

# Patch Diversity in Keihanshin Major Metropolitan Area

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**Abstract:** We propose a novel perspective on clusters as patches of space with diversity of organisations, instead of traditional definition of clusters as industry-related companies in the same spatial area. We proceed to calculate distribution frequency and diversity index of establishments in Keihanshin Major Metropolitan Area.

Diversity is considered to be an important characteristic of the complex adaptive systems (CAS) [1], where dynamics, evolution and resilience of the CAS emerge from interactions of numerous and heterogeneous agents. But even in biology, the diversity is a vague concept. May[2] defines ability to successfully reproduce as a condition for some species and indeed, from human perspective species seem constant and fixed, but during longer periods of time boundaries between species become less clear.

Biological jargon in general is well-spread in business culture. For example, in famous economic newspaper we can read about ecosystem of companies, Silicon Valley ecosystem, innovation ecosystem, etc. Furthermore, in business and economics literature we have life-cycle models [3], ecosystem models [4], and regional resilience concepts [5], for example. However, if we wish to quantitatively describe some socio-economic ecosystem, we easily realise there are no easy answers to questions like what makes an ecosystem, what is diversity, how do we calculate system resilience.

Although diversity and specialisation are both important topics of study in fields like urban and regional economics, international trade, geography, business and urban planning, we rarely can quantify some regularities or patterns.

Emerging science of cities [6-7] shows an increasing interest in the development of the quantitative methods suitable for the research of underlying similarities and patterns that exist in various urban systems [8]. Diversity seems like natural subject of such research, and as shown recently [9], there is universality in urban economic diversification among urban systems of various scale.

In this paper we propose a novel perspective on industrial clusters as hotspots of diversity in urban systems. We expand original concept of industrial cluster [3, 4] as geographic concentrations of

interconnected companies, firms in related industries, and associated institutions, to geographic concentrations of organisations in the same space and time.

In the original concept, and therefore in the business studies in general, universities, laboratories, patent offices and similar supporting organisations are defined as institutions.

However, we use New Institutional Economics demarcation between institutions and organisations to define institutions as rules of the game that determine what is possible and not possible in the environment, while organisations are groups of people that behave within institutional rules to achieve their goals [10]. This means that companies, universities, public offices, religious groups and hobby groups are all organisations, albeit a different type or species of organisations.

We select Keihanshin Major Metropolitan Area [11] as urban ecosystem, and the establishment as a single physical location where some activity is conducted for the basic unit of our study. Using 2014 Economic Census for Business Frame [12] and Japan Standard Industrial Classification [13] we measure frequency of organisation types for Keihanshin and develop a profile for each city. We proceed to calculate diversity index using Attribute Diversity method [1].

Results show that diversity index depends on the size of the city and resolution of industry classification (99 Major groups, 530 Groups, and 1460 Industries). In order to understand the structure of Keihanshin Major Metropolitan Area and to locate hotspots of organisational diversity, we split the big cities in patch of spaces using ward definition, while we observe small cities as one patch of space. We proceed to map the diversity index for each ward and city.

## References

1. Page, Scott E. "Diversity and complexity." Princeton University Press, 2010.
2. May, Robert M. "How many species inhabit the earth." *Scientific American* 267.4 (1992): 42-48.
3. Menzel, Max-Peter, and Dirk Fornahl. "Cluster life cycles—dimensions and rationales of cluster evolution." *Industrial and corporate change* (2009).
4. Martin, Ron, and Peter Sunley. "Conceptualizing cluster evolution: beyond the life cycle model?" *Regional Studies* 45.10 (2011): 1299-1318.
5. Simmie, James, and Ron Martin. "The economic resilience of regions: towards an evolutionary approach." *Cambridge journal of regions, economy and society* 3.1 (2010): 27-43.
6. Batty, Michael. *Cities and complexity: understanding cities with cellular automata, agent-based models, and fractals*. The MIT press, 2007.
7. Batty, Michael. *The new science of cities*. Mit Press, 2013.
8. Bettencourt, Luís MA, et al. "Growth, innovation, scaling, and the pace of life in cities." *Proceedings of the national academy of sciences* 104.17 (2007): 7301-7306.
9. Youn, Hyejin, et al. "Scaling and universality in urban economic diversification." *Journal of The Royal Society Interface* 13.114 (2016): 20150937.
10. North, Douglass C. *Institutions, institutional change and economic performance*. Cambridge university press, 1990.
11. <http://www.stat.go.jp/data/kokusei/2010/users-g/word7.htm#a05>
12. <http://www.e-stat.go.jp/SG1/estat/NewListE.do?tid=000001072573>
13. [http://www.soumu.go.jp/english/dgpp\\_ss/seido/sangyo/san13-2.htm](http://www.soumu.go.jp/english/dgpp_ss/seido/sangyo/san13-2.htm)