

SCIENCE PARKS IN CITY REGIONS AFTER THE GLOBAL ECONOMIC CRISIS

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ABSTRACT

We now live in a global knowledge economy where governments are investing to boost innovation, science and technological development. Their aim is to help position cities and regions to be competitive in the context of the current global economic change. The regional dimension is important. National policies create a framework for innovation but the locus of much innovation is at the regional and local level. Experience in the exploitation of technological innovation to support regional and local economic development has grown, and good practice relating to this process is much better understood. Innovation and collaboration are the keys. Isolationism through protectionism around domestic markets serves no one in the long term. The promotion and exploitation of innovation depends on research funded by both government and industry, as well as user-driven research. It also depends on high volumes of knowledge transfer and relationships between lot of international institutions collaborating formally on research in general or on specific scientific challenges. The main objective of the present study is to analyse through international, especially British experiences the possible development impacts to the city region of knowledge-based urban areas elsewhere in Europe.

Keywords: city regions, science park, innovation, knowledge transfer

INTRODUCTION

Globalizing processes are having diverse impacts on major urban areas, and as a result, urban policies will have to move beyond the familiar focus on urban problems so as to help cities benefit from, as well as cope with the implications of globalization. First, the paper examines some of the key components of globalising processes and what this means for different types of cities and urban regions. What is the role of cities in regional competitiveness and how can current territorial and urban policies be drawn together more effectively? This focus can also add to our understanding of soft policy instruments -- for example in higher education, skills, innovation, enterprise and social policy areas -- can be reconfigured in order to face these challenges more effectively, and to get a sense of what needs to change and why. In this study, the role of universities is reviewed, as large, globally-networked, but locally situated actors, in addressing particular problems faced.

SIGNIFICANCE AND METHOD

Increasing importance of knowledge capital has changed the nature of urban hierarchies, particularly increasing the importance of the mega-city. The most productive location for investing in knowledge is in existing knowledge capital concentrations. Beneath these mega-cities in the new urban hierarchy, traditional regional urban centres have become differentiated between core metropolitan areas and peripheral urban zones. However, there is a problem for peripheral urban zones, remote from core metropolitan areas and unable to develop close linkages to other successful places. Such towns and cities might once have specialised in manufacturing or food processing, but the attractive power of core cities hinders building dynamic knowledge-intensive clusters in those locations. An urgent planning challenge is 'finding a place' for such cities and their regions in the knowledge economy,

which has eroded these places' past rationale without providing a clear future for them (BENNEWORTH – HOSPERS, 2007).

Firstly, a number of traditional regional centres have successfully adjusted to the knowledge economy, developing strong networks around themselves where they pool and combine their knowledge capital with other places. Secondly, universities exist within global knowledge production networks which could provide access to external knowledge capital. They allow peripheral places to reinvent and renew themselves as well as offering potential capacity to invest in transformational activities in peripheral regions.

In this study, these two issues are brought together to consider roles of universities in helping peripheral city-regions adjust to the competitive pressures of knowledge economy. It is focused on one particular domain, universities roles' within regional governance networks in mobilising development coalitions, which help produce particular development projects which help such places adjust to these new realities. It is begun by presenting a theoretical framework for understanding the problems faced by less successful regions which lack a ready to made solution to the problems of peripheries in the knowledge economy, and the role of the university as a connected, global or local actor.

RESULTS AND DISCUSSION

Knowledge capital has promoted the rise of world cities, massive agglomerations in which a range of knowledge-intensive business service (KIBS) sectors interact producing complex systems of competitive advantage. Places like Aalborg in Denmark and Oulo in Finland have built up strong regional complexes of internationally competitive industry, but in many cases they have not been associated with a more general transformation of the regional economy. Larger cities also lie at the centre of networks of transport and communications that help to encourage external investments, which further reinforces their strength. Promoting regional development in the knowledge economy therefore appears requires concentrating particular types of knowledge investments into high-profile urban centres. The strength of London is dependent on a very strong economic situation that spreads well into the surrounding local counties. Policy-makers have attempted to strengthen provincial cities by building linkages to other such cities to develop critical mass across a shared hinterland (BENNEWORTH – HOSPERS, 2007).

Strong connections between knowledge producing activities (e.g. universities, government research laboratories and business R&D centres), and knowledge users, innovating businesses which embed local knowledge within exported products. Universities create new knowledge, challenge existing knowledge, diffuse and circulate that knowledge, exchange it with other academics, transferring it to businesses and teaching it to students. It is acknowledged that universities function in a very different knowledge creation environment to the earlier Fordist period, where universities provided basic science then commercialised by large vertically integrated businesses.

Universities as development actors in urban places are focused on, how the ways they rebuild and reinvent themselves institutionally and physically changes their contribution to their host cities, and whether this helps to redefine the position of these peripheral cities in their wider urban hierarchies. I am interested in exploring this through the interaction between universities and their governance networks. BENNEWORTH and HOSPERS (2007) suggest an ideal type local governance arrangement which could add value to the regional knowledge economy, with universities and other local actors working together effectively to create a knowledge laboratory, where the host cities have more high quality knowledge-intensive

investments that supports the regional knowledge economy. This also represents a de facto elevation of the host city within functional urban hierarchies.

Regional governance actors have begun to reorient themselves to exploit universities' capacities and potential. Whilst universities began their reinvention from small experimental projects, other regional actors' attempts to enrol those successes began from the opposite direction, starting with the ambitious concepts and eye-catching 'hybrid projects'. However, the transformations of governance networks have not been unproblematic, and the pathways by which governance arrangements have evolved provide insights into local, urban and regional governance processes in the knowledge economy.

GREENE ET AL (2007) in a study comparing 22 composite indices benchmarking cities and city-regions, he found many inconsistencies in theorising and measuring spatial competitiveness. In BERGER's (2011) opinion academics should work on the theoretical basis of regional competitiveness to bring back the discussion to regional development and not focus solely on regional competitiveness as a pure benchmarking topic.

It can be argued that regions and cities that do not adapt to the requirements of post industrial knowledge-based economies suffer from absolute disadvantages. It is argued here that this is theoretically inadequate and it is shown that, over several decades, this tendency is not supported by available empirical evidence for UK urban and regional economies. This leads to the argument that it is necessary to look elsewhere for theoretical explanations of the observed divergence in post-industrial knowledge-based economies. For us, dynamic evolutionary economic theory combined with endogenous growth theory offer much better prospects for explaining economic change in such economies.

Turning first to evolutionary theory, it offers an explanation of economic change in general that can be extended to understanding spatial economies in fundamentally different ways from neo-classical theory. Urban and regional economic development is not some unhistorical phenomenon, but a historical process rooted in the conditions and contexts of particular times and places. Furthermore, those conditions, especially institutional, social and technological conditions, are not exogenous, as assumed by orthodox neo-classical economic theory, but are endogenous to, and part of the process of, economic evolution itself.

One of the most significant elements of an evolutionary approach to understanding urban and regional economic development identified here is the capacity of spatial economies to adapt and innovate. These are essential dynamic processes in the ability of open economies to succeed in the context of powerful external sources of change.

Endogenous growth theory provides a systematic approach to understanding the crucial element of the adaptive capacity of spatial economies. Given that it is impossible to cover the whole rich spectrum of the dynamic evolutionary approach to economic development in a single paper such as this, the remainder of this analysis will be focused on the adaptive capacity of spatial economies and the insights offered by endogenous growth theory in understanding this particular element of evolutionary theory and how it can contribute to understanding the economic divergence of regions and cities.

Two main types would seem to be of most possible relevance to explaining the adaptive and innovative capacity of regions and cities: those intentional human capital models that stress the importance of education, learning by doing and spillover of knowledge; and Schumpeterian innovation models of purposive profit-seeking research and development (R&D) by firms. The first group of models portray technological progress as the result of intentional research and education, and introduce human capital into the production function.

Endogenous growth theory also suggests that regions/cities that start with the most of the assets outlined above are most likely to accumulate more of them over time. SIMMIE and CARPENTER (2008) following this line of reasoning, endogenous growth theory also suggests that cities (or regions) that have 'first mover advantage' in terms of innovation and

technology are likely to attract educated labour and capital from elsewhere, thereby producing a cumulative, self-reinforcing process of research and development leadership.

As London has significantly more higher education institutions than all other United Kingdom regions, it is important as well as a good chance to analyse the spread and concentration patterns of both knowledge-based venturing and finance provision across higher education institutions of the region, in order to understand the reasons underlying the region's relatively poor performance when compared with these other regions. It is concluded that although London has a higher concentration of higher education and finance institutions than other United Kingdom regions, there is no evidence that as a whole they are better connected or create and contribute to higher levels of university knowledge-based venturing. Five factors were given an equal weighting in generating an index of knowledge commercialisation (HUGGINS, 2008), consisting of:

- the number of patents registered;
- the number of licenses granted;
- number of spin-offs created;
- the number of projects requiring seed funding; and
- the overall demand for seed funds.

Once the index was constructed, the higher education institutions were placed into three groups: top ranked; middle ranked and bottom ranked, by order of their commercial activities, with the possibility of achieving a score between 0 and 100 (see *Table 1*). The top ranked higher education institutions scored 90.0 and the lowest a mere 2.5, with the mean average score being 39.5. This ranking system enables further analysis and differentiation of the issues and requirements appropriate to each group.

Table 1. Knowledge Commercialisation Ranking and Index Parameters for higher education institutions in London

| Ranking Group | Ranks Covered | Mean Average Score (%) | Index Score Range (%) |
|---------------|---------------|------------------------|-----------------------|
| Top | 1-5 | 76,5 | 70-90 |
| Middle | 6-13 | 50,9 | 35-65 |
| Bottom | 14-25 | 16,5 | 2,5-32,5 |
| Overall | 1-25 | 39,5 | 0-100 |

Source: derived from HUGGINS (2008)

A "premier league" of universities has formed in London, which runs the risk of ignoring the commercial exploitation value of innovations and ideas emerging from universities ranked in lower divisions of London. In terms of the differing approach adopted by London's universities towards knowledge commercialisation across the three ranked groups, one of the key differences is the presence within each university of unit, office or company dedicated to the management of know edge-based venturing. Of the top-ranked universities on the index of knowledge commercialisation, 80% have established a specific entity aimed at managing the commercialisation of research, compared with only 25% of the bottom ranked universities.

The differential in knowledge commercialisation performance across universities of London suggests that the poorer performing universities may have more barriers to navigate. It is important to interpret from HUGGINS' (2008) survey the lack of time factor highlighted by higher education institutions respondents of London as a barrier to involvement in knowledge

commercialisation processes. For the higher education institutions ranked at top of the knowledge commercialisation index the most significant constraint is a lack of management skills (80%). This suggests that these higher education institutions have much of the infrastructure requirements for knowledge commercialisation already in place, and are now in a position where it is human capital factors that are the focus of continuing and improving their knowledge commercialisation capabilities. Amongst the bottom-ranked higher education institutions the most important barriers were the lack of time (83%) and management skills.

The main and secondary sources of seed financing accessed by higher education institutions in London responding to HUGGINS' (2008) survey are shown in *Table 2*, which indicates that finance is drawn from a variety of internal and external sources, with many institutions accessing funds from several different sources. The most important funding sources are specialist funds created and funded within higher education institutions.

The University Challenge Fund (UCF) was the next most important source, and was the main source of funding for one-fifth of all higher education institutions. The University Challenge Fund is the most important United Kingdom national policy development relating to seed financing university knowledge commercialization. The purpose of the University Challenge Fund is to enable universities to establish seed funds for early-stage knowledge-based venturing.

Table 2. Sources of Seed Financing for Higher Education Institutions of London

| Source of Finance | Main Source (%) | Secondary Source (%) |
|--|------------------------|-----------------------------|
| Specialist Funds Created by the HEI | 36 | 48 |
| University Challenge Funding | 20 | 32 |
| Higher Education Funding Council for England | 12 | 44 |
| Private Sector Seed or Venture Capital | 8 | 36 |
| DTI Grants or Loans | 4 | 44 |
| EU Programme Funds or Loans | 0 | 20 |
| Welcome Trust | 0 | 16 |
| Other Charity, Trust or Research Foundation | 0 | 8 |
| Other | 0 | 4 |

Source: derived from HUGGINS (2008)

Less than two-thirds (63%) of the middle-ranked higher education institutions and only 33% of the bottom-ranked higher education institutions had accessed two or more funds. Private sector seed or venture sector capital is the main source of finance for only 8% of higher education institutions in London and a secondary source for 36%. Almost two thirds (64%) of responding higher education institutions stated they had no experience of private sector involvement in gaining seed financing for their knowledge commercialisation activities. Private sector involvement was most commonly through the provision of equity in return for seed financing. This was most frequent among the top-ranked universities, with 60% being

involved in seed financing through private equity staking. According to HORVATH and BENKO-KISS' (2011) investigation almost one third of the enterprises is willing to increase their own sources while less than 20% can undertake the rise of liabilities. They analysed agricultural companies in Hungary but their results reveal the main characteristics of the general investor attitude. However, only one institution had experience of gaining finance through corporate venturing – a very low figure given the strength of the region's business sector.

More surprisingly, perhaps, is the finding that 50% of the middle-ranked HEIs have also had involvement in this mode of seed financing, highlighting their increasing willingness to undertake knowledge-based venturing of this kind. However, none of the bottom-ranked universities surveyed had accessed any form of private seed funding. The private sector financiers interviewed stated that if they consider investing in the higher education sector, they only seek "low hanging fruit", and the relative concentration upon the top-ranked universities is evidence of such a focus. The relationship between private funding and public seed financing can be analysed by attributing scores for public and private funding for each institution, and then testing the hypothesis that private sector seed funding for knowledge commercialisation is more likely to be accessed if public funding is already in place. There was considerable agreement among Huggins' interviewees that public sector funding acts as a signal for private sector involvement, i.e. the probability of investment from the private sector rises with the amount of public funding secured, as explained by one interviewee: "Matched funding is used as a signal – with investors much more likely to become involved in a project that is backed by government money, as the risks of involvement are reduced."

In general, private sector investment in London comes either from venture capitalists or business angels; major banks are very unlikely to invest in university ventures, and will only lend money once significant equity is in place. All interviewees were of the view that any public sector investment in higher education knowledge commercialisation should retain a private sector dimension. When probed, interviewees generally stated that seed funding does not appeal to the majority of London's venture capitalists and business angels unless there is a level of public sector involvement. When probed about the nature of any future public sector involvement in seed financing for higher education institutions in London, interviewees were generally of the view that funds should contain some form of intra-fund stream relating to specific disciplines and sectors, since their requirements are often varied in terms of: the amount of investment required; the level of investor patience required; and the necessary management skills required – both current and future.

Overall, there is a requirement in London to broaden the focus of financing university knowledge commercialisation activities beyond the upper tier of higher education institutions if the region is to fulfil its economic objectives, particularly as a key driver of the knowledge economy in United Kingdom. From the views provided by interviewees, it can be suggested that information asymmetry and a resulting lack of suitable risk intelligence among potential private sector investors are having a negative effect on knowledge commercialisation processes in London's higher education sector. Similarly, potential investees do not have access to the relevant networks and intelligence needed to make an effective case for financing, and therefore cannot effectively demonstrate their ideas.

A number of interviewees in London provided evidence of higher education institutions projects that should have been able to attract private sector financing, but were instead "put-on-the shelf" due to a lack of effective engagement with those financiers capable of making a significant investment. Many of the interviewees – who can be considered as key players in the region - stated that they do not have a complete view of all the relevant actors, and that much of the total London network remains uncharted.

Indeed, for the most important players – both financial and academic – the level of diffusion is global, with many of London venture capitalists dealing purely at an international level, and the leading universities establishing commercial alliances with other leading universities and multinationals from around the world. However, as we have already seen, higher education sector of London has a long tail with a lack of strength in depth concerning successful involvement in knowledge-based venturing. This responsibility has largely fallen to the Technology Transfer Offices, which in a number of institutions are still embryonic. As we have already seen, the capability of these offices to operate effectively within a highly commercial environment is often considered to be below the level required by the finance community, which within London can be assumed to be even more demanding in less finance-centric cities and regions. One banker interviewed, who had experience of trying to broker deals in the region, explained: “Evidence from our dealings show that venture capitalists consider the timescales of the decision-making within universities to be too slow. Both venture capitalists and the universities indicate that the Technology Transfer Offices are under-resourced and can do very little for both sides of the fence” (HUGGINS, 2008).

Substantial spin-off and other commercialisation activities are restricted to only a small number of higher education institutions, highlighting the existence of a large knowledge commercialisation divide across higher education sector of London. Despite the density of both higher education and finance institutions in London, the interface between the two is fragmented and limited in its depth. It is often assumed that core economic regions possess an advantage over their more peripheral counterparts due to the existing and embedded intra-regional networks and interdependencies between economic and knowledge creating actors.

With regard to university-finance networks in London, this does not appear to be the case. Although London has a higher concentration of higher education and finance institutions than other United Kingdom regions, there is no evidence that as a whole they are better connected or create and contribute to higher levels of knowledge-based venturing. In terms of potential regional policy intervention in London, it is noticeable that the region currently lacks any form of knowledge commercialisation champion that is enabled to strategically influence the interaction between higher education institutions and the finance or business community. Such a strategic champion could not only act as the key facilitator of interaction between the business community and higher education institutions, but also map potential financing routes, co-ordinate university processes, and raise awareness of higher education knowledge commercialisation activities. The key feature of such a champion would be to work on behalf of all higher education institutions, both through and across existing networks and routes of interactions. In other words, the role of the champion would not be to displace or duplicate existing networks, actors/stakeholders, or initiatives/programmes, but to work effectively with them in a complementary and supporting manner. This could be achieved through the establishment of a regional academic-finance network co-ordinated by the champion.

This network should operate as a means of introducing potential academic entrepreneurs and their technology transfer officers to investors, business intermediaries (both public and private sector), as well as to other academic entrepreneurs and institutions. Furthermore, the development of databases drawing together a range of intelligence on the managers and mentors capable of working with academic entrepreneurs would reduce the search and transaction costs of accessing managerial expertise and increase the probability of acquiring appropriate type of expertise.

CONCLUSION

Universities should be very important actors within knowledge societies, as their purposes are intimately related to knowledge, learning and innovating. The absence of local absorptive capacity raises the question of whether universities can create forward and backward linkages so that regions can benefit collectively from knowledge spill-over arising from the knowledge circulating around universities. Economies that remain locked-in to old economic, technological and institutional forms in the face of such external change are likely to decline, sometimes with catastrophic consequences. In contrast, spatial economies where there is adaptive capacity to develop new forms of economic, technological and institutional arrangements in the face of key external sources of change in post-industrial economies, are most likely to lead to economic growth in knowledge-based information economies.

The University Challenge Fund is the most important United Kingdom national policy development relating to seed financing university knowledge commercialization. Such kind of funds would be very stimulating for the sake of the increasing significance of knowledge-based ventures. The lack of effective interaction networks between the higher education institutions and the business community can appear to have a negative effect on the commercialisation of knowledge not just in terms of financing, but also in terms of exchanging expertise and experience.

In order to improve the management of commercialisation processes, the network could be mobilised to create a far more co-ordinated approach for identifying and promoting suitable managers and mentors. Furthermore, the development of databases drawing together a range of intelligence on the managers and mentors capable of working with academic entrepreneurs would reduce the search and transaction costs of accessing managerial expertise and increase the probability of acquiring appropriate type of expertise.

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