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Kerstin Press

A Life Cycle for Clusters?

The Dynamics of Agglomeration,
Change, and Adaption

With 40 Figures and 16 Tables

Physica-Verlag

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ISSN 1431-1933

ISBN-10 3-7908-1710-4 Physica-Verlag Heidelberg New York

ISBN-13 978-3-7908-1710-2 Physica-Verlag Heidelberg New York

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Printed in Germany

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Cover-Design: Erich Kirchner, Heidelberg

SPIN 11685371 88/3153-5 4 3 2 1 0 – Printed on acid-free and non-aging paper

It is not the strongest of the species that survive, nor the most intelligent, but the one most responsive to change.

Charles Darwin, 1859

Foreword

The current research agenda in economics is witnessing the rediscovery of a set of theories investigating the determinants and effects of the location of economic activity in space. Based on the linkages between supply, production, sales and space in (traditional) location choice theory, reasoning is being extended to explain the emergence of spatial concentrations of economic activity as well as attempts to incorporate the issue of space into those general equilibrium models that still dominate most of mainstream economic research (e.g. the link between space and trade flows analysed in the New Economic Geography).

This renaissance of theoretical and empirical work on the spatial aspects associated with economics and especially the uneven spatial distribution of economic activity is of key interest in the age of globalisation. Increased international mobility of goods and production factors challenges not only firms and other private sector organisations but also localities interested in sustaining economic prosperity. Understanding the drivers of the distribution of economic activity in space can therefore be key to sustainable regional development, especially when it comes to the issue of local industrial centres, i.e. locations of heightened economic activity.

In the context of modern-day industrial centres (e.g. Silicon Valley), theoretic analysis is based on those empirically derived observations about apparent benefits from co-location that were first voiced by Alfred Marshall (e.g. in the 8th Edition of 'Principles of Economics', 1920). Existing and modern Marshallian agglomeration theory is focussed on an elaboration and further development of the mechanisms leading to benefits from co-location. As a result, this body of theory investigates the success factors of an existing agglomeration (or 'cluster') of firms at a specific point in time.

Within this context, Kerstin Press takes up an issue that is neglected in much of the theoretic literature on clusters while being very prominent in the real world: Do the dynamics of agglomeration, change and adaptation follow a life-cycle from emergence to decline, or is the development of existing clusters over time a non-deterministic one? Her study addresses this aspect by analysing the adjustment of existing clusters to exogenous shocks in their greater economic environment. It proceeds by investigating the success factors for regeneration and survival of the cluster, focussing on the effect of the cluster's architecture on the self-organisation processes taking place among its organisations when they adjust to exogenous shocks.

The analysis of such dynamic processes with methods from mainstream economics is problematic due to the dominance of general equilibrium models in the field. Since the focus of the present study is not on comparing initial and equilib-

rium states but on the development process following an external shock, Kerstin Press adopts a new methodological approach. She develops a theoretic model of clusters, change and adaptation that is based on the N/K model of complex systems (Kauffman 1993). Taking the existing insight on the dynamics of N/K systems, propositions on the influence of cluster architecture on adaptability are derived. In a second step, these propositions are tested by simulations comparing the adaptability of clusters with given differences in their architecture regarding the degree of division of labour on the one and the governance structure on the other hand. Both aspects (division of labour, governance) were found to matter for cluster adaptability in previous empirical studies but general causalities for their role in cluster adjustment could not be derived from individual case studies. Within the all else held equal perspective adopted in the simulation model, one explanation for how and when division of labour and governance matter for cluster adjustment is found. While the model faces several limitations, these are more to be seen as possible areas for future research.

The present study opens up new avenues in cluster research. Rather than just focussing on emergence or existence, clusters are viewed as entities underlying a dynamic development. The analysis of their adaptability to external changes constitutes a first important step towards a non-deterministic perspective on cluster development. The main contribution of Kerstin Press lies with a successful bridging of the gap between empirical observations and theoretical insights regarding clusters and adjustment. By providing a model able to explain stylised empirical findings while being based in the body of theoretical knowledge on clusters, important causalities for future theoretic and empirical research have been derived. The sound basis in the existing theoretic knowledge is also evident in an excellent presentation of the state-of-the-art literature on agglomeration and cluster research found in the present study.

Kerstin Press' dissertation offers a promising methodological approach, which – hopefully – encourages others in the field to transfer and apply the methodological tools available within and outside mainstream economics to other dynamic economic phenomena.

Duisburg, January 20th 2006

Günter Heiduk

Acknowledgements

This project would not have been possible without the generous advice and support I was fortunate enough to receive from a number of people and institutions.

I began working on my PhD dissertation in October 2001 at the Chair for International Economics, University of Duisburg-Essen. From the very start onwards, my thesis advisor Prof. Dr. Günter Heiduk took a very active interest in the project. He was virtually always available for discussions about ideas and (often unfinished) lines of argument and gave me considerable degrees of freedom for linking up with the international scientific community. I have also come to value his swift reviews of thesis chapters as well as the final monograph over the years. In sum, being his PhD student has been an enjoyable experience.

I would also like to thank Prof. Dr. Markus Taube for being the second referee of my dissertation. Despite their dense schedules, my examining committee comprising Prof. Dr. Günter Heiduk, Prof. Dr. Markus Taube as well as Prof. Dr. Dieter Cassel and Prof. Dr. Torsten Gerpott made time available for me to defend the thesis on the final day of my PhD studies. I greatly appreciate your help in meeting this very date.

During my PhD studies, I was employed as a research assistant at the Chair for International Economics, University of Duisburg-Essen. I would like to thank my colleagues for one great work environment. Dipl.-Oec. Christian Schabbel is one of the most fun people to work, travel and share an office with. Our secretaries (in sequence) Ms Brigitte Dunkel, Ms Marianne Appelt and Ms Nicole Jaschinski managed many daily details I am still not fully aware of and kept everyone supplied with the bare necessities – be they office material or fresh coffee. Several ‘generations’ of student assistants including André Böhmert, Andreas Eickel, Sonja Fischer, Jörg Knips, Nadja Kremser and Stefanie Lenz conquered internet resources as well as the local library and inter-library loan systems to assemble my bibliography (among other things).

On my ventures outside the University of Duisburg-Essen, I met a number of people that critically affected my research agenda. The project benefited immensely from discussions with colleagues at different conferences and workshops. Among the many venues attended that shaped the thesis in often intricate ways (when seen in retrospect) some were key in finalising the present study, including: The Research on Organizations, Coordination & Knowledge (ROCK) Workshop ‘*NK Model and Applications to Economics and Management*’ (Trento, Italy), the Danish Research Unit on Industrial Dynamics (DRUID) PhD Winter Conference ‘*Industrial Evolution and Dynamics*’ (Skørping, Denmark), the Consortium for Competitiveness and Collaboration ‘*The CCC's 12th Annual Colloquium for Doc-*

toral Student Research' (Berkeley, CA) and the DRUID 10th Anniversary Summer Conference '*Dynamics of Industry and Innovation: Organizations, Networks and Systems*' (Copenhagen, Denmark).

In 2004 and 2005, I had the chance to attend the European Doctoral School in the Economics of Technological and Institutional Change (EDS – ETIC). In particular, I would like to thank the local organisers at University Louis Pasteur (Strasbourg, France), Patrick Llerena and Monique Flasaquier as well as the teaching staff and fellow PhD students involved with the ETIC 2004 Spring Session and the Simulation in Evolutionary Economics (SIME) Eurolab Course in 2005. Both in- and outside class discussions have been incredibly rewarding.

Regarding the PhD thesis itself, several individuals have made outstanding contributions (in order of appearance). Philip Cooke was an invaluable source of ideas on biotechnology-related research and a very effective editor to work with. Thomas Brenner introduced me to the idea of life cycles in clusters and thereby indirectly contributed to a more theoretic orientation of my research project. In a later stage of the PhD, I met Peter Maskell who became an unofficial 'second' advisor to my thesis. This started with discussions at a couple of conferences and culminated in a stay as visiting researcher at the Institute for Industrial Dynamics and Strategy (IVS), Copenhagen Business School. The generous funding provided by the European Union's Marie Curie Programme is also gratefully acknowledged. It is probably fair to say that the thesis would not look the same without the time spent at IVS. When working out the details of the theoretic model, I strongly benefited from discussions with Thomas Brenner, Koen Frenken, Peter Maskell, Olav Sorenson, Marco Valente as well as my colleagues at IVS. Not being much of a programmer myself, I am particularly indebted to Marco Valente for his assistance and guidance in turning theoretic reasoning into a workable simulation model. Financial support for publishing the thesis by the DVF (Duisburger Volkswirtschaftliches Forschungsseminar) is also gratefully acknowledged.

On a final note, I would like to pay tribute to the indirect supporters of the present study. Very early in my PhD, I used to think that acknowledgements to friends and family were just a lovely tradition adhered to by most authors. My ignorance on the significance of the contribution of one's social network to a long-term project like the PhD was very soon at an end. I would like to start by thanking my parents Barbara and Hans-Winfried Wolter as well as my brother Niels who set the foundations for a path I am only beginning to walk. My grandfather, Karl Hoffmann, cheered me up with more anecdotes on academic life than I can recount here. Last but certainly not least, I would like to thank my husband, Achim Press, for enduring more than one thesis-induced mood swing. I could always rely on your faith when mine failed.

I therefore dedicate this monograph to my extended family.

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