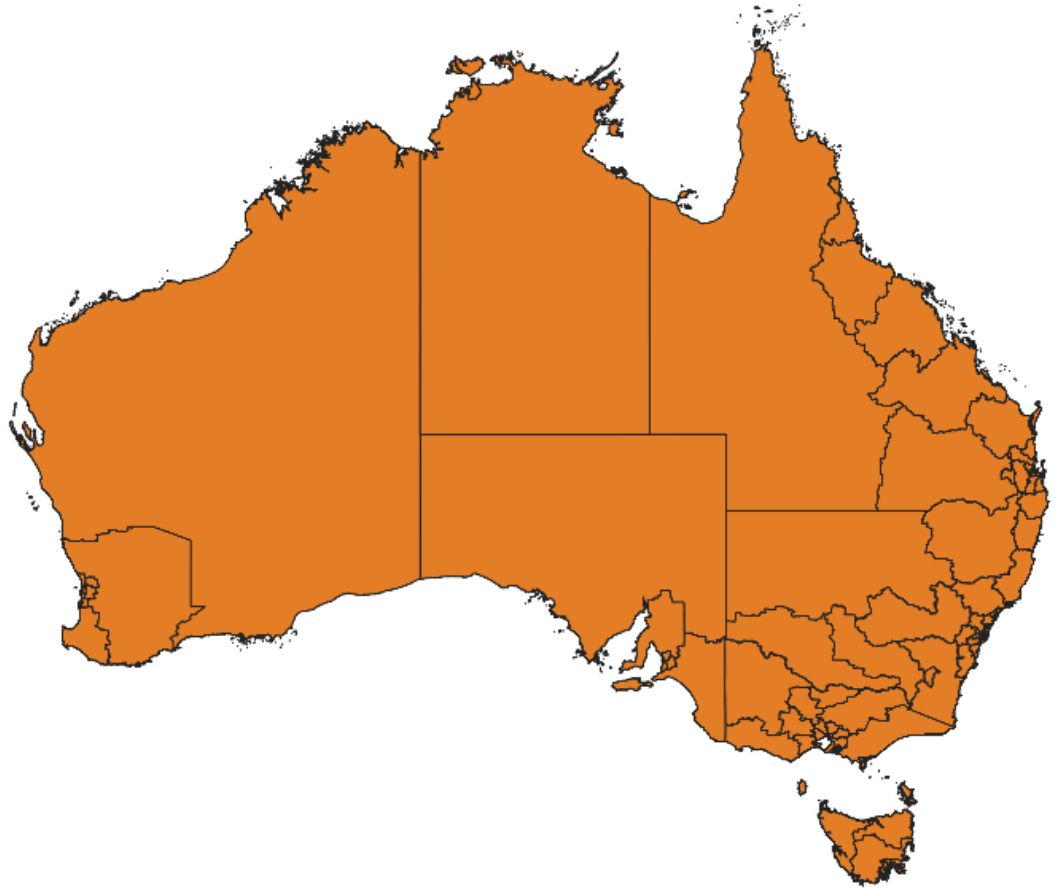
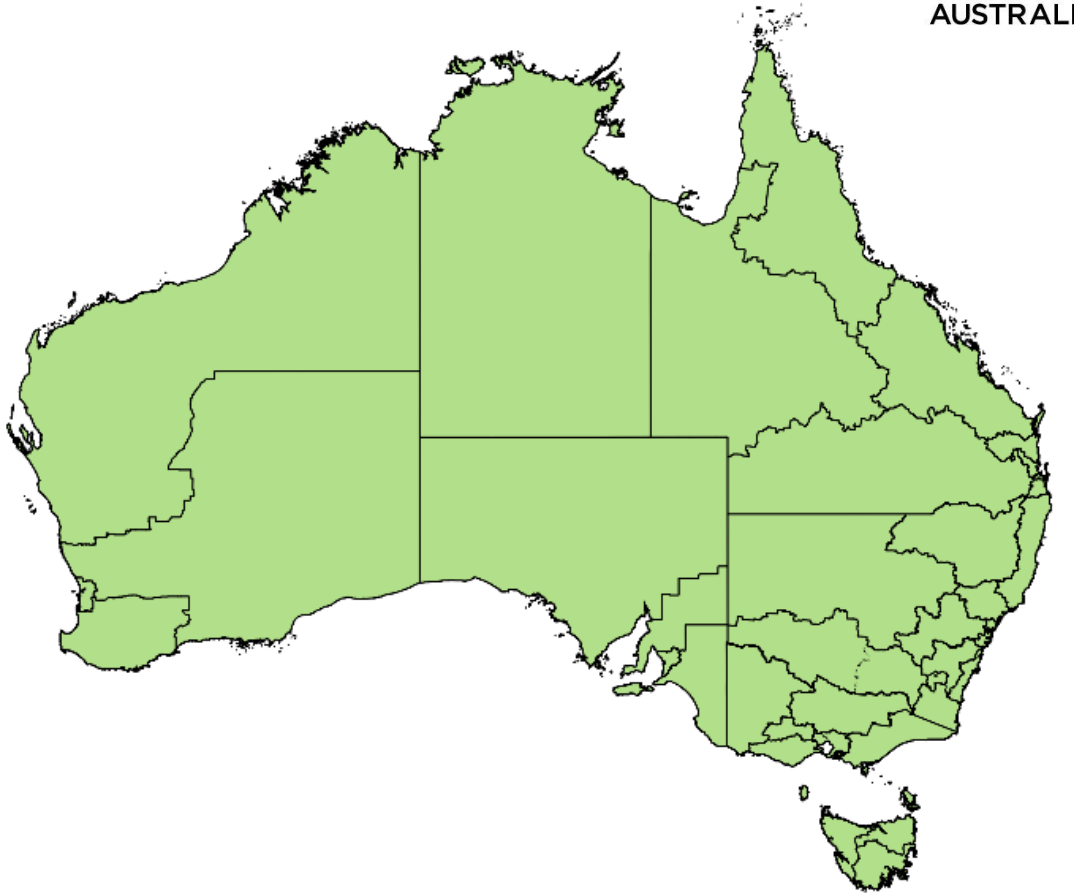
SA4 (2011)

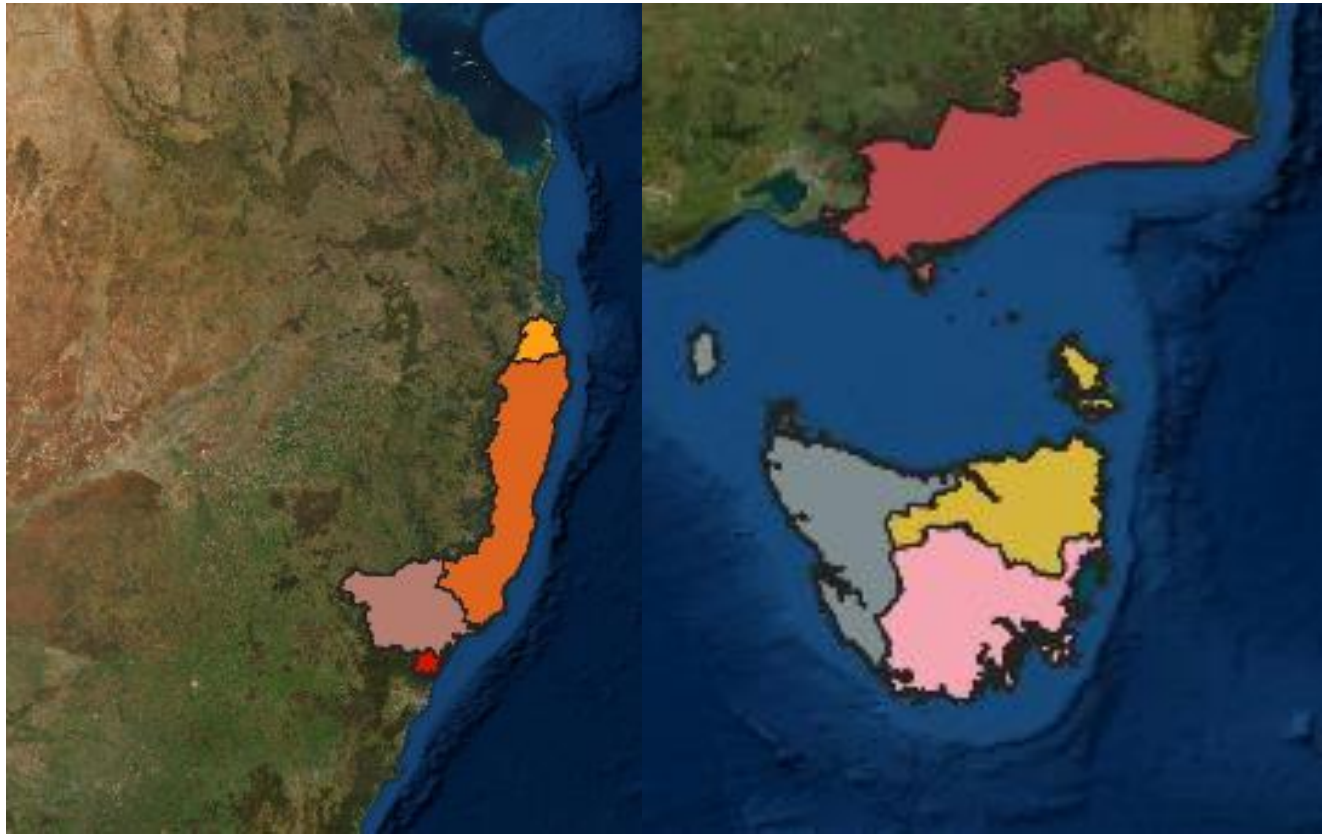


IVI Regions



Data

- To overcome this issue, we look for the best-fit regions.
- There are 8 IVI regions that approximately line up with SA4 boundaries.



Spatial Autocorrelation

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- Finally, of these 8 regions, we need to account for spatial autocorrelation.
- We examine employment status by Place of Work and Place of Residence to find out how many in and out-commuters exist is each region.
- We narrow the list of regions for which we perform this analysis, based on minimizing the potential for spatial autocorrelation.

Spatial Autocorrelation

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- This provided us with 3 regions that we could run our regression on with limited concern of spatial autocorrelation.

Region	% Jobs filled by locals	% Locals that work locally
Hobart	98.70%	94.50%
Launceston	97.40%	91.90%
North West Tasmania	96.70%	92.60%
NSW North Coast	95.40%	86.90%
Newcastle	95.20%	89.70%
Gippsland	95.00%	86.20%
Gosford	91.10%	68.30%
Gold Coast	85.20%	70.30%

Explanatory Variables

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- We want to investigate what factors are important in determining matching.
- We attempt to gather as much regional data as possible, guided by previous literature.
  - Particularly Destefanis & Fonseca (2007) provide a fairly comprehensive list of important variables.
- We test all variables for unit roots, finding that most are stationary or stationary at first difference.

Our Econometric Method

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- The standard log-linear model is implemented, then the ARDL model.
- We implement both models with what we term as baseline and full specification regressions.
  - The difference being the baseline regression contains labour market tightness as the only explanatory variable.
- From the ARDL regression, we are able to observe both short and long-run dynamics.
- Our ARDL model follows Borowczyk-Martins *et al.* (2013) closely with the major difference being the lag component is the difference of the explanatory variables.

Our Econometric Method

- Our baseline specification of the standard model:

$$6)\ \nabla \ln(F_t) = \nabla a + (1-\alpha)\cdot \nabla \ln(\theta_t) + \nabla g_t$$

  - The standard model is of first difference form to correct for non-stationarity.
- Below is the baseline ARDL:

$$7)\ \ln(F_t) = \gamma + \sum_{l=1}^{p} \beta_l \ln(F_{t-l}) + (1-\alpha)\cdot \theta_t + \sum_{l=-q}^{q} \lambda_l \nabla \ln(\theta_{t-l}) + \varepsilon_t$$

Results

- Our first set of results from the baseline regression (first difference of variables).
- Results indicate that ARDL regressions account for greater variation in the data.
- Results support the assumption of constant returns to scale.

	North West Tasmania			Hobart		
	S.M.	ARDL-SR	ARDL-LR	S.M.	ARDL-SR	ARDL-LR
Log Tightness	0.637*** (0.093)	0.198*** (0.061)	0.332*** (0.09)	0.601*** (0.11)	0.29*** (0.07)	0.436*** (0.07)
Constant	-0.002 (0.017)	0.045 (0.139)	0.076 (0.233)	-0.001 (0.016)	0.182* (0.107)	0.273* (0.147)
(*p*,*q*)		(1,1)			(1,1)	
					Robust s.e.	Robust s.e.
(Adjusted) R^2	0.29	0.4405		0.2028	0.477	

Results

	North West Tasmania			Hobart		
	S.M.	ARDL-SR	ARDL-LR	S.M.	ARDL-SR	ARDL-LR
Log Tightness	0.584*** (0.095)	0.242** (0.094)	0.348*** (0.127)	0.603*** (0.115)	0.425*** (0.111)	0.475*** (0.099)
Part-time Employment/Employment	3.21*** (1.153)	-0.099 (1.491)	-0.142 (2.143)	0.827 (1.51)	2.706** (1.202)	3.025** (1.269)
Participation Rate	-3.083* (1.628)	0.406 (1.398)	0.583 (2.005)	0.449 (2.429)	0.778 (2.232)	0.87 (2.514)
<35 y/o in Labour Force/Labour Force	0.593 (1.44)	-0.615 (1.228)	-0.883 (1.776)	-3.111 (2.499)	0.429 (1.658)	0.48 (1.852)
>54 y/o in Labour Force/Labour Force	0.629 (1.46)	-0.212 (1.144)	-0.304 (1.647)	-2.508 (2.914)	-2.494 (1.579)	-2.787 (1.754)
Females in Labour Force/Labour Force	0.316 (1.809)	4.388** (2.058)	6.304** (2.965)	5.724* (3.062)	-6.809** (2.6)	-7.611*** (2.772)
Log of Average Weeks Searching for a Job	0.035 (0.051)	-0.109* (0.064)	-0.157* (0.089)	-0.033 (0.043)	-0.09 (0.062)	-0.1 (0.066)
Constant	-0.001 (0.017)	-1.474 (1.217)	-2.117 (1.727)	-0.001 (0.016)	2.82* (1.562)	3.152* (1.632)
(p,q)		(1,1)			(3,1)	
R^2 or Adjusted R^2	0.3219	0.6038		0.207	0.5425	

COVID-19 Policies

- Of the top 6 regions we work with, only Gippsland showed evidence of an effect on matching.

Gippsland	S.M.	ARDL-SR	ARDL-LR
Log Tightness	0.943*** (0.057)	0.387*** (0.087)	0.715*** (0.101)
Part-time Employment/Employment	-0.896 (0.66)	-2.009*** (0.763)	-3.708*** (1.383)
Participation Rate	1.17 (0.837)	-0.843 (1.109)	-1.555 (2.118)
<35 y/o in Labour Force/Labour Force	0.288 (0.825)	1.468* (0.796)	2.709* (1.53)
>54 y/o in Labour Force/Labour Force	0.196 (0.836)	0.304 (0.543)	0.562 (1.033)
Females in Labour Force/Labour Force	0.99 (1.504)	-0.966 (1.633)	-1.782 (3.086)
Log of Average Weeks Searching for a Job	-0.01 (0.031)	-0.091* (0.047)	-0.167* (0.086)
Log of Est. Total JobKeeper Spend	0.029*** (0.008)	-0.018*** (0.006)	-0.033*** (0.012)
Constant	-0.006 (0.016)	1.966** (0.987)	3.628* (1.956)
(p,q)		(1,1)	
R^2 or Adjusted R^2	0.7282	0.8207	

COVID-19 Policies

- This effect of JobKeeper was positive in the standard model regression but negative in the ARDL regression.
- Other variables tested included the ratio of lockdown-days to days in a month and an international border closure dummy.
- Coefficients were insignificant for the Tasmanian regions, Newcastle, NSW North Coast and Gippsland.

Concluding Remarks

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- Estimated elasticity of vacancies with respect to unemployment in the matching process on a regional basis.
- Produced estimates that should not be bias due to endogeneity.
- Demonstrated a clear difference in short- and long-run elasticity estimates.
- Provided evidence as to what affects matching efficiency at the local level. Showing that effects are not necessarily consistent.
- For the moment, Tasmanian regions only.

Concluding Remarks

- For the moment, Tasmanian regions (given their isolation) are the best for this type of regional analysis.
- The lack of regular, sub-state data is to significant detriment of labour market research in Australia given heterogeneous nature of our regional economies.
- The IVI data set presents an opportunity to regionalise state level vacancy data that we seek to exploit next.

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Questions

Explanatory Variables

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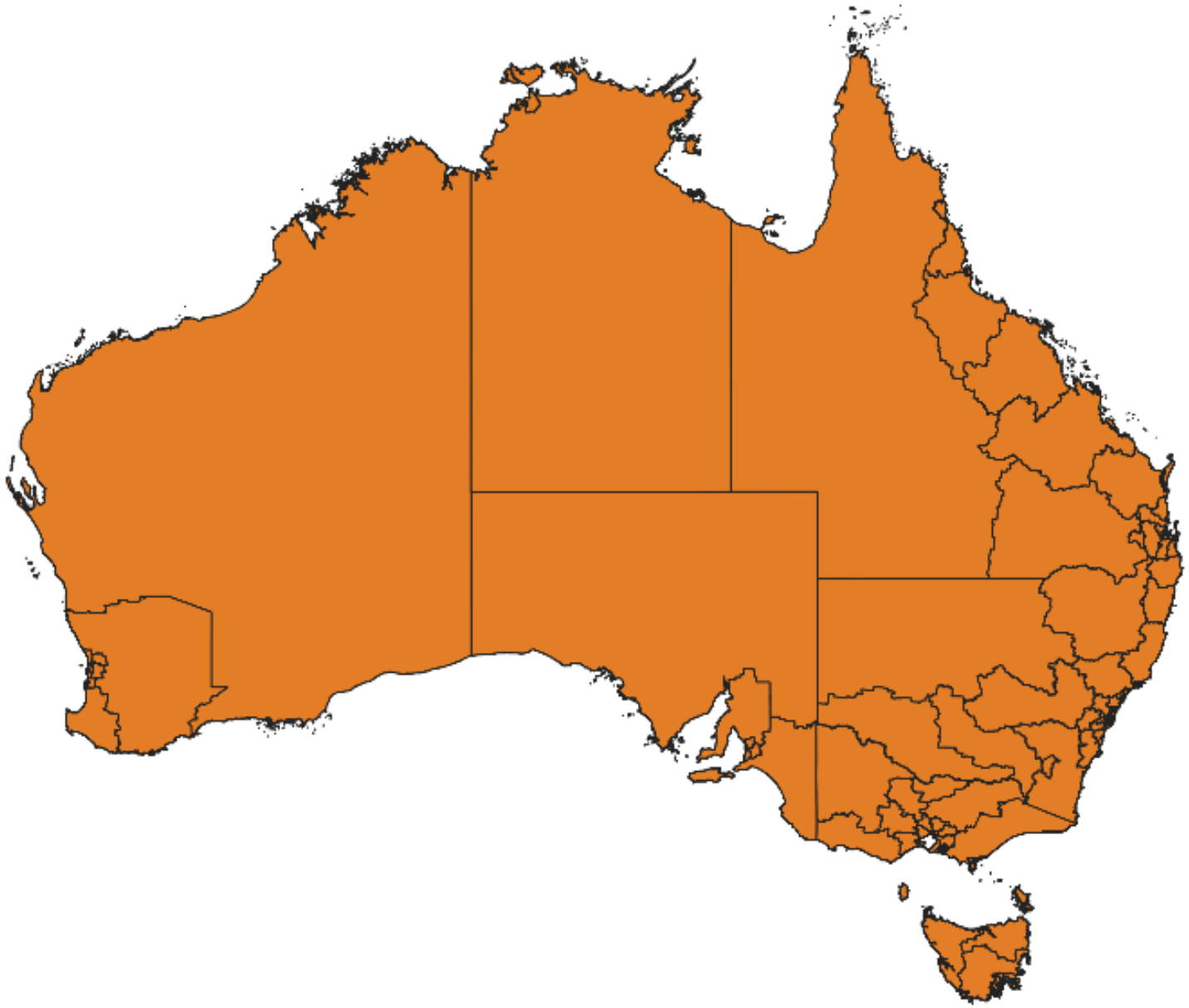
- We test all variables for unit root, finding that most are stationary or stationary at first difference.

Variable	Source
Log Tightness	NSC special request, Detailed Labour Force, ABS
Part-time Employment/Employment	Detailed Labour Force, ABS
Participation Rate	Detailed Labour Force, ABS
<35 y/o in Labour Force/Labour Force	Detailed Labour Force, ABS
>54 y/o in Labour Force/Labour Force	Detailed Labour Force, ABS
Females in Labour Force/Labour Force	Detailed Labour Force, ABS
Log of Average Weeks Searching for a Job	Detailed Labour Force, ABS
Lockdown Ratio	ABC and Government Websites
Lockdown Dummy	Generated based on Prime Minister's website
JobKeeper Spend	Generated based on Treasury website data by Postcode

SA4 (2011)



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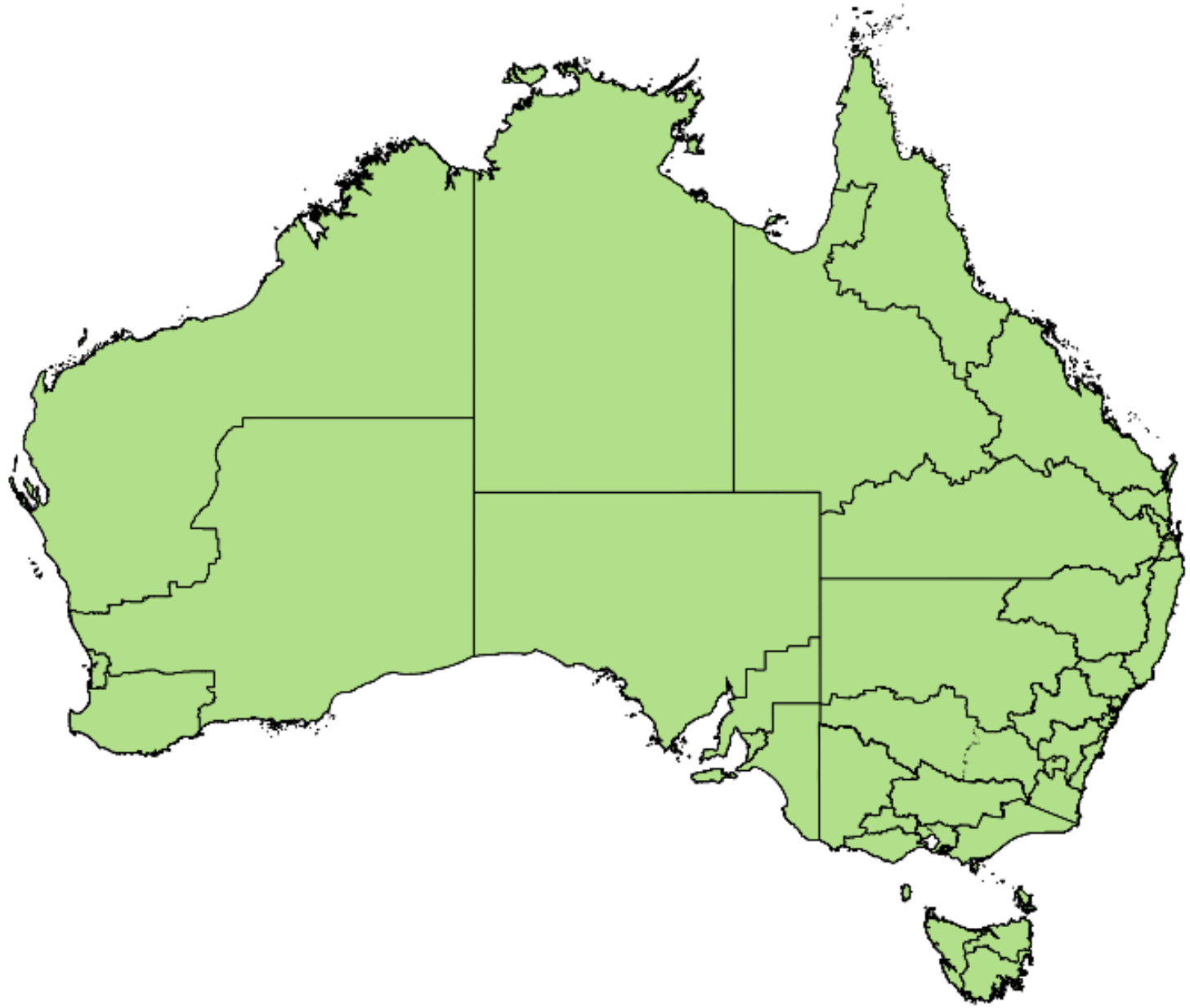
IVI Regions



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Our Econometric Method

- Our full specification standard model:

$$8)\ \nabla \ln(F_t) = \nabla a + (1-\alpha)\cdot \nabla \ln(\theta_t) + \sum_{i=1}^{I} \psi_i \nabla \ln(z_i) + \nabla g_t$$

- Below is the full specification ARDL:

$$9)\ \ln(F_t) = \gamma + \sum_{l=1}^{p} \beta_l \ln(F_{t-l}) + \varphi \theta_t + \sum_{l=-q}^{q} \lambda_l \nabla \ln(\theta_{t-l}) + \sum_{i=1}^{I} \psi_i \ln(z_i) + \sum_{i=1}^{I} \sum_{l=-q}^{q} \xi_{i,l} \nabla \ln(z_{i,t-l}) + \varepsilon_t$$