

NETWORKS AND ECONOMIC AGGLOMERATIONS: INTRODUCTION TO THE SPECIAL ISSUE

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AGGLOMERATION GOING STRONG IN ECONOMICS

From the 1980s onwards, there has been a renewed interest in economic geography generally and economic agglomeration particularly. This interest can be ascribed mainly to the fact that orthodox economics proper provided insufficient explanations for the variations in the wealth and poverty of cities and regions. By tradition, the mainstream vehicle used in economic analyses is the theory of the competitive equilibrium, culminating in the Arrow and Debreu (1954) framework of a competitive general equilibrium (GE). In such a competitive equilibrium, economic actors maximise their utility by producing and consuming goods while operating in a market environment of perfect competition. Moreover, all markets are closed and a system therefore prevails where every individual and society gets what it wants given its resource constraints. This basic theoretical framework does not take location or space explicitly into account. Moreover, Starrett (1978) shows that, in an homogeneous space, the only possible competitive equilibrium that exists is equilibrium without transport costs, namely, a situation of backyard capitalism where every region produces for its own consumption and trade is non-existent. The reason why the competitive equilibrium theory fails to explain the stylised facts of trade and agglomeration lies in the basic presumptions of the theory. The theoretical framework does not allow for scale economies, imperfect competition (firms with market power) and

indivisibilities or physical differences in locations (heterogeneous space). Clearly, the outcomes of this mainstream modelling approach are far from reality where trade among locations plays an important role and where agglomerations and agglomeration forces exist (Hahn 2002).

Since the 1990s, a new family of models has been developed, following the seminal paper by Krugman (1991). This new approach, generally known as new economic geography (NEG) models, takes space explicitly into account by introducing not only specific location factors but also imperfect competition and economies of scale. To some extent, NEG can thus be regarded as a mathematical formalisation of older theoretical work in economic geography (Martin & Sunley 1996). NEG models explain dynamic processes that lead to agglomerations, as well as the persistence of these agglomerations and, as such, these models are at the edge of the theoretical developments in spatial economic modelling (Fujita & Thisse 2002). Recently, empirical models have been developed that are based on the theoretical framework as described above. This group of computable general equilibrium models is not analytically tractable and must therefore be solved numerically (see for example Thissen *et al.* 2009, in this issue). Most NEG models used in policy analysis are therefore based on simplifications of the theoretical models that are analytically tractable (see Baldwin *et al.* 2003 for an overview). The stylised facts suggest that the concentration of activities, people and resources contributes to regional economic development and can lead to a self-reinforcing process in which

agglomerations attract progressively more economic activity due to their advantageous location factors. Economic activity would be concentrated in one place if there were no dispersion effects at work as well. However, considering the still growing size of agglomerations in both developed as well as developing countries, the strength of these dispersion effects is not overwhelming.

THE NEED FOR COMPLEMENTARY CONCEPTUAL FRAMEWORKS

The new economic geography models include space, but are primarily based on economics. Although there are many overlapping interests, the NEG modelling tradition is in many respects different from 'old' economic geography, specifically in accepting general equilibrium models and disregarding detailed and specific attributes of cities, regions and international relations. In particular, the explanatory power of spatial externalities in terms of knowledge spillovers has remained a black box until today. However, opening up the black box of the exact working of externalities comes at the cost of less structured and complete modelling (McCann & Van Oort 2009). Martin and Sunley (1996) mention, for instance, the differences in the weights of the factor levels of spatial scale and the acceptance of heterogeneous actors and non-economic (e.g. psychological and socio-political) factors. Another important difference is the acceptance of general and specific spatial behaviour and structures. The NEG models are based on the idea that it is possible to construct and use spatial general equilibrium models. 'Old' economic geography emphasises the existence of specific situations where it is not always useful to work with those kinds of models. One of the reasons is that ('old') economic geography focuses on heterogeneity of actors and territories, and has a strong relation with empirical case studies and specific policy discourses. The GE tradition has little to no variation in types of firms (sectors), life cycles of firms (firm formation or incumbent firm growth) and scales within regional and urban space (Van Oort 2004; Boschma & Frenken 2006). Geographical and evolutionary economic theories shed light on modelling details the NEG will never be able to address and therefore are interesting.

Both the GE and economic geography conceptualisations build on location theory, especially on the concept of externalities or spillovers. Externalities or spillovers occur if an innovation or growth improvement implemented by a certain enterprise increases the performance of other enterprises without the latter benefiting enterprise having to pay (full) compensation. Spatially bounded externalities are related to an enterprise's geographical or local network contexts and are not related to internal firm performance. Localisation economies usually take the form of Marshallian externalities whereby the productivity of labour in a given sector in a given city is assumed to increase with total employment in that sector. In short, they arise from labour market pooling, creation of specialised suppliers and the emergence of knowledge spillovers. The strength of local externalities is assumed to vary so that these are stronger in some sectors and weaker in others. The associated economies of scale comprise factors that reduce the average cost of producing commodities. External scale economies apply when the industry in which the firm belongs (rather than the firm itself) is large. Under further assumptions on crowding (congestion costs that increase with population trigger dispersion), perfect product and labour mobility within and between locations and the influence of large agents, an urban system is composed of (fully) specialised cities, provided that the initial number of cities is large enough. Once cities exist, urbanisation economies (applicable to all firms, regardless of their sectoral membership) become important as well.

MICRO FOUNDATIONS AND NETWORKS

Inspired by the success of Silicon Valley, Cambridge (UK) and The Third Italy compared to the decline of other regions in the West (in particular, the old industrial areas), pressing questions are thus, why industries choose to locate in a particular area and which kind of concentration of economic activities is needed to foster local and regional economic growth. Despite a burgeoning geographical and economic empirical literature, we currently fail to carefully analyse and identify the processes that underlie the relationship between agglomeration, firm performance and local economic growth, thereby

treating agglomerations as a black box. Although the micro foundations (such as a specialised labour pool, presence of intermediate goods, and knowledge spillovers) that underlie the benefits of agglomeration have theoretically been specified, empirical evidence of the presence of these factors is mostly absent. Recently, however, we witness a surge of studies in various disciplines (economic geography, evolutionary economics, management science, network sociology) analysing the various mechanisms underlying knowledge spillovers using micro-data. One can distinguish between at least three forms of knowledge spillovers (Boschma & Frenken 2006): spinoff firms, labour mobility and R&D collaboration. All these topics have been addressed systematically in empirical research (Uzzi 1996; Almeida & Kogut 1999; Breschi & Lissoni 2003; Giuliani 2007; Klepper 2007; Ponds *et al.* 2007; Morrison 2008). With the systematic analysis of empirical micro-data, economists, geographers and sociologists join forces to get a glimpse of what is in the black box of knowledge spillovers. One of the main findings has been that firms in economic agglomerations do not profit automatically from co-location. Rather, spillovers occur mainly between firms with strong social network relations. A second finding that has come out of this research holds that a substantial part of spillovers takes place over longer distances as firms have many network relations outside the agglomeration they are located in. In sum, networks of economic actors (firms, researchers, inventors, employees) are the most accurate unit of analysis to trace the actual exchange (flows) of knowledge, labour or intermediate goods in economically agglomerated spaces. This approach resonates with Castells' (1996, 2002) distinction between the spaces of flows and the spaces of places as a potential new paradigm in understanding localised growth. The set of papers bundled in this issue of *TESG* deals with this new paradigm. The papers highlight current empirical research on the edge of agglomeration and networks. But there is also an actual need for pointing out and interpreting network and agglomeration economies in a coherent conceptual framework, because despite the appealing character of both concepts in the new paradigm, there is a priori little commonality in the two individual theoretical discourses. For a useful understanding of the role of interactions and networks in agglomerated

economies, the notion of networks should not be associated with a metaphorical, fuzzy meaning. Although network relations can be manifold in conceptualisation, they deserve a serious empirical testing – ranging from physical and trade networks to information and institutional networks (Torre & Rallet 2005).

IN THIS ISSUE

This issue of *TESG* brings together several papers stemming from economic, social and geographical disciplines that, while differing in their specific focus, take up the issue of the interplay between agglomeration and network externalities in relation to economic growth. Based on both theory and empirics, the papers show that the notions of physical space (agglomeration) and networks are simultaneously important attributes to the economic action space of firms. Conceptualising the micro foundations of agglomeration economies by analysing the networks of economic actors (firms, researchers, inventors or employees) is at the heart of the current economic agglomeration debate.

The first three papers in the issue are all theoretical contributions that deal with the lack of and need for proper network-based conceptualisations in research on agglomerations in regional science, economic geography and NEG. Providing an overview of the agglomeration economies literature, Capello (2009) concludes that local network behaviours, embedded in a socio-cultural and cognitive perspective, are an alternative way to understand the complex mechanisms by which exchanges of knowledge, labour or intermediate goods are facilitated in agglomerated areas. Capello argues that such a perspective is largely absent in the mainstream literature, which mainly takes an industrial and geographic perspective on agglomeration economies. An integrated approach to the study of agglomeration economies that considers all three perspectives simultaneously is proposed. The second paper by Huber (2009) advocates the concept of social capital of clusters in economic geography. Huber argues that this concept is currently fuzzy, focuses too much on cohesive communities, and suffers from a lack of understanding of actor-driven social processes. As an alternative, a network-based conception of social resources is proposed in which social capital is

defined as resources embedded in social networks that economic actors can mobilise for their activities. Thissen *et al.* (2009) criticise the use of abstract bi-regional origin-destination networks when analysing agglomeration economies in NEG-based spatial equilibrium models. Typically, these bi-regional networks do not take into account the actual roads in real infrastructure networks used for transport and traffic between destinations. To overcome this problem, they introduce a methodology that translates the agglomeration effects in a bi-regional origin-destination network into similar effects in a full network.

The remaining seven papers, though not ignoring theory, study the interplay between agglomeration and network externalities empirically. Boshuizen *et al.* (2009) examine agglomeration economies from a network perspective. Social interactions between firms are argued to be one of the mechanisms behind knowledge spillovers. Focusing on firms in the high tech sector, they show that local network ties via informal business associations positively affect firm performance. Soetanto and Van Geenhuizen (2009) analyse how firms benefit differently from knowledge spillovers in different urban environments. Comparing the network profiles of university spin-offs and network externalities in a city in a large metropolitan area (Delft, the Netherlands) and in a relatively isolated city (Trondheim, Norway), they find more differences than similarities between the two cities. Most importantly, they find that strong network relationships are conducive to firm growth in Trondheim, but tend to hamper firm growth in Delft. The article by Faggian and McCann (2009) shifts the attention to agglomeration and the (non)-localness of human capital. The authors argue that although agglomeration economies are often associated with localised knowledge spillovers and the availability of a specialised and skilled labour force, some forms of human capital may in fact be very mobile. Hence, in order to better understand local agglomeration processes, inter-regional flows of human capital must also be taken into account. Analysing the migration behaviour of students and graduates in Great Britain, Faggian and McCann conclude that university attendance in Great Britain is associated with high levels of human capital mobility and that some types of higher education

institutions play a significant employment role in their local economies. The paper by Meyer *et al.* (2009) approaches the interplay between economic agglomerations and networks from a transaction costs perspective. They show that Hong Kong electronics firms can be described as Janus-faced, being intermediaries between global customers and local Chinese producers in the value chain. In this, producer relations with China are organised mainly in hierarchical ways, whereas globally spread customers govern their relations with Hong Kong firms via the market. In this, geographical proximity to the Chinese producers also facilitates face-to-face contacts, which help to establish trust relations, a faster exchange of information and quicker negotiations.

Brandt *et al.* (2009) discuss the use of network analysis as a strategic information tool for regional knowledge management. Focusing on knowledge-based networks in the Hannover-Braunschweig-Göttingen-Wolfsburg region, they demonstrate that there exist notable differences in network properties (size, density, centrality, cohesion and connectivity) across different fields of competence. Their message is that policy-makers should account for these differences in the design and implementation of a knowledge-based regional networking strategy. Karreman (2009) analyses the contemporary financial geographies of Central and Eastern Europe. Using an interlocking network approach, he shows that there exists a distinct spatial order of financial centres organised around three main city clusters (Athens, Vienna and Copenhagen/Stockholm). From this, it is argued that, given the growing markets of Central and Eastern Europe, these cities may enhance their competitiveness as financial centres in the near future. The final paper by Wall (2009) takes an urban network perspective on economic agglomerations. In this, it is argued that the literature on urban competitiveness has put too much emphasis on city attributes and local economic coherence and has ignored the fact that the economic importance of cities is strongly determined by economic networks between cities worldwide. Focusing on the Randstad Holland and using network analysis techniques, he demonstrates the local, continental and global significance of Amsterdam, Rotterdam, The Hague and Utrecht within worldwide corporate networks.

Despite using different armoury, in the end the papers in this special issue all try to open the 'black box' of agglomeration economies by building on various strands of network analysis. It is clear that the complexity and relatedness between the concepts of agglomeration and networks calls for continuous reflections on the question how exactly networks and agglomeration economies are intertwined in processes of localised economic growth – one of the most persistent stylised facts in economics.

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