++++

The Role of Linkages in Employment Growth Across Australia's Region.

Tom Murphy*, Mark Morrison*, John Hicks* Parikshit Basu* and Danielle Ranshaw**

*Charles Sturt University
** Western Research Institute

Outline

- Specialisation, Diversity and Growth
- Backwards and Forwards Linkages
- Growth and Shift Share Analysis
- The Data and Method
- The Results and Discussion
- Conclusions
- References

Specialisation, Diversity and Growth

- Expectation- increased complexity as economy grows.
- Economic growth- decrease in specialisation and increase in diversity.
- However majority of empirical studies support increasing specialisation and growth.
- E.g. West (2002) Queensland economy reduced complexity of linkages during periods of growth.

Backwards Linkages/Multipliers

- Backwards linkages/multipliers derive from the purchase of inputs by local industry

.

- Total backwards multiplier (**TBM**) for all industries in the region is given by:

$$TBM_{rt} = \sum_{j} B_{jrt} = \sum_{j} (n \sum_{i} b_{ijrt})$$

Forwards Linkages Multipliers

- Forwards linkages/multipliers derive from the sale of local industry output to other local industry.
- The total forward multiplier (**TFM**) for the region is given by the expression:

$$TFM_{rt} = \sum_{i} \vec{B}_{irt} = \sum_{i} (n \sum_{j} \vec{b}_{ijrt})$$

Spread of Linkages BSI and FSI

- The spread of linkages is a measure of the range of local industries bought from or sold to other local industries for a given level of output by a local industry.
- For example an industry which purchases inputs from 5 other local industries has a greater spread than an industry that purchases inputs from only one other local industry.
- West -lower index higher spread.

$$V_{rt} = \sqrt{\frac{\sum_j V_{jrt}^2}{n}}$$

Growth and Shift Share Analysis

- Growth variable can be employment, value-added or income. We choose employment.
- Employment growth determined by national/state growth, mix of industry (fast growing, average growing or slow growing) and local competitive factors.
- We focus on the local competitive factor. Is the local economy out-performing or under-performing given its location and industry mix?

Method

- To this point we have four variables which could impact on a region's economic activity; total backwards multiplier (*TBM);* total forwards multiplier (*TFM*); backwards spread index (*BSI*) and forwards spread index (*FSI*). The general form of our model utilised is:

$$CE = f(TBM, TFM, BSI, FSI)$$

- We experiment using both the absolute values of the dependant and independent variables and changes in the dependant and independent variables.

Data

- Australian Bureau of Statistics (ABS) 2006 and 2011 place of work 105 sector, industry, employment, census, data for 46 non-metropolitan regions of Australia.
- 2006 and 2013 regional input-output tables for each of the 46 regions constructed using the GRIT technique developed by Jensen and West and based on the ABS 2006/07 national input output table; the Australian Labour Force Survey 2012-13; Australian National Accounts 2012-13; and State Accounts 2012-13.

Results Hypothesis 1

```
. regress CE TBM TFM BSI FSI
```

Source	SS	df	MS
Model	3.9157e+09	4	978921565
Residual	3.9128e+09	41	95435239.1
Total	7.8285e+09	45	173967357

Number of obs	= 46
F(4, 41)	= 10.26
Prob > F	= 0.0000
R-squared	= 0.5002
Adj R-squared	= 0.4514
Root MSE	= 9769.1

CE	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
TBM	285496.9	86214.74	3.31	0.002	111382.7	459611.1
TFM	-247132.6	40440.65	-6.11	0.000	-328804.2	-165461.1
BSI	-327657.4	217993.1	-1.50	0.140	-767903.4	112588.6
FSI	472619.4	145674.7	3.24	0.002	178423.3	766815.4
_cons	-159858.9	156340.5	-1.02	0.313	-475595	155877.2

Discussion Hypothesis 1

- Total Backward Multipliers (TBM) have a significant **positive** effect on the competitive factor of employment growth (CE)
- Total Forward Multipliers (TFM) have a highly significant **negative** effect on CE.
- Backward Spread Index (BSI) negative (meaning greater the spread the more CE but not significant.
- Forward Spread Index (FSI) positive (meaning less) and highly significant. (**narrow spread to export industry.)**

Results Hypothesis 2

```
. regress CE CHTBM CHBSI CHTFM CHFSI
```

Source	SS	df	MS
Model	2.2267e+09	4	556677024
Residual	5.6018e+09	41	136629828
Total	7.8285e+09	45	173967357

Number of obs	46
F(4, 41)	4.07
Prob > F	0.0072
R-squared	0.2844
Adj R-squared	0.2146
Root MSE	11689

CE	Coef.	Std. Err.	t	P>|t|	[95% Conf.	Interval]
CHTBM	3026793	880759.4	3.44	0.001	1248064	4805523
CHBSI	-521927.5	270599.9	-1.93	0.061	-1068415	24560.07
CHTFM	1563.008	761.2828	2.05	0.046	25.56575	3100.45
CHFSI	-124422.6	56262.99	-2.21	0.033	-238048	-10797.16
_cons	-13052.09	3479.497	-3.75	0.001	-20079.08	-6025.108

Discussion Hypothesis 2

- Turning to changes in the independent variables, we observe that both CHTBM and CHTFM have a positive and significant impact on employment and that CHBSI and CHFSI have a negative (and hence positive) and significant impact on employment.
- Thus given the industrial structure of a region, growth in the values of either forward or backward multipliers will give rise to higher levels of employment as will the increase in the spread of the multiplier impact.

Conclusions

- The prevalence of strong backwards linkages is associated with better performing regions and regions will be advantaged by attracting industries with strong backward linkages – especially where the linkages are widely spread.
- The development of industries with strong forwards linkages may disadvantage a region because such industries will be dependent on local demand and unable to take advantage of export opportunities.

Conclusions

- This suggests that increased industry specialisation (which can take advantage of export opportunities) is preferable to diversification as the industries will be dependent on local demand.
- Notwithstanding the foregoing, action to increase the value of all employment multipliers, and their spread, will be beneficial for a regional economy.

References

Beer, A. and Clower, T. (2009), 'Specialisation and Growth: Evidence from Australia's Regional Cities', *Urban Studies*, vol. 46, pp. 369-389.

Belke, A. and Heine, J. (2006), 'Specialisation Patterns and the Synchronicity of Regional Employment Cycles in Europe', *International Economics and Economic Policy*, vol.3, pp. 91-104.

Bradley, R. and Gans, J. (1998), 'Growth in Australian Cities', *Economic Record*, vol. 74, pp. 266-278.

Dixon, R. and Freebairn, J. (2009), 'Trends in Regional Specialisation in Australia', *Australasian Journal of Regional Studies*, vol 15, pp. 281-296.

Lilien, D. M. (1982), 'Sectoral Shifts and Cyclical Unemployment', *Journal of Political Economy*, vol. 90, pp. 777-793.

Hicks, John, Basu, P.K. and Sherley, Christopher (2014) 'The Impact of Employment Specialisation on Regional Labour Market Outcomes in Australia', *Australian Bulletin f Labour*, 40(1), pp. 68-90.

Hirschmann, A. O. (1958) *The Strategy of Economic Development*, New Haven: Yale University Press

Marelli, E. (2004), 'Evolution of Employment Structures and Regional Specialisation', *Economic Systems*, vol. 28, pp. 35-59.

Rasmussen, P. (1957) *Studies in Intersectoral Relations*, Amsterdam: North Holland.

Robson, M. (2006), 'Sectoral Shifts, Employment Specialization and the Efficiency of Matching: An Analysis Using UK Regional Data', *Regional Studies*, vol. 40, pp. 743-754.

Robson, M. (2009), 'Structural Change, Specialization and Regional Labour Market Performance: Evidence from the UK', *Applied Economics*, vol. 41, pp. 275-293.

Schnabl, H., West Guy R., Foster, John and Cook, Averil (1999), A New Approach to Identifying Structural Development in Economic systems: The Case of the Queensland Economy', mimeo.

Shearmur, R. and Polèse, M. (2005), 'Diversity and Employment Growth in Canada', *The Canadian Geographer*, vol. 49, pp. 272-290.

Stimson, R. J., Robson, A. and Shyy, T. K. (2009), 'Modeling Regional Endogenous Growth: An Application to the Non-metropolitan Regions of Australia', *Annals of Regional Science*, vol. 43, pp. 379-398.

Suedekum, J. (2006), 'Concentration and Specialisation Trends in Germany Since Re-unification', *Regional Studies*, vol. 40, pp. 861-873.

West, Guy R. (1999) 'Structural Change in the Queensland Economy: An Industry Analysis', *Economic Analysis and Policy*, (Special Edition), pp.27-51.

Wren, C. and Taylor, J. (1999), 'Industrial Restructuring and Regional Policy', *Oxford Economic Papers*, vol. 51, pp. 487-516.