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Mapping urban networks

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Comparing and visualising intra- and extra-firm networks of High-Tech companies in Switzerland

There is a widespread agreement in the academic literature that knowledge has become the main source of regional development in advanced economies. A variety of knowledge sources have to be used by firms whilst more collaboration and division of labour among actors along the value chain are needed to launch innovations and to remain competitive. Based on the requirements for knowledge creation, most corporations in the knowledge economy develop their location network as part of their overall business strategy, whereby highly specific human resources and core competencies are flexibly combined in order to create differentiation and competitive advantage. The locational strategy considers both where a firm's internal functions should be placed and where suppliers and customers should be located. These internal and external linkages are woven across physical space, not only connecting firms and parts of firms but also more or less dispersed cities and towns.

In this paper, we compare and visualise data from intra-firm and extra-firm networks based on two surveys made in Switzerland. The analysis of intra-firm networks is based on the interlocking network model developed by the Globalisation and World Cities Study Group (GaWC) at Loughborough University. It provides one specific way to address the question how inter-city relations can be empirically measured despite the chronic lack of data on inter-city information flows. The method was originally developed to measure the connectivity between global cities based on multi-branch advanced producer services firms as they organise business activities across their offices worldwide. The model uses a proxy – intra-firm networks of multi-branch, multi-location enterprises – to estimate potential flows of knowledge-creating information between cities and towns. In the study of Lüthi et al. (2013), the model is adapted to measure relations between cities within and beyond the functional urban system of Switzerland, based on intra-firm networks of High-Tech companies.

The network data of Lüthi et al. (2013) is compared with data from the European Manufacturing Survey (EMS). The EMS for Switzerland is a survey of product and process innovations among Swiss companies of the industrial sector carried out every three years since 2001. The objective of the survey is the systematic analysis and comparison of the innovation behaviour as well as the performance (by means of economic indicators) of companies of the industrial sector over a longer period of time. Among others, the survey investigates the following elements: innovation strategies, the use of innovative organizational and technical concepts, R&D rates, turnover with new products, type of R&D-cooperation along the value chain, qualifications, relocation of production and R&D etc. In the EMS survey for Switzerland (2015), additional variables were collected regarding the spatial cooperation patterns of Swiss industrial companies. With this data, spatial network patterns of the Swiss High-Tech sector can be assessed and compared with the intra-firm data of Lüthi et al. (2013). The innovative approach lies in combining relational data from Lüthi et al. (2013) with positional data from the EMS 2015 survey. The analysis is complemented by methods and tools of visualization and spatial statistics, using the statistical program R. Statistical relationships are examined with multiple regression models and, if necessary, with structural equation models.