ECONOMIC AND PUBLIC POLICY RESEARCH

Level 1, 97 Cuba Street, Te Aro, Wellington 6011; PO Box 24390, Wellington 6142
P: +64 4 939 4250 F: +64 4 939 4251 E: info@motu.org.nz W: http://motu.nz

LOCAL GROWTH — IT'S COMPLEX!

Ben Davies and David C Maré

Motu Economic and Public Policy Research

BACKGROUND

Cities thick with related activities enjoy agglomeration economies from labour market pooling, input sharing and knowledge spillovers.[1] Such relatedness need not be spatial — knowledge, skill, and input/output linkages are alternative dimensions of proximity that contribute to local growth.[2]

Recent studies consider the complexity that emerges from related activities' interaction, and find strong relationships between complexity and economic prosperity.[3]

OUR CONTRIBUTION

We estimate the relatedness and complexity of economic activities in New Zealand, and test their ex-post ability to predict local employment growth.

We find that complex activities experienced faster growth between 1981 and 2013, especially in cities dense with such activities.

DATA

We use historical census data aligned to current industry, occupation, and urban area codes. Our sample comprises 50 urban areas ("cities") and 200 industry-occupation combinations ("activities") in census years 1981, 1991, 2001, and 2013.

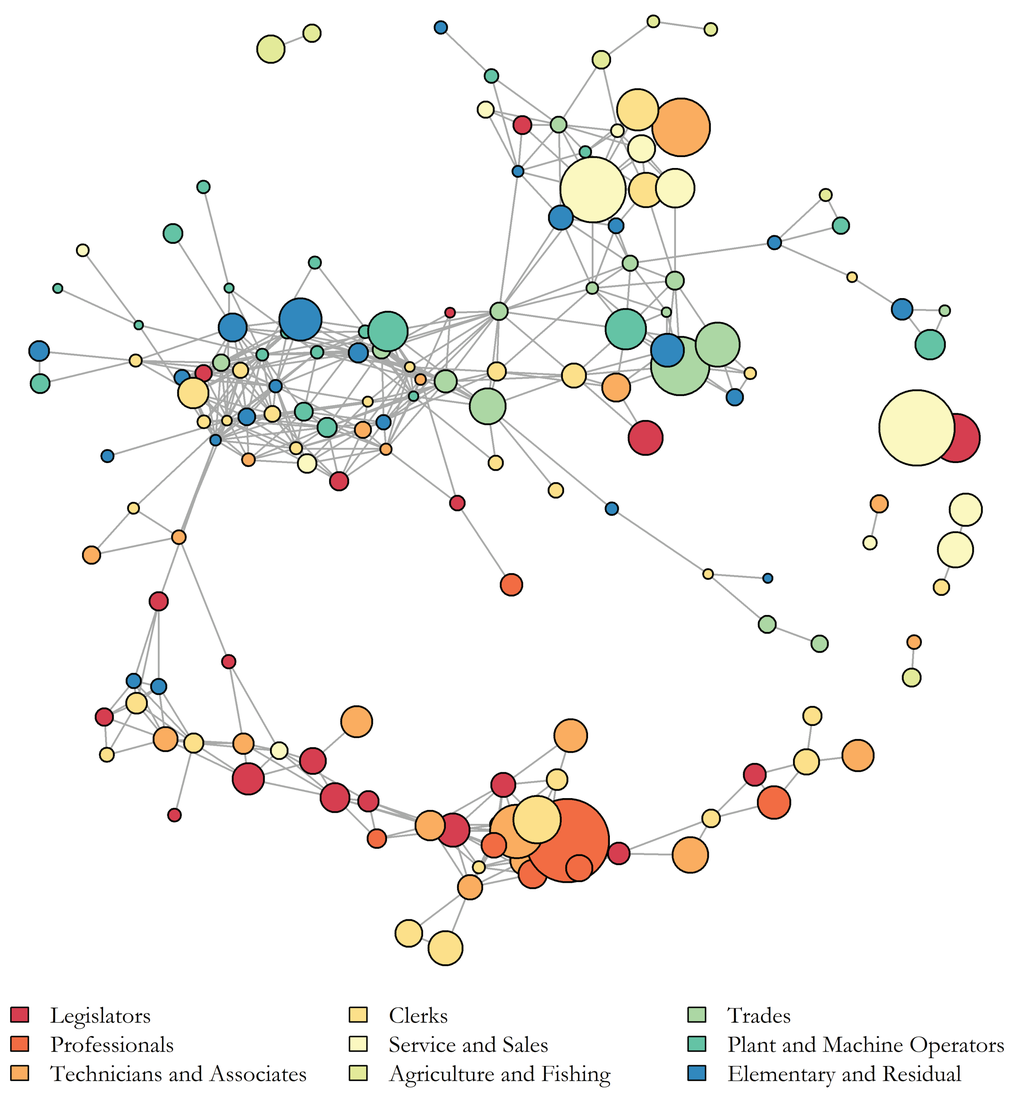
MAPPING RELATEDNESS

Activities are related if they employ similar technologies and workers with similar skills. In equilibrium, similar workers colocate due to firms pursuing agglomeration economies. Such colocation manifests as related activities being over-represented in the same cities relative to their shares of national employment.

We measure activities' relatedness via weighted correlations in local employment shares. Our approach extends discrete measures based on revealed comparative advantage used in previous studies.[4]

We visualise our estimates using a network map in which nodes represent activities and with links weighted by activities' pairwise relatedness. The heaviest 500 links in that network are shown below, laid out so that related activities are close together and with nodes colored by occupation.

Our map reveals a densely connected cluster of activities involving low-skill occupations, reflecting strong colocation patterns. Activities involving high-skill occupations (e.g., legislators and technicians) are less tightly clustered.

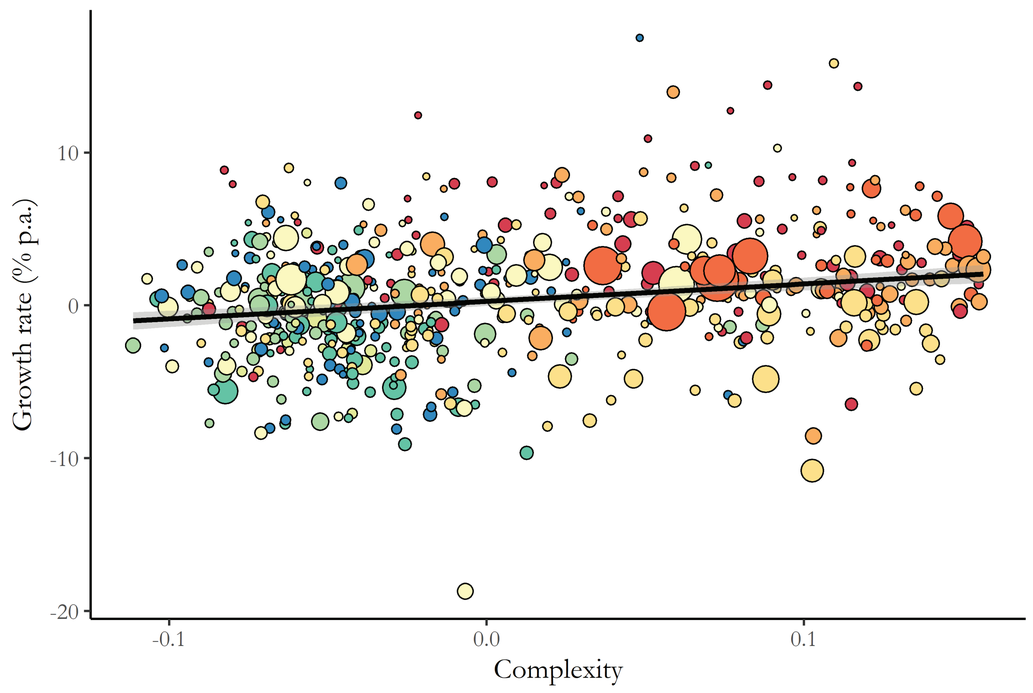


ESTIMATING COMPLEXITY

Complexity captures the interaction between complementary activities. It is defined recursively: complex activities are highly inter-related with other complex activities.

We measure complexity using an eigenvector approximation to the Method of Reflections.[5] The chart below plots activities' complexity against their annualised decadal growth rate, pooled across census years.

On average, a one standard deviation rise in activity complexity is associated with a one percentage point increase in employment growth per year. High-skill occupations are associated with more complex activities than low-skill occupations.



We estimate city complexity symmetrically to activity complexity: by transposing the city-activity matrix of employment counts and applying the eigenvector approximation.

TESTING FOR PREDICTIVE POWER

Finally, we regress local growth in activity employment on local average relatedness, city complexity and activity complexity (all standardised to have zero mean and unit variance), along with city and activity growth overall. Growth rates are defined as annualised percentage changes between decades. Observations correspond to city-activity pairs in a given census year.

	City-activity growth rate		
	Full sample	Complex cities	Complex activities
Local average relatedness	-0.139***	-0.184***	-0.259***
	(0.0416)	(0.0525)	(0.0513)
City complexity	0.198***	0.332***	0.597***
	(0.0322)	(0.0676)	(0.0402)
Activity complexity	0.0288	0.174***	-0.133
	(0.0315)	(0.0428)	(0.0756)
City growth rate	0.533***	0.544***	0.480***
	(0.0285)	(0.0415)	(0.0397)
Activity growth rate	0.950***	0.949***	0.975***
	(0.0110)	(0.0143)	(0.0178)
Obs.	21,502	6,457	6,878
R-squared	0.669	0.738	0.717

Heteroskedasiticy-robust standard errors in parentheses. Constant not reported. * p < 0.05, ** p < 0.01, *** p < 0.001

KEY RESULTS

- Complex cities grew faster and accelerated growth in complex activities between 1981 and 2013.
- Less locally related activities, especially those that are complex, experienced faster growth.

In short, context matters: local growth depends upon what is both spatially and technologically nearby.

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Te Pūnaha Matatini
Data ▪ Knowledge ▪ Insight

[1]Marshall (1920); [2]Porter (2014); [3]Tachella et al. (2012); Balland et al. (2017); Abdon et al. (2018); [4]Balassa (1965); Hidalgo et al. (2007); [5]Hidalgo and Hausman (2009); Calderelli et al. (2012); Balland and Rigby (2017)