executive briefing

aim research

Advanced Institute of Management Research

The Cluster Effect

How clusters policy can make the UK more competitive

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The Advanced Institute of Management Research (AIM) develops UK-based world-class management research. AIM seeks to identify ways to enhance the competitiveness of the UK economy and its infrastructure through research into management and organisational performance in both the private and public sectors.

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- Expand the size and capacity of the active UK research base on management
- Engage with practitioners and other users of research within and beyond the UK as co-producers of knowledge about management

contents

AIM research themes

Current AIM research projects focus on:

UK productivity and performance for the 21st century.

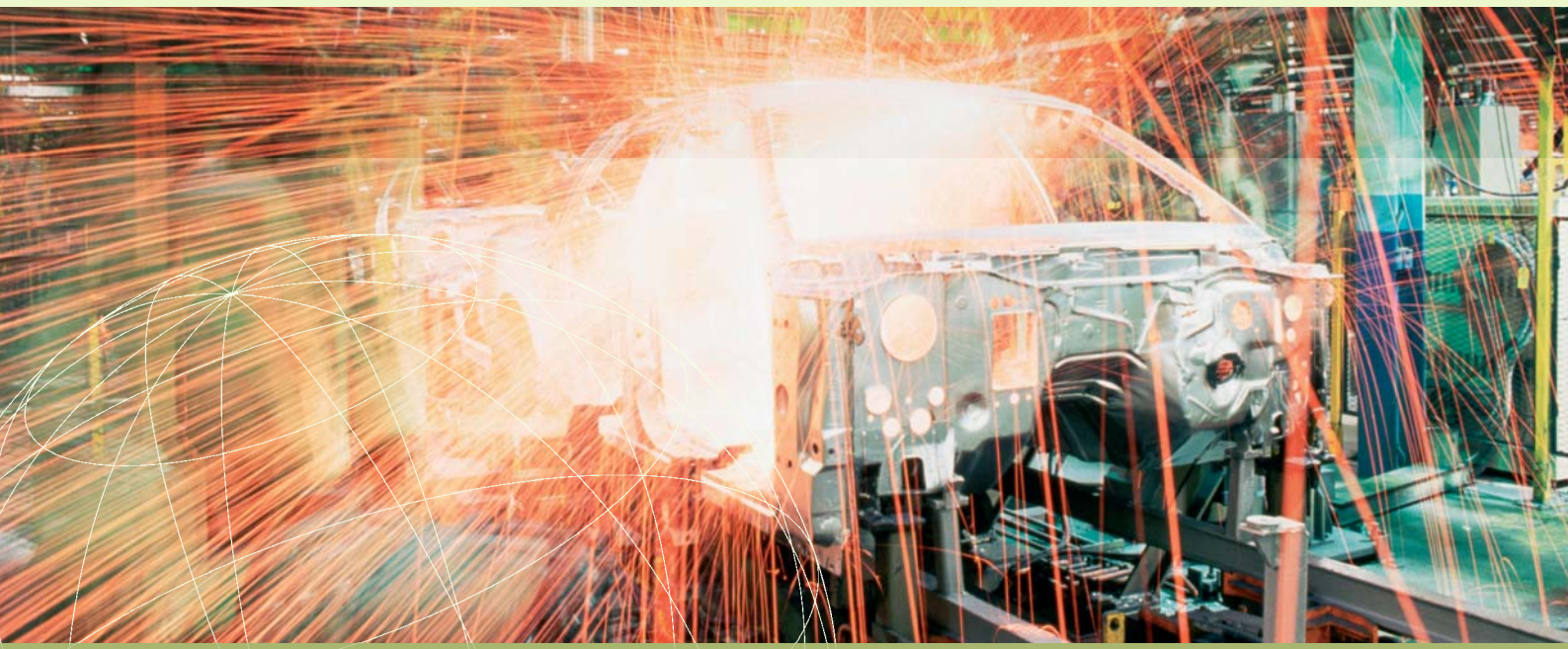
How can UK policy makers evaluate and address concerns surrounding the UK's performance in relation to other countries?

National productivity has been the concern of economists, government policymakers, and corporate decision-makers for some time. Further research by scholars from a range of disciplines is bringing new voices to the debates about how the productivity gap can be measured, and what the UK can do to improve the effectiveness of UK industry and its supporting public services.

Sustaining innovation to achieve competitive advantage and high quality public services.

How can UK managers capture the benefits of innovation while meeting other demands of a competitive and social environment?

Innovation is a key source of competitive advantage and public value through new strategies, products, services and organisational processes. The UK has outstanding exemplars of innovative private and public sector organisations and is investing significantly in its science and skills base to underpin future innovative capacity.



Adapting promising practices to enhance performance across varied organisational contexts.

How can UK managers disseminate their experience whilst learning from others?

Improved management practices are identified as important for enhancing productivity and performance. The main focus is on how evidence behind good or promising practices can be systematically assessed, creatively adapted, successfully implemented and knowledge diffused to other organisations that will benefit.

executive review

In a global economy, regional economies are exposed to greater economic threats, but also opportunities. In the UK several strategies have been introduced to improve local and regional competitiveness. One important strategy is the promotion of clusters – geographic concentrations of expertise and economic activity.

The focus on clusters raises a number of important questions: What exactly are clusters? Are their supposed benefits real? Can public policy help in their development? Our findings suggest that clusters can be highly effective at improving regional and national competitiveness. And that public policy can help, so long as it is coherent, and targeting the specific needs of clusters. Currently it is not.

Key Findings

Cluster fundamentals:

- **Clusters are important.** They can increase innovation, productivity and competitiveness, and boost regional and national economic growth;
- **Clusters emerge spontaneously.** Clusters can emerge only if and where there is a competitive advantage to begin with;
- **Cluster development feeds on start-ups and firms moving into the cluster.** Therefore access to capital and a positive attitude to risk is essential;
- **Clusters grow** because firms share and create knowledge and specialised labour; and because of the presence of a network of support services and a complex fabric of social relationships.

Cluster policy principles:

If the UK is to develop clusters that thrive, cluster policy must:

- Concentrate on activities and groups of products and services rather than sectors;
- Have a long time-frame – decades rather than years;
- Use a range of policy tools. Not a one-policy-fits-all-situations approach;
- Use qualitative and quantitative evaluation tools to measure performance;
- Use coherent and consistent language and terms;
- Tailor policies to fit the phases of the cluster life cycle. Look at:
  – entrepreneurship, capital provision and skills development for triggering clusters;
  – physical, human and network capacity, information dissemination, for encouraging embryonic clusters to mature;
  – intervention to remove barriers to growth when required.

Finally, cluster policy requires much better co-ordination among national and regional policy makers.

In a global economy, regional economies are exposed to greater economic threats, but also opportunities.

introduction

In a globalised economy, regional and local economies across the world are exposed to intense competitive forces. As a result, the attention of policy makers is focused on improving the competitiveness of these regional centres.

It is suggested that one of the key drivers of regional competitiveness are firm clusters. Clusters are 'concentrations of competing, collaborating and interdependent companies and institutions connected by a system of market and non-market links'.[1] Their potential for improving national competitiveness and productivity was noted by Harvard Business School academic Professor Michael Porter in a report commissioned by the DTI: "Competitiveness increasingly relies on a country's appropriate structures of roles, institutions and processes to enable, organise, and drive efforts to improve business environment and **clusters**".[2]

Potentially, clusters are important pillars of UK competitiveness, yet they are still something of an enigma. Theoretically it should be possible to create conditions that encourage cluster development, yet fostering the formation of clusters is hit and miss. Often the benefits are far less 'cluster specific' than expected, sometimes they do not materialise at all.

On the 13th April 2005, the fifth AIM Management Research Forum discussed the evidence on clusters and their impact on aspects of regional development, innovation and economic performance.

The key objectives of the Forum included:

- Examining the evidence on clusters and the benefits that they deliver;
- Assessing the challenges of putting clusters policy into practice;
- Considering whether clusters can be created and/or supported, and policy implications.
- In this briefing we draw on our forum discussion and further desk research to explore the subject of clusters. In particular we ask: Do clusters benefit businesses and the wider economy? Do they enhance the competitiveness of a region, or country? What role can clusters play in local regional and national economic policies?

the anatomy of clusters

Before looking at whether public policy can help create and facilitate clusters, and if so, how to put that policy into practice, we must examine clusters in more detail.

1 Clusters defined

A cluster is a distinctive form of local production system. We define clusters as having the following characteristics:

- A critical mass of firms and institutions, located in the same area and specialising in a specific economic activity;
- Closeness of firms on a geographical, organisational, cultural, and knowledge basis;
- Firms specialising in different aspects of the value chain;
- Interdependent, complementary firms generating multiple, overlapping networks of activity, learning and social links;
- Firms with trading and non-trading based relationships;
- Public and private institutions and organisations able to support the growth of the cluster.

Although clusters may share these characteristics, there will also be significant differences, how the cluster is governed for example, its degree and direction of specialisation, the role of public organisations, the division of labour, and the organisation of innovation and learning processes.

Some clusters specialise in traditional manufacturing goods, shoes for example. Others are high-tech clusters competing in the global software or biotechnology industry. In the former, on-the-job learning and vocational learning will be important for learning. In the latter, higher education institutions and formal R&D play a more dominant role.

2 The importance of clusters

Policymakers, and researchers, believe that clusters make a difference when it comes to regional and national competitiveness. But why do clusters matter?

The simple answer is that companies located in a cluster can be more productive than their non-cluster counterparts; and, from the perspective of the UK economy, regional productivity improvement promotes national economic growth and competitiveness.

(i) Increased productivity

The increase in productivity and productivity growth comes from several sources.

Increased efficiency and knowledge spillover: Increased efficiencies are the most important source of increased productivity in clusters. An important source of these efficiencies is knowledge spillover. Knowledge spillover is where there is an unpaid, uncompensated, transfer of ideas or information from one organisation to another, or from one individual to another.

In the information economy, knowledge is a key asset. It feeds directly into innovation, and thus productivity and competitiveness. In clusters, knowledge spills over from its source wherever that may be, and other companies benefit – especially as the cost of acquiring that knowledge are substantially reduced or even nil.

The knowledge spillover may happen as a result of a direct relationship with a company as part of the vertical supply chain. Alternatively, other companies may benefit from a single company's R&D efforts. Product imitation is common in clusters. Reproducing knowledge is often a lot cheaper than acquiring it.

Finally, knowledge may spill over solely because of geographical proximity, through formal and informal contacts, such as industry clubs, conferences, talks and seminars. Knowledge also travels with individuals as they change jobs.

Policymakers, and researchers, believe that clusters make a difference when it comes to regional and national competitiveness.

Companies in clusters have a higher rate of innovation than their non-cluster counterparts. Take high-tech innovation. A few centres around the world are responsible for the majority of science and technology production. Why does it happen in clusters? A number of reasons: knowledge and skills come from localised social networks; and innovation is a serendipitous process, clusters increase the probability of accidental discoveries and recombinant innovations – the combining of pre-existing technologies and inventions to create new products and services.

Another factor that helps boost innovation in clusters are the rules, norms and values, written and unwritten, that govern the industries operating within the cluster. These are built over time, and constitute a set of practices that build trust and cooperation, ensure contracts are enforced, and reduce costly disputes and litigation.

3 Clusters – nature or nurture?

The cluster life cycle is a familiar one: birth, rapid growth followed by stability, decline, and death – or renewal.

(i) The birth of a cluster

How do clusters 'happen' in the first place? Our research suggests that no single condition or factor is responsible for the creation of clusters. Clusters emerge for a variety of reasons.

Pioneering companies: A pioneering firm spins off other companies, or employees leave and found other firms in the locality. The birth of Silicon Valley is often associated with the departure of eight dissatisfied employees from Shockley Semiconductor Laboratories in Mountain View California, to form Fairchild Semiconductor.

Public sector investment: Public research laboratories have spawned clusters. For example, the US National Institutes of Health (NIH) in Maryland and their laboratories sparked the emergence of the biomedical cluster.

Shocks and precipitating events: Sometimes, specific historic events or circumstances give rise to clusters. Mass redundancies at a Fiat tractor factory in Modena in the 1950s, for example, resulted in a local economy of small producers in the mechanical sector.

Unfortunately, creating a cluster is not as simple as building a public research laboratory and waiting for a cluster to materialise. While certain events may lead to cluster formation, there is no guarantee it will happen. There are, however, certain facilitating conditions that improve the chances: a specialised labour force; a technological or market opportunity; and ready access to customers and market channels (*see table 1*).

Table 1: Clusters: facilitating conditions

Conditions	Examples
Labour force	higher education public sector entrepreneurial activity
Breakthrough technological/market opportunity	technological breakthrough (biotech, semi-conductor) consumer behaviour/taste (ski-boots, tiles)
Demand/market access	Global market (semi-conductor) Local demand Supply chain demand (capital goods for local industry) Public-sector procurement (defence)

(ii) Cluster evolution

Once a cluster is established, it is sustained by the relationships and interactions across the different stakeholders involved – entrepreneurs, enterprises, and institutions. These interactions occur on different levels: individual, organisational and institutional.

The relationships and interactions on these levels contribute to the stability of the cluster. Cluster evolution then depends primarily on three factors: human capital, finance and the network of relationships between companies.

(a) Human capital

A specialised localised labour market is the most important driver of cluster development. Clusters are characterised by high degrees of mobility of people across different firms and organisations. This is an important source of knowledge spillover and thus learning, both in terms of technical expertise and entrepreneurial or managerial competence.

What are the processes involved in creating and sustaining localised labour pools?

Communities of interest and communities of practice: Clusters, such the Motorsport Valley situated in the Midlands and East of England, attract groups of engineers, scientists and professionals with a strong commitment to their own field. They form formal and informal networks and forums where ideas are exchanged and practices are improved.

Formal training and education: Successful clusters develop learning and training activities that benefit the localised labour pool. This might be on a private company basis. Training at Hewlett Packard and Intel has benefited Silicon Valley as a whole for example. It might be via large public sector employers. Or it might be higher education institutions as with the University of Cambridge for the high-tech Cambridge cluster: spin-offs from the university and strong research collaborations between faculty and businesses have contributed to shape the local cluster specifically specialised in information technology, biotechnology and materials/nanotechnology.

Labour mobility: Clusters benefit from a specialised labour pool if and when that labour is reasonably mobile. Silicon Valley workers are said to change jobs more often than their parking space.

Labour migration: Labour does not just come from inside the cluster. Successful clusters are magnets for qualified people, both technical and managerial.

Policy interventions aimed at developing the pool of skilled knowledge workers can be some of the most effective public sector interventions for promoting cluster growth.

Clusters provide the conditions that motivate and enable individuals and groups to establish new firms.

(b) Finance, investment, entrepreneurship

Successful clusters are characterised by high numbers of new ventures. Clusters provide the conditions that motivate and enable individuals and groups to establish new firms.

Access to investment capital is a crucial driver of entrepreneurship. Venture capital (VC) is a particularly popular source of funding and management expertise for new ventures. In many clusters the venture capital industry is embedded in and co-evolves with the cluster. Informal venture capitalists, so-called 'business angels' who are well-networked, wealthy individuals also play a role funding early-stage ventures.

Capital may be provided by other means, via regional banks, retained profits, or through social network relationships. Regardless of the source, the ability of would-be entrepreneurs to raise capital for the foundation of new firms, and/or the growth of existing ones, remains a crucial ingredient of cluster development.

Shoes Shine: The Brazilian Shoe Cluster of Sinos Valley

Brazil is one of the world's biggest exporters of leather shoes. Within Brazil, the most dynamic region for shoe production is the cluster of Sinos Valley, in the State of Rio Grande de Sul.

Sinos Valley's cluster success can be attributed to strong links between firms up and down the supply chain: between shoe producers and local suppliers of machinery and producer services; and between producers and buyers.

The success of this cluster contrasts with the lack of dynamism shown by the two shoe clusters located in Mexico. There are two specialised clusters – in Leon, and Guadalajara. In spite of being closer to the US market and operating in specialised clusters, the Mexican shoe sector has not been as competitive the Brazilian. This is because firms within the cluster have not been as effective at establishing relationships with each other.

(c) Relationships between companies

Clusters are conducive to companies developing relationships that create benefits not available to single, isolated firms or large, integrated enterprises. Although companies in clusters often compete in similar markets, they are still able to co-operate to overcome technological or other market-related challenges.

The relationships between companies within the cluster operate on several levels.

Supply-chain relationships: Widespread vertical co-operation is a defining features of clusters (see Shoes Shine box). As individual firms are task specialised, they buy and sell intermediate goods to other firms. This generates input-output exchanges along the production chain that channel cooperation and joint initiatives. Employee mobility between firms also contributes to cooperation between firms. In high-technology clusters employees often leave a company and start a new company that supplies their previous employer.

Horizontal relationships: Clusters also facilitate collaboration horizontally between similar firms. Competitors within clusters exchange knowledge via employee turnover, forums or communities of interest. Social networks play an important part in this. At an institutional level co-opetition (cooperation and competition) between companies produces benefits such as technical standards.

Product and process innovation is becoming so complex even single clusters are growing unable to master the entire range of skills and know-how required.

Associations and consortia: Companies in clusters create umbrella organisations that operate in the collective interest of the members-- regional marketing bodies, for example. Take the 'Brilliantly Birmingham' jewellery events and exhibitions initiative, which showcases the Birmingham Jewellery Quarter, part of a high value added consumer products cluster in the West Midlands.

Support services: Clusters will have a group of firms that provide non-core services and support. The 'Beltway Bandits' for example, are a group of consulting firms located around the Pentagon, in the US. The availability of these services is a distinct advantage, particularly for small firms that do not have the critical mass and competence to generate these services internally.

4 The future of clusters

Key changes in technology and the global economy will have a significant impact on clusters. For example the development of global and virtual innovation networks, facilitated by the internet, such as the open source community, shows how learning and knowledge sharing is becoming less constrained by location.

Product and process innovation is becoming so complex even single clusters are growing unable to master the entire range of skills and know-how required. As a result the long-term sustainability of industrial clusters as self-contained closed systems is in question.

Montebelluna: Adapting Clusters for the Future

Montebelluna, is a small town in the North East of Italy near the Dolomites. A core of 400 firms employ about 8000 local workers with 60,000 additional workers employed in subcontracting activities, nearby in Eastern Europe.

The numbers are impressive: 80 per cent of motorcycle shoes produced in the world, 75 per cent of all ski boots, 65 per cent of after-ski boots, 50 per cent of technical mountain shoes, and 25 per cent of in-line skates are manufactured in Montebelluna or in areas under its influence.

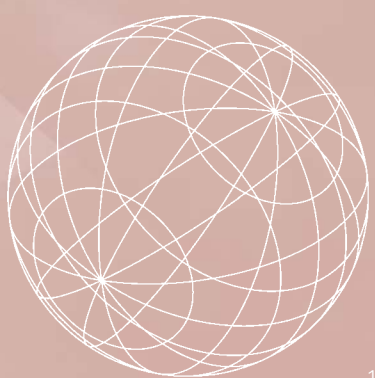
Montebelluna is now a technological cluster, an area of extraordinary concentration of international firms with dynamic capabilities around innovation and production. From the end of the 1970s, many leading firms such as Intersport, Reebok, Timberland, Fila, Mizuno, Asics, Mitre, Umbro, and Rossignol, have located R&D departments or started partnerships or collaboration programmes with local firms in the area. In this sense, Montebelluna is an example of a localised cluster that is simultaneously located within a wider international value chain of activities.

A number of lessons may be taken from this case.

The need to access information and to take advantage of a global division of production does not mean the end of the cluster form. Instead clusters evolve towards a more open form where an eco-system of local and external companies interact product and process innovation.

Montebelluna highlights a result of globalisation and mobility of firms: multinational corporations delocalise part of their innovation-related activities close to existing innovation and production clusters and enter into relations of partnerships and subcontracting with local companies. This is called 'diffused globalisation'.

Montebelluna's decentralisation of production activities to Eastern European countries shows that successful clusters can survive by expanding and shifting specific value chain activities to other countries. Globalisation of production means the end of the self-contained cluster model not the end of clustering *per se*.



clusters: what role for public policy?

If we accept that clusters can play an important part in boosting local, regional and even national competitiveness, what can public policy do to help?

1 Limitations

It is a clear that there are limitations to what cluster policy can achieve.

Government cannot create clusters from scratch: The current DTI website notes: '(the DTI)… encourages Regional Development Agencies (RDAs) to develop *existing and embryonic clusters* in their region, building on their *natural regional capabilities'*.[3] In other words, there has to be the beginnings of a cluster, coupled with conditions that will help it flourish. Successful cluster development depends on natural regional capabilities conferring an advantage, compared to other regions that might support clusters in the same activities.

Clusters aren't a competitiveness panacea: Urban regeneration, and the revival of rural economies are both admirable goals. But a cluster is by definition complex and requires a minimum number of organisations. Lack of critical mass is a major problem for poorer and dispersed areas. Clustering may be of no help.

2 What cluster policy *can* do

Public policy can have an impact at three distinct stages of cluster development.

Clusters formation: Social and economic structures can make clustering behaviour more likely. For example, creating patenting and intellectual property laws, recognising and encouraging joint ownership. A creative and tolerant population, able to accumulate knowledge in a variety of ways, where entrepreneurship is respected, and in which social networking is the norm, is more 'cluster friendly'. Education can play a role here.

Encourage embryonic clusters: Not all potential clusters thrive. Internal and external barriers can prevent them from reaching their potential. There may be a lack of physical infrastructure, for example, such as incubator-type premises where potential cluster members can meet and discuss suitable joint developments, innovation or input into public policy. Short-term intervention can help remove such barriers.

Protecting or enhancing cluster development: The public sector can provide a useful service to clusters in critical situations. It can for example, provide suitable physical, ICT or training infrastructure.

3 When should public policy intervene?

Clusters are highly complex structures – not the ideal target for blunt public policy intervention. Case study evidence suggests that, in the majority of cases, successful cluster development depend on policy interventions associated with the provision of public goods, such as education, training, R&D facilities, physical infrastructure.

Public intervention should only take place when there is a clear failure of the market. For example, if poor access to Silverstone race circuit in the Midlands was a barrier to the development of the UK motorsport cluster, intervention from public agencies, in the form of improving the infrastructure development would be useful.

4 How should public policy intervene?

Because of the complexity of clusters intervention requires a flexible suite of policy tools to suit different situations. Appropriate cluster policy is likely to have the following features:

An activity/product element: Cluster policy is not sector policy. Clusters are made up of related but distinct industries. Cluster identification and any consequent policy intervention cannot be based on a narrow industry concept or classification. Instead consider what activities are taking place and what products, commodities or services are being created.

A long time-frame: Cluster development takes time. Complex processes and high-value relationships between companies and people cannot be created overnight. Cluster policies need tens of years, rather than just a few.

Because of the complexity of clusters intervention requires a flexible suite of policy tools to suit different situations.

Restricted to appropriate circumstances: Cluster policy must be confined to situations where there are enough companies, and enough social and economic capital, to make clustering activities sustainable. Trying to use only clusters for rural or inner city regeneration in particular is not a good idea.

A consistent approach: In the UK, the DTI and other agencies have emphasised a variety of factors as critical to economic development – productivity, the 'competitiveness agenda', sector-specific aspects, clusters. There is little attempt to explain the relationships between them. If the emphasis is consistently shifting, there is unlikely to be widespread acceptance of any of the development agendas, including clusters.

Effective evaluation tools and mechanisms: Clusters require appropriate measures and indicators, not blunt tools such as employment outcomes and levels of value-added. The public sector must develop adequate evaluation tools for cluster policy, which are more process-oriented and qualitative than those currently in place.

5 Policy administration and implementation: What must change?

At present UK economic development policy emphasises competition, both between regions for inward investment, and in cluster development. Regional Development Authorities (RDAs) implement cluster policy and develop the specific policy tools.

This approach may not be suitable. Clusters work because of cooperation and sharing between cluster members. Yet RDAs exhibit competitive rather than cooperative behaviour. Also, clusters focus on specific activities. How could over half of UK regions legitimately claim to be potential leaders in activities as diverse as ICT and software, creative industries and media, bio-technology, food and drink and automotive? Yet these activities are identified as key by many RDAs (*see table 2*).

A sensible move might be away from the current model of 'competitive regionalism', towards a central agency that would get more involved in the overall moderation and co-ordination of regional cluster policies.

Table 2: Regional Development Agencies – Priority Sectors & Clusters

RDA	Sectors identified
Scottish Enterprise DA www.scottish-enterprise.com	Biotechnology, food, oil and gas, opto-electronics, semiconductors, software including multimedia, tourism.
Invest Northern Ireland www.investni.com	Contact centres, hi-tech manufacturing, life and health sciences, software, telecoms/electronics.
East of England DA www.eeda.org.uk	Key sectors: Selected against a range of criteria including size, growth prospects, R&D base, markets and multiplier effects. ICT, life sciences, media and cultural industries, financial and business services, agriculture and food processing, tourism leisure and heritage, automotive, high-technology manufacture and advanced engineering, transport gateways.
South West of England RDA www.southwestrda.org.uk	Aerospace, biotechnology, creative industries, environmental technologies, food and drink, ict, marine, tourism.
One NorthEast www.onenortheast.co.uk	Seeking to develop and support a strong portfolio of clusters in: Automotive and precision engineering, bio-science, chemicals, clothing and textiles, culture, digital/ multimedia, electronics, environmental industries and energy, food and drink, nanotechnology, offshore/ marine engineering tourism.
South East England DA www.seeda.co.uk	Sector groups have been established: Defence and aerospace, media and creative industries, transport and logistics
Advantage West Midlands www.advantagewm.co.uk	Added value engineering, automotive, electronics and telecommunications, food and drink, healthcare and pharmaceuticals, logistics and e-fulfilment, rubber and plastics' services and e-business, software.
Yorkshire Forward www.yorkshire-forward.com	Advanced engineering, bioscience, chemicals, digital industries, food and drink.
North West DA www.nwda.co.uk	Automotive components, financial services, food and drink, ICT, life sciences (pharmaceutical, biochemical centres), software.
East Midlands DA www.emda.org.uk	Existing/emerging clusters area seen to have a competitive advantage in and where there is potential for growth: clothing and textiles, creative industries, food and drink (processing and technology), healthcare industries, high performance engineering.
London DA www.lda.gov.uk	Setting up business-led advisory 'sector commissions' in: Creative industries, manufacturing.

conclusions

Clusters can be important drivers of regional competitiveness. This, in turn, will improve the productivity and competitiveness of the country in which the cluster is located.

Our findings indicate that clusters have some key characteristics:

- They can increase innovation, productivity and competitiveness, and boost regional and national economic growth;
- Knowledge spillover is an important mechanism within clusters;
- Clusters emerge spontaneously;
- They require an abundance of new firms –either new ventures or new entrant firms – to secure development;
- Growth comes through firms taking advantage of their close proximity to share and create knowledge, through exploiting specialised labour and the social network, and through the network of support services.

Implications for policy

Furthermore we note that public policy relating to clusters needs to be coherent and strategic. At present it is neither. Indeed it may be misguided.

Cluster policy must:

- Take care not to focus on sectors. Instead focus on products or/and activities;
- Think long-term. Clusters take time to develop;
- Not waste time and resources attempting to create clusters where no competitive advantage exists to start with;
- Use a range of policies for different purposes, rather than a one-size fits all approach;
- Use qualitative and quantitative evaluation tools to measure performance;
- Use coherent and consistent language and terms;
- Tailor policies to fit different phases of the cluster life cycle.

Finally, cluster policy requires co-ordination among national and regional policy makers. Coherent policy frameworks, as well as tools for analysis, evaluation and interventions should be provided at the national level.

Clusters can be important drivers of regional competitiveness.

Implications for research

There are many important unanswered questions about clusters and their development in the UK. Given the central importance of and interest in clusters these questions cannot afford to be ignored. They include:

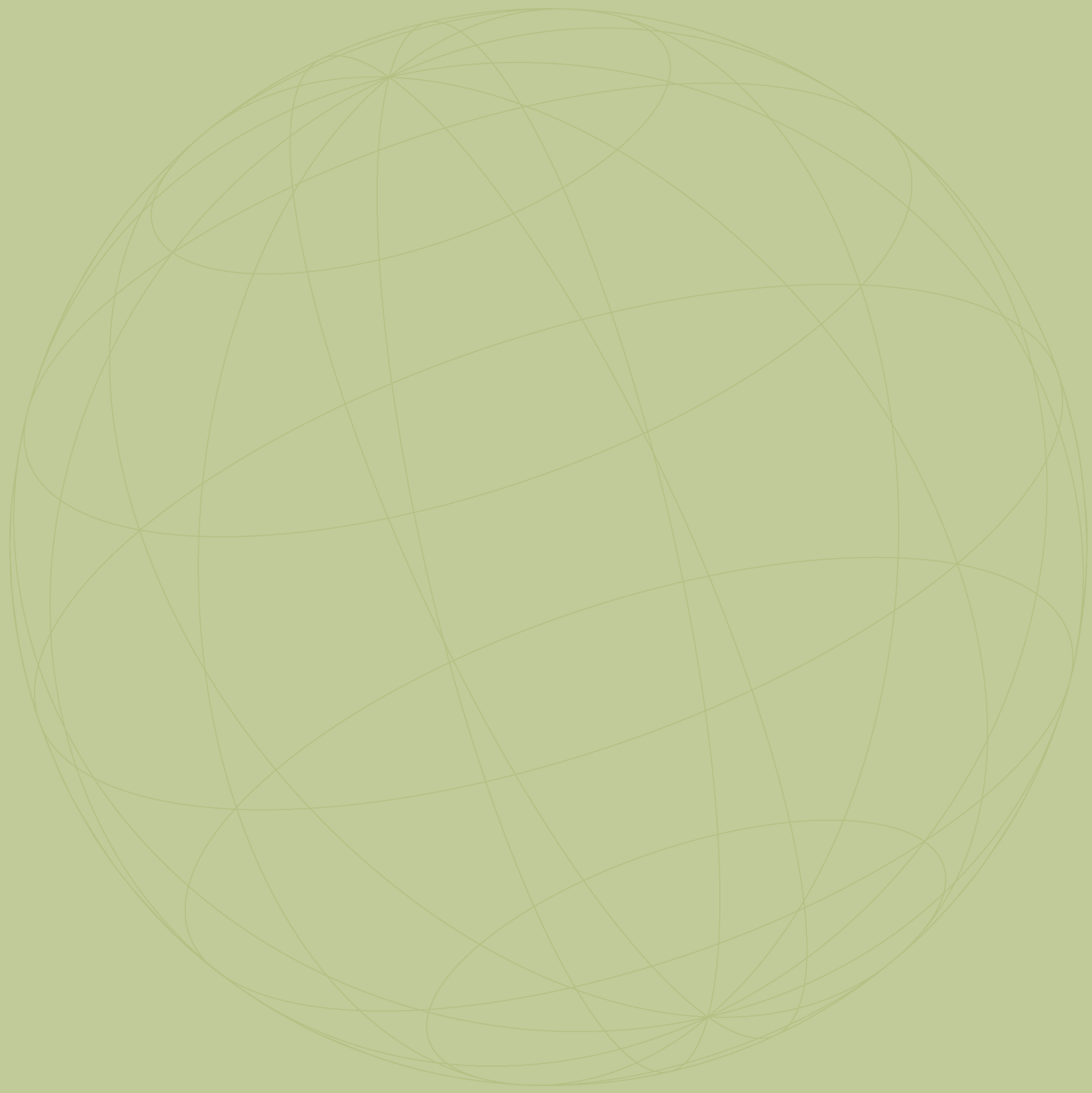
- **How can embryonic clusters be identified?** Embryonic clusters are so small they that defy econometric-based analysis techniques. Qualitative methods are too labour-intensive, expensive and difficult to generalise across different areas and sectors. What type of methods can provide reliable and timely results about the emergence of embryonic clusters?
- **How do clusters emerge?** Does the presence of labour facilitate the development of clusters or is it the other way around?
- **Established and embryonic clusters constitute two very different classes of clusters.** One implication is that policy should differentiate between the two. What policy instruments best suit these two classes of cluster?
- **What is the impact of cluster diversity on innovation?** Does diversity within a cluster facilitate or hinder innovation and where are the boundaries?

These are just a few of the many questions that require further research. Only then will we be able to adjust public policy to best suit the creation and development of clusters.

[1] www.dti.gov.uk

[2] Porter, M.E. and Ketels, C.H.M. (2003). UK Competitiveness: Moving to the next stage, DTI Economics paper No.3, London, DTI.

[3] www.dti.gov.uk



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