

1-12-2016

Economic Clusters Research an Annotated Bibliography

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Economic Clusters Research an Annotated Bibliography

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RRI Resource Doc 2015-04

Date submitted: December, 7, 2015

Date revised: January 12, 2016

Key words/Codes: Economic clusters, Agglomerations, Typologies;
R11, R12, O18

Economic Clusters Research

Jing Chen *
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1 Introduction

The concept of “economic clusters” is usually referred to as geographical concentrations of firms in the same or related industries. Illustrative examples of economic clusters are medical devices clusters in Massachusetts and high-tech clusters in Silicon Valley, California. Such phenomenon have attracted interests from geographers, regional economists, urban planners and regional scientists a long time ago, yet in recent decades it has become extremely popular among policy-makers for regional development. Thus, an annotated bibliography on the state of the art of economic cluster research will be useful for current academicians and practitioners and will

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help them gain a deep and comprehensive understanding towards current economic clusters research.

This annotated bibliography enumerates the empirical, theoretical and methodological aspects of economic clusters research. In searching enormous related reports, book chapters and journal articles, we unintentionally omit some important literature thus limiting the use of the annotated bibliography is limited. It is particularly true for such a dynamic topic like economic clusters. Thus, we welcome all comments from readers to improve the quality of this bibliography and hope to continue to regularly update it.

Note that our main focus is on journal articles and might include several book chapters, but this does not undermine the importance of other publication formats. Books with an exclusive focus on economic clusters have appeared (e.g. Karlsson, 2010; Duranton et al., 2010), and economic clusters research accounts for a significant proportion in more general books on geography or regional economics. *The Oxford Handbook of Economic Geography* (Clark et al., 2000) has at least five chapters with connections to economic clusters, both directly and indirectly, including ?, and we have listed some of these book in the Appendix section with plans to include more in our future versions of the annotated bibliography. In addition to books, there are also burgeoning journals that contribute to economic clusters research in their special issues; for example, a special issue of *European Planning Study* (Benneworth et al., 2003), which focuses on the general theoretical and practical perspective of industrial clusters while another special issue of *European Planning Study* (Fornahl et al., 2015) attempts to broaden our views on cluster evolution. These special issues provide us thoughtful insights on economic clusters, and we include most of them here as separate articles. We also incorporate several interesting policy reports on economic clusters inspired by Porter's ideas on competitiveness or innovation because they can provide different views from conventional academic journals. Finally, we have not included conference presentations in this annotated bibliography because of their limited public accessibility.

In this annotated bibliography, we start by proposing several typologies for current economic cluster literature primarily based on authors' initiatives and methodologies. We also list several interesting topics that integrate economic clusters. After that, the literature is tagged with several keys to demonstrate their features. Lastly, the abstracts of the literature are included if available.

2 Typologies and Selective Examples

1. Authorial intents

This subsection introduces a general typology based on authorial intents; therefore, we classify economic cluster research into three categories: theory-related research, methodological illustrations and practical applications. Theory-centered research can build or test a single cluster theory through empiricism or pure reasoning or, alternatively, it can be an eclectic literature review on multiple cluster theories. Because we regard reviews as an approach of research enquiry, reviews have also been included in the next subsection on methods. By comparison, methodological illustrations are method-related research for measuring or identifying clusters and these methods can be based on input-output analysis, spatial analysis and the like and each has its strengths and weaknesses. As for practical applications, most of them are empirical studies and usually relate to one or more industries in study areas and they are not difficult to identify from their own titles. For example, the title “Knowledge-based clusters and urban location: the clustering of software consultancy in Oslo” (Isaksen, 2004) indicates the author’s focus is on the software industry in Oslo. In the following subsection, we list our first typology with representative examples.

(a) Theory-centered research

Glaeser, E. L., Kallal, H. D., Scheinkman, J. A., & Shleifer, A. (1992). Growth in Cities. *Journal of Political Economy*, 100(6), 1126-1152.

Renski, H. (2011). External economies of localization, urbanization and industrial diversity and new firm survival. *Papers in Regional Science*, 90(3), 473-502.

Woodward, D. (2012). Industry Location, Economic Development Incentives, and Clusters. *The Review of Regional Science*, 42(1), 5-23.

Spencer, G. M., Vinodrai, T., Gertler, M. S., & Wolfe, D. A. (2010). Do Clusters Make a Difference? Defining and Assessing their Economic Performance. *Regional Studies*, 44(6), 697-715.

(b) Methodological illustrations

Arguelles, M. (2014). A New Approach to the identification of regional

clusters: hierarchical clustering on principle components. *Applied Economics*, 46(21), 9.

Kelton, C. M. L., Pasquale, M. K., & Rebelein, R. P. (2008). Using the North American Industry Classification System (NAICS) to Identify National Industry Cluster Templates for Applied Regional Analysis. [Article]. *Regional Studies*, 42(3), 305-321.

Reid, N., Smith, B. W., & Carroll, M. C. (2008). Cluster Regions: A Social Network Perspective. *Economic Development Quarterly*, 22(4), 345-352.

Schultz, S. (1977). Approaches to Identifying Key Sectors Empirically by Means of Input-Output-Analysis. *Journal of Development Studies*, 14(1), 77-96.

Temurshoev, U. (2010). Identifying Optimal Sector Groupings with the Hypothetical Extraction Method. *Journal of Regional Science*, 50(4), 872-890.

(c) Practical applications

Asheim, B., & Isaksen, A. (1997). Location, Agglomeration and Innovation: Towards Regional Innovation Systems in Norway? *European Planning Studies*, 5(3), 299-330.

Drucker, J. (2011). Regional Industrial Structure Concentration in the United States: Trends and Implications. *Economic Geography*, 87(4), 421-452.

Isaksen, A. (2004). Knowledge-based clusters and urban location: the clustering of software consultancy in Oslo. *Urban Studies*, 41(5-6), 1157-1174.

Leibovitz, J. (2004). 'Embryonic' Knowledge-based Clusters and Cities: The Case of Biotechnology in Scotland. *Urban Studies*, 41(5/6), 23.

Morgan, J. Q. (2012). Regional clusters and jobs for inner city workers:

the case of transportation, distribution, and logistics. *Community Development*, 43(4), 492-511.

Norcliffe, G. B., & Kotseff, L. E. (1980). Local Industrial-Complexes in Ontario. *Annals of the Association of American Geographers*, 70(1), 68-79.

Sadler, D. (2004). Cluster Evolution, the Transformation of Old Industrial Regions and the Steel Industry Supply Chain in North East England. *Regional Studies*, 38(1), 55-66.

2. Methods

The methods for cluster research also capture our attention because many of them are rooted in regional economics and geography research, for example, input-output analysis, which accounts for a significant proportion of articles on detecting or measuring clusters. However, recent cluster research incorporates or imports more methods from other fields, for example, Social Network Analysis (SNA), which originates from sociology and has been used to analyze connections within clusters. Recently, numerous scholars have also adopted life cycle analysis (LCA) for clusters research so we include this literature as a separate group. Moreover, as discussed before, we regard reviews as one method in cluster research and, therefore, include several literature reviews or critical reviews as a special group here. In addition, several papers might review existing numerous methods for measuring clusters, and we have included them here. The remaining part gives us a few examples of each method.

(a) Input-output analysis

Roepke, H., Adams, D., & Wiseman, R. (1974). A new approach to the identification of industrial complexes using input-output data. *Journal of regional science*, 14(1), 15-29.

Titze, M., Brachert, M., & Kubis, A. (2011). The Identification of Regional Industrial Clusters Using Qualitative Input-Output Analysis (QIOA). *Regional Studies*, 45(1), 89-102.

Gurgul, H., & Majdosz, P. (2008). The Modified Diagonalization Method for Analysing Clusters within Economies. *Managing Global Transitions*, 6(1), 53-73.

(b) Econometrics and statistics

Mukim, M. (2012). Does Agglomeration Boost Innovation? An Econometric Evaluation. *Spatial Economic Analysis*, 7(3), 357-380.

Zhicheng, L., & Luodan, X. (2004). Regional Specialization and Dynamic Pattern of Comparative Advantage: Evidence from China's Industries 1988-2001. *Review of Urban and Regional Development Studies*, 16(3), 231-244.

(c) Review

Rocha, Hector O. "Entrepreneurship and Development: The Role of Clusters." *Small Business Economics* 23.5 (2004): 363-400.

Martin, R., & Sunley, P. (1996). Paul Krugman's Geographical Economics and Its Implications for Regional Development Theory: A Critical Assessment. *Economic Geography*, 72(3), 259-292.

Martin, R., & Sunley, P. (2003). Deconstructing clusters: chaotic concept or policy panacea? *Journal of Economic Geography*, 3(1), 5-35.

Bekele, G., & Jackson, R. (2006). *Theoretical Perspectives on Industry Clusters*: Regional Research Institute, West Virginia University.

Yu, J. B., & Jackson, R. (2011). *Regional Innovation Clusters: A Critical Review*. *Growth and change*, 42(2), 111-124.

(d) Life cycle analysis

Stough, R. R. (2015). Cluster Life-Cycles, Entrepreneurship and Regional Economic Development with a Case Study of the Korean Shipbuilding Cluster. In P. Nijkamp, A. Rose & K. Kourtit (Eds.), *Regional Science Matters* (pp. 223-254): Springer International Publishing.

(e) Spatial analysis

Jensen, P. D., Basson, L., Hellowell, E. E., & Leach, M. (2012). 'Habitat' Suitability Index Mapping for Industrial Symbiosis Planning. [Article]. *Journal of Industrial Ecology*, 16(1), 38-50.

Feser, E., Renski, H., & Goldstein, H. (2008). Clusters and Economic Development Outcomes An Analysis of the Link Between Clustering and Industry Growth. *Economic Development Quarterly*, 22(4), 324-344.

(f) Rationality

Glaeser, E. L., Kallal, H. D., Scheinkman, J. A., & Shleifer, A. (1992). Growth in Cities. *Journal of Political Economy*, 100(6), 1126-1152.

(g) Others

Reid, N., Smith, B. W., & Carroll, M. C. (2008). Cluster Regions: A Social Network Perspective. *Economic Development Quarterly*, 22(4), 345-352.

Delgado, M., Porter, M. E., & Stern, S. (2014). Defining Clusters of Related Industries. National Bureau of Economic Research Working Paper Series No. 20375

3. Definitions of clusters

The conceptual definitions of clusters have a long tradition ever since Marshall (1890) proposed agglomeration and a variety of clusters with different emphases has evolved. Recent emphasis on knowledge economy is one track of the variety and has brought new insights on clusters, which never existed before. However, a comprehensive literature on the conceptual evolution of clusters is beyond our scope. Rather, several scholars have already developed excellent frameworks to link various dimensions of clusters. See Rocha (2004), Bekele and Jackson (2006). Here we propose a typology based on Bekele and Jackson's (2006) summary and divide all clusters definitions into six aspects: agglomeration traditions, flexible specialization, New Economic Geography (NEG), innovation, competitiveness and dynamic externalities. In doing so, readers could find that most clusters literature overlaps with one or more aspects of clusters here. Below we list several representative examples of each aspect, hoping readers can

gain more understanding on this typology.

(a) Agglomeration traditions

Parr, J. B. (2002). Missing Elements in the Analysis of Agglomeration Economies. *International Regional Science Review*, 25(2), 151-168.

McCann, P. (1995). Rethinking the Economics of Location and Agglomeration. *Urban Studies*, 32(3), 563-577.

McCann, P., & Shefer, D. (2003). Location, agglomeration and infrastructure. *Papers in Regional Science*, 83(1), 177-196.

(b) Flexible specialization

Sabel, C. (1999). Flexible Specialization and the Re-emergence of Regional Economies. In P. Hirst & J. Zeitlin (Eds.), *Reversing Industrial Decline: Industrial Structure and Policies in Britain and Her Competitors* (pp. 17-70). Oxford: Burg.

Storper, M. (1989). The geographical foundations and social regulation of flexible production complexes. In J. Wolch & M. E. Dear (Eds.), *The power of geography: how territory shapes social life*. (pp. 25-43): Unwin Hyman.

(c) New Economic Geography (NEG)

Krugman, P. (1991). Increasing Returns and Economic Geography. *Journal of Political Economy*, 99(3), 483-499.

Krugman, P. (1998). What's New about the New Economic Geography? *Oxford review of economic policy*, 14(2), 7.

(d) Innovation

Asheim, B., & Isaksen, A. (2002). Regional Innovation Systems: The Integration of Local 'Sticky' and Global 'Ubiquitous' Knowledge. *Journal of Technology Transfer*, 27(1), 77-86.

Doloreux, D., & Parto, S. (2005). Regional innovation systems: Current discourse and unresolved issues. *Technology in Society*, 27(2), 133-153.

Yu, J. B., & Jackson, R. (2011). Regional Innovation Clusters: A Critical Review. *Growth and change*, 42(2), 111-124.

(e) Competitiveness

Porter, M. E. (2000). Location, Competition, and Economic Development: Local Clusters in a Global Economy. *Economic Development Quarterly*, 14(1), 15-34.

Ketchen, D. J., Snow, C. C., & Hoover, V. L. (2004). Research on Competitive Dynamics: Recent Accomplishments and Future Challenges. *Journal of Management*, 30(6), 779-804.

Rosenfeld, S. (2007). *Cluster-Based Strategies for Growing State Economies*. Washington, D. C.: National Governor Association.

(f) Dynamic externalities

Romer, P. M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy*, 94(5), 1002-1037.

Glaeser, E. L., Kallal, H. D., Scheinkman, J. A., & Shleifer, A. (1992). Growth in Cities. *Journal of Political Economy*, 100(6), 1126-1152.

(g) All above

Rocha, Hector O. "Entrepreneurship and Development: The Role of Clusters." *Small Business Economics* 23.5 (2004): 363-400.

4. Related topics

There are several topics exogenous to economic cluster research yet they generate "chemical reactions" when combining with economic clusters. Economic development is an example of one such topic that can be integrated with economic cluster strategy making it popular among policy practitioners for economic development. Thus it becomes meaningful to collect these papers in our bibliography. Likewise, we have listed several other topics with examples be-

low. However, we have encountered several issues from including these articles. It should be noted that it is almost impossible to include every topic closely related to economic clusters; it is also difficult to draw boundaries between ambiguous concepts. We hope to update this annotated bibliography regularly.

(a) Economic development

Barkley, D. L., & Henry, M. S. (1997). Rural Industrial Development: To Cluster or Not to Cluster? *Review of Agricultural Economics*, 19(2), 308-325.

Partridge, M. D. (2013). America's Job Crisis and the Role of Regional Economic Development Policy. *The Review of Regional Studies*, 43(2,3), 97-110.

Rocha, H. O. (2004). Entrepreneurship and development: The role of clusters. *Small Business Economics*, 23(5), 363-400.

Gordon, I. R., & McCann, P. (2005). Innovation, agglomeration, and regional development. *Journal of Economic Geography*, 5(5), 523-543.

Czamanski, D. Z., & Czamanski, S. (1977). Industrial complexes: Their typology structure and relation to economic development. *Papers of the Regional Science Association*, 38(1), 93-111.

(b) Entrepreneurship

Stough, R. R. (2015). Cluster Life-Cycles, Entrepreneurship and Regional Economic Development with a Case Study of the Korean Shipbuilding Cluster. In P. Nijkamp, A. Rose & K. Kourtit (Eds.), *Regional Science Matters* (pp. 223-254): Springer International Publishing.

Rocha, H. O. (2004). Entrepreneurship and development: The role of clusters. *Small Business Economics*, 23(5), 363-400.

Rocha, H. O., & Sternberg, R. (2005). Entrepreneurship: The Role of Clusters Theoretical Perspectives and Empirical Evidence from Germany. *Small Business Economics*, 24(3), 267-292.

Harrison, R. T., Cooper, S. Y., & Mason, C. M. (2004). Entrepreneurial Activity and the Dynamics of Technology-based Cluster Development: The Case of Ottawa. *Urban Studies*, 41(5/6), 26.

(c) Economic structure

Beyers, W. B. (1976). Empirical Identification of Key Sectors: Some Further Evidence. *Environment and Planning A*, 8(2), 231-236.

Hewings, G. J. D. (1974). The Effect of Aggregation on the Empirical Identification of Key Sectors in a Regional Economy: A Partial Eval of Altern Techniques. *Environment and Planning, Series A*, 6(4).

Lynch, L. K. (1979). Economic Structure and Economic Performance: Some Evidence for States. *Journal of Regional Analysis and Policy*, 09(1).

(d) Economic base

Lane, T. (1966). The Urban Base Multiplier: an Evaluation of the State of the Art. *Land Economics*, 42, 339-347.

Tiebout, C. (1956). The Urban Economic Base Reconsidered. *Land Economics*, 32, 95-99.

Ullman, E., & Dacey, M. (1960). The Minimum Requirements Approach the Urban Economic Base. *Papers and Proceedings, Regional Science Association*, 6, 175-194.

Hill, E. W., & Brennan, J. F. (2000). A methodology for identifying the drivers of industrial clusters: The foundation of regional competitive advantage. *Economic Development Quarterly*, 14(1), 65-96.

(e) Growth poles

Darwent, D. F. (1969). Growth poles and growth centers in regional planning - a review. *Environment and Planning A*, 1(1), 5-32.

Parr, J. B. (1973). Growth Poles, Regional Development, and Central Place Theory. *Papers in Regional Science*, 31(1), 173-212.

Thomas, M. D. (1975). Growth Pole Theory, Technological Change, and Regional Economic Growth. *Papers in Regional Science*, 34(1), 3-25.

(f) Industrial symbiosis

Chertow, M. R. (2007). “Uncovering” Industrial Symbiosis. *Journal of Industrial Ecology*, 11(1), 11-30.

Chertow, M. R., Ashton, W. S., & Espinosa, J. C. (2008). Industrial symbiosis in Puerto Rico: Environmentally related agglomeration economies. *Regional Studies*, 42(10), 1299-1312.

Jensen, P. D., Basson, L., Hellowell, E. E., Bailey, M. R., & Leach, M. (2011). Quantifying “geographic proximity”: Experiences from the United Kingdom’s National Industrial Symbiosis Programme. *Resources, Conservation and Recycling*, 55(7), 703-712.

Jensen, P. D., Basson, L., Hellowell, E. E., & Leach, M. (2012). ‘Habitat’ Suitability Index Mapping for Industrial Symbiosis Planning. *Journal of Industrial Ecology*, 16(1), 38-50.

(g) Regional policy

Engelstoft, S., Jensen-Butler, C., Smith, I., & Winther, L. (2006). Industrial clusters in Denmark: Theory and empirical evidence. *Papers in Regional Science*, 85(1), 73-97.

3 Alphabetical Listing with Keys

As illustrated before, our typologies in Section 2 are not mutually exclusive and one article might fall into two categories at the same time. In this regard, we list all literatures alphabetically with keys here. These keys illustrate characteristics of these articles from a multidimensional perspective: authorial intents, methods, clusters definitions and related topics. Note that the last dimension is optional because several literatures might focus on economic clusters *per se* and do not interact with other topics.

Table 1: Article keys with their representations

	Authorial intents		Methods		Cluster definitions		Related topics
A	Theory-centered research	1	Input-output analysis	a	Traditional agglomerations	I	Economic development
B	Methodological illustrations	2	Econometrics and statistics	b	Flexible specialization	II	Entrepreneurship
C	Practical applications	3	Review	c	New Economic Geography	III	Economic structure
		4	Life cycle analysis	d	Innovation	IV	Economic base
		5	Spatial analysis	e	Competitiveness	V	Growth poles
		6	Rationality	f	Dynamic externalities	VI	Industrial symbiosis
		7	Others	g	All above	VII	Regional policy

1. Arguelles, M. (2014). A New Approach to the identification of regional clusters: hierarchical clustering on principle components. *Applied Economics*, 46(21), 9. B1a
2. Arrow, K. J. (1962). The Economic Implications of Learning by Doing. *The Review of Economic Studies*, 29(3), 155-173. D6a
3. Asheim, B., & Isaksen, A. (1997). Location, Agglomeration and Innovation: Towards Regional Innovation Systems in Norway? *European Planning Studies*, 5(3), 299-330. C6ad VII
4. Barkley, D. L., & Henry, M. S. (1997). Rural Industrial Development: To Cluster or Not to Cluster? *Review of Agricultural Economics*, 19(2), 308-325. A6aI
5. Barth, J., Kraft, J., & Wiest, P. (1975). A Portfolio Theoretic Approach To Industrial Diversification And Regional Employment. *Journal of Regional Science*, 15(1), 9-15. A6bI

6. Bathelt, H., & Malmberg, A. (2004). Clusters and Knowledge: Local Buzz, Global Pipelines and The Process of Knowledge Creation. *Progress in Human Geography*, 28(1), 31-56.
A6dVII
7. Bekele, G., & Jackson, R. (2006). Theoretical Perspectives on Industry Clusters: Regional Research Institute, West Virginia University.
A3g
8. Benneworth, P., & Henry, N. (2004). Where is the value added in the cluster approach? hermeneutic theorising, economic geography and clusters as a multiperspectival approach. *Urban Studies*, 41(5-6), 1011-1023.
A6e
9. Berg, S.-H. (2015). Creative cluster evolution: The case of the film and TV industries in Seoul, South Korea. *European Planning Studies*, 23(10), 1993-2008.
C7d
10. Beyers, W. B. (1974). On Geographical Properties of Growth Center Linkage Systems. *Economic Geography*, 50(3), 203-218.
A1aV
11. Bishop, P. (2008). Diversity and employment growth in sub-regions of Great Britain. *Applied Economics Letters*, 15(14), 1105-1109(1105).
A2fI
12. Bishop, P., & Gripaos, P. (2007). Explaining Spatial Patterns of Industrial Diversity: An Analysis of Sub-regions in Great Britain. *Urban Studies*, 44(9), 1739-1757.
A7fVII
13. Brachert, M., Titze, M., & Kubis, A. (2011). Identifying industrial clusters from a multidimensional perspective: Methodical aspects with an application to Germany. *Papers in Regional Science*, 90(2), 419-439.
B1e
14. Bradshaw, T., & Blakely, E. (1999). What are " Third-Wave" State Economic Development Efforts? From Incentives to Industrial Policy. *Economic Development Quarterly*, 13(3), 229-244.
C7fI

15. Brewer, H. L., & Moomaw, R. (1985). A Note on Population Size, Industrial Diversification, and Regional Economic Instability. *Urban Studies*, 22(4), 349-354.
A2f
16. Bun, M. J. G., & Makhloufi, A. E. (2007). Dynamic Externalities, Local Industrial Structure and Economic Development: Panel Data Evidence for Morocco. *Regional Studies*, 41(6), 823-837.
C2fI
17. Capello, R. (2007). Spatial Transfer of Knowledge in High Technology Milieux: Learning versus Collective Learning Processes (Volume 33, Number 4, 1999). *Regional Studies*, 41(S1), S161 - S173.
A2d
18. Chenery, H. B., & Watanabe, T. (1958). International comparisons of the structure of production. *Econometrica*, 26(4), 487-521.
C1aIII
19. Chertow, M. R. (2007). "Uncovering" Industrial Symbiosis. *Journal of Industrial Ecology*, 11(1), 11-30.
A3aVI
20. Chiang, S.-h. (2009). The effects of industrial diversification on regional unemployment in Taiwan: is the portfolio theory applicable? *The Annals of Regional Science*, 43(4), 947-962.
A2f
21. Chinitz, B. (1961). Contrasts in Agglomeration: New York and Pittsburgh. *The American Economic Review*, 51(2), 279-289.
C7aIII
22. Clancy, P., O'Malley, E., O'Connell, L., & Van Egeraat, C. (2001). Industry clusters in Ireland: An application of Porter's model of national competitive advantage to three sectors. *European Planning Studies*, 9(1), 7-28.
C7eVII
23. Conroy, M. E. (1975). The Concept and Measurement of Regional Industrial Diversification. *Southern Economic Journal*, 41(3), 492-505.
B7a

24. Cooke, P. (2004). Life sciences clusters and regional science policy. *Urban Studies*, 41(5-6), 1113-1131.
A7fVII
25. Cumbers, A., & Mackinnon, D. (2004). Introduction: clusters in urban and regional development. *Urban Studies*, 41(5-6), 959-969.
A3eI
26. Czamanski, D. Z., & Czamanski, S. (1977). Industrial complexes: Their typology structure and relation to economic development. *Papers of the Regional Science Association*, 38(1), 93-111.
A2aI
27. Czamanski, S., & Ablas, L. A. (1979). Identification of Industrial Clusters and Complexes: A Comparison of Methods and Findings. *Urban Studies*, 16, 61-80.
B3a
28. Darwent, D. F. (1969). Growth poles and growth centers in regional planning - a review. *Environment and Planning A*, 1(1), 5-32.
A3aV
29. de Vor, F., & Groot, H. (2010). Agglomeration externalities and localized employment growth: the performance of industrial sites in Amsterdam. *Annals of Regional Science*, 44(3), 409-431.
C2a
30. Delgado, M., Porter, M. E., & Stern, S. (2014). Defining Clusters of Related Industries. National Bureau of Economic Research Working Paper Series No. 20375.
B1a
31. Deller, S. (2012). Targeting Industrial Gaps and Disconnects for Community Economic Development. Choices: *The Magazine of Food, Farm & Resource Issues*, 27(2), 14.
A7eI
32. Desmet, K., & Fafchamps, M. (2005). Changes in the spatial concentration of employment across US counties: a sectoral analysis 1972-2000. *Journal of Economic Geography*, 5(3), 261-284.
C2a

33. Desrochers, P., & Sautet, F. (2008). Entrepreneurial Policy: The Case of Regional Specialization vs. Spontaneous Industrial Diversity. *Entrepreneurship: Theory & Practice*, 32(5), 813-832.
A3fII
34. Diamond, C. A., & Simon, C. J. (1990). Industrial Specialization and the Returns to Labor. *Journal of Labor Economics*, 8(2), 175-201.
A7a
35. Dietzenbacher, E., & Lahr, M. L. (2013). Expanding Extractions. *Economic Systems Research*, 25(3), 341-360.
B1a
36. Dietzenbacher, E., & van der Linden, J. (1997). Sectoral and Spatial Linkages in the EC Production Structure *. *Journal of Regional Science*, 37(2), 235-257.
C1a
37. Dissart, J. C. (2003). Regional Economic Diversity and Regional Economic Stability: Research Results and Agenda. *International Regional Science Review*, 26(4), 423-446.
A3fI
38. Doeringer, P. B., & Terkla, D. G. (1995). Business Strategy and Cross-Industry Clusters. *Economic Development Quarterly*, 9(3), 225-237.
A3aI
39. Doloreux, D., & Parto, S. (2005). Regional innovation systems: Current discourse and unresolved issues. *Technology in Society*, 27(2), 133-153.
A3d
40. Drucker, J. (2011). Regional Industrial Structure Concentration in the United States: Trends and Implications. *Economic Geography*, 87(4), 421-452.
A3fI
41. Duranton, G., & Puga, D. (2000). Diversity and specialisation in cities: Why, where and when does it matter? *Urban Studies*, 37(3), 533-555.
A3f
42. Elsner, W. (2010). Regional service clusters and networks. Two approaches to empirical identification and development: the case of logistics in the German

port city-states Hamburg and Bremen. *International Review of Applied Economics*, 24(1), 1-33.

C2a

43. Engelstoft, S., Jensen-Butler, C., Smith, I., & Winther, L. (2006). Industrial clusters in Denmark: Theory and empirical evidence. *Papers in Regional Science*, 85(1), 73-97.

C2fVII

44. Feser, E., Renski, H., & Goldstein, H. (2008). Clusters and Economic Development Outcomes: an Analysis of the Link between Clustering and Industry Growth. *Economic Development Quarterly*, 22(4), 324-344.

C5fI

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4 Alphabetical Listing with Abstracts

1. Arguelles, M. (2014). A New Approach to the identification of regional clusters: hierarchical clustering on principle components. *Applied Economics*, 46(21), 9.
This study focuses on the identification of regional business clusters as a primary step in the design and implementation of cluster-based development strategies. A methodology that has not been used previously to identify clusters is applied to data on inter-industry linkages from the input–output table of a region in northern Spain. The first advantage of this approach, hierarchical clustering on principal components (HCPC), over the use of factorial analysis alone, is that it involves the application of objective clustering techniques to the principal components analysis results, which leads to a better cluster solution. A second advantage is derived from using a mixed algorithm for the clustering process – a combination of the Ward's classification method with the K-means algorithm – which improves the robustness of the final results.

2. Asheim, B., & Isaksen, A. (1997). Location, Agglomeration and Innovation: Towards Regional Innovation Systems in Norway? *European Planning Studies*, 5(3), 299-330.

The theoretical part of the article examines the concept of regional innovation systems against the background of modern theories of innovation. The view of interactive learning as a fundamental aspect of the innovation process provides the ground for an interactive innovation model, which is greatly facilitated by geographical proximity and territorial agglomeration. The empirical part analyzes geographical variations in innovation activity in Norwegian industry, as well as examining more thoroughly innovation performance in two industrial agglomerations in Norway. On the basis of the theoretical clarification and empirical analyses carried out, the article finally discuss how to design a regional innovation policy for three main area types in Norway.

3. Barkley, D. L., & Henry, M. S. (1997). Rural Industrial Development: To Cluster or Not to Cluster? *Review of Agricultural Economics*, 19(2), 308-325.

Current regional industrialization strategies encourage recruitment, small business development, and business retention and expansion efforts to promote industry cluster development. In this paper, we provide an overview of the advantages and disadvantages of promoting industry clusters as an industrial development alternative for rural areas. Advantages of successful cluster promotion include stronger external economies, a more conducive environment for industrial reorganization, greater networking among firms, and more efficient use of public resources. The disadvantages of an industry cluster approach are selecting industries to target, overcoming late-comer disadvantages, and providing supportive institutions. Findings indicate that an industry cluster strategy is not appropriate for many rural communities. Areas considering cluster promotion should compare costs of initiating or expanding a cluster with the potential benefits of successful cluster development.

4. Bathelt, H., & Malmberg, A. (2004). Clusters and Knowledge: Local Buzz, Global Pipelines and The Process of Knowledge Creation. *Progress in Human Geography*, 28(1), 31-56.

The paper is concerned with spatial clustering of economic activity and its relation to the spatiality of knowledge creation in interactive learning processes. It questions the view that tacit knowledge transfer is confined to local milieus whereas codified knowledge may roam the globe almost frictionlessly. The paper highlights the conditions under which both tacit and codified knowledge can be exchanged locally and

globally. A distinction is made between, on the one hand, the learning processes taking place among actors embedded in a community by just being there dubbed buzz and, on the other, the knowledge attained by investing in building channels of communication called pipelines to selected providers located outside the local milieu. It is argued that the co-existence of high levels of buzz and many pipelines may provide firms located in outward-looking and lively clusters with a string of particular advantages not available to outsiders. Finally, some policy implications, stemming from this argument, are identified.

5. Bekele, G., & Jackson, R. (2006). *Theoretical Perspectives on Industry Clusters*: Regional Research Institute, West Virginia University.

The concept of industry clustering has generated much discussion in regional economic development theory and practice in recent years. Yet it is fair to say that an accepted definition or a unified theoretical framework has failed to emerge from the discussion, as the concept often seems to enliven itself under divergent theoretical approaches, including but not limited to work on agglomeration economies, industrial districts, business networks, knowledge spillovers, and regional innovation systems. This paper provides a review of the major theoretical propositions that seek to explain the clustering of economic activity and its presumed link with regional economic development. While there is undoubtedly some overlap on some of the explanations offered by various theoretical perspectives, the concept of clustering has been used so widely in varying contexts and in a multifaceted manner that it risks creating more confusion than clarity, especially in empirical research.

6. Benneworth, P., & Henry, N. (2004). Where is the value added in the cluster approach? hermeneutic theorising, economic geography and clusters as a multiperspectival approach. *Urban Studies*, 41(5-6), 1011-1023.

Barnes has argued that (new) economic geography has moved in to a phase of theory development that he describes as 'hermeneutic' theorising. This epistemological position is characterised by an interpretive, reflexive and open-ended mode of inquiry that recognises the diversity of sources available for theorising and the subsequent conversations that will ensue from such diversity. In a recent deconstruction of the clusters concept in economic geography, and especially that version (or brand) expounded by Michael Porter, Martin and Sunley ask the question as to what added value is delivered by the concept's gatecrashing of academic and policy debates. This paper argues that clusters should not be overendowed as a singular 'brand', but recognised as an

emergent set of multiple perspectives in dialogue. From a position of hermeneutic theorising, 'clusters' have the potential to add value by allowing theoretical debate across a wide range of (overlapping and competing) perspectives whose partiality and situatedness are made explicit. The possibilities for theoretical, empirical and policy cross-fertilisation from the difficult act of holding together these threads is one potential drawn from the conversations engendered through hermeneutic theorising in economic geography. Nevertheless, this 'work in progress' must be deepened and extended if the potential of clusters is to be realised.

7. Berg, S.-H. (2015). Creative cluster evolution: The case of the film and TV industries in Seoul, South Korea. *European Planning Studies*, 23(10), 1993-2008.

Can the concept of co-evolution help to analyse and explain the dynamics of creative industries? This article tackles the question by investigating the film and TV cluster in Seoul, South Korea. The analysis of the 35 semi-structured interviews confirms the dynamics of the film and TV industries in Korea. First, Hallyu began with the export of Korean TV drama series across East Asia. The state deregulation and neo-liberal reforms during the 1990s in Korea boosted an explosion of the export of the Korean film and TV industry. Second, the core of the film and TV production is concentrated within Seoul, while dispersion of those industries occurred in Gyeong-gi province. Third, from an institutional perspective, tensions between the central government and the film and TV industry can be observed, which have been intensifying since 2006. This paper concludes that particularly co-evolution could potentially be an important concept to explain and analyse dynamics in creative industries.

8. Beyers, W. B. (1974). On Geographical Properties of Growth Center Linkage Systems. *Economic Geography*, 50(3), 203-218.

In recent years the growth center and growth pole concepts have been in vogue as explanatory concepts for processes of structural change and as conceptual foundations upon which regional development policies have been articulated. Much recent work has been done to clarify and amplify these theoretical constructs. However, we still have relatively little empirical information on the structural properties of single growth centers or systems of urban regions at a point in time or over time. This paper begins with a conceptual articulation of certain spatial and structural characteristics of growth centers. Next, some data are presented which provide empirical bases for elements of this conceptual framework. Interpretive remarks are then made with re-

spect to these data, and a number of implications for theory, policy, and research are discussed.

9. Bishop, P. (2008). Diversity and employment growth in sub-regions of Great Britain. *Applied Economics Letters*, 15(14), 1105-1109(1105).

This article presents evidence from an empirical study of employment growth across 203 sub-regions of Great Britain using OLS and maximum likelihood spatial econometric techniques. The results suggest a positive relationship between diversity and local employment growth implying that cross-sector externalities may be of considerable importance to the local growth process. The presence of spatial autocorrelation in the data suggests the existence of substantive interactions across contiguous sub-regions.

10. Bishop, P., & Gripiaios, P. (2007). Explaining Spatial Patterns of Industrial Diversity: An Analysis of Sub-regions in Great Britain. *Urban Studies*, 44(9), 1739-1757.

This paper argues that effective local policy development requires a thorough understanding of patterns of spatial diversity involving the integration of theoretical work from geography, economics and management. An empirical analysis of diversity in Great Britain for the period 1995-2002 is presented utilising entropy measures of diversity. The results of empirical models of the determinants of diversity across sub-regions examine the significance of a number of explanatory factors including regional size, level of urbanisation, industry structure, market structure and key resources. Decomposing the model into related and unrelated diversity components reveals some important differences between the two types of diversity. The paper concludes that policies fostering long-term diversity are a crucial complement to policies focusing on key sectors.

11. Brachert, M., Titze, M., & Kubis, A. (2011). Identifying industrial clusters from a multidimensional perspective: Methodical aspects with an application to Germany. *Papers in Regional Science*, 90(2), 419-439.

If regional development agencies assume the cluster concept to be an adequate framework to promote regional growth and competitiveness, it is necessary to identify industrial clusters in a comprehensive manner. Previous studies used a diversity of methods to identify the predominant concentrations of economic activity in one industrial sector in a region. This paper is based on a multidimensional approach

developed by Titze et al. With the help of the combination of concentration measures and input–output methods they were able to identify horizontal and vertical dimensions of industrial clusters. This paper aims to refine this approach by using a superior measure of spatial concentration and by integrating information about spatial interdependence of industrial cluster structures to contribute to a more adequate framework for industrial cluster identification.

12. Bradshaw, T., & Blakely, E. (1999). What are " Third-Wave" State Economic Development Efforts? From Incentives to Industrial Policy. *Economic Development Quarterly*, 13(3), 229-244.

“Third-wave” state economic development strategies have been widely acknowledged to reduce high-stakes incentives and promotions and have shifted emphasis from firm-based programs to broader regional programs. Although the change is well documented, less consensus has emerged about what has taken their place. Based on analysis of economic development programs in 16 states competing for high-technology industry, the study documented that the emerging third-wave economic development efforts—especially leadership, information, and brokering—are the essential tools by which states can establish their industrial policies. These policies are based on extensive strategic planning, public-private partnerships, foundations of technology, human resources and capital, and the development of strategic industrial clusters. The report concludes that the third wave is a state policy direction that focuses rather than replaces earlier strategies and that downplays expensive programs by mobilizing many established state programs to build strategic advantages in industry clusters that will stimulate the entire state economy.

13. Brewer, H. L., & Moomaw, R. (1985). A Note on Population Size, Industrial Diversification, and Regional Economic Instability. *Urban Studies*, 22(4), 349-354.

This study investigates the relationships among city size, economic stability, and various measures of industrial diversification. It was prompted by the conflicting findings of previous researchers concerning the above relationships. It finds different relationships between city size and various diversification measures. Therefore, part of the past disagreement may be due to the use of different definitions of diversification. The study also shows that a portfolio measure of diversification is highly significant in explaining instability. Instability can also be partly explained by measures of the equality of employment distribution. Finally, holding diversification measures con-

stant, instability decreases with larger city size.

14. Bun, M. J. G., & Makhloufi, A. E. (2007). Dynamic Externalities, Local Industrial Structure and Economic Development: Panel Data Evidence for Morocco. *Regional Studies*, 41(6), 823-837.

The impact of industrial structure on local economic development is analysed for the case of Morocco. Using annual data for six urban areas and 18 industrial sectors indicators for specialization, diversity and competition of firms within a particular region are constructed for the years 1985–1995. The effects of these and other explanatory variables on local economic activity are estimated using a dynamic panel data model with both individual and time-specific effects. The estimation results suggest significant positive specialization and diversity effects and significant negative competition effects asserting the importance of industrial structure for local economic development. The empirical evidence is robust to the measure of economic activity used in the analysis, i.e. either employment or value added. A similar analysis is conducted restricting the space to the region of Casablanca. Using data on seven districts and 18 sectors for the period 1992–1995 again significant externalities are found within this specific region.

15. Capello, R. (2007). Spatial Transfer of Knowledge in High Technology Milieux: Learning versus Collective Learning Processes (Volume 33, Number 4, 1999). *Regional Studies*, 41(S1), S161 - S173.

An analysis of the definitions provided so far in the literature shows ambiguities in the conceptualization of collective learning. A parallel analysis of the concepts of learning and collective learning is provided, and similarities and differences underlined. One of the main distinguishing features of collective learning is embedded in the element of ‘club externality’, while ‘continuity’ and ‘dynamic synergies’ are common properties of learning and collective learning. These reflections lead to some interesting empirical questions which are investigated in the empirical part of the paper. In particular, the empirical analysis addresses the questions: (1) is it true that collective learning is not the result of co-operative behaviour, but of a collective behaviour; and (2) is it true that collective learning is the way of achieving new creative resources for SMEs in local areas, and not other kinds of learning? The empirical analysis is based on three Italian high technology milieux. Descriptive and interpretative statistical methodologies are used in this part of the paper.

16. Chenery, H. B., & Watanabe, T. (1958). International comparisons of the structure of production. *Econometrica*, 26(4), 487-521.

This paper uses input-output studies to compare the structure of production in four countries: the United States, Japan, Norway, and Italy. It first analyses the nature of interdependence as revealed by the pattern of interindustry flows and the extent of similarity in each country. Differences in the cost structure and use of each type of commodity are then measured, and some conclusions are drawn as to their origin.

17. Chertow, M. R. (2007). "Uncovering" Industrial Symbiosis. *Journal of Industrial Ecology*, 11(1), 11-30.

Since 1989, efforts to understand the nature of interfirm resource sharing in the form of industrial symbiosis and to replicate in a deliberate way what was largely self-organizing in Kalundborg, Denmark have followed many paths, some with much success and some with very little. This article provides a historical view of the motivations and means for pursuing industrial symbiosis - defined to include physical exchanges of materials, energy, water, and by-products among diversified clusters of firms. It finds that uncovering existing symbioses has led to more sustainable industrial development than attempts to design and build eco-industrial parks incorporating physical exchanges. By examining 15 proposed projects brought to national and international attention by the U.S. President's Council on Sustainable Development beginning in the early 1990s, and contrasting these with another 12 projects observed to share more elements of self-organization, recommendations are offered to stimulate the identification and uncovering of already existing kernels of symbiosis. In addition, policies and practices are suggested to identify early-stage precursors of potentially larger symbioses that can be nurtured and developed further. The article concludes that environmentally and economically desirable symbiotic exchanges are all around us and now we must shift our gaze to find and foster them.

18. Chiang, S.-h. (2009). The effects of industrial diversification on regional unemployment in Taiwan: is the portfolio theory applicable? *The Annals of Regional Science*, 43(4), 947-962.

Unemployment issues, particularly recently, have been the subject of heated rhetoric in Taiwan due to the currently high unemployment rate in this small open economy. This paper investigates regional unemployment in 23 counties or cities from 1982 to 2004. Izraeli and Murphy (Ann Reg Sci 37:1-14, 2003) suggested that the Herfindahl index of industrial structure is positively correlated with the unemployment rate. In

this regard, the portfolio theory argues that industrial diversification can only reduce volatility in the regional labor market. In other words, there is a relatively higher regional unemployment rate during periods of economic prosperity and relatively lower unemployment rate during periods of economic slowdown. This view is fully confirmed from the fixed effects model using panel data and the implication is that a comprehensive industrial policy to lower both the unemployment rate and risk in regional labor markets is critical in Taiwan today.

19. Clancy, P., O'Malley, E., O'Connell, L., & Van Egeraat, C. (2001). Industry clusters in Ireland: An application of Porter's model of national competitive advantage to three sectors. *European Planning Studies*, 9(1), 7-28.

This paper examines the importance of industrial clusters, and the relevance of Porter's diamond model, in the context of the small open economy of Ireland. It analyses the experience of three relatively successful Irish indigenous sectors and it considers to what extent have clusters of related or connected industries been important in accounting for the degree of success attained in Ireland. We do not find evidence of well-developed clusters of the type described by Porter, and our study provides support for some previous critiques of Porter's model. It is concluded that Irish industrial policy does not need to be focused strongly on developing the type of industry clusters described in Porter's model. At the same time, different elements of Porter's model do prove to be relevant and we find that companies in Ireland benefit from being part of some form of wider grouping of connected or related companies and industries, although these groupings can differ from Porter's clusters in significant respects.

20. Cooke, P. (2004). Life sciences clusters and regional science policy. *Urban Studies*, 41(5-6), 1113-1131.

This paper focuses upon Life Sciences and the manner in which R&D-led clustering concentrates key resources such as basic research funding, research infrastructure and innovative businesses in a few clusters where even large pharmaceuticals firms are nowadays often learners (from academia) rather than research leaders, as in the past. Because Life Sciences and healthcare are strongly intertwined, and huge increases in healthcare R&D and general expenditure mean that some 20 per cent of GDP is accounted for by the broad sector, regions that have missed out on this future 'knowledge economy' bonanza are desperately seeking to remedy things. Examples are provided of new regional science policy instruments for redistribution of such

knowledge economy advantages that moves beyond mere innovation support.

21. Czamanski, S., & Ablas, L. A. (1979). Identification of Industrial Clusters and Complexes: A Comparison of Methods and Findings. *Urban Studies*, 16, 61-80.

The paper reviews systematically studies dealing with the identification of clusters and complexes, or of groups of industries linked by flows of goods and services, or showing significant mutual locational attraction. The studies are classified according to the method used for identification, and to their spatial focus. Some 60 types of industrial groupings have been found to exist by the various students of spatial aggregation of industries but many showed only small differences in their sectoral composition. The similarity of results despite the diversity of methods used, degree of sectoral disaggregation, and areas examined was striking. A set of tables comparing the findings is presented along with a detailed analysis of methods and results.

22. Darwent, D. F. (1969). Growth poles and growth centers in regional planning - a review. *Environment and Planning A*, 1(1), 5-32.

This paper analyses the concepts of growth pole and growth center. Immense confusion surrounds these notions at present and they are used in many different ways in the literature. The present aim is to unravel some of the confusion, and to evaluate the usefulness of the concepts both in explanatory and narrative contexts. The role of the concepts is reviewed in relation to both geographic and economic space, and to such notions as polarization, and linkage effects.

23. de Vor, F., & Groot, H. (2010). Agglomeration externalities and localized employment growth: the performance of industrial sites in Amsterdam. *Annals of Regional Science*, 44(3), 409-431.

This paper addresses the question to what extent the performance of industrial sites is affected by their local economic structure and accessibility. For this aim, we test for the existence of statistically significant relationships between agglomeration externalities (specialization, diversity, and competition), accessibility measures and the employment growth of a particular industry on a particular site. We use data on employment growth of site-industries on 68 formal industrial sites in the municipality of Amsterdam between 1998 and 2006. We show that at the site-industry level, specialization hampers growth. Furthermore, we find that industrial sites that are easily accessible from the highway grow relatively fast, as well as sites located in the

Amsterdam harbour area.

24. Delgado, M., Porter, M. E., & Stern, S. (2014). Defining Clusters of Related Industries. National Bureau of Economic Research Working Paper Series, No. 20375.

Clusters are geographic concentrations of industries related by knowledge, skills, inputs, demand, and/or other linkages. A growing body of empirical literature has shown the positive impact of clusters on regional and industry performance, including job creation, patenting, and new business formation. There is an increasing need for cluster-based data to support research, facilitate comparisons of clusters across regions, and support policymakers and practitioners in defining regional strategies. This paper develops a novel clustering algorithm that systematically generates and assesses sets of cluster definitions (i.e., groups of closely related industries). We implement the algorithm using 2009 data for U.S. industries (6-digit NAICS), and propose a new set of benchmark cluster definitions that incorporates measures of inter-industry linkages based on co-location patterns, input-output links, and similarities in labor occupations. We also illustrate the algorithm's ability to compare alternative sets of cluster definitions by evaluating our new set against existing sets in the literature. We find that our proposed set outperforms other methods in capturing a wide range of inter-industry linkages, including grouping industries within the same 3-digit NAICS.

25. Desmet, K., & Fafchamps, M. (2005). Changes in the spatial concentration of employment across US counties: a sectoral analysis 1972-2000. *Journal of Economic Geography*, 5(3), 261-284.

Using US county data, we estimate employment growth equations to analyze how the spatial distribution of jobs has changed between 1972 and 2000. We find that total employment has become increasingly concentrated. This aggregate picture hides important sectoral differences though: whereas non-service employment has been spreading out, service jobs have clustered in areas of high aggregate employment. By controlling for employment at different distances, we explicitly take into account the spatial dimension. This allows us to conclude that the spreading out of non-service jobs has benefitted counties 20 to 70 km away from large agglomerations, whereas the concentration of services has come at the expense of jobs in the surrounding 20 kilometers.

26. Desrochers, P., & Sautet, F. (2008). Entrepreneurial Policy: The Case of Regional Specialization vs. Spontaneous Industrial Diversity. *Entrepreneurship: Theory & Practice*, 32(5), 813-832.

Regional economic development policy is recognized as a key tool governments use to foster economic prosperity. Whether specialization (or diversity) of economic activities should be a regional development policy goal is often debated. We address this question in a local-diversity context, by reviewing traditional arguments in its favor, supplemented with evidence for more entrepreneurial concepts like industrial symbiosis and Jacobs externalities. We show that the context of entrepreneurship matters more to policy than the type and form of resulting industries. Policies enabling entrepreneurs to exploit opportunities in a context of spontaneously evolved industrial diversity are better facilitators of regional development.

27. Diamond, C. A., & Simon, C. J. (1990). Industrial Specialization and the Returns to Labor. *Journal of Labor Economics*, 8(2), 175-201.

Comparative advantage and the division of labor make geographic concentration of production within a nation profitable and cause many cities to be specialized in one or a few main industries. Specialized cities, however, suffer greater unemployment risk. The theory of compensating wage differentials predicts that individuals living in more specialized cities will be compensated in the form of higher wage rates. We study the effects of specialization on wages and unemployment in the United States. We find evidence of compensating wage differentials. That firms choose to locate in more specialized, higher-wage cities is indirect evidence of the gains to specialization.

28. Dietzenbacher, E., & Lahr, M. L. (2013). Expanding Extractions. *Economic Systems Research*, 25(3), 341-360.

In this paper, we generalize hypothetical extraction techniques. We suggest that the effect of certain economic phenomena can be measured by removing them from an input-output (I-O) table and by rebalancing the set of I-O accounts. The difference between the two sets of accounts yields the phenomenon's effect (or importance). We suggest that the approach can be used to measure the effect of changes in intermediate output, which are otherwise not easily rationalized within a Leontief framework. Of course, it can also be used to estimate the possible effects of the shutdown of a particular establishment or other identifiable segment of an economy. We demonstrate some properties and potential of the approach using the annual 2006 US I-O accounts.

29. Dietzenbacher, E., & van der Linden, J. (1997). Sectoral and Spatial Linkages in the EC Production Structure. *Journal of Regional Science*, 37(2), 235-257.

This paper provides a description of the interdependencies in the production structure of the European Community (EC). For the measurement of these interdependencies, a new variant of the hypothetical extraction method is introduced. In contrast to earlier adaptations of this method, our approach allows for a natural distinction of the interdependencies into backward and forward linkages. The empirical results are based on the 1980 intercountry input-output table for seven countries of the EC. The nature of this type of data (viz. country-specific sectors) enables us to focus on the sectoral as well as the spatial dimension of the interdependencies.

30. Dissart, J. C. (2003). Regional Economic Diversity and Regional Economic Stability: Research Results and Agenda. *International Regional Science Review*, 26(4), 423-446.

This article on regional economic diversity addresses several issues: (1) theoretical foundations for arguments forwarding increased economic diversity as a development goal, (2) common empirical measures of economic diversity, and (3) empirical literature on economic diversity and its effect on regional economic stability. This examination of the literature suggests four main directions in which future research on regional economic diversity could go. First, it is shown that research on the relationship between economic diversity and regional income distribution is scarce yet critical. Second, recent research suggests that applications of input-output analysis hold the potential for integrative research on issues related to economic diversity. Third, an examination of the local economic development literature indicates that regional scientists could use the concept of “diversified specializations” to classify economic regions and evaluate clusters. Fourth, the literature on ecological diversity suggests additional ways to look at the issue of economic diversity-stability.

31. Doeringer, P. B., & Terkla, D. G. (1995). Business Strategy and Cross-Industry Clusters. *Economic Development Quarterly*, 9(3), 225-237.

Although industry clusters are becoming the focus of state economic development policies, most states continue to define clusters in ad hoc ways, often focusing only on clusters of firms in single industries. Such policies run the risk of wasting development resources by neglecting important linkages among firms that cut across industries. Exploiting the dynamic nature of the competitive advantages associated with the clustering process requires an understanding of strategic business decisions made at

the firm level. This article draws on previous field research to identify several external economies that contribute to the clustering of firms across industries-collaboration economies, transfers of knowledge, local specialized labor pools, and relationships with nonbusiness institutions. The article concludes by suggesting specific development policies that can identify and use these external economies to attract industry clusters.

32. Doloreux, D., & Parto, S. (2005). Regional innovation systems: Current discourse and unresolved issues. *Technology in Society*, 27(2), 133-153.

In recent years, the concept of regional innovation systems has evolved into a widely used analytical framework that generates the empirical foundation for innovation policy making. Yet, the approaches that utilize this framework remain ambiguous on such key issues as the territorial dimension of innovation, i.e. the region, and the apparently important role played by ‘institutions’ or the institutional context in the emergence and sustenance of regional innovation systems. This paper reviews and summarizes important ideas and arguments in the recent theorizing on regional innovation systems. It also examines such issues as (a) definition confusion and empirical validation; (b) the territorial aspect of regional innovation systems; and (c) the role of institutions.

33. Drucker, J. (2011). Regional Industrial Structure Concentration in the United States: Trends and Implications. *Economic Geography*, 87(4), 421-452.

In a seminal article, Chinitz (1961) considered the effects of industry size, structure, and economic diversification on the performance of firms and regional economies. His inquiry suggested a related but conceptually distinct issue: how does the extent to which a regional industry or industrial sector is concentrated in a small number of firms affect the local performance of that industry? The question has not been addressed systematically in empirical research other than case studies, principally because accurately measuring regional concentration requires firm-level information. This exploratory study uses confidential plant-level data to gauge concentration in manufacturing industries at the regional scale across the continental United States, to explore changes over time in geographic patterns of concentration, and to investigate associations between regional industrial structure concentration and changes in employment. The implications for understanding the impacts of regional industrial structure on economic development processes are discussed.

34. Duranton, G., & Puga, D. (2000). Diversity and specialisation in cities: Why, where and when does it matter? *Urban Studies*, 37(3), 533-555.

Why are some cities specialised and others diversified? What are the advantages and disadvantages of urban specialisation and diversity? To what extent do the structure of cities and the activities of firms and people in them change over time? How does the sectoral composition of cities influence their evolution? To answer these and related questions, we first distil some key stylised facts from the empirical literature on cities and the composition of their activities. We then turn to a review of different theories looking at such issues, and study the extent to which these theories contribute to the understanding of the empirical regularities.

35. Elsner, W. (2010). Regional service clusters and networks. Two approaches to empirical identification and development: the case of logistics in the German port city-states Hamburg and Bremen. *International Review of Applied Economics*, 24(1), 1-33.

This article discusses two approaches to the identification and measurement of regional clusters and its networks in "cross-sectoral" services which are not available through official industrial statistics. The first approach is a "secondary-statistical" one consisting of a firm-based blending of two separate official statistical datasets, industrial and functional (that is, the professions practised within firms). Thus, a service "cross-sector" is identified across manufacturing and service industries. In the matrices resulting, weights are attached in an expert survey to the numbers of employees to aggregate the "real" logistics cross-sector. This is applied to the two German port city-states, Hamburg and Bremen. The second approach is "primary-statistical", based on a small firms survey which generated data on functional supplier relations (the cluster) and on project-based strategic cooperations (the networks within that cluster). This follows a two-stage model of emerging clusters and its networks. This dataset is combined with the firms' affiliations to branches, firm size, age and sales growth classes, in order to connect information with the industry statistics. Also, the net densities and centrality structures are calculated. The combined information provides indications of the relevance of the service cluster and its networks as factors of future regional development. The latter approach is applied to the State of Bremen only. Two results appear to be transferable beyond the German cases: first, the two approaches improve the knowledge about policy-relevant "cross-sectors", clusters and networks; and second our knowledge about service, namely logistics, clusters and networks (for which port regions are prominent nodes) is improved. Finally, some implications for regional cluster strategies are discussed.

36. Engelstoft, S., Jensen-Butler, C., Smith, I., & Winther, L. (2006). Industrial clusters in Denmark: Theory and empirical evidence. *Papers in Regional Science*, 85(1), 73-97.

This article tests the hypothesis that two industrial clusters exist in Jutland, Denmark. The article first discusses the theory of agglomeration economies in relation to industrial clusters, particularly with respect to spillover effects as a positive technological externality. Different methodological approaches to the identification of these effects are examined. In the light of this discussion, the article investigates the performance of two Danish industrial clusters that are frequently identified and examined in the literature. Little evidence is found to support claims concerning the existence and performance of the two clusters, raising wider doubts about cluster-based industrial policy.

37. Feser, E., Renski, H., & Goldstein, H. (2008). Clusters and Economic Development Outcomes: an Analysis of the Link between Clustering and Industry Growth. *Economic Development Quarterly*, 22(4), 324-344.

Much of the existing empirical research on industry clusters focuses on the detection of clusters for economic development purposes. There are comparatively few studies that relate identified clusters to business and industry growth or that trace changes in designated clusters over time. This article seeks to better understand the link between industry clustering and regional economic outcomes. In a comprehensive study sponsored by the Appalachian Regional Commission and released in 2002, the authors identified technology-based clusters within and on the border of the Appalachian region. The Appalachian technology clusters constituted subregional concentrations of related industrial, research and development, and university-based strengths as of the middle to late 1990s. In this article, the authors investigate how the industries in the identified clusters fared over the subsequent several years in terms of employment and new business formation. They find evidence that clustering is associated with new business formation for selected technology industries but not with employment growth.

38. Feser, E. J., & Bergman, E. M. (2000). National industry cluster templates: A framework for applied regional cluster analysis. *Regional Studies*, 34(1), 1-19. A growing number of cities, states and regions in Europe, North America and elsewhere are designing development strategies around strategic clusters of industries. In many

cases, a lack of data on local and interregional industrial linkages, shared business institutions, channels of technology and knowledge transfer, and other dimensions of the cluster concept means that relatively simple measures (location quotients, industry size) are often used to initially detect clusters in subnational regions. In this paper, we suggest a means of using available information on national interindustry linkages to identify potential clusters in subnational areas. Specifically, we derive a set of 23 US manufacturing clusters and employ them as templates in an illustrative analysis of the manufacturing sector in a single US state. The template clusters help detect gaps and specializations in extended product chains and therefore constitute a useful first step in more comprehensive examinations of local cluster patterns.

39. Fornahl, D., & Guenther, C. (2010). Persistence and Change of Regional Industrial Activities: The Impact of Diversification in the German Machine Tool Industry. *European Planning Studies*, 18(12), 1911-1936.

The paper investigates the stability and change of regional economic activities in the long run. As the unit of analysis, we selected the machine tool industry in West Germany for the years 1953–2002. We spot a strong variance in the activities between different regions. These differences are relatively stable over time, and the regional activities are rather path-dependent. Nevertheless, the paper also identifies changes in the level of activities. As the main driving factors for these developments, we examine the effect of changing regional degrees of diversification over time. We find that those regions which generally broaden their scope of activities have a higher likelihood to grow than regions which are specializing. Furthermore, diversification into totally new technological and product fields is only beneficial under specific circumstances based on technological and market developments. Hence, in most cases, a broad diversification is superior to one focusing on new state-of-the-art technological fields.

40. Fu, S., Dong, X., & Chai, G. (2010). Industry specialization, diversification, churning, and unemployment in Chinese cities. *China Economic Review*, 21(4), 508-520.

This paper studies how industry specialization, diversification, and churning affect unemployment rates in Chinese cities. Using a city level panel data set from 1997 to 2006, we find that in contrast to the evidence from developed countries, industry diversity is positively and significantly associated with unemployment rates, possibly due to the high degree of industry churning during the sample period. We also

find that the specialization of construction industry and wholesale and retail trade industry can significantly decrease unemployment rate, but specializing in finance industry increases unemployment rate. Urban growth, market maturity measured by the proportion of private sector employment, and human capital can decrease unemployment rate. The effect of industry structure on unemployment instability is also discussed.

41. Gancarczyk, M. (2015). Enterprise-and industry-level drivers of cluster evolution and their outcomes for clusters from developed and less-developed countries. *European Planning Studies*, 23(10), 1932-1952.

This article aims to discuss the international strategies of lead companies and the modularization of production networks as drivers of cluster evolution in developed countries, and to formulate propositions regarding the impact of those drivers on relationships with clusters in less-developed countries, based on literature reviews. Three streams of literature were combined, namely, that on (1) the role of lead companies in the development of industrial agglomerations, (2) the life cycle and evolution of clusters, founded on evolutionary economic geography and (3) the possibilities of upgrading by suppliers from less-developed countries. The article contributes by proposing a conceptual model that covers internal cluster evolution and the evolution of inter-cluster relationships globally to inform business and policy choices. Moreover, the research gap is addressed to study how the cluster dynamics in developed countries affect the upgrading opportunities for clusters in less-developed countries. The theoretical input consists in using the constructs of knowledge exploration and exploitation as mechanisms that determine cluster development prospects. Cluster development perspectives are shown as determined by those clusters' capacity to jointly pursue knowledge exploration and exploitation activities.

42. Gilchrist, D. A., & St. Louis, L. V. (2001). An Equilibrium Analysis of the Diversification of Regional Agriculture. *Environment and Planning A*, 33(1), 11-26.

Regional industrial diversification policies seek to achieve a more stable economy through a 'better' balance among the industries currently active in the region and through the development of new industries. In this paper, we provide a consistent model of regional industrial diversification that explicitly incorporates the regional industrial structure and sources of economic instability, and facilitates the inclusion of data on technologies not currently observable in the region. We illustrate it with

an application to a current policy concern: the diversification of agriculture and food processing in Saskatchewan.

43. Glaeser, E. L., Kallal, H. D., Scheinkman, J. A., & Shleifer, A. (1992). Growth in Cities. *Journal of Political Economy*, 100(6), 1126-1152.

Recent theories of economic growth, including Romer (1986), Porter (1989) and Jacobs (1969), have stressed the role of technological spillovers in generating growth. Because such knowledge spillovers are particularly effective in cities, where communication between people is more extensive, data on the growth of industries in different cities allows us to test some of these theories. Using a new data set on the growth of large industries in 170 U.S. cities between 1956 and 1987, we find that local competition and urban variety, but not regional specialization, encourage employment growth in industries. The evidence suggests that important knowledge spillovers might be between, rather than within industries, consistent with the theories of Jacobs (1969).

44. Gordon, I. R., & McCann, P. (2005). Innovation, agglomeration, and regional development. *Journal of Economic Geography*, 5(5), 523-543. This paper provides a critical examination of the widely disseminated view that innovation in all or most activities is favoured by certain common characteristics in the local 'milieu', involving a cluster of many small firms benefiting from flexible inter-firm alliances, supported by mutual information exchanges of both an informal and formal nature. The general applicability of this model, and the localness of crucial linkages, is questioned initially on the basis of a review of different hypotheses about the geography of innovation. Moreover, examination of new survey evidence from a large number of firms in the London conurbation suggests that the importance of specifically local informal information spillovers for successful innovation is very much more limited than has been suggested, as are the supposed advantages of firm smallness.

45. Grupp, H., & Mogege, M. E. (2004). Indicators for National Science and Technology Policy: How Robust are Composite Indicators? *Research Policy*, 33(9), 1373-1384.

This article addresses a set of issues that were central to Keith Pavitt's research, that is, the construction and use of tools to measure national innovative performance and to design national policies relating to innovation. It presents an overview of the development of science and technology (S&T) indicators and their use in national policy making and provides evidence of the vulnerability of composite S&T indicators to

manipulation. A brief history of the development of S&T indicators begins with the role of the United States followed by their worldwide diffusion with particular emphasis on Europe. Newer developments towards composite indicators, benchmarking and scoreboarding are discussed. To investigate the robustness of innovation scoreboards empirically, a sensitivity analysis of one selected case is presented. It is shown that composite scores and country rank positions can vary considerably depending on the selection process. Thus, the use of scoreboards leaves room for manipulation in the policymaking system. Further research is needed on alternative methods of calculation to prevent their misuse and abuse.

46. Gurgul, H., & Majdosz, P. (2008). The Modified Diagonalization Method for Analysing Clusters within Economies. *Managing Global Transitions*, 6(1), 53-73.

In this paper a modification of the diagonalization method, originally put forward by Hoen (2002), is suggested which is aimed at uncovering clusters of sectors within an input-output framework. Our interest in this subject was largely motivated by the fact that the preceding method appears to be incapable of providing us with an accurate representation of the real cluster structure that exists in an economy, as a consequence of missing the position at which a given inter-sectoral flow stands in the hierarchy of the purchasing industry and the supplying industry. By making a distinction between an internal and external relationship, when it comes up at the moment of deciding whether each pair of industries is categorized as belonging to the same or different clusters, the proposed alternative, which will be referred to as the modified diagonalization method, seems to be superior to its predecessor. Such a conclusion is supported by the results of comparison of the relative performance of the rival methods (i.e. the original and modified diagonalization method) which show, among other things, that the average value of flows between industries grouped into clusters is higher in the case of the proposed method.

47. Hackbart, M. M., & Anderson, D. A. (1975). On Measuring Economic Diversification. *Land Economics*, 51(4), 374-378.

Regional business cycle theorists have debated the thesis that as a region becomes more economically diversified, the economy of the region becomes less responsive to fluctuations in extraregional economic activity [Nourse 1968, p. 176]. Based upon this thesis, much regional growth policy discussion revolves around the development of strategies designed to induce greater economic diversification. This is particularly

true in rural areas which specialize in primary products and have realized frequent fluctuations in economic activity. This paper is not intended to enter into the debate regarding the pros and cons of a diversification development strategy. Rather, it has a more modest objective which is to consider a method for measuring economic diversification. For purpose of illustration, the measure is then applied to state and regional economic diversification in Wyoming.

48. Hallencreutz, D., & Lundquist, P. (2003). Spatial clustering and the potential for policy practice: Experiences from cluster-building processes in Sweden. *European Planning Studies*, 11(5), 533-547.

In the last decade, there has been an increased interest in the cluster approach as a regional development tool. Moreover, it has been increasingly acknowledged that TIME (Telekom, IT, Media and Entertainment) industries have come to be of great importance to the economy. This article sets out to examine the use of the cluster approach as an analytical tool as well as a proactive policy tool and an approach based on negotiated and collaborative efforts to manufacture and utilize 'visions' of regional development futures to good effect. Consequently, the intent is not to judge the economic performance of firms in the three case clusters but rather to demonstrate problems and prospects in regional TIME industry cluster-building.

49. Harris, Thomas R., Chang K. Seung, and Rangesan Narayanan. "Targeting Economic Diversification: An Application of Target Motad Procedures." *The Review of Regional Science* 31.2 (2001): 197-215.

With rapid change in national, state, and local economies, many economic development agencies and practitioners have attempted to diversify state and local economies to minimize the variability of state and local economic activity. However, minimizing variability may reduce expected economic growth, which may run contrary to the desires of state and/ or local officials. This paper applies Minimization of Total Absolute Deviations (MOT AD) and Target Minimization of Total Absolute Deviations (Target MOTAD) for economic diversification plans. MOTAD procedures; which are a linear programming algorithm for portfolio analysis, minimize positive and negative deviations from mean growth rates. Target MOT AD, unlike portfolio variance and MOTAD procedures, minimizes only negative deviations from targeted economic growth rates. Economic diversification plans derived from MOT AD and Target MOT AD procedures are compared and contrasted.

50. Harrison, B. (1992). Industrial Districts - Old Wine in New Bottles. *Regional Studies*, 26(5), 469-483.

According to the theory of industrial districts, a new wave of economic growth is being led in a number of regions in Europe, North America and East Asia by spatially concentrated networks of mostly small and medium sized enterprises, often using flexible production technology and characterized by extensive local interfirm linkages. Does this amount to a re-emergence of the dominance of what urban and regional economists call ‘agglomeration economies’ over the well-known pressures on business to spatially disperse its operations? Neoclassical economic theorizing from Marshall to Perroux provides one perspective on the contemporary industrial district phenomenon. Another is afforded by Granovetter’s more recent elaboration of the ideas of ‘embedding’, ‘under-’ and ‘over-socialization’. Confronting each of these theoretical approaches with the other leads me to conclude that the industrial district prototypes involve more than simply a reassertion of agglomeration economies. Nor can the industrial districts be satisfactorily explained by Williamsonian concepts about the internalization (within the firm or within the region) of transaction costs.

While emphasizing the mutual/shared benefits to individual firms/plants/production units of co-location (such as access to a larger and more specialized local labour pool, and the realization of scale economies in infrastructure provision), both agglomeration theory and transaction cost economics nevertheless follow standard neoclassical logic in conceptualizing local economies as collections of atomistic competitors, formally aware of one another solely through the intermediation of price/cost signals, embodied in contracts of varying completeness. By contrast, contemporary industrial district theory emphasizes the contextual significance of communal non-economic institutions and the importance of relations of ‘trust’ in reproducing sustained collaboration among economic actors within the districts. Whatever their empirical importance to economic growth and development, their ethical/distributive implications, and to whatever extent they prove over time to be stable institutions, industrial districts are definitely more than ‘old wine in new bottles’.

51. Harrison, R. T., Cooper, S. Y., & Mason, C. M. (2004). Entrepreneurial Activity and the Dynamics of Technology-based Cluster Development: The Case of Ottawa. *Urban Studies*, 41(5/6), 1045-1071.

Relatively little attention has been given to the role of entrepreneurial dynamics in the origin and growth of technology clusters. To the extent that the role of entrepreneurship is considered at all, the emphasis is on the locally embedded nature of the process and on the characteristics of the incubator organisation—the immediate

past employer of the entrepreneur—and its role as the source of entrepreneurial know how and the technological ideas upon which the new business is based. This paper argues that this is too simplistic a view. There are two strands to the argument. First, entrepreneurs are not 'local'. Rather, they are attracted to technology clusters, or incipient clusters, by a range of magnet organisations (talent attractors). Secondly, entrepreneurs draw on their experience and the networks established during their entire career, working in different organisations and places, and not just on those resulting from their immediate past employment. These processes are illustrated with reference to the technology-based cluster in the Ottawa region of Canada. The paper concludes that the entrepreneurial dynamics underlying cluster development are best understood through an analysis of the role of magnet organisations and the development of a 'talent pool' in supporting the localisation of economic activity in particular spaces over time.

52. He, C., Wei, Y. D., & Xie, X. (2008). Globalization, Institutional Change, and Industrial Location: Economic Transition and Industrial Concentration in China. *Regional Studies*, 42(7), 923-945.

Marketization and globalization in China may stimulate industrial clustering, while decentralization may lead to protectionism and industrial dispersion. This paper examines industrial distribution in China during 1980–2003. While Chinese industries have been increasingly concentrated geographically, the study found significant temporal and sectoral variations in concentration. Least protected industries have become increasingly concentrated, and most globalized industries are clustered in the coastal region. The analysis indicates that globalization and internal scale economies have contributed to geographical concentration, while protectionism has hindered industrial specialization. While industries are more likely to locate based on comparative advantages, external scale economies have not fostered industrial concentration.

53. Hewings, G. J. D. (1974). The Effect of Aggregation on the Empirical Identification of Key Sectors in a Regional Economy: A Partial Evaluation of Alternative Techniques. *Environment and Planning A*, 6(4).

The open nature of regional economies requires that careful attention be paid to the magnitude of intraregional interindustry relationships when decisions about the allocation of investment are made. A number of methods have been proposed for the purposes of identifying key sectors in a national economy using input - output models. This research reports on attempts to identify key sectors at the regional level

using the 1963 and 1967 Washington State input - output models at various levels of aggregation. The lack of consistency of identification of key sectors by the various methods suggests that these approaches have limited utility at the regional level.

54. Hill, E. W., & Brennan, J. F. (2000). A methodology for identifying the drivers of industrial clusters: The foundation of regional competitive advantage. *Economic Development Quarterly*, 14(1), 65-96.

This article presents a theoretically based method for identifying the clusters of industries in which a region has a competitive advantage. The method combines cluster analysis with discriminant analysis, using variables derived from economic base theory and measures of productivity, to identify the industries in which a region has its greatest competitive advantage. These industries are called driver industries because they drive the region's economy. The driver industries are linked to supplier and customer industries with information from a region-specific input-output model to form industry clusters. After introductory comments about cluster-based approaches to understanding regional economies, the authors present an overview of their method and the variables used. They then apply this method to the Cleveland-Akron Consolidated Metropolitan Statistical Area.

55. Hu, Z., Zheng, J., & Wang, J. (2011). Impact of Industrial Linkages on Firm Performance in Development Zones: The Case of Jiangsu Province. *Chinese Economy*, 44(2), 78-105.

This article investigates the effect of industrial linkages on firm performance in Chinese development zones, using Jiangsu province as a case study. An ordered response model based on the dependent variable being ordinal was developed. The empirical results reveal an insignificant relationship between industrial linkages and firm performance. Our interpretation of this finding mainly lies with the global and domestic challenges that have changed the way participating firms operate and organize in the development zones of Jiangsu. When many other economic factors take precedence over industrial linkages in driving superior firm performance, firms feel it less important to get closer to their suppliers or customers, therefore weakening the impact of industrial linkages. Although this article primarily focuses on development zones in Jiangsu province, the findings and discussion will provide insights for other development zones in China that may be, reviewing their development strategies because most of them have similar development problems.

56. Isaksen, A. (2004). Knowledge-based clusters and urban location: the clustering of software consultancy in Oslo. *Urban Studies*, 41(5-6), 1157-1174.

The paper examines the reasons for the clustering of Norwegian software firms in Oslo. The analysis focuses on how software firms perform individual activities and how they interact with other players in performing the activities. The clustering of software firms in Oslo rests first of all on the need for very close interaction between consulting companies and important customers, and among software consulting companies themselves. The fact is that consulting activity is project-based and involves lots of coalition-building and face-to-face contact which is facilitated when players co-locate. Demand-side factors are important in explaining the concentration of software companies in Oslo, while important supply-side factors are the possibilities of meeting persons in other software firms and the gathering of information in formal and informal settings.

57. Izraeli, O., & Murphy, K. J. (2003). The effect of industrial diversity on state unemployment rate and per capita income. *Annals of Regional Science*, 37(1), 1-14.

This paper examines the effect of industrial diversification on state unemployment and per capita income. Diversification may provide a form of employment insurance to states during cyclic downturns. Thus well diversified states should experience lower unemployment. To the extent that specialization confers economic benefit, however, more concentrated states should have higher per capita personal income. We use two sets of panel data for seventeen states spanning a thirty-eight year period to test these hypotheses. When state heterogeneity is controlled for properly, our results show that a strong link exists between industrial diversity and reduced unemployment. The evidence that per capita personal income is associated with industrial concentration is much weaker.

58. Jackson, R. W. (1984). An evaluation of alternative measures of regional industrial diversification. *Regional studies*, 18(2), 103-112.

Industrial diversity continues to be a goal in regional planning and policy contexts. While the concept has strong intuitive appeal, its definition and measurement suffer from problematic theoretical and statistical issues. An empirical analysis of the relationship between employment stability and four measures of diversity for multicounty regions in the State of Illinois is presented. The results indicate that the nature of the stability/diversity relationship is swamped by the measurement and estimation

techniques employed. Current diversity measures are deemed inadequate for regional policy makers. The ensuing discussion highlights a number of conceptual and statistical issues which must be addressed by practitioners.

59. Jackson, R. W., Hewings, G. J. D., & Sonis, M. (1989). Decomposition approaches to the identification of change in regional economies. *Economic Geography*, 65(3), 216-231.

This paper reports the results of ongoing research into the measurement of economic structure and structural change using two approaches to the decomposition of regional economic structure. Because of its wealth of detail on the structure of interindustry interactions, the input-output table provides the basis for analysis. Two methods are applied to the Washington input-output tables for 1963, 1967, and 1972 to uncover changes in structure that occurred over the period. The first approach applies Theil's entropy decomposition methods to a nine-fold partition of forty-nine industrial sectors grouped according to primary, secondary, and tertiary categories. The second method, Sonis' extreme tendency decomposition, hierarchically orders transactions in a regional economy. Each method can provide important insights into regional economic structure. Although the results of the test application of the decomposition methods are not definitive, they reveal aspects of structural change that otherwise could not have been noted. Future applications should reveal the utility of the two approaches in a broader context. The issues raised throughout these applications accentuate the heuristic value of this area of research.

60. Jensen, P. D., Basson, L., Hellowell, E. E., Bailey, M. R., & Leach, M. (2011). Quantifying 'geographic proximity': Experiences from the United Kingdom's National Industrial Symbiosis Programme. *Resources, Conservation and Recycling*, 55(7), 703-712.

Geographic proximity is said to be a key characteristic of the resource reuse and recycling practice known as industrial symbiosis. To date, however, proximity of symbiotic companies has remained an abstract characteristic. By conducting a statistical analysis of synergies facilitated by the United Kingdom's National Industrial Symbiosis Programme during their first five years of operation, this article attempts to quantify geographic proximity and in the process provide practitioners with an insight into the movement trends of different waste streams. Among other it was found that the median distance materials travelled within a symbiotic relationship is 20.4 miles. It is argued that quantitative information of this form is of practical value

for the effective deployment of industrial symbiosis practitioners and wider resource efficiency planning. The results and discussion presented within this article are specific to industrial symbiosis opportunities facilitated within the United Kingdom; the methodology and assessment of resource movement influences are, however, expected to be relevant to all countries in which industrial activity is similarly mature and diversified.

61. Jensen, P. D., Basson, L., Hellowell, E. E., & Leach, M. (2012). 'Habitat' Suitability Index Mapping for Industrial Symbiosis Planning. *Journal of Industrial Ecology*, 16(1), 38-50.

By 'working with the willing', the National Industrial Symbiosis Programme (NISP) has successfully facilitated industrial symbiosis throughout the United Kingdom and, in the process, delivered significant economic and environmental benefits for both Programme members and the country as a whole. One of the keys to NISP's success is that, unlike failed attempts to plan and construct eco-industrial systems from scratch, the Programme works largely with existing companies who have already settled in, developed, and successfully operate within a given locale. This article argues that existing and mature industrial systems provide the best prospects for identifying opportunities for, and ultimately facilitating, industrial symbiosis. Due to levels of diversification and operational fundamental niches that, in the fullness of time, develop within all industrial systems, industrially mature areas are deemed to be industrial symbiosis 'conducive environments'. Building on the conservation biology concept of a habitat suitability index, the article presents a methodology for comparing a potential site for eco-industrial development to a known baseline industrial 'habitat' already identified as being highly conducive to industrial symbiosis. The suitability index methodology is further developed and applied to a multi-criteria evaluation geographic information system to produce a 'habitat' suitability map that allows practitioners to quickly identify potential industrial symbiosis hotspots (the methodology is illustrated for England). The article concludes by providing options for the development of symbiosis suitability indices and how they can be used to support the facilitation of industrial symbiosis and regional resource efficiency.

62. Johansson, B., & Quigley, J. M. (2003). Agglomeration and networks in spatial economies. *Papers in Regional Science*, 83(1), 165-176.

We consider the parallel developments in the economics of agglomeration and the economics of networks. We explore the complementarities between the productivity

benefits of agglomeration and those of network linkages, arguing that networks of actors dispersed over space may substitute for agglomerations of actors at a single point.

63. Karlsen, A. (2005). The dynamics of regional specialization and cluster formation: dividing trajectories of maritime industries in two Norwegian regions. *Entrepreneurship & Regional Development*, 17(5), 313-338.

The theoretical starting point of this paper is the academic debate on regional specialization, agglomeration and industrial clusters. The paper offers further insights into the industrial dynamics within regional contexts by combining two approaches: (1) an historical study of industrial agency focusing on entrepreneurship, diversification and specialization; (2) a study of the relations within contemporary industrial systems important for industrial upgrading. Methodical triangulation has provided longitudinal studies. Particular attention is paid to path dependence as well as entrepreneurial capacity in order to explain why the industrial trajectories of matching regions divide. As the paper discusses continuity and change, a more dynamic perspective on path dependency is introduced. The past is not just regarded as a constraint, but as heritage as well. The dynamics leading to cluster formation and upgrading as well as industrial fragmentation are investigated in detail. The developments of shipyards and related maritime industries of the two Norwegian regions compared are characterized by static continuity and dynamic continuity, respectively.

64. Kelton, C. M. L., Pasquale, M. K., & Rebelein, R. P. (2008). Using the North American Industry Classification System (NAICS) to Identify National Industry Cluster Templates for Applied Regional Analysis. *Regional Studies*, 42(3), 305-321.

Whereas Feser and Bergman developed the concept of national-level cluster templates and introduced a systematic methodology to identify such clusters, their technique and results were based on the now-outdated Standard Industrial Classification (SIC) system for categorizing industries. The paper updates their results using the 1997 Benchmark Input–Output Accounts for the USA, which are based on the North American Industry Classification System (NAICS). Since the treatment of services is much more comprehensive under NAICS, the paper expands on the Feser and Bergman manufacturing templates to identify more comprehensive mixed-sector templates. The cluster templates determined can provide a foundation for regional economic development strategies.

65. Ketchen, D. J., Snow, C. C., & Hoover, V. L. (2004). Research on Competitive Dynamics: Recent Accomplishments and Future Challenges. *Journal of Management*, 30(6), 779-804.

Understanding the nature and consequences of the competitive dynamics among firms is a key objective of the strategic management field. We review recent developments in six research streams relevant to competitive dynamics: competitive action and response, first-mover advantage, co-opetition, multipoint competition, strategic groups, and regional clusters. As a first step toward filling gaps in knowledge identified in our review, we provide suggestions for future inquiry within each research stream. We also describe opportunities for conceptual integration across the streams that could significantly advance the understanding of competitive dynamics.

66. Koo, J. (2005). Knowledge-based industry clusters: Evidenced by geographical patterns of patents in manufacturing. *Urban Studies*, 42(9), 1487-1505.

Since Porter introduced his diamond model of industry clusters, clusters have become a mantra in economic development literature for many academics and professionals alike. There is, however, little consensus on how to define and identify industry clusters. Firms may co-locate looking for high quality suppliers, a large pool of skilled workers or local knowledge stock. Therefore, characteristics of industry clusters may differ according to the type of 'glue' that creates formal and informal ties and binds firms together. Most previous cluster studies investigated the first two factors, but knowledge still remains unexplored. This study presents an exploratory analysis of US industry clusters from the perspective of knowledge and its flows using a common data reduction technique and patent data. The study also examines geographical patterns of knowledge-based clusters in the US in terms of employment and patents. The analysis shows that the distributions of employment and patents are significantly associated. However, the degree of association varies cluster by cluster.

67. Koo, J. (2007). Determinants of Localized Technology Spillovers: Role of Regional and Industrial Attributes. *Regional Studies*, 41(7), 995-1011.

Based on a simultaneous framework, the study investigates regional and industrial attributes that influence the geographical localization of technology spillovers. It provides substantial evidence that agglomeration, industry structure, small establishment, and local competition play important roles in the localization of technology spillovers. The influence of industry structure on localized technology spillovers, however, varies by industry. Diversity and specialization are important, but the

magnitude of their importance decreases as the knowledge intensity of an industry increases. In particular, for more knowledge-intensive industries, it is the presence of a group of industries sharing similar knowledge bases that stimulates technology spillovers in metro areas.

68. Krugman, P. (1991). Increasing Returns and Economic Geography. *Journal of Political Economy*, 99(3), 483-499.

This paper develops a two-region, two-sector general equilibrium model of location. The location of agricultural production is fixed, but monopolistically competitive manufacturing firms choose their location to maximize profits. If transportation costs are high, returns to scale weak, and the share of spending on manufactured goods low, the incentive to produce close to the market leads to an equal division of manufacturing between the regions. With lower transport costs, stronger scale economies, or a higher manufacturing share, circular causation sets in: the more manufacturing is located in one region, the larger that region's share of demand, and this provides an incentive to locate still more manufacturing there. Thus when the parameters of the economy lie even slightly on one side of a critical "phase boundary", all manufacturing production ends up concentrated in only one region.

69. Krugman, P. (1998). What's New about the New Economic Geography? *Oxford Review of Economic Policy*, 14(2), 7-17.

Since 1990 a new genre of research, often described as the 'new economic geography', has emerged. It differs from traditional work in economic geography mainly in adopting a modelling strategy that exploits the same technical tricks that have played such a large role in the 'new trade' and 'new growth' theories; these modelling tricks, while they preclude any claims of generality, do allow the construction of models that - unlike most traditional spatial analysis - are fully general-equilibrium and clearly derive aggregate behaviour from individual maximization. The new work is highly suggestive, particularly in indicating how historical accident can shape economic geography, and how gradual changes in underlying parameters can produce discontinuous change in spatial structure. It also serves the important purpose of placing geographical analysis squarely in the economic mainstream.

70. Lall, S. V., & Chakravorty, S. (2005). Industrial Location and Spatial Inequality: Theory and Evidence from India. *Review of Development Economics*, 9(1), 47-68.

The authors argue that spatial inequality of industry location is a primary cause of spatial income inequality in developing nations. Their study focuses on understanding the process of spatial industrial variation: identifying the spatial factors that have cost implications for firms, and the factors that influence the location decisions of new industrial units. The analysis has two parts. First the authors examine the contribution of economic geography factors to the cost structure of firms in eight industry sectors and show that local industrial diversity is the one factor with significant and substantial cost-reducing effects. They then show that new private sector industrial investments in India are biased toward existing industrial and coastal districts, whereas state industrial investments (in deep decline after structural reforms) are far less biased toward such districts. The authors conclude that structural reforms lead to increased spatial inequality in industrialization, and therefore, income.

71. Lande, P. S. (1994). Regional Industrial Structure and Economic Growth and Instability. *Journal of Regional Science*, 34(3), 343-360.

National and regional employment patterns are subject to growth-instability trade-offs. This paper applies the portfolio selection model to detailed employment data for the U.S. economy and selected states. Empirical results indicate that growth-instability trade-offs exist in a form not previously understood. The paper also identifies growth and stabilization potential by identifying stabilizing sectors.

72. Learmonth, D., Munro, A., & Swales, J. K. (2003). Multi-sectoral cluster modelling: The evaluation of Scottish enterprise cluster policy. *European Planning Studies*, 11(5), 567-584.

This article describes the ex post cluster evaluation framework being developed by Scottish Enterprise. It focuses primarily on the macro level evaluation and, in particular, on the use of multi-sectoral modelling techniques to identify the effects of cluster policy on key indicators such as gross domestic product (GDP), unemployment and competitiveness. The Scottish Input-Output (I-O) table is a key element in this approach. The strengths and weaknesses of I-O data, both as a basis for this analysis and as a means of identifying important intra-cluster linkages are explored. Further, the article describes methods for visual representation of the linkages identified using such a method.

73. Leibovitz, J. (2004). 'Embryonic' Knowledge-based Clusters and Cities: The Case of Biotechnology in Scotland. *Urban Studies*, 41(5/6), 1133-1155.

The cluster concept has been promoted in recent years as a panacea for economic development, both locally and nationally. One source of theoretical and empirical ambiguity in the concept is related to the spatial processes underpinning cluster development, and to the relationship between cities and clusters in particular. This paper examines the case of the biotechnology cluster in Scottish cities, with particular reference to Glasgow and Edinburgh. The promotion of a biotechnology cluster has become a priority for Scotland's economic development strategy because of its potential role in the knowledge-driven economy. The paper examines the major locational dynamics affecting biotechnology in Scotland and interrogates the balance between the major forces driving the development of biotechnology firms in their urban location. It concludes that the importance of cities to cluster growth lies mainly in the size and diversity of their labour markets, in the presence of key research institutions and public-sector anchors and in the provision of infrastructure and services. At the same time, historical legacies, national and international regulatory frameworks and external linkages play an important role in shaping the development trajectory of Scotland's biotechnology cluster.

74. Lenzen, M. (2003). Environmentally important paths, linkages and key sectors in the Australian economy. *Structural Change and Economic Dynamics*, 14(1), 1-34.

Traditional work on linkages, fields of influence and structural paths is extended to include environmental and natural resource parameters. The theoretical basis for the generalisation of all three concepts is presented. Recent empirical data on energy consumption, land disturbance, water use and emissions of greenhouse gases NO_x and SO₂, is used to reveal the interdependence of industries in the Australian economy in terms of environmental pressure and resource depletion. Grazing industries, electricity generation, metals, chemicals, textiles, meat and dairy products, wholesale and retail, non-residential building and hospitality exhibit above-average linkages. A considerable part of environmental and resource pressure is exerted along paths for providing exports.

75. Li, J., & Geng, S. (2012). Industrial clusters, shared resources and firm performance. *Entrepreneurship & Regional Development*, 24(5/6), 357-381.

Drawing upon the resource-based view, this paper examines the relationships between various types of cluster-based shared resources and cluster firm performance in the Chinese context. Using survey data from a sample of 294 small- and medium-sized

enterprises from industrial clusters in Zhejiang Province, we find evidence to support arguments that cluster firms in comparison with non-cluster firms demonstrate significantly higher perceptions of shared resources and that shared resources exclusively available to cluster firms link to better cluster firm performance. The findings of our research suggest that cluster policy needs to attend to the constituents of shared resources in order to enhance firm performance.

76. Livi, C., & Jeannerat, H. (2015). Born to be Sold: Start-ups as Products and New Territorial Life Cycles of Industrialization. *European Planning Studies*, 23(10), 1953-1974.

Territorial innovation models and policy practices traditionally tend to associate the emergence, resurgence and growth of start-ups with the development of local industries, either as industrial pioneers or as innovative spinoffs embedded in a regional production system. This approach is in line with a “life cycle” pattern of innovation and of industrialization marked by sequential waves of growth and decline, by technological renewal and by sectorial transitions. In a knowledge and financial economy characterized by combinatorial knowledge dynamics, by even shorter project-based innovations and by global financial and production networks, this approach is called into question. Through the case of Swiss medical technologies (Medtech), this paper highlights how local medtech start-ups’ evolution is shaped, from its early phase on, by the corporate venture strategies of multinational companies. While the economic potential of start-ups was traditionally perceived in a longer run, they seem to be more often “born to be sold” today. New research avenues and policy issues are finally derived from this particular case to address territorial innovation and competitiveness in the future.

77. Loviscek, A. L. (1982). Industrial Cluster-Analysis - Backward or Forward Linkages. *Annals of Regional Science*, 16(3), 36-47.

Regional and urban analysts have applied cluster analysis to input-output data to gain information about interindustry structure. This information has been used in studies of industrial location, changes in interindustry structure, and agglomeration economies. An important distinction which is underemphasized, however, is the difference between demand-constrained and supply-constrained interindustry relationships. Industrial clusters generated from demand-constrained (backward) linkages are likely to be quite different from those generated from supply-constrained (forward) linkages. This paper explores this difference using demand-constrained,

supply-constrained, and weighted (combination of demand- and supply-constrained linkages) Leontief inverses. The results suggest strongly the need for generating clusters based on both types of linkages in order to obtain an accurate picture of interindustry structure.

78. Malizia, E. E., & Ke, S. (1993). The Influence Of Economic Diversity On Unemployment And Stability. *Journal of Regional Science*, 33(2), 221-235.

For many years, regional scientists, economists, and geographers have been unable to clarify the influence of economic diversity on unemployment and instability in regional economies of the United States, the United Kingdom, and Canada. This article presents plausible theory, proper units of analysis, valid measures, and more inclusive models of the diversity-stability relationship. The findings are generalizable because the sample includes most metropolitan areas in the U.S. The empirical analysis estimates the influence of diversity, employment concentrated in unstable industries, population size, growth rate, and control variables on unemployment and employment instability during the 1972–88 period. The results indicate that metropolitan areas which are more diverse experience lower unemployment rates and less instability than areas which are less diverse.

79. Martin, H., & Coenen, L. (2015). Institutional context and cluster emergence: The biogas industry in Southern Sweden. *European Planning Studies*, 24(3), 2009-2027.

According to some scholars in evolutionary economic geography (EEG), the role of (territory-specific) institutions is relatively small for explaining where a new industry emerges and grows as firms develop routines in a path-dependent and idiosyncratic manner. This article evaluates this assertion by studying the evolution of the biogas industry in the region of Scania in Southern Sweden. The biogas is predominantly used as a fuel in the regional transport system and is considered as a crucial means to achieve environmental goals in the region. Recently, regional public policy has been actively promoting this biogas industry, aiming for cluster development. Drawing on literature from EEG and technological innovation systems, this article seeks to unpack the evolutionary process that has led to the emergence of this industry. In particular, it studies to what extent territory-specific institutions have been crucial in that respect. The analysis is case-based, drawing predominantly on in-depth interviews with key stakeholders and firms in the industry. By doing so, the paper seeks to make a contribution to our understanding of cluster development, considering the

interplay between technology, industry dynamics and institutions.

80. Martin, R., & Sunley, P. (1996). Paul Krugman's Geographical Economics and Its Implications for Regional Development Theory: A Critical Assessment. *Economic Geography*, 72(3), 259-292.

Economists, it seems, are discovering geography. Over the past decade, a "new trade theory" and "new economics of competitive advantage" have emerged which, among other things, assign a key importance to the role that the internal geography of a nation may play in determining the trading performance of that nation's industries. Paul Krugman's work, in particular, has been very influential in promoting this view. According to Krugman, in a world of imperfect competition, international trade is driven as much by increasing returns and external economies as by comparative advantage. Furthermore, these external economies are more likely to be realized at the local and regional scale than at the national or international level. To understand trade, therefore, Krugman argues that it is necessary to understand the processes leading to the local and regional concentration of production. To this end he draws on a range of geographical ideas, from Marshallian agglomeration economies, through traditional location theory, to notions of cumulative causation and regional specialization. Our purpose in this paper is to provide a critical assessment of Krugman's "geographical economics" and its implications for contemporary economic geography. His work raises some significant issues for regional development theory in general and the new industrial geography in particular. But at the same time his theory also has significant limitations. We argue that while an exchange of ideas between his theory and recent work in industrial geography would be mutually beneficial, both approaches are limited by their treatment of technological externalities and the legacy of orthodox neoclassical economics.

81. Martin, R., & Sunley, P. (2003). Deconstructing clusters: chaotic concept or policy panacea? *Journal of Economic Geography*, 3(1), 5-35.

Over the past decade, there has been growing interest in local industrial agglomeration and specialization, not only by economic geographers but also by economists and by policy-makers. Of the many ideas and concepts to have emerged from this new-found focus, Michael Porter's work on 'clusters' has proved by far the most influential. His 'cluster theory' has become the standard concept in the field, and policy-makers the world over have seized upon Porter's cluster model as a tool for promoting national, regional, and local competitiveness, innovation and growth. But

the mere popularity of a construct is by no means a guarantee of its profundity. Seductive though the cluster concept is, there is much about it that is problematic, and the rush to employ 'cluster ideas' has run ahead of many fundamental conceptual, theoretical and empirical questions. Our aim is to deconstruct the cluster concept in order to reveal and highlight these issues. Our concerns relate to the definition of the cluster concept, its theorization, its empirics, the claims made for its benefits and advantages, and its use in policy-making. Whilst we do not wish to debunk the cluster idea outright, we do argue for a much more cautious and circumspect use of the notion, especially within a policy context: the cluster concept should carry a public policy health warning.

82. Maskell, P., & Lorenzen, M. (2004). The cluster as market organisation. *Urban Studies*, 41(5-6), 991-1009.

This paper views clusters as a specific spatial configuration of the economy suitable for the creation, transfer and usage of knowledge. It investigates how the modern exchange-economy becomes organised as rent-seeking firms build network relations to create knowledge and obtain resource efficiency while keeping transaction costs at bay. It moves on to consider the cluster as an emerging, self-organising, attractive alternative for interfirm relationships in cases where (global) network formation becomes a less feasible strategy. The paper empirically investigates two industries where clustering for different reasons might be considered superior to other forms of market organisation.

83. McCann, P. (1995). Rethinking the Economics of Location and Agglomeration. *Urban Studies*, 32(3), 563-577.

Fundamental problems exist with the classical characterisation of agglomeration economies, since such definitions do not reflect the various cost issues on which firms may wish to economise. A lack of understanding of the relationship between the notions of market hierarchies and locational behaviour leads to confusion not only in applied economic interpretation, but more fundamentally in the construction of theoretical location models. In particular, neo-classical location theory can be shown to be crucially flawed as a basis for spatial analysis. This paper therefore attempts to provide an alternative definition of the various types of agglomeration economies such that the various strands of economic theory might be used in a more rigorous manner in the discussion of spatial increasing returns.

84. McCann, P. (2006). On the supply-side determinants of regional growth. *Construction Management & Economics*, 24(7), 681-693.

The major developments in thought regarding regional economic growth and development are traced over the last two decades. The supply-side micro-foundations of regional growth have come under scrutiny in a manner which has previously not been evident. In particular, an examination of the elements of industrial clustering, regional industrial structure, and place characteristics which may promote innovation, have become a central focus of modern regional growth analysis. The micro-foundations of these arguments are analysed, and the links between innovation and clustering explored within a transactions-costs framework. This allows us to point to areas in which our understanding has grown over recent years, and to identify further areas of analysis which are required.

85. McCann, P., & Shefer, D. (2003). Location, agglomeration and infrastructure. *Papers in Regional Science*, 83(1), 177-196.

In this article we discuss the relationships between transportation infrastructure, firm location, agglomeration and regional development. We will argue that the spatial transaction costs faced by modern firms have changed over recent decades, and that this has changed the ways in which transportation infrastructure contributes to form location behaviour and regional economic development. Therefore, in order to analyse these issues, it is necessary to consider the spatial transaction costs faced by modern firms and to investigate the conditions under which reductions in these costs due to infrastructure improvements will allow firms to move. These complex relationships are seen to be mediated via different geography-firm-organisation structures and consideration of these is essential for any realistic evaluation of the role of transportation infrastructure.

86. Mizuno, K., Mizutani, F., & Nakayama, N. (2006). Industrial diversity and metropolitan unemployment rate. *The Annals of Regional Science*, 40(1), 157-172.

The main goal of our study is to evaluate whether or not industrial diversity helps reduce the frictional unemployment rate of a metropolitan area. We used a data set from Japan's 118 metropolitan areas. Our analysis shows that although industrial diversity might reduce the frictional unemployment rate of a metropolitan area, its effect is not statistically significant in our model. Second, the location quotient for industries, considered to be related to types of unemployment other than frictional,

has a stronger impact on unemployment rate than industrial diversity does. In particular, it was found that the location quotients for both the manufacturing and the construction industry have a negative relationship with the unemployment rate of a metropolitan area. We also discovered that the higher the percentage of graduates of post-secondary institutions there are in a metropolitan area, the lower its unemployment rate will be.

87. Morgan, J. Q. (2012). Regional clusters and jobs for inner city workers: the case of transportation, distribution, and logistics. *Community Development*, 43(4), 492-511.

This article examines the usefulness of a particular type of industry cluster – transportation, distribution, and logistics (TDL) – for linking less-skilled workers in the inner city to job opportunities that exist in a larger regional economy. The findings are based on case studies of cluster-based development in three metropolitan regions: Indianapolis, IN, Louisville, KY, and Memphis, TN. These regions are known for their high concentrations of TDL firms. The TDL cluster was selected as the focus for this study because it potentially offers substantial employment opportunities for low-skilled workers at the entry-level and might be able to accommodate those that are hard to employ. The article discusses what these regions have done to leverage TDL to provide jobs for inner city workers and identifies some of the factors that either enhance or constrain the cluster’s usefulness for that purpose.

88. Mukim, M. (2012). Does Agglomeration Boost Innovation? An Econometric Evaluation. *Spatial Economic Analysis*, 7(3), 357-380.

Innovation is crucial to regional economic competitiveness and to productivity growth. A salient feature of the Indian economy is the geographic clustering of both economic activity and innovation. In this paper, I study to what extent the spatial distribution of economic activity drives innovation. I analyse patent applications between 1999 and 2007 across districts in India and my econometric findings suggest that R&D expenditures, industrial diversity and the distribution of human capital endowments can have an important effect on generating innovation. The estimates are robust to omitted variables bias, to different model specifications and to the type of applicant.

89. Mikkala, K. (2004). Agglomeration economies in the Finnish manufacturing sector. *Applied Economics*, 36(21), 2419-2427.

Regional concentration of population and economic activity is a common phenomenon both in Finland and the other most developed countries, which refers to the existence of agglomeration economies. Two types of economies are usually recognized to be important: specialization (Marshall externalities) and diversity (Jacobs externalities) economies. The former refer to the geographical concentration of a specific industry and the latter to the industrial diversity of the local system. This study examines the relationship between agglomeration economies and regional productivity in the manufacturing sector in Finland. A distinction is made between the effects of urbanization and localization economies. The production function method is applied to the manufacturing sub-sectors in the 83 NUTS 4-level regions in 1995 and 1999. The results support the regional specialization more than diversification even if some differences can be seen between the manufacturing sub-sectors.

90. Mulligan, G. F., & Schmidt, C. (2005). A Note on Localization and Specialization. *Growth & Change*, 36(4), 565-576.

Analysts and policy makers frequently measure industrial localization and regional specialization. However, they rarely examine the nation's full array of industries or regions. So local indices, appropriate for specific industries or selected regions, are typically estimated. But in some instances global indices would be preferable in order to assess the wider features of the entire space-economy. This article constructs global indices from the local indices already used in assessing localization and specialization. Global localization and global specialization are shown to be identical when all local indices use the dissimilarity logic. Two-digit standard industry codes manufacturing data, taken from the U.S. during 1958–1995, are used to illustrate the results. The values of these global coefficients, like their local constituents, are shown to vary with geographic scale. The discussion addresses spatial distributions (evenness) but not geographic arrangements (clustering).

91. Murray, E. P. (1999). Cluster-based development strategies: Lessons from the plastics industry in north central Massachusetts. *Economic Development Quarterly*, 13(3), 266-280.

Much written attention has been given to the rise of technologically dynamic industrial regions. These regions are characterized by the spatial clustering of small firms into flexible production networks that have the ability to quickly respond to changing global markets. Case studies generally have been limited to high-tech manufacturing clusters, even though mature industrial regions have demonstrated similar traits.

A case study of the plastics industry in north central Massachusetts gained a formative perspective on a mature industrial cluster and an appreciable understanding of the correlation between the industry's spatial concentration and organization of production. The case study findings have clear implications for regional economic development. Planning for industrial development will need to rely more on "grounded" contextual analysis, give greater focus to local capacity building, and devise more formalized networks of institutional support.

92. Neffke, F., Henning, M., & Boschma, R. (2011). How Do Regions Diversify over Time? Industry Relatedness and the Development of New Growth Paths in Regions. *Economic Geography*, 87(3), 237-265.

The question of how new regional growth paths emerge has been raised by many leading economic geographers. From an evolutionary perspective, there are strong reasons to believe that regions are most likely to branch into industries that are technologically related to the preexisting industries in the regions. Using a new indicator of technological relatedness between manufacturing industries, we analyzed the economic evolution of 70 Swedish regions from 1969 to 2002 with detailed plant-level data. Our analyses show that the long-term evolution of the economic landscape in Sweden is subject to strong path dependencies. Industries that were technologically related to the preexisting industries in a region had a higher probability of entering that region than did industries that were technologically unrelated to the region's preexisting industries. These industries had a higher probability of exiting that region. Moreover, the industrial profiles of Swedish regions showed a high degree of technological cohesion. Despite substantial structural change, this cohesion was persistent over time. Our methodology also proved useful when we focused on the economic evolution of one particular region. Our analysis indicates that the Linköping region increased its industrial cohesion over 30 years because of the entry of industries that were closely related to its regional portfolio and the exit of industries that were technologically peripheral. In summary, we found systematic evidence that the rise and fall of industries is strongly conditioned by industrial relatedness at the regional level.

93. Newlands, D. (2003). Competition and Cooperation in Industrial Clusters: The Implications for Public Policy. *European Planning Studies*, 11(5), 521-532.

Alfred Marshall believed that, while the benefits of clusters resulted from cooperation between firms, competition was an important driving force. In contrast, contemporary theories of clusters place most emphasis on collective action. This article seeks

to distinguish processes of competition and cooperation within clusters, through a critical reading of different theoretical approaches. This distinction has important implications for the scale and nature of public policy. An emphasis on competitive processes implies a more macro-economic role for public agencies in seeking to raise investment in innovation while the fostering of cooperation implies measures to support decentralized public-private research collaborations.

94. Norcliffe, G. B., & Kotseff, L. E. (1980). Local Industrial-Complexes in Ontario. *Annals of the Association of American Geographers*, 70(1), 68-79.

Local industrial complexes have recognizable patterns of location. They are groups of industries which have production interrelationships and which are geographically associated at the urban scale. Their existence is attributed to agglomeration economies in general and those gained by juxtaposing linked industries in particular. A case study of the Province of Ontario, Canada, shows that local industrial complexes are most prevalent in large towns and in towns located at the center of the provincial space economy. Certain types of complex are absent from peripheral regions and from smaller towns. These geographical regularities suggest that complexes should be used very selectively as a policy instrument to develop depressed areas.

95. O'Donoghue, D. (1999). The relationship between diversification and growth: some evidence from the British urban system 1978 to 1991. *International Journal of Urban and Regional Research*, 23(3), 549-566.

Employment diversification has traditionally been seen as beneficial for local economies. Most of the previous research on diversity and diversification has been conducted in the North American context where a positive association between diversification and growth has been observed. This paper explores the diversification process for 150 Job-Centre Travel-to-Work Areas (JCTWAs) which make up what is called here the British urban system. Regression analysis is used to highlight that there is no evidence for the trends previously found in North America, in fact the opposite appears to be true. From 1978 to 1991 deindustrialization was seen to be a contributing factor to diversification and the associated decline of employment. Those centres which displayed growth from 1978 to 1991 were apparently those places which became more sectorally specialized, albeit from a relatively diverse initial position.

96. O'Donoghue, D. A. N., & Townshend, I. (2005). Diversification, specialization, convergence and divergence of sectoral employment structures in the British

urban system, 1991-2001. *Regional Studies*, 39(5), 585-601.

This paper examines the changing employment structure of 150 travel-to-work areas (TTWAs) in Britain from 1991 to 2001. Using data from the Annual Employment Survey and the Annual Business Inquiry, 20 sectors of economic activity are defined and investigated. The analysis clearly identifies the continued shift away from primary and manufacturing employment as increasingly more people are employed in the so-called service-based and informational economy. Clear spatial patterns emerge associated with employment change across sectors and these are also explored. Given the changing pattern of employment and the spatial characteristics of each sector, new patterns of specialization and diversification are expected to emerge. The analysis identifies these patterns and places their explanation into the context of changing technology and skills. It becomes clear that at an urban system level there is a weak convergent trend across urban system. However, when the largest places are examined separately, it is apparent that the largest urban areas in Britain appear to have employment structures that are divergent from the rest of the urban system. This highlights the changing roles played by larger cities in Britain and has obvious implications for local labour markets and policy in those places.

97. O'hUallachain, B. O. (1984). The Identification of Industrial-Complexes. *Annals of the Association of American Geographers*, 74(3), 420-436.

The objective of this paper is to reassess the value of principal components analysis as a technique for identifying regional industrial complexes, taking explicit account of the different kinds of relationships that are possible among industries. The empirical evidence offered here tends to confirm recent criticism of principal components analysis as a means for detecting vertical relationships, but it demonstrates the usefulness of this method with complementary relationships. In this study two principal components analyses were performed on a single regional input-output table for the state of Washington. Although initial inspection of component loadings did not always disclose industrial complexes, it was found that tracing the network of interactions, as indicated by the profiles of purchases and sales, revealed many critical links in a variety of industrial subsystems. A comparison of the results of this study with other analyses of Washington data suggests that the technique used here provides more information on the industrial structure than did the multivariate analysis conducted by Czamanski (1971) and the graph-theoretic approach of Campbell (1974). Also explored here are the links between principal components analysis and the general issue of aggregation in input-output analysis.

98. Padmore, T., & Gibson, H. (1998). Modelling systems of innovation: II. A framework for industrial cluster analysis in regions. *Research Policy*, 26(6), 625-641.

We present a model for describing and assessing the strengths and weaknesses of industrial clusters from a regional perspective. The model is a symmetrical framework combining dimensions of the Porter competitiveness ‘diamond’ with an equally explicit accounting of infrastructure and markets, important in a regional framework. Measures are organized under headings of Groundings, Enterprises and Markets, which gives the model its name: GEM. The characteristics of regional innovation systems are contained in the overall competitiveness framework. The GEM determinants are organized in a way that facilitates subjective scoring and allows a mapping onto a more conventional production-system structure. We have developed scoring criteria for each of the six determinants that relate to overall competitiveness of the cluster and have established an heuristic competitiveness function (GEM Assay) that captures the substitution/complementarity relationships among the determinants. We present some examples of the use of the framework and the assay in assessing regional clusters and policies for strengthening them.

99. Parr, J. B. (2002). Missing Elements in the Analysis of Agglomeration Economies. *International Regional Science Review*, 25(2), 151-168.

The concept of agglomeration economies continues to represent an important aspect of locational analysis and regional economics. However, the term agglomeration economies is frequently used as a jargon or shorthand, leading to the obvious dangers of misspecification and misinterpretation. Treating agglomeration economies as cost savings to the individual firm, it is argued that these may be seen as particular forms of internal economies and also as particular forms of external economies. It is further argued that each group of economies (internal or external) can be examined in terms of the dimensions of scale, scope, and complexity. Such an approach forms the basis for a classification of agglomeration economies. This classification, which contains an important parallelism of form, is then used to consider a neglected aspect of the analysis—namely, the coexistence of different types of agglomeration economy.

100. Partridge, M. D. (2013). America’s Job Crisis and the Role of Regional Economic Development Policy. *The Review of Regional Studies*, 43(2,3), 97-110.

2013 Fellows Address: The biggest issue facing the United States in recent years is the poor economy, most dramatically illustrated by the lack of job creation. The

lack of jobs is not a phenomenon that began with the 2007-2009 Great Recession and sluggish recovery, but has been a feature of the entire early 21st Century. There are federal fiscal and monetary policy responses that would help lift job creation. Yet, in lieu of federal efforts, state and local officials have aggressively promoted job creation by a host of schemes including cluster-based policies and tax incentives and subsidies. While data is hard to come by, anecdotal evidence suggests that state and local efforts to lure businesses with generous inducements have escalated to a feverous pitch. The distinctive feature of such efforts is that governments are increasingly more inclined to offer these inducements to individual firms or industries as opposed to general business tax cuts for all firms, in which the former is a case where officials are “picking winners,” while in the latter, markets and relative comparative advantage determine business location. State and local officials justify such “picking winners” as a way to fend off competition in neighboring jurisdictions and as a way to make their region more competitive. In this paper I examine whether these efforts have helped matters.

101. Partridge, M. D., & Olfert, M. R. (2011). The Winners’ Choice: Sustainable Economic Strategies for Successful 21st-Century Regions. *Applied Economic Perspectives and Policy*, 33(2), 143-178.

Throughout the second half of the 20th century, urbanization, new technologies, rapid labor-saving productivity growth in primary industries, and improved highways combined to create large-scale regions which are now functionally integrated at the rural-urban level. These forces have raised the stakes for regions in their pursuit of economic development and growth, making successful regional policy even more important. Changes to the governance structures consistent with the increased interdependence within broad rural-urban regions will improve the region’s competitiveness; adopting fad-based approaches and policies aimed at “picking winners” will be less fruitful. Going forward, continuing globalization and environmental sustainability have the potential to reshape fundamentally the relative attractiveness of regions.

102. Phelps, N. A. (2004). Clusters, dispersion and the spaces in between: for an economic geography of the banal. *Urban Studies*, 41(5-6), 971-989.

While the geographical clustering of economic activities remains an enduring feature of the industrial landscape and a perennial source of theoretical and empirical interest, the geographical scale at which external economies and agglomerative effects are now claimed to operate is on the increase. Such changes in the spatial form and potential causes of agglomeration over time pose important questions. How should we analyse

changes in the spatial extent of external economies and agglomerative effects? Ought we to pay more attention to the sorts of banal economic spaces thrown up as part of increasingly diffuse forms of agglomeration? To answer the first of these questions, it is noted how economists and geographers have explained agglomerations often in the rather singular and invariant categories of pecuniary and Marshallian externalities respectively. This paper considers the relevance of neo-Marshallian analysis and the concept of 'borrowed size'—as variations on these classical principles—to an analysis of the mobility and fixity of external economies and contemporary diffuse forms of agglomeration. Whilst reflecting important changes in the spatial extent of industrial agglomerations, they are insufficiently sensitive to the interaction of different types of external economies with different scale-dependencies. In answering the second question, it is noted that part of the value of analysing the economic basis of largely overlooked 'banal' intermediate places lies in what they may reveal about the functioning of diffuse forms of agglomeration.

103. Porter, M. (2003). The Economic Performance of Regions. *Regional studies*, 37(6-7), 545-546.

This paper examines the basic facts about the regional economic performance, the composition of regional economies and the role of clusters in the US economy over period of 1990 to 2000. The performance of regional economies varies markedly in terms of wage, wage growth, employment growth and patenting rate. Based on the distribution of economic activity across geography, we classify US industries into traded, local and resource-dependent. Traded industries account for only about one-third of employment but register much higher wages, far higher rates of innovation and influence local wages. We delineate clusters of traded industries using co-location patterns across US regions. The mix of clusters differs markedly across regions. The performance of regional economies is strongly influenced by the strength of local clusters and the vitality and plurality of innovation. Regional wage differences are dominated by the relative performance of the region in the clusters in which it has positions, with the particular mix of clusters secondary. A series of regional policy implications emerge from the findings.

104. Porter, M. E. (2000). Location, Competition, and Economic Development: Local Clusters in a Global Economy. *Economic Development Quarterly*, 14(1), 15-34.

Economic geography during an era of global competition involves a paradox. It is

widely recognized that changes in technology and competition have diminished many of the traditional roles of location. Yet clusters, or geographic concentrations of interconnected companies, are a striking feature of virtually every national, regional, state, and even metropolitan economy, especially in more advanced nations. The prevalence of clusters reveals important insights about the microeconomics of competition and the role of location in competitive advantage. Even as old reasons for clustering have diminished in importance with globalization, new influences of clusters on competition have taken on growing importance in an increasingly complex, knowledge-based, and dynamic economy. Clusters represent a new way of thinking about national, state, and local economies, and they necessitate new roles for companies, government, and other institutions in enhancing competitiveness.

105. Power, D., & Lundmark, M. (2004). Working through knowledge pools: labour market dynamics, the transference of knowledge and ideas, and industrial clusters. *Urban Studies*, 41(5-6), 1025-1044.

This article explores a prominent cluster in the Swedish capital Stockholm and its surrounding region: the ICT (information and communications technology) cluster. In particular, the article focuses on the issue of the extent to which labour market and labour mobility are the most likely channels for local and extra-local sources of knowledge and ideas. Thus the article positions itself against a growing literature that focuses on rather diffuse and vague notions that knowledge and innovation reside 'in the air' or in the 'buzz' of urban life. Instead, the underlying hypothesis is that in many sectors and industries such things as a cosmopolitan street life or accidental face-to-face encounters play relatively little part in the flow of experiences, knowledge and innovation. Rather, it is in the workplace that these exchanges and flows are located and it is thus through labour mobility that intracluster exchanges occur. The article tests such ideas in relation to the ICT cluster and the Stockholm region using a uniquely detailed time-series data-set. The data-set used is based on official taxation and civil registration records and contains complete details on everything from education to career changes to income levels for every individual resident in Sweden. The detail of the individual records and the complete nature of the data-set mean that it offers a unique possibility to examine, on a large scale, the micro dynamics of individuals in the labour market and in clusters. The data are used to examine whether there have existed over time higher levels of labour market mobility in clusters as opposed to the rest of the urban economy. The article empirically verifies the idea that labour market mobility is significantly higher in the cluster than in the rest of the urban economy.

106. Reid, N., Smith, B. W., & Carroll, M. C. (2008). Cluster Regions: A Social Network Perspective. *Economic Development Quarterly*, 22(4), 345-352.

One ongoing debate in the cluster literature concerns methods of delineating the spatial footprint of industrial clusters. Some cluster regions correspond to political boundaries. Researchers have also used qualitative methods and various quantitative techniques including location quotients and spatial statistics to demarcate clusters. A common weakness of most approaches is that researchers do not incorporate collaboration among cluster participants. In this article, the use of social network analysis (SNA) is illustrated. SNA is not proposed as an alternative to other methods of cluster mapping. Instead, the authors suggest that it complements other methods. Because SNA focuses on networks of social or interpersonal relationships, it provides a dimension that techniques focusing on economic relationships do not capture. One advantage of SNA is that it enables the identification of critical nonindustry actors, such as politicians, economic development practitioners, and academic researchers.

107. Renski, H. (2011). External economies of localization, urbanization and industrial diversity and new firm survival. *Papers in Regional Science*, 90(3), 473-502.

This paper explores how external economies influence the survival of new, independent business establishments in the continental United States using a confidential, establishment-level dataset on new firm longevity. Industrial localization has a positive influence on new businesses survival in five of the eight industries examined. Regional industrial diversity is also beneficial to new firms in five study industries, particularly those that are more knowledge-intensive. The benefits of city size are limited to two study industries, with diseconomies of size found for an additional three.

108. Rocha, H. O. (2004). Entrepreneurship and development: The role of clusters. *Small Business Economics*, 23(5), 363-400.

Defining entrepreneurship as the creation of new organisations, this paper explores, from a literature review standpoint, the moderating effect of clusters on the impact of entrepreneurship on development. To identify potential causes of this moderating effect, the paper focuses on three different impacts: entrepreneurship on development, clusters on development, and clusters on entrepreneurship. The findings of the paper are

threefold. First, entrepreneurship is positively associated with economic growth. Given the importance of entrepreneurship in changing the economic and social structure of the economy, more research on the impact of entrepreneurship on development - i.e. focus on capabilities rather than on output - is needed. Second, it is difficult to reach empirical generalisations on the impact of clusters on development and entrepreneurship given conceptual and methodological constraints. Both positive results and caveats are found at different levels of analysis and at different stages of development of a cluster. Finally, given the previous finding, it is difficult to generalise on the impact of clusters on the association between entrepreneurship and development. Consensus on and validity between conceptual and operational definitions of clusters; consideration of context as well as process and, therefore, quantitative and qualitative methods; and differentiation between levels of analysis controlling for cluster stage and strength are the main criteria for future studies to consider to disentangle the impact of clusters on entrepreneurship, development and the association between entrepreneurship and development.

109. Rocha, H. O., & Sternberg, R. (2005). Entrepreneurship: The Role of Clusters Theoretical Perspectives and Empirical Evidence from Germany. *Small Business Economics*, 24(3), 267-292.

This paper is about the impact of clusters on entrepreneurship at the regional level. Defining entrepreneurship as the creation of new organisations and clusters as a geographically proximate group of interconnected firms and associated institutions in related industries, this paper aims to answer three research questions : first, do clusters matter to entrepreneurship at the regional level? Second, if clusters are associated with different levels of entrepreneurship, what explains those differences? Third, what do the answers to the previous questions imply for academics and policy makers? To answer these questions, this paper distinguishes between clusters and industrial agglomerations and advances a theoretical model and empirical research to explain the impact of clusters on entrepreneurship at the regional level. This paper uses the 97 German planning regions as units of analysis to test the hypotheses. Using hypotheses testing and OLS fixed-effects model, this paper finds that clusters do have an impact on entrepreneurship at the regional level, but industrial agglomerations do not. Implications for academics and policy makers and suggestions for future research are given in the concluding section.

110. Romer, P. M. (1986). Increasing Returns and Long-Run Growth. *Journal of Political Economy*, 94(5), 1002-1037.

This paper presents a fully specified model of long-run growth in which knowledge is assumed to be an input in production that has increasing marginal productivity. It is essentially a competitive equilibrium model with endogenous technological change. In contrast to models based on diminishing returns, growth rates can be increasing over time, the effects of small disturbances can be amplified by the actions of private agents, and large countries may always grow faster than small countries. Long-run evidence is offered in support of the empirical relevance of these possibilities.

111. Rosa, P., & Scott, M. (1999). Entrepreneurial diversification, business-cluster formation, and growth. *Environment and Planning C*, 17(5), 527-547.

In its 1998 White Paper on competitiveness, the British government stressed the importance of entrepreneurship in halting Britain's apparent relative economic decline and in enhancing international competitiveness. In this document the potential contribution of entrepreneurship is envisaged primarily in terms of the need to increase the supply of entrepreneurs capable of starting and growing innovative new businesses; less recognition is given to the entrepreneurial vitality of the existing business base. This is in keeping with much of the influential policy and research literature, in which concentration through core growth of single firms has tended to be valued, rather than growth through diversification by entrepreneurs starting additional firms. The authors researched diversification as an entrepreneurial phenomenon through case studies of new high-growth Scottish companies. Most business founders in the study had established more than one company, and many had successfully pursued entrepreneurial forms of diversification. The high-growth companies were, in effect, embryonic business clusters, rather than single unidimensional businesses. This supports the notion that the greatest source of new high-growth businesses is entrepreneurs with existing businesses, not novice entrepreneurs. This has implications for future policy support for entrepreneurship.

112. Sadler, D. (2004). Cluster Evolution, the Transformation of Old Industrial Regions and the Steel Industry Supply Chain in North East England. *Regional Studies*, 38(1), 55-66.

This paper reports on research carried out in response to the decline of the steel industry in North East England. Drawing on survey evidence, it maps out the consequences of contraction for the industry's regional supply chain. The issues confronting engineering firms are explored in particular detail. The changing fortunes of the steel industry supply chain are interpreted in terms of the industrial cluster discourse. It

is argued that an effective regional cluster policy needs to identify clusters on a number of variables, including knowledge flows, and should recognize the significance of dynamic cluster evolution.

113. Schultz, S. (1977). Approaches to Identifying Key Sectors Empirically by Means of Input-Output-Analysis. *Journal of Development Studies*, 14(1), 77-96.

114. Scott, A., & Storper, M. (2007). Regions, Globalization, Development. *Regional Studies*, 41(S1), S191-S205.

On the basis of input-output tables from developing countries sectors are distinguished according to the degree of their interdependencies. Using 20 standard sectors for all 22 tables analysed, the paper takes the intensity of interindustrial linkages as an indicator of a sector's ability to spread growth impulses to its economic environment. Backward and forward linkages are calculated; in addition, spread effects are computed via the inverse matrix. Then the sectors are classified according to their total (direct and indirect) primary input requirements per unit of final demand. The analysis is supplemented by the determination of the sectoral employment impact, i.e. applying figures for the persons engaged sectorwise. Particularly under the linkage aspect, the obtained rankings are checked for similarity. Although some rankings are highly correlated, none of the criteria under consideration proves superior to all others.

115. Sherwood-Call, C. (1990). Assessing regional economic stability: a portfolio approach. *Economic Review(Win)*, 17-26.

Regional economic stability is examined using the analytical framework often used to study financial portfolios. The hypotheses are: 1. Nonsystematic volatility should be lower in states with more diverse economies. 2. Growth should be positively correlated with systematic variations in the region's economy. The analysis shows that industrial diversification reduces economic volatility in the same manner that portfolio diversification reduces financial risk. The conditions that create a tradeoff between risk and return in financial markets do not exist for regional economies, therefore, regions do not face a trade-off between stability and growth. The instability that is associated with fluctuations in the national economy remains a significant source of instability for most states, and it is not compensated by higher growth rates as the

analogy with portfolio theory suggests it should be.

116. Siegel, P. B., Alwang, J., & Johnson, T. G. (1994). Toward an improved portfolio variance measure of regional economic stability. *The Review of Regional Studies*, 24(1), 71-86.

The portfolio variance has gained popularity as a tool to evaluate alternative strategies that promote regional economic stability. As it is commonly applied, however, the portfolio variance has several problems that limit its appropriateness for regional economic analysis. There are several implicit assumptions about the relationship between structural change and stability, and about the emphasis on aggregate region-wide stability that should be recognized when using the portfolio variance approach to predict the impact of alternative diversification strategies. These assumptions and their implications are discussed, and an improved portfolio variance measure of regional economic stability is presented.

117. Siegel, P. B., Johnson, T. G., & Alwang, J. (1995). Regional Economic Diversity and Diversification. *Growth and Change*, 26(2), 261-284.

Regional scientists have long attempted to develop meaningful definitions and measures of economic diversity and diversification, and to establish functional relationships between diversity, diversification, and economic performance. The multiplicity of definitions and measures explains, in part, the confusion about these relationships. A framework that sorts out the overlaps, contradictions, and gaps of the various definitions and measures is needed. Such a framework would explicitly address the question, "What is the relationship between a region's changing economic structure and performance?" In this paper it is suggested that an input-output model that incorporates elements of portfolio theory be used as the integrating framework for analysis.

118. Simmie, J. (2004). Innovation and clustering in the globalised international economy. *Urban Studies*, 41(5-6), 1095-1112.

In this paper, it is argued that innovation is the key driver of competitiveness and productivity. Innovation is an internationally distributed system of activities and therefore geographically localised and clustered firms are likely to form only a limited set of the total actors engaged in such a system. Where Porter's concept of clusters is used to describe mainly localised economic interactions it is not therefore

likely to contribute much to an understanding of the relationships between innovation and economic growth. On the other hand, when the concept is applied to trading nodes in the global economy it is more likely to incorporate the international linkages between suppliers, producers and customers that are a key characteristic of the most innovative firms. The paper focuses on Porter's main arguments concerning the relationships between innovation and clustering. The vagueness of his analysis of the geography of clusters is highlighted. Nevertheless, following his argument that trading clusters are the key to economic growth, the analysis focuses on the nature and extent of linkages and in particular their contribution to innovation. Evidence from previous studies is used to suggest that national and international linkages and networks are just as significant as their local counterparts for firms in the UK. Evidence from the third Community Innovation Survey is used to test four of Porter's six hypotheses concerning the contribution of clustering to innovation. All of them are shown to benefit from national and international linkages and collaboration.

119. Simon, C. J. (1988). Frictional Unemployment and the Role of Industrial Diversity. *The Quarterly Journal of Economics*, 103(4), 715-728.

Since many individuals are immobile between city labor markets in the short run, the industrial structure of cities plays an important role in determining the national rate of unemployment. This paper argues that a city's frictional unemployment rate will be lower, the more industrially diversified is the city; that is, the more evenly distributed is employment across industries. The empirical work on 91 large SMSAs strongly supports the hypothesis. The difference in frictional unemployment rates between the twenty most and least diverse cities is estimated at about 2.4 percentage points.

120. Sinozic, T., & Tödtling, F. (2015). Adaptation and change in creative clusters: Findings from Vienna's New Media sector. *European Planning Studies*, 23(10), 1975-1992.

This paper investigates some of the features of technological heterogeneity in the New Media cluster in Vienna and the local and global factors that have shaped territorial learning conditions over time. Technological heterogeneity is given a central role in cluster evolution for the expansion of local capacities and opportunities for change. In this paper, it is argued that technological heterogeneity is an important but insufficient motor for cluster evolution. Rather, what is required are local technological capabilities and learning conditions for the exploitation of technologies for operations

and procedures that are relevant for firm and cluster performance, as posited by evolutionary theories of technical change. These perspectives are used to interpret the complex, variegated and partially unpredictable features of technological heterogeneity in the New Media cluster in Vienna, revealing the importance of the capabilities embodied in people and local conditions of managing uncertainty mediated via heterogeneity in products, processes and client needs. For this sector, conditions of technological instability create increasing importance for local learning and networks if clusters are to be propelled more deeply into existent or more radically into novel specializations.

121. Skålholt, A., & Thune, T. (2013). Coping with Economic Crises-The Role of Clusters. *European Planning Studies*, 22(10), 1993-2010.

The paper analyses the role clusters can play in coping with the impacts of economic crises, specifically by addressing how cluster organizations have acted to meet the challenges following the economic crises in Norway in the period 2008–2010. The paper investigates whether cluster maturity influences how the cluster acts in response to a crisis. To shed light on these questions, survey data from Norwegian cluster organizations were collected in two waves (spring 2009 and autumn 2010), and case studies of four cluster organizations provide further detail. The data indicate that clusters play a role in reducing uncertainty and improving access to necessary resources in crises periods. The data indicate that these advantages are not only due to increased collaboration between firms within the cluster, but that cluster organizations engage in considerable lobbying on behalf of their firms in regards to regional and national policy makers and public funding bodies. When comparing the impact experienced by mature and emerging clusters and their adaptation strategies, the data show that more mature clusters adapted to recent crises by implementing new innovation strategies and increasing collaboration and competence-building activities, to a greater extent than emerging clusters.

122. Soete, L. (2007). From Industrial to Innovation Policy. *Journal of Industry, Competition and Trade*, 7, 273-284.

Industrial policy has been a cornerstone of economic policy in Europe after the world war and the transformation of basic industries like coal and steel were key issues at the beginning of European integration. In the 1970s and 1990s industrial policy shifted toward support of high-tech industries. In the seventies the importance of a more systemic view came up, policy had to address the specific weaknesses of the

innovation system. The Lisbon agenda finally combines competitiveness with social and environmental goals. Industry plays an important role in generating welfare and industrial policy is in different forms and sorts back, high on the agenda.

123. Sonis, M., & Oosterhaven, J. (1996). Input-output cross analysis: A theoretical account. *Environment and Planning A*, 28(8), 1507-1517.

In this paper we deal with extractions of one sector (region) or a number of sectors (regions) from an (interregional) input-output system. When a certain number of sectors is taken out of the input-output matrix one obtains a cross. It is shown that the Leontief-inverse for a cross can be decomposed into the product of three matrices, $OUT \cdot INTRA \cdot IN$, where INTRA represents all intracross economic interactions, IN represents all effects from the rest of economy upon the cross, and OUT represents all effects from the cross upon the rest of economy. Furthermore, we present a general scheme of additive as well as multiplicative decompositions of the Leontief-inverse, reflecting the hierarchical decomposition of the matrix of input coefficients into the sum of crosses. These decompositions provide us with the means to find new insights into efficient aggregation, importance of regions, and issues of industrial complexes in inter alia input - output analysis.

124. Spencer, G. M., Vinodrai, T., Gertler, M. S., & Wolfe, D. A. (2010). Do Clusters Make a Difference? Defining and Assessing their Economic Performance. *Regional Studies*, 44(6), 697-715.

This paper contributes to the literature on cluster dynamics by developing a new methodology for identifying clusters that is not dependent on United States-based definitions. This methodology is used to test if the geographical clustering of economic activities leads to superior industrial performance and regional competitiveness. The analysis produces two important findings. First, when industries locate in an urban region with a critical mass of related industries, they tend to generate both higher incomes and rates of employment growth. Second, the overall prevalence of clustering within a city-region is positively associated with income levels and employment growth.

125. Stehrer, R., & Woerz, J. (2009). Industrial Diversity, Trade Patterns, and Productivity Convergence. *Review of Development Economics*, 13(2), 356-372.

Recent developments in economic integration show rather diverse patterns of integration in the world economy. Some countries remain predominantly in the low-tech

industries whereas other countries succeed in becoming competitive in high-tech industries as well. The authors postulate that a country positioning itself at the lower end of the spectrum of high-tech industries is more favorable to its long-term development than aiming at the upper end of low-tech industries. They argue that countries which specialize in the lower end of the medium-high-tech activities are rewarded by faster productivity increases also in the upper end of the high-tech industries. In contrast, early specialization in medium-low-tech branches yields positive spillovers, mainly in the low-tech sector, which is not conducive to increasing activity in high-tech industries. The authors sketch a theoretical outline of this idea and present econometric results, including four aggregate manufacturing branches across 37 countries.

126. Tallman, S., Jenkins, M., Henry, N., & Pinch, S. (2004). Knowledge, Clusters and Competitive Advantage. *Academy of Management Review*, 29(2), 258-271.

Researchers in international strategy are increasingly investigating the role of regional clusters as features of international industry, most concerned with the competitive role of clusters and the competitive interactions among cluster firms. We look instead at knowledge sharing between firms through the medium of untraded interdependencies—knowledge exchanged informally and without explicit compensation. We specifically address knowledge development at the firm and the cluster level and examine the role of knowledge stocks and flows in establishing competitive advantage for clusters and firms.

127. Temurshoev, U. (2010). Identifying Optimal Sector Groupings with the Hypothetical Extraction Method. *Journal of Regional Science*, 50(4), 872-890.

We formulate the problems of finding a key sector and a key group of sectors in the economy by the hypothetical extraction method (HEM), and derive their analytic solutions that are termed industries' factor worths. It is shown that the key group of $k > 2$ sectors is, in general, different from the set of top k industries selected on the basis of the key sector problem, the issue which is totally ignored in the input-output (IO) linkage literature. Further, the related problems of finding a key region and a key group of regions in an interregional IO setting are discussed. We also examine how a change in an input coefficient affects the factor worth of an industry. The key group problem is applied to the Australian economy for factors of water use, CO2 emissions, and generation of profits and wages.

128. Temurshoev, U., & Oosterhaven, J. (2014). Analytical and Empirical Comparison of Policy-Relevant Key Sector Measures. *Spatial Economic Analysis*, 9(3), 284-308.

We consider the 10 most salient key sector measures (linkages) and identify groups of the most similar indicators on both analytical and empirical grounds. We derive new closed-form formulas for the generalized complete and partial hypothetical extraction linkages and add the up-till-now-undefined forward counterpart of the net backward linkage. The analytical relations and some stylized facts enable us to formulate hypotheses about the direction and strength of the relationships between various linkages. To study policy-relevant measures, our empirical tests are based on income (GDP) linkages, CO2 emission linkages and employment linkages for 34 industries and 33 countries. The data show that the information on the 10 key sector measures may be summarized by three to at most four measures.

129. Titze, M., Brachert, M., & Kubis, A. (2011). The Identification of Regional Industrial Clusters Using Qualitative Input-Output Analysis (QIOA). *Regional Studies*, 45(1), 89-102.

The cluster theory has become one of the main concepts promoting regional competitiveness, innovation, and growth. As most studies focus on measures of concentration of one industrial branch in order to identify regional clusters, the appropriate analysis of specific vertical relations within a valueadding chain is developing in this discussion. This paper tries to identify interrelated sectors via national inputoutput tables with the help of Minimal Flow Analysis by Schnabl (1994). The regionalization of these national industry templates is carried out with the allocation of branchspecific production values on regional employment. As a result, the paper shows concentrations of vertical clusters in only 27 of 439 German NUTS3 regions.

130. Todtling, F., & Trippl, M. (2004). Like phoenix from the ashes; The renewal of clusters in old industrial areas. *Urban Studies*, 41(5-6), 1175-1195.

Many cluster studies have focused on growth regions and industries covering only the early phases of cluster development. Little attention, however, has been paid to the renewal of clusters in old industrial regions. The aim of the paper is to address the question of how clusters renew themselves in such regions and how they adjust to changes in their environment. After identifying relevant factors from the literature, a comparison is made of the renewal of the automotive and the metal clusters in the old industrial region of Styria. The paper investigates and analyses the different

development paths. Critical factors of cluster renewal turn out to be a well developed regional innovation system, the establishment of new innovation networks and new and more indirect forms of policy approach.

131. Trendle, B. (2006). Regional economic instability: the role of industrial diversification and spatial spillovers. *Annals of Regional Science*, 40(4), 767-778.

Within regional science there has been a long history of interest in the relationship between economic instability and regional diversification. Despite this interest there are many unresolved issues in the literature, and while regional economic theory suggests that greater diversity will make regional economies more stable, the evidence is far less convincing. In addition, very little is known about how other variables affect the level of instability experienced by regional economies. This paper intends to clarify some of these points, with developments in the field of spatial data analysis meaning that additional insights may be gathered using these techniques. The analysis uses data from the 125 Local Government Areas of Queensland, a state economy of Australia that consists of many types of regions, ranging from densely settled urban centres to sparsely settled rural regions.

132. Trendle, B., & Shorney, G. (2003). The effect of industrial diversification on regional economic performance. *Australasian Journal of Regional Studies*, 9(3), 355-369.

The effect of economic diversification on regional economic performance has received considerable attention from regional scientists and a number of themes have emerged from this literature. In particular, it has frequently been suggested that a more diversified regional economy will experience greater economic growth and stability. Specifically, a number of relationships have been hypothesised including, a relationship between the level of regional diversification and a regions employment growth and the instability of this growth; regional diversity and the regional unemployment rate and the instability of this rate and finally, the diversity of a regional economy and the level and stability of regional income. In addition, regional performance may be spatially dependent, with regions sharing similar performance clustered together in geographic space. This paper tests these hypotheses using data from the Local Government Areas of Queensland. In general, the findings support the hypothesised relationship between regional diversification and economic performance, while spatial clusters of regions sharing similar economic performance are also identified.

133. Trippl, M. (2010). Developing Cross-border Regional Innovation Systems: Key Factors and Challenges. *Tijdschrift voor economische en sociale geografie*, 101(2), 150-160.

The literature on regional innovation systems has considerably enhanced our understanding of the critical role played by geographical proximity and local institutional conditions for the production of new knowledge and its economic exploitation. In most cases, however, both theoretical and empirical work has focused on regional innovation systems situated within a national context. Little research has been done so far on cross-border regional innovation systems. The aim of this paper is to explore conceptually whether the theoretical approach of regional innovation systems can be applied to cross-border settings. It investigates some critical conditions for the emergence of transfrontier innovation systems and concludes that cross-border areas differ enormously regarding their capacity to develop an integrated innovation space.

134. Trippl, M., & Otto, A. (2009). How to turn the fate of old industrial areas: a comparison of cluster-based renewal processes in Styria and the Saarland. *Environment and Planning A*, 41(5), 1217-1233.

The aim of this paper is to explore the role of regional innovation systems and clusters in the economic recovery of old industrial regions. We draw a distinction between three types of cluster-based renewal: an innovation-oriented adjustment of mature clusters (incremental change); the emergence of new agglomerations in established industries (diversification); and the rise of knowledge-intensive and high-technology activities (radical change). In the empirical part of the paper we compare cluster-based recovery processes in the regions of Styria and the Saarland. It is shown that Styria rebuilt its regional innovation system more successfully, enabling the innovation-oriented adjustment of a mature cluster, the rise of a new cluster in an established industry, and the emergence of knowledge-intensive activities. In the Saarland, in contrast, the regional innovation system has been more specialised, which has resulted in weak performance with respect to incremental change and diversification and high performance regarding radical change.

135. Trippl, M., Grillitsch, M., Isaksen, A., & Sinozic, T. (2015). Perspectives on Cluster Evolution: Critical Review and Future Research Issues. *European Planning Studies*, 23(10), 2028-2044.

The past two decades have witnessed an ever-growing scholarly interest in regional

clusters. The focus of research has mainly been on exploring why clusters exist and what characteristics “functioning” clusters possess. Although the interest in more dynamic views on clusters is not new, in recent years, however, greater attention has been paid to providing better explanations of how clusters change and develop over time, giving rise to an increasing popularity of the cluster life-cycle approach. This paper discusses the key ideas and arguments put forward by the main protagonists of this approach and identifies several missing elements, such as indifference to place-specific factors, neglect of multi-scalar impacts and underappreciation of the role of human agency. Based on this critical assessment, a number of suggestions for future research are made. We argue that there is a need to study the influence of the wider regional environment on cluster evolution and to explore how cluster development paths are influenced by a multiplicity of factors and processes at various spatial scales. Finally, it is claimed that future research should pay more attention to the role of human agents and the ways they shape the long-term development of regional clusters. We outline how future studies can tackle these issues.

136. Turok, I. (2003). Cities, clusters and creative industries: the case of film and television in Scotland. *European Planning Studies*, 11(5), 549-565.

Interest in the creative industries has burgeoned in recent years. They convey many positive images for the development of cities and regions in an increasingly market-driven, globalized economy. The cluster concept has had an important influence on thinking and policy towards the creative industries. The purpose of this article is to examine the extent to which these ideas help to explain a particular situation. It analyses the various forces affecting the performance of the film and television industries in Scotland. It concludes that these sectors have a more modest economic impact than commonly assumed and that national and transnational organizations and government regulation are more important than localized networks in influencing their scale and durability.

137. Velluzzi, N. D. (2010). Community Colleges, Clusters, and Competition: A Case from Washington Wine Country. *Regional Studies*, 44(2), 201-214.

This paper investigates the role of community colleges in shaping the competitiveness of industry clusters. The following analysis presents a case study on the role of the Walla Walla Community College Center for Enology and Viticulture (the Center) cluster-based economic development strategy. The case study examines the ways the Center – which is in Washington State – operates as an intermediary that influences

both local labour supply and the social foundations underpinning the production system. Based on case study evidence, it is concluded that the Center's cluster strategy can be understood as a process of 'institutional thickening' that enhances the competitiveness and performance of the localized wine industry.

138. Viladecans-Marsal, E. (2004). Agglomeration economies and industrial location: city-level evidence. *Journal of Economic Geography*, 4(5), 565-582.

There is clear evidence that economic activity, in particular industrial activity, is unequally located in Spain. Further, the results from the analysis of single manufacturing sectors show an even higher spatial concentration. The aim of this paper is to demonstrate the extent to which agglomeration economies account for this high industrial concentration. To this end, I analyse the influence of various types of agglomeration on the location of manufacturing employment in Spanish cities. I consider two types of agglomeration economies: urbanization economies (associated with a city's population and employment levels and the diversity of its productive structure) and localization economies (associated with a city's specialization in one specific sector). Special attention is given to the geographical unit of analysis by employing spatial econometric techniques that allow the influence of agglomeration effects extending beyond a city's limits to be considered. The results demonstrate that agglomeration economies influence the location of manufacturing activity, with most sectors being influenced by urbanization economies and a few by localization economies. In some sectors, population or employment levels in neighboring cities were found to enhance a city's agglomeration economies.

139. Wagner, J. E. (2000). Regional Economic Diversity: Action, Concept, or State of Confusion. *Journal of Regional Analysis and Policy*, 30(2).

Economic diversity has been promoted as a means to achieve the goals of stability and growth. However, the link between diversity, diversification and economic performance depends on the differences, both conceptually and empirically, between diversity and diversification. Unfortunately, the literature contains varying definitions of diversity and diversification. I propose two key points in defining diversity. First, it is a static concept. Second, it examines the size, the presence of multiple specializations, and the linkages present among industries within a region's economy. A brief review of diversity measures is used to discuss measuring diversity relative to some standard, as an explanatory variable in examining growth and stability, and other issues. No one diversity measure is critique free; care should be taken when

using a diversity measure as the only factor in a policy designed to change the structure of a region's economy, given the goals of growth and stability.

140. Wagner, J. E., & Deller, S. C. (1998). Measuring the Effects of Economic Diversity on Growth and Stability. *Land Economics*, 74(4), 541-556.

The role of economic diversity in regional stability and growth is examined. Contrary to "conventional wisdom" the empirical literature has been unable to confirm the link between diversity and economic performance. Traditional notions of diversity tend to be defined narrowly, usually emphasizing the distribution of employment across industries. These approaches are inadequate because they do not capture elements of inter-industrial linkages. An alternate approach to conceptualizing diversity, based on a regional input-output model, is described and computed for the 50 states. Empirical results suggest that diversity within the theoretical construct of input-output is associated with higher levels of stability and growth.

141. Waits, M. J. (2000). The added value of the industry cluster approach to economic analysis, strategy development, and service delivery. *Economic Development Quarterly*, 14(1), 35-50.

Economic development always has been a moving target. Not surprisingly, there is growing evidence that the shape of economic policy and practice is changing significantly in many American states on the eve of the 21st century. This new approach has public officials addressing new issues, using new tools, and beginning to experience new types of results. It is called cluster-based economic analysis and strategy development. This article reviews key literature and events that point to a new phase emerging in state economic development. Then, using Arizona as a case study, it presents practical evidence of the benefits from this new approach. For example, Arizona uses clusters as a tool for better understanding the economy, getting key industry stakeholders together to address common problems, and providing high-value specialized services to key industries.

142. Wolfe, D., & Gertler, M. (2004). Clusters from the inside and out: local dynamics and global linkages. *Urban Studies*, 41(5-6), 1071-1093.

This paper surveys some of the current methodologies employed to analyse cluster development, as well as some of the key themes emerging from both the analytical and prescriptive literature noted above. It uses this survey as the context in which to

present a synthesis of the initial findings of the current national study of industrial clusters in Canada, conducted by the Innovation Systems Research Network. The national study comprises 26 cases which aim to identify the presence of significant concentrations of firms in the local economy and to understand the process by which these regional-industrial concentrations of economic activity are managing the transition to more knowledge-intensive forms of production. The central questions in each case are: What role do local institutions and actors play in fostering this transition? How important is interaction with non-local actors in this process? How dependent are local firms on unique local knowledge assets and what is the relative importance of local versus non-local knowledge flows between economic actors? How did each local industrial concentration evolve over time to reach its present state and what key events and decisions shaped its path? And, finally, to what extent do these processes, relationships and local capabilities constitute a true cluster? Ultimately, what are the key relationships, linkages and processes that ground the cluster in its existing location?

143. Woodward, D. (2012). Industry Location, Economic Development Incentives, and Clusters. *The Review of Regional Science*, 42(1), 5-23.

In his Presidential Address, Professor Woodward uses South Carolina's economic development experience as a case study of significant challenges in regional development. The state has re-industrialized and emerged as a leader in attracting capital investment through generous financial incentives, after watching the demise of its major industry cluster (textiles and apparel) since the 1970s. The address argues that regional science research continues to advance our understanding of regional policies promoting industrial location. He urges caution regarding development incentives as a regional strategy. Instead, emerging research suggests that stronger agglomeration and cluster-based strategies are better suited to promote contemporary economic development.

144. Yu, J. B., & Jackson, R. (2011). Regional Innovation Clusters: A Critical Review. *Growth and Change*, 42(2), 111-124.

In this paper, we present a critical assessment of recent economic development policy directions centered on the concept of regional innovation clusters. We begin by investigating the rationale underlying the Obama administration's promotion of regional innovation clusters (RICs) and their introduction to the policy arena in its Strategy for American Innovation. The connections among RICs and existing research

and policies in industry and occupational clusters, regional innovation systems and regional economic development are identified and analyzed to highlight those most critical challenges to conceptualizing and theorizing RICs. While we applaud the long overdue focus of economic development policies on sub-national regions, we identify several major conceptual shortcomings and programmatic difficulties associated with RICs as a centerpiece for economic development strategies.

145. Zhicheng, L., & Luodan, X. (2004). Regional Specialization and Dynamic Pattern of Comparative Advantage: Evidence from China's Industries 1988–2001. *Review of Urban & Regional Development Studies*, 16(3), 231-244.

Different comparative advantages may affect the pattern of regional specialization in many ways. In this paper, by employing panel data covering 20 main industrial sectors in 29 Chinese provinces over the period of 1988–2001, and applying the generalized method of moment techniques, the determinants of regional specialization in China are investigated, paying particular attention to the role of dynamic comparative advantages. It is found that changing comparative advantages arising from technical efficiency improvement, scale economies enhancement, and growing economic openness contribute positively and significantly to China's regional specialization.

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