



Innovation, science and the city

Chris Webber

Executive summary

Innovation is a key driver of economic growth, and over the past ten years policy makers at all levels of government have strengthened efforts to increase rates of innovation in the UK. Research funding has been increased; more investment has gone into science parks; partnerships between the public sector, universities and businesses have been improved; and a wide range of technology transfer and business support policies have been introduced.

But the emergence of innovation as a specialist policy area has also generated risks around policy prioritisation and problems on organisational fragmentation and policy coordination. This report highlights these issues and explains how they can be addressed to improve policy effectiveness.

Supporting innovation is about more than specialist partnerships or business support initiatives. Policy makers also need to understand and deal with the wider barriers to innovation in their economies. Delivering on an economy's transport, housing and planning needs must be seen as a key part of the innovation agenda. City-regions that fail to deliver the right infrastructure for growth risk stifling or choking off innovation in their economies.

Some good progress has been made on city and regional innovation policies, especially on the improvement of university-business links. But the organisational structures around business and innovation support have become too fragmented. This is confusing businesses and making policy coordination more difficult.

The introduction of Science Cities reflects national government's desire to increase rates of innovation. However, the value added of Science Cities has varied between participating cities and across policy areas. In some cities - such as Newcastle and Birmingham - the initiative has had a valuable catalytic effect, strengthening partnerships and sparking new activity. In others, particularly in Manchester, it has been more of an awkward add-on to what was already in place.



“City-regions need to tackle the wider barriers to innovation in their economies”

The report argues that policy makers need to deal with these issues by reviewing structures and plugging innovation policy back into the mainstream economic growth agenda. It makes four key recommendations:

- 1. City-regions need to tackle the wider barriers to innovation in their economies – in areas like transport, housing and planning.** In many city-regions, dealing with pressing problems in these areas could have a greater impact on rates of innovation than introducing dedicated innovation support policies.
- 2. City-regions should rationalise organisational structures around business and innovation support, and national government should shelve plans to introduce Partnerships for Innovation.** The Business Support Simplification Programme and evolving devolution agenda provide an ideal opportunity to simplify organisational structures.
- 3. The designated Science Cities should review their Science City status and drop the brand if they see fit.** There are signs of strategic tensions and branding problems in all of the participating cities except for York and Newcastle. There is a strong case for Manchester to drop the brand.
- 4. City-regions should adopt a more realistic attitude towards the idea of university-led economic growth.** As part of the review of their Science City status, the designated Science Cities should conduct an honest appraisal of the prospects for university-led growth in their city. Other city-regions should also adopt a clear-headed approach. In most cases, university related business activity will only ever be one part of a much wider growth story. Economic strategies and investments need to reflect this reality.



“Innovation is about applying new knowledge and ideas for significant commercial gain”

Introduction

In business, innovation is about applying new knowledge and ideas for significant commercial gain. This acts as a major driver of economic growth by increasing productivity, opening up new markets for innovating firms and creating new goods and services that can be used by the rest of the economy (Romer, 1990; Cameron, 1998; HMT, 2007). City-regions able to facilitate an increase in rates of innovation are likely to benefit from this by experiencing higher levels of employment creation and income growth (Hall & Kramarz, 1998; Acs, 2002).

Innovation has climbed up the UK’s economic policy agenda as the competitive pressures from globalisation have increased (DTI, 2003; Brown, 2008). At the national level, this is evidenced most recently by the Sainsbury Review of Science and Innovation (Sainsbury, 2007) and the publication of the UK’s first dedicated innovation White Paper, Innovation Nation (DIUS, 2008). At the local and regional levels, economic strategies have been populated with references to innovation and plans to promote it; university-business links have been strengthened; and numerous ‘innovation centres’ have been built.

Innovation’s increased prominence is to be welcomed and some good progress has been made, particularly on the improvement of university-business links (see section 3). However, the emergence of innovation as a specialist policy area has also generated risks on policy prioritisation and problems around organisational fragmentation and policy coordination. This report argues that policy makers need to address these issues by reviewing structures and plugging innovation policy back into the mainstream economic growth agenda.

Much of the discussion in the report focuses on university or manufacturing related innovation policies because to date that is where most policy interventions - such as improvements in university-business links and the Science Cities initiative - have been targeted. However, many of the report’s key policy messages – particularly those around the need for city-regions to deal with wider barriers to innovation and economic growth like transport, housing and planning – are relevant to all forms of innovation taking place in the economy, whether in manufacturing or services.

The report is split into four sections:

- First, it highlights the **wider barriers to innovation**, arguing that city-regions and regions must see delivery in these areas as a critical part of their efforts to increase rates of innovation and growth in their economies
- Second, it looks at local and regional innovation policies, arguing that **organisational structures need to be rationalised and that national government should shelve plans to introduce local Partnerships for Innovation**
- Third, it provides an **assessment of the Science Cities initiative**, and suggests some next steps for national government, RDAs and the designated Science Cities
- Fourth, it draws these themes together to make some **practical policy recommendations** for central, regional, and local level decision makers



1. The wider barriers to innovation and economic growth

Innovation is an important driver of economic growth, but businesses are the economy's key innovators, not the public sector. Overwhelmingly, innovation takes place without the direct involvement of government. In a market economy, the principal role of government and its agencies is to create the conditions for businesses to innovate and grow, rather than to assist them directly. Among other things, this means balancing policy objectives and getting incentives right in areas like competition and fiscal policy, ensuring that society benefits from first class transport and housing infrastructure, and continually improving the educational standards and technical skills of the workforce.

In the UK, central government takes the lead in a number of these policy areas, especially regulation and fiscal policy, but local and regional policy makers have a major role to play in others, particularly in areas like housing and transport. For city-regions, therefore, 'innovation policy' is just as much about delivering in these mainstream policy areas – in areas like housing, transport, planning and skills - as it is about improving links between universities and businesses or establishing cluster networks.

Though increased policy attention on innovation is positive, there are signs – such as the creation of the Department for Innovation, Universities and Skills, the widespread adoption of dedicated innovation strategies, the establishment of Science Cities, and the planned introduction of Partnerships for Innovation – that innovation is increasingly being treated as a specialist policy area rather than one strand of a wider economic growth strategy.

Drawing this kind of distinction between innovation and economic growth policies creates two problems. First, it can encourage an unhelpful proliferation of business support structures and organisations that risks confusing business and making policy coordination more difficult (see sections 2 and 3). Second, it risks policy makers losing sight of the full range of policy levers they can use to support innovation and economic growth in their areas (see below).

City-regions need to tackle the wider barriers to innovation in their economies

The links between increasing rates of innovation and dealing with transport, housing, planning and other mainstream economic growth issues tend to be under-appreciated in innovation policy debates. For example, there is little mention of these kinds of issues in regional innovation strategies, and, while the government's Innovation White Paper references transport issues frequently, it does not mention housing or planning at all – even when it discusses innovation and place (DIUS, 2008)

- **Transport** – transport is a well known enabler of economic growth, allowing goods to move around the economy and bringing people together to transact. Poor quality, congested transport systems increase costs and reduce the relative attractiveness of city-regions as locations for workers and businesses, undermining their ability to nurture innovation and attract innovative firms (DIUS, 2008). Dublin's well documented difficulties in coping with its rapid growth are a good example of how transport problems can weaken the performance of an economy (Forfas, 2007).

“Overwhelmingly, innovation takes place without the direct involvement of government”



“City-regions
need to
concentrate on
where they can
add the most
value”

Added to this, breakthroughs in economic theory over the past few years have allowed us to measure the benefits of transport investments far more accurately. As the Centre for Cities showed in its recent work on the wider economic benefits of transport investments in the Leeds city-region (Marshall & Webber, 2007), the productivity impact of improving transport links into and between cities has been significantly underestimated for years. Transport economists now understand the scale of these additional productivity benefits much more clearly than in the past, with increased innovation thought to be an important source of the gains (see Webber & Athey, 2007 for a review).

- **Housing and quality of place** - a city-region needs to provide a housing offer that meets the needs of its workforce and is responsive to changing demand. It also needs to ensure that its ‘place’ offer is capable of attracting high-skilled workers. Anecdotal evidence from Dundee, suggests that improved housing and quality of place factors have played an important role in attracting the highly skilled researchers that have helped drive the success of its university and life sciences cluster (Athey et al, 2008).

More widely, as argued in the Centre for Cities’ recent housing report, Home Economics (Gibb, O’Sullivan & Glossop, 2008), city-regions - such as Cambridge - that struggle to accommodate the housing (and wider infrastructure) needs of their economies risk undermining their competitiveness as locations for business by significantly increasing the costs of living and operating a business in their areas.

- **Planning** - as the Barker Review of Land Use Planning (2007) made clear, planning decisions can inhibit innovation in a variety of ways, including delaying or restricting the development of business clusters around universities - as has arguably happened in places like Oxford, Cambridge, Bath and York - or failing to accommodate the general growth needs of a city-region. By contrast, a positive, responsive planning approach can help to attract business and enable innovation. In Reading and the Thames Valley, for example, the availability of land and the supportive approach adopted by local authorities has been a major factor in attracting the high tech firms that have made that area one of the UK’s most innovative sub-regions (Athey et al, 2008).
- **Education and skills** - an economy’s stock of knowledge, experience and creativity is one of the key determinants of its ability to innovate and grow (see for example, Glaeser & Saiz, 2003; Dakhli & De Clercq, 2004; HM Treasury, 2008). But for city-regions, building these intellectual assets is about more than just education and skills policy. It is also about creating an environment that helps businesses work with, attract and retain talented workers. Again, this means delivering on an economy’s needs in areas like housing and transport – particularly the provision of international transport options (Simmie, Sennet & Wood, 2002; Simmie, 2003).

City-regions need to concentrate on where they can add the most value

Policy makers need a broad understanding of the levers they can use to enable innovation, and they need to focus their attention on where they can have the greatest marginal impact on rates of innovation and economic growth in their areas.



City-regions that introduce dedicated innovation support policies while failing to deliver the right infrastructure for growth risk preventing or choking off innovation in their economies. In many city-regions – especially high growth ones like Cambridge, York and Brighton – dealing with pressing transport, housing and planning challenges could well have a greater impact on rates of innovation than dedicated ‘innovation’ policies. And importantly, it is in these areas where local authorities and regions have significant powers and can make a real difference to the performance of their economies.

As discussed in section three, those directly involved with Science City projects are beginning to acknowledge the importance of dealing with the wider barriers to innovation, with a focus on quality of life issues at the 2007 Science Cities summit.

2. Coordination problems in local and regional innovation policy

Over the past decade, national government, RDAs, local authorities and universities have introduced a wide range of dedicated innovation and business support policies.

The public sector has built up a web of dedicated innovation support structures and initiatives, ranging from investments in science parks and innovation centres, to direct business support and the improvement of university-business links. These policies appear to have had a positive effect. A new focus on harnessing the power of public procurement to promote innovation could also generate significant returns.

However, the rise of innovation as a niche policy area has also created problems. The growth of specialist organisations and support initiatives has fed the complexity of the innovation and business support environment, reducing efficiency, making policy coordination more difficult and confusing business.

This section of the paper argues that city-regions need to rationalise the organisational structures around innovation and business support, and that national government should shelve plans to introduce Partnerships for Innovation.

Regional innovation policies

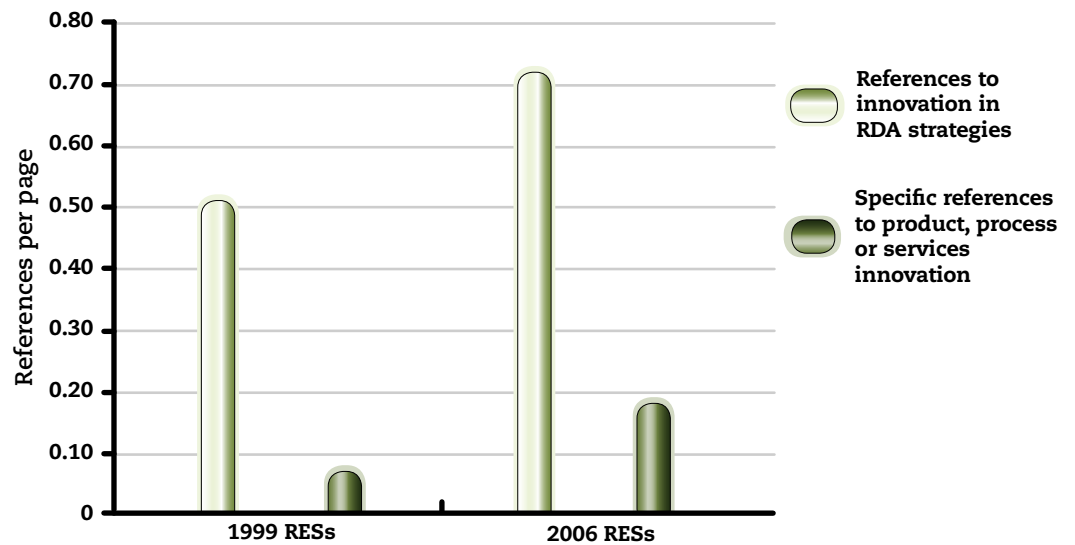
RDAs have taken steps to integrate innovation into their policy making processes by establishing Science & Industry Councils in each of England’s regions. At the same time, innovation’s profile in sub-national policy debates has risen significantly, with the number of references to innovation in Regional Economic Strategies up by nearly half between 1999 and 2006 (see figure 1). The way in which innovation is perceived also seems to have changed. RDAs are now much more likely to make specific reference to product, process and services innovation than they were in the past (see figure 1). This is positive because it suggests a more nuanced understanding is emerging about what innovation means and how it happens, which should in turn lead to better policy choices.

“The rise of innovation as a niche policy area has also created problems”



“Many local authorities and city-regions have also developed their own approaches to supporting innovation”

Figure 1: References to innovation and to product innovation, process innovation or services innovation in Regional Economic Strategies



Source: Author’s own calculations based on content analysis of 1999 and 2006 Regional Economic Strategies from SEEDA, SWDA, EMDA, AWM and Yorkshire Forward. The 1999 strategies for the remaining RDAs were either unavailable or were not available in the appropriate format.

Local authorities and city-regions

Many local authorities and city-regions have also developed their own approaches to supporting innovation. Some have created dedicated bodies, with Greater Manchester setting up Manchester Knowledge Capital in 2002. Some have integrated innovation support functions into existing organisations, as with the Thames Valley Economic Partnership (see figure 2). And others, such as Liverpool and Sheffield, have begun to roll innovation support functions into the remit of their new Economic Development Companies (see figure 3).

Figure 2: Thames Valley Economic Partnership

The Thames Valley Economic Partnership focuses on sustaining and improving the economic performance of the Thames Valley area. It has a wide membership of businesses and local authorities across the sub-region and a remit covering issues such as transport, inward investment, skills and innovation. On innovation support, it has created an online business networking service and organises high profile networking events aimed at helping to stimulate innovation in the local business community.

Figure 3: Creative Sheffield

Creative Sheffield was set up in 2007 as one of England’s first Economic Development Companies. The main partners are Sheffield City Council, Yorkshire Forward and English Partnerships, who use it as the principal economic development vehicle for the city. Creative Sheffield was formed through the merger of Sheffield First for Investment, the Cultural Industries Quarter Agency and Sheffield One – the city’s former Urban Regeneration Company.

It has a broad remit covering issues like physical regeneration, inward investment, skills and innovation. On innovation, one of the key projects is a collaboration between Creative Sheffield, the University of Sheffield and Sheffield Hallam University called Knowledge Starts which aims to increase spin out activity from the two universities.



Universities

Innovation policies themselves have often focused on improving the links between universities and businesses and increasing the commercialisation of university research. There are some clear signs that these have had a positive effect on rates of innovation in science and technology around the country.

One of the key drivers for change has been the introduction of the Higher Education Innovation Fund (HEIF), which was set up in 2002 to incentivise knowledge transfer from universities to the private sector. Among other benefits, HEIF has encouraged universities to develop strategic plans for business support, to set up enquiry points for small and medium sized enterprises (SMEs), and to expand business support for SMEs (Galsworthy & Knee, 2007).

The increased focus on these activities has coincided with (and probably helped to stimulate) a growth in knowledge transfer from universities to businesses, with universities seeing good progress on most knowledge transfer indicators over the past five years (see figure 4).

Figure 4: Selected knowledge transfer indicators

Knowledge transfer indicator	2000/1	2001/2	2002/3	2003/4	2004/5	2005/6	Percent change 2000/1-2006/7
Number of new patent applications filed by HEIs	896	960	1222	1308	1649	1537	72
Number of patents granted	250	198	377	463	711	576	130
Number of licensing agreements	728	615	758	2256*	2099	2699	271
Income from licensing intellectual property (£million)	18	47	37	38	57	58	215
Number of spin outs	248	213	197	161	148	187	-25
Income from business (value of consultancy contracts) (£million)	104	122	168	211	219	236	128

Source: Higher Education–Business and Community Interaction (from Sainsbury, 2007)
 *From 2003–04 onwards more HEIs included software licenses.

Policy coordination problems

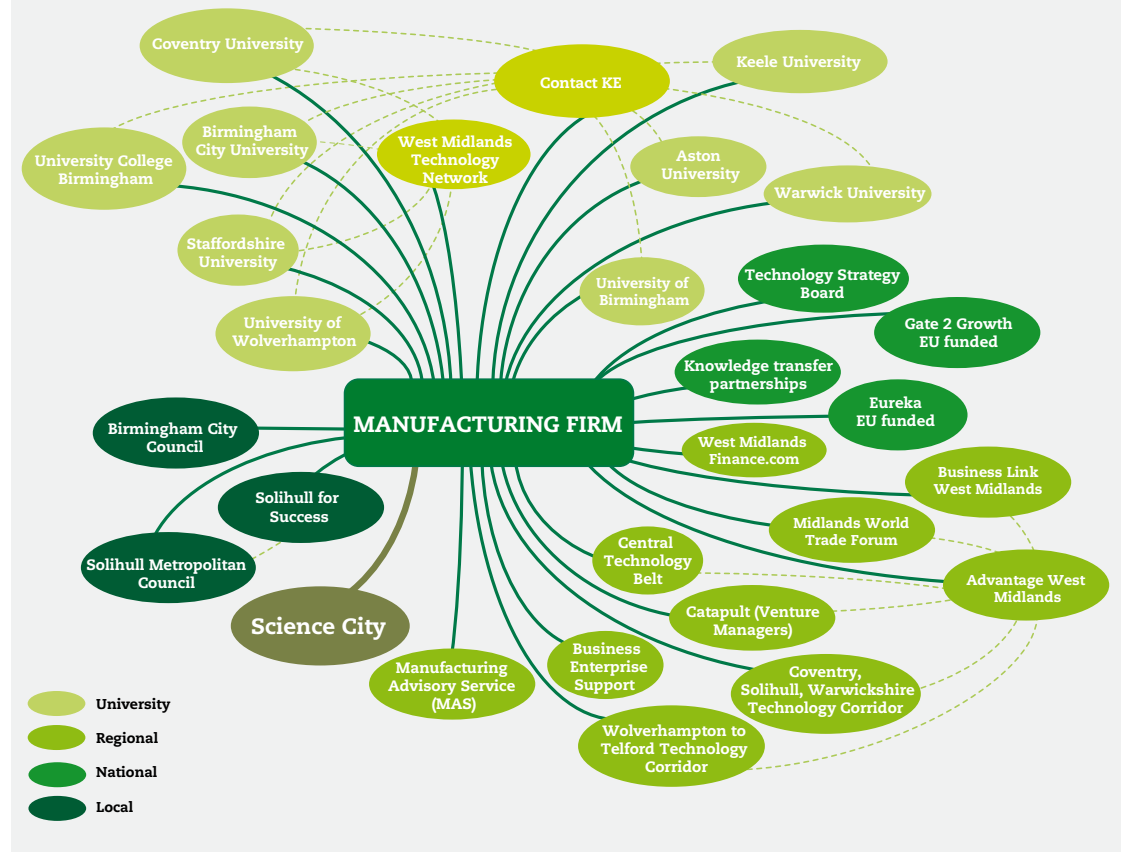
However, as argued above, the emergence of innovation as a distinct policy agenda has encouraged organisational fragmentation, exacerbating longstanding policy coordination problems and increasing private sector confusion about the support offer available to them (Perry, May & Monaghan, 2008)

Figure 5 illustrates the support offer confronting manufacturing businesses in the Birmingham area. The map does not claim to be comprehensive, but it does give a rough indication of the number of general support providers in the Birmingham area.

“The emergence of innovation as a distinct policy agenda has encouraged organisational fragmentation”



Figure 5: Manufacturing business and innovation support in Birmingham



“It is probably not necessary to have six separate organisations offering access to the university base”

One of the most striking findings here is the number of organisations offering support to business. Our count showed that Birmingham’s manufacturing firms can select between around 55 different support initiatives across at least 29 separate delivery bodies or portals.

In Birmingham, one of the principal sources of these support schemes and structures are universities. Of course, the academic knowledge and talent in Birmingham’s universities should be viewed as an asset that needs to be leveraged for maximum economic benefit, and the range of support organisations and initiatives reflect the effort that has gone in to doing this.

At the same time, however, it is probably not necessary to have six separate organisations offering access to the university base. Why, for example, do there need to be two university managed business portals – the West Midlands Technology Network and Contact KE? As discussed in section 4, Birmingham’s Science City project has had some positive partnership effects, but there is more work to do in terms of coordinating the support offer for local businesses.

Coordination problems have surfaced elsewhere too. In the Solent area, for example, ‘Solent Synergy’ and the ‘Solent Enterprise Hub’ provide similar business support and technology transfer brokerage services for technology firms. Both are the product of public sector/ university collaborations and should be rationalised.

There are similar problems with organisational fragmentation in Bristol and the South West, with the South West Regional Development Agency now putting pressure on Sub Regional Partnerships to rationalise their approach.



Businesses are confused

A recent report from the British Chambers of Commerce (BCC) and Sustainable Urban and Regional Futures (SURF) reveals the private sector's frustration about the inaccessibility of the support offer (Perry, May & Monaghan, 2008). Business chambers around the country have a number of concerns about regional innovation and business support systems, including:

- The complexity of outward-facing RDA structures, and a disconnect between university-business exchange initiatives and plans for business support simplification
- The fragmentation of innovation support efforts and a perceived inability to prioritise interventions
- A perception that business engagement is a 'tick box' exercise rather than a genuine effort to integrate business views into the design of strategies and policies
- A narrow emphasis on property-centred innovation as opposed to knowledge exchange

The government's Business Support Simplification Programme (BSSP) is already aiming to reduce the number of support initiatives in England from around 3,000 to no more than 100 by 2010, with all support services to be channelled through Business Link. Innovation support initiatives are just as much in need of simplification, and the BSSP acknowledges this (BERR, 2008).

Organisational structures should be rationalised

Businesses have a complex range of needs, but national government, RDAs, local authorities and universities need to ensure that they provide a simple, accessible support offer that the private sector understands. This means not only simplifying business support policies, but also the organisational structures around business and innovation support.

The rationalisation of organisational structures would complement the government's BSSP by helping to simplify the interface between businesses and support organisations, improving policy coordination and increasing efficiency.

The BSSP and devolution agenda provide an ideal opportunity to rationalise organisational frameworks

The evolving process of devolution towards regions and local authorities (through the Sub-National Review process and the introduction of Local and Multi Area Agreements) risks creating additional complexity in the business support environment. But the combination of devolution and the BSSP also gives decision-makers in universities, local authorities and RDAs an important window of opportunity to create a simpler, more effective organisational framework around business and innovation support.

“The rationalisation of organisational structures would complement the government's BSSP by helping to simplify the interface between businesses and support organisations”



“City-regional structures will often be the right way to go”

Precise organisational solutions will vary between areas, but businesses and the public sector should grasp this opportunity for rationalisation by winding down or merging support organisations wherever they judge this to be appropriate.

City-regional structures will often be the right way to go – especially in our larger urban areas

As the Centre for Cities has previously argued (see for example, Marshall, 2006), city-regional governance structures often make most sense for economic policy governance – especially in larger cities like Manchester and Birmingham – because city-regions provide a good match for the economic footprint of these areas.

On this basis, one model that might prove viable for city-regions would be a city-regional Economic Development Company (EDC) with delivery responsibilities across a range of infrastructure, skills, inward investment and business support issues. Overlapping business and innovation support organisations across the city-region could then be rolled into this new structure, as has happened at the local authority level with the establishment of Sheffield’s EDC, Creative Sheffield.

Establishing city-regional EDCs would provide a simpler interface for firms looking to access business or innovation support; it would help to improve cross-boundary collaboration and funding coordination in areas like transport, physical regeneration and skills as well as innovation; and it would also increase efficiency by limiting duplication and reducing the time it takes to build and manage partnerships.

In terms of technology transfer, city-regional EDCs could then be backed up by regional university partnerships of the kind seen in the West Midlands with Contact KE, the East of England with its i10¹ partnership and Yorkshire with the White Rose Consortium². Universities have made progress in this area, but they have more to do - both in terms of building up inter university partnerships and ensuring that their activities are suitably integrated into the wider support environment. The latest round of HEIF funding (running from 2008/09 until 2010/2011) stressed the need for collaborative working between universities and other partners, but so did previous rounds. Future funding allocations could provide stronger incentives for universities to do more in this area.

National government should shelve its plans to introduce local Partnerships for Innovation and work through existing structures instead

National government should support the process of organisational simplification by shelving its plans to introduce local Partnerships for Innovation. The Innovation White Paper explains that the aim of these Partnerships will be to ‘bring together public, private and third sector organisations to develop innovative solutions to local and regional challenges, such as economic, social, environmental or a combination of these’ (DIUS, 2008: 22).

1. i10 is a partnership set up by ten universities in the East of England – including Cambridge, Cranfield and the University of Essex – to provide a single point of access for businesses to engage with the region’s knowledge base. www.i10.org.uk

2. The White Rose University Consortium is a partnership between the universities of Leeds, Sheffield and York to improve research strength and increase the economic impact of the universities on the Yorkshire area. www.whiterose.ac.uk



“National government should support the process of organisational simplification by shelving its plans to introduce local Partnerships for Innovation”

The problem here is that structures to facilitate this kind of activity already exist, whether in the form of local economic partnerships, Economic Development Companies, Science Cities (discussed below) or a mixture of these. The Innovation White Paper says that the new Partnerships will complement existing activities, but it is difficult to see where their niche would be. The risk is that Partnerships for Innovation will largely duplicate what is already going on at the sub-national level.

Against the backdrop of devolution and business support simplification, the real challenge for national policy makers is to help shape and complement existing or emerging city-regional approaches rather than to create new structures. In this context, DIUS should be thinking about how it can embed innovation thinking and objectives in emerging economic development structures such as EDCs or Multi Area Agreements. The inclusion of innovation in the recently introduced Local Economic Assessment duty for local authorities is a clear step in the right direction.

3. Science Cities and university-led economic growth

Six cities around England have been designated as Science Cities by national government. York, Manchester and Newcastle received their designations in 2004. Bristol, Nottingham, and Birmingham got theirs in 2005.

The Science Cities idea emerged out of the government’s desire to increase rates of innovation and better leverage the UK’s top regional research universities for economic growth (Sainsbury, 2007). It also reflected the government’s emphasis on science and technology transfer as the principal source of innovation in the economy, with Gordon Brown making clear that he saw Science Cities as part of the effort to make Britain ‘a world leading location for the next wave of research and development’ (Brown, 2005).

Summary

Science Cities were an unfunded announcement with unclear objectives. HMT, and more recently DIUS (DIUS, 2008), have presented this as a virtue, arguing that government wanted to leave cities to work objectives out for themselves.

Flexibility has been a positive feature of the Science Cities initiative, but overall value added has varied between cities and across policy areas. In some cities and areas of policy, the designation has had a valuable catalytic effect on new partnerships and activities. This has helped to bring forward or shape property development plans, in Newcastle and Nottingham, for example, or to facilitate major investments in research facilities and equipment, as in Birmingham.

In other cities and policy areas the designation has been more of an awkward add-on to existing activities. Partners have had (and still have) varying visions of how the initiative fits into city-regional plans; property development deals and projects that were already in train or on the horizon have been re-titled as the product of Science City activity; and inward investment branding has been confused. Moreover, the way university related partnership structures and



development activities have evolved in other cities with top universities, such as Southampton and Sheffield, suggests that much of the activity associated with designation as a Science City could have taken place without it.

Government needs to let the cities themselves decide what to do with their Science City status, including dropping the brand altogether if they see fit. For their part, the designated cities need to figure out how the initiative sits in their overall approach to economic growth, including resolving strategic tensions between public sector partners and developing coherent city-regional inward investment profiles.

In reviewing the role of their Science City status, each city also needs to decide how realistic the idea of university-led economic growth is in their city. The reality is that, in most cases, university related business activity is only ever likely to be one part of a wider growth story – especially in larger cities like Newcastle, Manchester and Nottingham. Economic priorities and investments need to be grounded in a balanced understanding of a city's economic challenges and opportunities. Universities can play a part in dealing with these, but, most cities should not expect them to lead economic growth.

Science Cities: national policy on the hoof?

There was no consultation over the first round of Science City designations. This has understandably given rise to the suspicion that it was based more on the desire for an eye-catching announcement than a clear policy need. In future, national government should give more detailed consideration to how it intervenes in sub-national approaches to economic growth, including consulting fully with local and regional partners.

The need for an assessment and the method used here

Ambiguity around the objectives of Science Cities and the web of existing policies and economic partnership structures already in place in each of the participating areas makes the Science Cities initiative a difficult one to evaluate.

The Sainsbury Review called for an assessment of the project's impact and for ideas about what needs to happen next (Sainsbury, 2007). This section draws on the views of those involved with Science Cities and tries to assess its impact in each of the designated cities.

Our research is based on 35 semi-structured interviews with key stakeholders involved in the Science Cities initiative at the national, regional and local levels. Interviewees included project managers from each of the Science Cities as well as representatives from RDAs, universities and businesses. Expert academics and policy specialists were also interviewed.

The impact of Science Cities is analysed in four areas:

- Strategic fit and partnership working
- Branding and inward investment
- Projects – both capital and revenue
- Public engagement

“Government needs to let the cities themselves decide what to do with their Science City status”



“The overall impact of science businesses on the York economy has actually been quite small”

The analysis highlights examples of where Science Cities projects have added value by establishing or significantly strengthening partnerships or innovation projects. It also identifies coordination problems and strategic tensions, between Science Cities objectives and the wider economic development approach in participating cities. And finally, it looks at two other cities with high quality universities – Sheffield and Southampton - that have not been designated as Science Cities, to judge whether awarding them Science City status would have made any significant difference to the approaches they have adopted.³

Strategic fit and partnership working

York

York had already labelled itself as ‘York Science City’ in 1998, well before the 2004 designation from central government. York City Council originated the idea as a key focus of its economic development efforts, using the Science City brand to complement its goal of maximising the economic impact of York University. The approach has brought together the council, university, local business leaders and Yorkshire Forward in what is acknowledged as an impressive partnership (see for example, Lambert, 2003).

But views are mixed on how much value national government’s Science City designation has added to what was already going on in York. Some maintain that the government designation has added little or nothing to what was already in place. Others argue that the national designation has been useful in strengthening York’s profile in regional and national policy debates, and that this has helped the city and university to attract funding and overcome planning problems. The second interpretation is a more reasonable assessment, though it is impossible to tell exactly what funding and planning decisions would have been made had the Science City initiative not been introduced.

One of the big challenges for policy makers in York now is to find new and better ways to maximise the impact of the university on the local economy. All agree that there is more to be done in this area, and that the overall impact of science businesses on the York economy has actually been quite small (Future York Group, 2007). The Centre for Cities is currently working with York to help address these issues.

Manchester

In a similar way to York, Manchester had already kick-started its effort to maximise the impact of its universities and to stimulate the development of knowledge based industries in the city before its Science City designation in 2004. The clearest evidence of pre-existing activity is Manchester Knowledge Capital (M:KC), which now houses the Science City project. M:KC was established in 2002 as a partnership between all ten local authorities in the Manchester city-region, the city’s four universities, leading businesses, the Strategic Health Authority and other public sector bodies. It seeks to be ‘a dynamic force for innovation and economic transformation, built around a highly competitive combination of knowledge assets in the Manchester city-region’⁴.

3. The paper’s final recommendations are the views of the Centre for Cities and do not necessarily reflect the official positions of the Science City projects.

4. See Manchester Knowledge Capital website: www.manchesterknowledge.com



The objectives of M:KC and the general thrust of the Science City model overlap quite significantly. Valuable projects - such as helping to secure funding for the Manchester Cancer Research Centre - have been branded as Science City activity, but it is not clear how the Science City designation has added value to what M:KC was already doing or what it would have been likely to do - either by strengthening partnerships or significantly shifting their focus.

Added to this, there is a tension between the 'Knowledge Capital' brand that Manchester created for itself and the Science City idea that was given to it by central government. The Manchester Knowledge Capital tag reflects the city's desire to build up a range of knowledge based industries, including finance and the creative industries, as well as those linked more directly to the science base, such as life sciences. The Science City tag therefore seems too narrow as a description of what Manchester is trying to achieve.

There have been benefits for Manchester - in public engagement with science, for example - but in terms of overall policy fit, the Science City initiative has been an awkward bolt-on to existing activity. Overall, there is a strong case for dropping the Science City brand in Manchester.

Newcastle

The Science City idea has had a much bigger impact in Newcastle. Here, the initiative has had a powerful catalytic effect, strengthening partnerships between the council, Newcastle University and One North East (ONE), and sparking new activity - especially in the property sphere.

The Science City designation has helped to crystallise the idea of harnessing Newcastle University to drive growth in the city's economy. And in particular it has brought partners together around ambitious plans to develop 'Science Central' at the old Scottish and Newcastle Brewery site near the city centre.

But is it realistic to expect a powerful life sciences cluster to develop in the city? If not, how much time and money should Newcastle dedicate to trying to build one up? Unfortunately, the answer to the first question is that this seems unlikely - at least in the medium term. Life sciences activity tends to cluster disproportionately around the very best research universities (Library House, 2007), and while Newcastle University performs very well in research it does not rank alongside the likes of Cambridge, Oxford and others either in research performance or economic impact (see figure 9).

The answer to the second question is more difficult. First, it places some doubt over the project's property development plans, suggesting that there might be alternative uses or a different mix of uses for the old Scottish and Newcastle Brewery site that could generate higher returns for the city's economy. Also, with property developers now more cautious about marginal developments due to the current financial and property market difficulties, the viability of the Science Central idea could be subject to some reassessment by potential private sector partners.

Second, it raises the question of how Newcastle might modify its economic strategy to make it more realistic. Here, previous research has suggested that while the city should retain the Science City brand, it should clarify and tone down the goals of project - by, for example, acknowledging that science

“The Science City designation has helped to crystallise the idea of harnessing Newcastle University to drive growth in the city's economy”



“Nottingham City Council championed the Science City idea from the outset, making the Science City model a major part of the city’s economic strategy”

jobs will only be a small part of total employment (Marshall & Seex, 2007). The same report argued that Newcastle should also place more emphasis on helping existing ‘non-science’ businesses improve their productivity. These firms constitute the majority of businesses in the area and their productivity is significantly lower than the national average, meaning that the economic returns to improvement would be substantial.

Nottingham

Nottingham City Council championed the Science City idea from the outset, making the Science City model a major part of the city’s economic strategy. A key objective for the Council now is to be ‘one of the top ten science cities in Europe by 2030’, though it is not clear how this might be judged.

Other partners - such as Nottingham Trent University, the University of Nottingham and the East Midlands Development Agency – also bought into the idea, though their enthusiasm was somewhat weaker at the start of the process than it is now, principally due to fears about duplication and limited value added. These concerns have now dissipated, though visions about the purpose of the Science City initiative still vary between stakeholders.

In terms of value added to public sector partnerships, the initiative has helped to formalise and strengthen links between the universities, businesses, Nottingham City Council and EMDA – especially in property development and skills provision.

But how realistic is the idea of a powerful bioscience cluster in Nottingham? The city’s flagship Biocity incubator facility - a building donated to Nottingham Trent University when the German chemicals company, BASF, left the city in 2001 - is seen as a great success by local partners. However, in order for a major cluster to develop, Nottingham University will need to substantially increase its impact on the local economy. According to the most recent research Nottingham University only comes out around average on most measures of technology transfer when compared to other top performing universities in the UK (Library House, 2007). In particular, the university will need to generate significantly more and better spin-outs to feed the development of a local cluster. Without a step change in the performance of its top university, Nottingham’s objective of becoming one of Europe’s top ten science cities by 2030 is unlikely to be realised.

Birmingham

Birmingham is another city where the Science City initiative appears to have had a positive effect on partnership working and to have generated some additional activity.

In contrast to most of the other participating cities, the Science City project has been led by and housed in the RDA, Advantage West Midlands (AWM). Universities across the region – including Birmingham, Coventry and Warwick - have also linked up with the initiative, no doubt partly attracted by the prospect of securing some research funding from AWM. Though supportive, Birmingham City Council was more hesitant about the initiative because it is still working out its strategy for stimulating the growth of knowledge economy sectors.



“Bristol’s Science City initiative has taken longer to get going than its second round counterparts”

The kind of activities that the project has focused on have also varied from the norm. There has been no activity on property development, with AWM focusing instead on business support projects and investments in university research equipment – principally a £6m investment in equipment to support Birmingham University and Warwick University research into hydrogen energy.

One of the biggest problems for Birmingham lies around the fragmentation of business support initiatives and organisations in the area (described in section 3). Though stakeholders argue that the Science City initiative has strengthened partnership working, there is still some way to go before initiatives and organisations are coordinated as effectively as they could be. Another issue is the project’s comparatively low profile in policy debates, possibly reflecting uncertainty about where it fits into the city’s wider economic development plans.

Bristol

Bristol’s Science City initiative has taken longer to get going than its second round counterparts, Nottingham and Birmingham, though partners – including Bristol University, Bristol City Council, and the South West Development Agency (which manages the project) – have been committed to the project. The key reason for the delay in setting the initiative up was that there was a smaller gap for the Science City initiative to plug than in other cities. The Bristol area was already one of the UK’s top performers in terms of science and technology industries – especially aerospace, and the city already had plans and structures in place for supporting innovation. As a result, local and regional decision-makers had to figure out where Science City could add value before starting activity.

Despite this, interviewees were consistent in their view that the project has benefited the city. In particular, partnerships between universities and the wider public sector have been strengthened and the initiative has encouraged policy makers to link up innovation thinking across issues like transport and planning. Also, as with most of the other cities, branding and public engagement are seen as significant benefits.

Going forward, the biggest challenge for the Bristol project lies in ensuring that the Science City concept is fully embedded in the city’s economic growth activities. There are signs that this has not happened yet – particularly in inward investment – and partners will need to address these problems as soon as possible.

Knowledge sharing and access to national government

Most cities stressed the benefits of knowledge sharing with Science Cities elsewhere in the country. Regular meetings and an annual Science Cities summit are seen as a valuable forum for policy learning.

A number of interviewees also emphasised the importance of the Science City designation as a means of maintaining profile in national government thinking and gaining access to ministers and top civil servants. Having a strong profile in national government can only be a good thing, but national government should make clear that no additional funding will be allocated to cities based on their Science City status. Related to this, it is questionable



“What makes Science Cities more deserving of access than other cities with good universities, like Sheffield, Leeds, Southampton or Belfast?”

whether Science Cities should be given privileged access to government policy makers based on a designation that was not thought through in detail. What makes Science Cities more deserving of access than other cities with good universities, like Sheffield, Leeds, Southampton or Belfast?

Signs of an increased focus on the wider barriers to innovation

The emphasis on quality of life factors at the 2007 Science City summit suggests that Science City projects are also beginning to think about wider enablers of innovation. As argued in section 2, those interested in supporting innovation need to consider these kinds of policy links when deciding how to prioritise their policies and investments. Strengthening cross-issue, cross-organisation partnerships could prove to be a valuable area of work for Science City projects if they can help to facilitate progress on the wider barriers to growth in their economies. In doing this, however, Science City projects will need to ensure that they add value to what is already in place. It may be that the best way to achieve the cross-issue, cross-organisation partnership working is to roll the Science City in to the wider economic development framework.

Branding and inward investment

One of the biggest perceived benefits of the Science City designation is its value as a brand. Most interviewees identified this as a major benefit, but the evidence is mixed on how well integrated the idea of Science Cities is in the inward investment offer of participating cities.

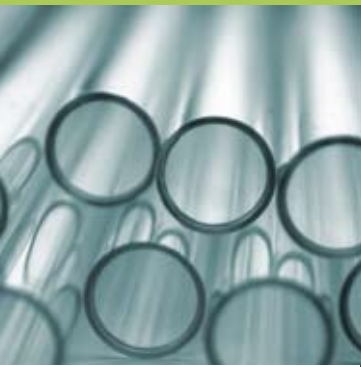
The Science City brand is fairly well linked into inward investment marketing in Nottingham and Birmingham, with relatively clear referencing on inward investment websites and a strong emphasis on science and technology.

The picture is more mixed elsewhere, however. Newcastle’s inward investment services are delivered by the Council and One North East, but neither market Newcastle as a Science City – though ONE’s Invest North East England website is strongly focused on science activity and so complements the Science City brand.

The inward investment brand is not particularly clear in Bristol either. The Council’s inward investment website makes limited reference to their status as a Science City even though this covers many of the same business sectors. Partners acknowledge that the city’s branding is confused at present and they are working to address this.

The role of Science Cities is perhaps most uncertain in Manchester. The city-regional inward investment agency, MIDAS, makes no reference to Manchester’s position as a Science City - though it rightly highlights the city’s university base as a major asset. Also, reflecting the city’s wider ‘knowledge economy’ focus, MIDAS has been concentrating on trying to attract finance firms from the United States.

Cities ignoring their Science City designation when branding themselves makes perfect sense if the Science City idea does not fit with the brand that the city wants to portray. In these cases, however, it might make more sense to drop the Science City brand in favour of a more accurate tag line rather



“The area which has received most policy attention through Science City projects has been property development”

than risk undermining marketing efforts. On the other hand, if cities do want to keep the brand they need to ensure that it adds value by being suitably embedded in their profile and marketing activities. Science City partners need to do more to resolve these branding tensions.

Projects – property work and revenue projects

The area which has received most policy attention through Science City projects has been property development. Designations have acted as an important catalyst for action in some cities – particularly Newcastle - and detailed plans have been drawn up. However, many of the facilities or planned investments linked to Science Cities projects had been delivered or were in the process of development well before Science Cities emerged, making the value added of the Science City designation questionable in a number of cases. This applies to Bristol and Manchester in particular. Newcastle and Nottingham are the two clearest examples of Science City projects having added value to property development activities. In Nottingham, for example, a Science Cities hub has been included in plans for the redevelopment of part of the large Alliance Boots site in the city (Nottingham City Council, 2008).

In the majority of cases, there has been less activity on direct business support policies than there has on property planning and investments. One of the support projects to emerge from Science Cities has been Newcastle’s ‘Professors of Practice’ initiative – a collaboration with Newcastle University which sees experienced scientists dedicate part of their time to spotting and facilitating knowledge transfer opportunities.

There is some frustration at a lack of progress in this area, but it should not automatically be regarded as a failure. With the extensive range of support services available to business already in need of simplification, restraint on the provision of new support programmes should probably be seen as helpful rather than disappointing.

Public engagement

Aside from property investment, the area where there has been most visible activity has been in efforts to promote public engagement in the science base. Manchester, Newcastle, Bristol and Nottingham have all increased their focus on promoting science to school children and the wider public with exhibitions at festivals, science weeks and other events. In Bristol, for example, the Science City project helped to increase the scientific content in the city’s Festival of Ideas and it is starting pilot projects in local schools to develop skills in Science, Technology, Engineering and Maths.

Though this type of activity was probably not what national policy makers had in mind when they created Science Cities, it seems to have been one of the clearest benefits generated by the initiative. There is widespread agreement that the Science City brand has been useful in this, with the name acting as a useful tag line capable of appealing to the wider public.



What's been going on elsewhere?

One way of getting a clearer sense of how useful Science Cities have been is to examine what has been happening in other cities around the country to see whether a Science City designation would have been any use to them. Figures 6 and 7 look at Southampton and Sheffield respectively. Both case studies suggest that much of the activity associated with Science Cities has also taken place in Southampton and Sheffield.

Figure 6: Southampton case study

The University of Southampton has helped to set up the SETsquared partnership with Bristol, Bath and Surrey Universities with the aim of providing comprehensive support for the commercialisation of their research. On infrastructure, the Millbrook Technology Campus was established in 2006, adding to the University of Southampton's Science Park which was set up in the 1970s. In common with a number of other research intensive universities Southampton has also contracted out the commercialisation of its intellectual property to a private sector firm, IP Group PLC.

One area where the Science City initiative might conceivably add value is in better coordination between local partners. As described in section 3, there is some overlap between the area's Solent Synergy body and the Solent Enterprise Hub, which both aim to facilitate knowledge transfer. It is possible that a Science City designation could have helped to coordinate these actions more effectively, but it seems unlikely given that there are already a number of partnership organisations (including university-business/ public sector link ups) in the area. As argued in section 3, a more effective means of improving coordination would be to strengthen existing partnerships and simplify organisational structures rather than add to the number of organisations and delivery bodies in an area.

Figure 7: Sheffield case study

Partnerships between the University of Sheffield, Sheffield Hallam University, Sheffield City Council and Yorkshire Forward have become stronger over the past 10 years. On physical infrastructure, partners collaborate on the management and development of Sheffield Technology Parks and the University of Sheffield and Yorkshire Forward have invested heavily in the Sheffield Bioincubator. On wider collaboration, the university has a representative on secondment to Creative Sheffield – the economic development company case studied in section 2 – and it is also a key member of the White Rose university partnership along with Leeds and York Universities.

Meanwhile, the University of Sheffield's Business and Industry Office delivers a range of technology transfer services and partnering opportunities; has produced an award winning project on public and business engagement in science; and (in a similar way to Southampton and others) has partnered with a private sector firm, Fusion IP, to maximise the commercialisation of its intellectual property.

“Much of the activity associated with Science Cities has also taken place in Southampton and Sheffield ”



“ The ‘Golden Triangle’ of London, Oxford and Cambridge gets around 45 percent of the total public sector research pot, whereas the Core Cities combined receive only 28 percent”

A more realistic view on the prospects for university-led growth

The view that the UK should do a better job of leveraging its excellence in scientific research to improve economic performance is not a contentious one. Science related business activity is already an important source of growth for the UK, and its role as an economic driver is increasing as competitiveness in other industries declines. All cities and regions throughout the UK need to maximise the economic value of their higher education institutions, and the government is right to push this as an area worthy of concerted policy action.

However, policy-makers need to remain cautious about pursuing university-led growth in cities where this might not be a viable growth path. Many see the economic growth achieved on the back of university excellence in places like Cambridge and Oxford and want to replicate this elsewhere, but it is not realistic to think that all universities will be able to have this kind of impact on their local economy. There are three main reasons for this.

First, research performance and funding varies significantly between universities (and the cities that they are located in). Oxford, Cambridge and London house England’s top research universities (see figure 9) and the universities in these cities receive a large chunk of available public sector research funding. The ‘Golden Triangle’ of London, Oxford and Cambridge gets around 45 percent of the total public sector research pot, whereas the Core Cities combined receive only 28 percent.

Figure 8: England’s top ten research universities on international rankings, 2007

University	International ranking
University of Cambridge	2
University of Oxford	9
Imperial College London	23
University College London	25
University of Manchester	48
University of Edinburgh	53
University of Bristol	62
University of Sheffield	72
University of Nottingham	81
Kings College London	83

Source: Institute of Higher Education at Shanghai Jiao Tong University

Second, linked to these variations in research funding and performance, the economic impact of universities also varies significantly. For example, of the twenty universities sampled in a 2007 study, five - Oxford, Cambridge, Imperial, Bristol and Southampton - generated 55 percent of the venture capital backed spin-outs and attracted 75 percent of the spin-out related venture finance between 2001 and 2006 (Library House, 2007).

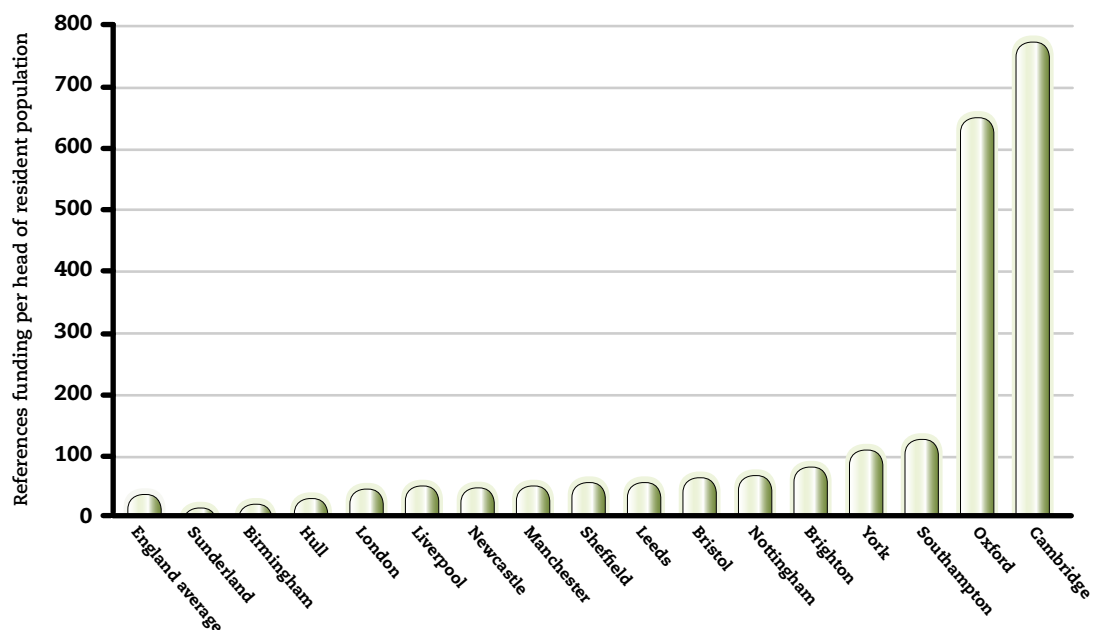
Third, top universities in smaller cities are likely to have a proportionally larger impact on overall economic growth than top universities in larger cities. Places like Cambridge, Oxford, Southampton and York receive a much higher amount of research spending per head of population than larger cities like



London, Birmingham, Newcastle and other core cities (see figure 9). Just as London cannot expect its outstanding universities to be its main source of economic growth, places like Newcastle, Birmingham and Nottingham must also have other economic strings to their bows.

Policy makers at all levels (but particularly at the local and regional levels) need to take these nuances into account when thinking about their economic growth priorities. Dedicating a disproportionate amount of policy time and money to objectives that are unlikely to have the desired impact is unlikely to be the most sensible approach to achieving economic growth.

Figure 9: Total quality related research funding per head of population (2006)



Source: HEFCE and CLG

What should happen next on Science Cities?

- Government should leave cities to decide how they take forward the Science Cities designation. If participants see the brand and structures as a poor fit for their city, they should drop the brand and roll the associated structures into the mainstream economic policy framework.
- For their part, all cities need to review their Science City status and figure out what role they want their Science City designation to play in their overall economic development plans. There are signs of strategic tensions and policy coordination problems - such as varying visions for Science Cities and confused branding - in all participants except York and Newcastle. Some - particularly Manchester - should consider dropping the brand.
- In reviewing their Science City status, cities also need to conduct an honest appraisal of the role that universities and closely related business clusters can play in delivering overall economic growth in their areas. In most places - especially large cities like Manchester, Newcastle, Nottingham and Birmingham - university related business activity will only ever be one part of a wider growth story. Economic strategies and public sector investments need to reflect this reality.

“All cities need to review their Science City status and figure out what role they want their Science City designation to play in their overall economic development plans”



“Enabling innovation is just as much about transport, housing, planning and skills as it is about improving university-business links or other forms of direct innovation support”

4. Recommendations

Cities and RDAs need to deal with the wider barriers to innovation and economic growth in their economies

- **Enabling innovation is just as much about transport, housing, planning and skills** as it is about improving university-business links or other forms of direct innovation support. Delivery in these areas helps create the conditions for workers and businesses to innovate and grow.
- Cities need to focus their attention on where they can have the **greatest marginal impact on rates of innovation and economic growth**. In many cities, dealing with pressing housing, transport and planning issues could have a bigger impact on increasing rates of innovation than introducing dedicated innovation support policies.

Rationalise existing business and innovation support structures, and shelve plans to introduce Partnerships for Innovation

- **Cities and RDAs should rationalise the organisational structures around business and innovation support** by winding down or merging support organisations wherever possible. This will increase the accessibility of the support offer as well as helping to improve policy coordination and efficiency.
- **The Department for Innovation Universities and Skills should shelve its plans to introduce local level ‘Partnerships for Innovation’** and work through existing or emerging structures like conventional economic partnerships or Multi-Area Agreements.

Participants should review their Science City designation and drop the brand if they see fit

- **National government should leave Science Cities to decide what to do with the designation**, including dropping the brand altogether if they see fit.
- Most participating cities still **need to decide what role Science Cities should play in their overall approach to economic growth**. Only in Newcastle and York is public sector support clear-cut. There is a strong case for dropping the brand in Manchester.

City-regions should adopt a more realistic attitude towards the idea of university-led economic growth

- As part of the review of their Science City status, **cities should conduct an honest appraisal of the prospects for university-led economic growth** in their areas. In most cases, universities will only ever be one part of a wider growth story. Economic strategies and investments need to reflect this reality.
- **City-regions elsewhere in the UK also need to be realistic about the role their universities can play in supporting economic growth**. University-led growth is more realistic in places like Cambridge, Oxford and (to a lesser extent) York because the size and strength of their universities relative to the size of the cities themselves means that they can have a greater relative impact.



References

- Acs Z (2002) *Innovation and the growth of cities* Massachusetts: Edward Elgar Publishing
- Athey G, Glossop C, Harrison B, Nathan M & Webber C (2007) *Innovation and the city: how innovation has developed in five city-regions* London: NESTA
- Barker K (2006) *Barker review of land use planning: final report and recommendations* London: HM Treasury
- BERR (2008) *Simple support, better business: business support in 2010* London: BERR
- BERR/DIUS (2008) *Supporting innovation in services* London: BERR/DIUS
- Brown G (2005) *Chancellor of the exchequer's budget statement*, 16 March 2005
- Brown H (2008) *UK cities in the global economy* London: Centre for Cities
- Cameron G (1998) *Innovation and growth: a survey of the empirical evidence* <http://hicks.nuff.ox.ac.uk/users/cameron/papers/empiric.pdf>
- Cooper M & Larkin K (2008) *Financial services in Britain's cities: weathering the storm?* London: Centre for Cities
- Dakhli M & De Clercq D (2004) 'Human capital, social capital, and innovation: a multi-country study' *Entrepreneurship & Regional Development* 16 (2)
- DIUS (2008) *Innovation nation* London: DIUS
- DTI (2005) *4th community innovation survey 2002-2004* London: DTI
- DTI (2003) *Competing in the global economy: the innovation challenge* London: DTI
- Forfas (2007) *Annual competitiveness report 2007 – volume 1: benchmarking Ireland's competitiveness* Dublin: Forfas
- Future York Group (2007) *The future York group report: an independent strategic review of the York economy* York: Future York Group
- Galsworthy J & Knee P (2007) *Higher education innovation fund impact survey (study C)* London: HEFCE
- Glaeser E (1994) 'Cities, information and economic growth' *Cityscape* 1(1)
- Glaeser E & Saiz A (2003) *The rise of the skilled city* Philadelphia: Federal Reserve Bank of Philadelphia
- Hall B & Kramarz F (1998) 'Effects of technology and innovation on firm performance, employment, and wages: introduction' *Economics of Innovation and New Technology* 6(1-2)



HM Treasury (2007) *Productivity in the UK 7: securing long-term prosperity* London: HM Treasury

HM Treasury (2008) *Social bridges II – The importance of human capital for growth and social inclusion* London: HM Treasury

Higher Education Funding Council for England (2008) *Higher education – business & community interaction survey* London: HEFCE

Lambert R (2003) *Lambert review of business-university collaboration* London: HM Treasury

Library House (2007) *An analysis of UK university technology and knowledge transfer activities* Cambridge: Library House

NESTA (2007) *The innovation gap: Why policy needs to reflect the reality of innovation in the UK* London: NESTA

Nottingham City Council & Broxtowe Borough Council (2007) *Statement of development principles: regeneration of the Beeston site*

Mahroum S, Huggins R, Clayton N, Pain K & Taylor P (2008) *Innovation by absorption: measuring and mapping innovation in UK nations and regions – preliminary report* London: NESTA

Marshall A (2006) *City leadership: giving city-regions the power to grow* London: Centre for Cities

Marshall A & Webber C (2007) *The case for better transport investment: agglomeration and growth in the Leeds city-region* London: Centre for Cities

Miles I & Green L (2008) *Hidden innovation in the creative Industries* London: NESTA

ODPM (2006) *State of the English cities* London: ODPM

OECD (2006) *OECD territorial reviews: Newcastle in the North East* Paris: OECD

Perry B, May T & Monaghan A (2008) *The ideas business: the real innovation nation* London: British Chambers of Commerce

Porter M (1998) 'Clusters and the new economics of competition' *Harvard Business Review* 76(6)

Power D & Scott A (2004) *Cultural industries and the production of power* London: Routledge

Romer P (1990) 'Human capital and growth: theory and evidence' *Carnegie-Rochester Conference Series on Public Policy* (32)

Rosenberg N (1982) *Inside the black box: technology and economics* Cambridge: Cambridge University Press



Rosenberg N (2004) *Innovation and economic growth* Paris: OECD

Sainsbury D (2005) *Speech to 'Investing in innovation' conference*, 10 November 2005

Sainsbury D (2007) *Sainsbury review of science and innovation* London: HM Treasury

Seex P & Marshall A with Johnson M (2007) *OECD Review of Newcastle in the North East: 'one year on' report* London: Centre for Cities

Simmie J, Sennet J & Wood P (2002) 'Innovation and clustering in the London metropolitan region' in *Urban Competitiveness: Policies for Dynamic Cities* Bristol: Policy Press

Simmie J (2003) 'Innovation and urban regions as national and international nodes for the transfer and sharing of knowledge' *Regional Studies* 37 (7)

Simme J (2005) 'Innovation and space: A critical review of the literature' *Regional Studies* 39 (6)

Webber C & Athey G (2007) *The route to growth: transport, density and productivity* London: Centre for Cities

Wood G & Parr J (2005) 'Transaction costs, agglomeration economies and industrial location' *Growth and Change* 36



October 2008

Enterprise House
59 - 65 Upper Ground
London SE1 9PQ

t **020 7803 4300**
www.centreforcities.org

© **Centre for Cities 2008**

Centre for Cities is a registered charity (No 1119841) and a company limited by guarantee registered in England (No 6215397)