Grant Black (2004), *The geography of small firm innovation*. ISEN International Studies in Entrepreneurship. Dordrecht: Kluwer. ISBN 1-4020-7612-6, 180p.

The role accorded to agglomeration economies in determining growth has long been a central theme in urban and regional economics. In theoretical terms, the topic has acquired greater importance in years following seminal contributions by Romer (1986) and Lucas (1988) where economic growth was modelled in an endogenous framework. In these types of models, knowledge spillovers between economic agents, an important source of agglomeration economies, play a crucial role in the growth and innovation process leading to external economies of scale in production. At the core of the new economic growth theory lies the concept of technological change as a non-rival and partially excludable good (as opposed to the neoclassical view of knowledge as an entirely public good). On this basis, new technological knowledge is usually tacit, meaning that its accessibility, as well as its growth and innovation spillovers, are bounded by geographic proximity of high-tech firms or knowledge institutions, and by the nature and extent of the interactions among these actors in an innovation system. A large and growing empirical literature has grown around testing this idea using data from cities (Drennan 2002). The assumption here is that if knowledge spillovers are important to growth and firm dynamics, they should be more easily identified in cities where many people are concentrated into a relatively small and confined space and where knowledge is transmitted more easily. While it is one thing to argue that such relationships exist, it is quite another to establish the extent to which knowledge spills over within and between sectors of an economy. To measure a localized or regionalized knowledge production function (KPF), measures of knowledge inputs and knowledge outputs of firms and universities are needed.

Mayor contributions in this quest for understanding the spatial knowledge economy were made by Jaffe (1989) who estimated the KPF when he established a relationship between patent activity and R&D activity at the state level in the USA. Feldman (1994) added to this line of research, focussing on innovation counts as the dependent variable, given that many innovations are never patented. Much remains unknown in the spatial innovation diffusion process, and the book written by Black offers two important empirical contributions to the debate. The first is the spatial scale of analysis. Knowledge spillovers are argued to be important at the urban level, but most studies have no urban focus. Black's study (analyzing MSA's) does. The need to examine spillovers at a finer geographic area than the state is especially important given the tacit and sticky nature of knowledge. In Black's study, spatial detail turns out to be an important ingredient in capturing the heterogeneity in the spillover process. Second, a critical area is the need for a measure of innovation that is more broadly based than patent counts. Black uses 4,000 Small Business Innovative Research Phase II (SBIR II) awards for five different industries in the period 1990-1995 that are selective and have higher rates of commercialization than do patents. Using a negative binomial hurdle model, Black firstly estimates whether an urban area is innovative in the first place and secondly if so, at what rate. Black finds that geographic proximity matters for small-firms innovation, more pronounced so for whether an urban area is innovative rather than the rate of innovativeness. To compare his results with previous studies on patent activity, Black presents similar analysis using that alternative indicator. He finds similar significant patterns, indicating that his research results are robust.

The two empirical novelties in the study (relatively low spatial scale of analysis and an alternative innovation indicator) are important contributions to the current debate on the spatial knowledge economy. Some aspects of the knowledge production function approach applied in the study can be criticised on the indicator

level, but more important: some conceptual issues in the debate are not addressed. I will focus on these issues more closely now.

On the indicator level, an important measurement issue is how to distinguish between related and unrelated sectors. In the analysis, the location quotients of industries (the percentage of an industries' employment in a region in relation to its national distribution, p.40) are important predictors of localized innovation intensity and are labelled as a 'related industry'. This notion clearly hints at the importance of (the absence of) diversification and variety. The concept of related variety holds that some sectors are more related than other, in terms of inputs they use, and, as a result, will profit from the same knowledge infrastructure (also a central notion in the book) and will generate relatively more inter-industry knowledge spillovers. When the knowledge infrastructure is urban bounded (as the study of Black assumes), we speak of urbanisation economies. But the knowledge infrastructure can also be defined in terms of (not necessarily based on proximate) networks, especially in science-based industries like chemicals, electronics and instruments in Blacks study. To examine empirically the effect of related or unrelated sectors in urban areas or functional inter-firm networks is not a trivial matter, as sophisticated methodologies to measure inter-sectoral spillovers are scarce. But it appears to me that the location quotient approach does not fully address the two aspects of relatedness of industries adequately. If we stick to the localized spillovers conceptualisation, one expects that variety in a region at different digit levels of sector aggregation has different effects on economic performance (e.g. innovation) variables of a region. For example, one expects variety at a high level of aggregation, as an indicator of *unrelated* variety, to relate negatively to unemployment as it dampens demand shocks. And, one expects variety at the lowest possible level of aggregation, as an indicator of (strongly) *related* variety, to relate positively with economic growth and employment growth (Dissart 2003, Frenken e.a. 2005). Concerning the central notion of knowledge

infrastructures in the book, a more clear conceptualisation of the relatedness issue is needed, together with some elaboration on the sensitivity of three other crude indicators: the presence of merely R&D-*labs* as indicator of R&D input (instead of commonly used R&D employment or R&D expenditures rates), population density as sole indicator of urbanisation economies and the presence of business services as indicator for "innovation related services". These variables turn out important in the models, but do they really control for the things suggested?

The most important issue related to the book is: can the theory and conceptualisation of the localized knowledge production function give answers to the question of the importance and evolution of knowledge infrastructures? The critique on the KPF can be summarised as: (1) the actual transmission and adaptation of knowledge for productive applications by firms is not measured and (2) the spatial (co-location) character of the KPF stresses hotspots of innovation and 'forgets' about the role of hubs of knowledge networks (especially in knowledge-based industries). Black suggests that these processes (of spillovers and relatedness) play at the firm level rather than the industry or state level, but also remarks that "the force of this implication, however, must not be overstated based only on the empirical results shown in this chapter" (p.73). More research is needed to answer the questions on transmission and network relatedness; none of these was the exact focus of Black's book. His book is a very welcome addition to the existing literature though, because it proves that lower-spatial-scale analysis has value over generative analysis, and it discusses the value of innovation indicators thoroughly.

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