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# Regional Economies in a Globalising World

Edited by  
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# Introduction

John Osmond

This book asks a number of economists and economic geographers working in contrasting regional economies around the world to reflect on their experience of analysing new approaches to economic development in the context of globalisation. What has worked in their context and what has disappointed? What policy exchange can be realistically attempted? How best can regional economies engage with the forces of globalisation? The objective is to study what lessons Wales can learn from the experiences of regional economies as far apart as Europe, the Middle East, the Far East and North America.

The project builds on a report *Competing with the World*, published by the Institute in 2004. Again, this surveyed regional economies throughout the world to see what initiatives might be transferable to Wales. Fifteen economic regions were identified and studied as having potential lessons, divided into two categories. The following eleven were examined for their general success:

- Atlanta, Georgia, USA
- Auckland, New Zealand
- Cambridgeshire, UK
- Cleveland, Ohio, USA
- Rhône-Alpes
- Emilia-Romagna, Italy
- Ireland

- Limburg, Belgium and Netherlands
- Östergötland, Sweden
- Overijssel, Netherlands
- Basque Country, Spain

In addition, Darmstadt in Germany, and Oulu in Finland were studied because of the salience of University involvement in their economies. Québec was examined because of its high levels of public investment, and Singapore was chosen because of its changing approaches to entrepreneurship and creativity. The most important lessons that emerged can be summed up as follows:

- High quality independent research and analysis should underpin a ‘communal’ effort in which business plays an active part alongside government.
- Entrepreneurial universities dedicated to the region’s economy should be promoted. Support for the indigenous fabric, especially networks of small businesses, should be given top priority.
- There are no quick fixes or magic formulae. Successful economic regeneration policies must be tailored to local conditions, and then pursued consistently over decades.

In themselves these four recommendations were unremarkable. What was most informative was that, invariably, the regional economies we studied were successful because they exhibited all four in combination. So the lesson was this: unless you follow at least these four directions your regional economy is unlikely to reach its full potential.

Looking back at the assumptions underlying the study, it is striking that climate change was hardly taken into account. Moreover, while globalisation was taken as a given, its impact was not considered in detail. Yet, within a space of five years, globalisation, climate change and the need to promote sustainable development have come to dominate economic development thinking across the world. It is also argued for example, that smaller economies should have the ability to mobilise inherent advantages in adapting to world markets. They have relatively short lines of communication, and small and potentially cohesive policy communities that should allow them to respond rapidly to changes in external conditions.

Each of the economists and economic geographers featured in this study have published widely in their fields of regional economic development, globalisation, and intellectual capacity building. In November 2008 they attended a two-day event organised by the IWA and British Council Wales at Cardiff University in which they participated in debate and discussion around the following question: how far can global policy transfer enhance regional economic development, social cohesion, and the engagement of civil society? The first day was spent with their discovering a little about the experiences of the Welsh economy. This included visiting Cardiff Bay and the National Assembly where they met with Leighton Andrews AM, Minister for Economic Regeneration in the Welsh Assembly Government. Following this they toured the south Wales Valleys which included a visit to the Big Pit Mining Museum in Blaenafon, a World Heritage Site. The second day was given over to a more formal seminar in which each of the participants presented papers on which the chapters in this publication are based.

The IWA is grateful to British Council Wales and to the Centre for Advanced Studies at Cardiff University for supporting the project. Professor Phil Cooke, Director of the Centre for Advanced Studies and Professor Kevin Morgan, Professor of Governance and Development at Cardiff University's School of City and Regional Planning Cardiff University have been closely involved with the project at every stage.

Chapter 1

# Localised Clusters in Global Networks

Anders Malmberg

How is the performance of firms affected by their place of location, and why do certain cities and regions prosper more than others? Why do similar or related firms so often co-locate in certain places, and how are such patterns of regional specialisation reproduced over time? The increased focus in recent years on the role of learning and innovation as key processes behind sustained industrial competitiveness has brought some of these core considerations of economic geography onto to the research agenda in a wider community of economic scholars (Porter 1998, Fujita et al 1999, Morgan 1997, Maskell and Malmberg 1999).

In today's knowledge-based economy, innovation is allegedly more important than cost efficiency in determining the long-term competitive performance of firms – and regions. Innovation, then, should be defined broadly, as the ability to come up with new and better ways of organising the production and marketing of new and better products (Porter 1990, Lundvall 1992). This does not mean that cost considerations are unimportant, but simply that the combined forces of globalisation of markets and deepening divisions of labour have made it increasingly difficult to base a competitive position on cost-advantage only.

Furthermore, most innovations occur as a result of interactions between various actors. Innovations are often new combinations of already existing knowledge, ideas and artefacts, and many innovations emerge from some form of interactive problem solving. One actor perceives a problem and turns to another for help and advice. In an industrial context, these interactions typically follow the value chain (Malmberg

and Power 2005). A firm faces a technological or other problem and turns to a supplier, a customer, a competitor or some other related actor, to get help in specifying the problem and defining the terms for its solution. From this it follows that the level of analysis for understanding the processes of industrial innovation and change should be some notion of an industrial system or network of actors carrying out related economic activity.

This is where 'geography' enters the picture. For several reasons, interactive learning and innovation processes tend to be localised rather than space-less or universal. Among other things, spatial proximity carries with it, easily arranged face-to-face interaction, short cognitive distance, common language, trustful relations between actors, easy observation and immediate comparison (Malmberg and Maskell 2002). In short, spatial proximity enhances processes of interactive learning and innovation, and therefore industrial systems should be assumed to have a distinctly localised component.

An implication is that the knowledge structures of a given geographical territory are more important than other characteristics, such as general factor supply, raw materials, production costs and so on, when it comes to determining where we should expect economic growth and prosperity in today's world economy.

This chapter aims to achieve two things. First it will provide a brief but still hopefully accurate summary of what scholars in economic geography and related disciplines so far have learnt about spatial clustering, innovation and competitiveness. Second it will discuss some experiences and lessons from recent cluster initiatives and policies in the small and open economies.

### **Clusters and Competitiveness**

Since its appearance in academic and policy scenes in the early 1990s, cluster analysis has had a huge impact. As an analytical approach it is undoubtedly persuasive and has contributed to substantial progress in the understanding of several of the classical issues dealt with by economic geographers. At the same time it is an elusive, and at times confusing concept, open to shifting interpretations and sometimes misunderstanding. On the one hand, the cluster approach brought with it a revitalisation of research in economic geography (broadly defined)

as well as progressive re-formulation of agendas in regional and industrial policy. On the other hand, the cluster concept and the associated models to which it has given rise, have arguably come to embrace too much: such that now it has become increasingly unclear what they represent and what they can help us achieve.

The cluster concept promises to explain how innovation and competitiveness occur via a series of interactive processes within systems of actors assembled in a milieu defined through some form of spatial proximity. It is little surprise that the approach as presented by Porter (1990) and subsequently developed by himself, his associates and others (Porter 1994, 1998, 2000, Enright 1998, Malmberg et al 1996, Malmberg and Maskell 2002, Sölvell 2008), has caught the interest of social scientists and brought genuine contributions to the analysis of key issues of economic geography.

The cluster approach provides a way to describe the systemic nature of an economy: that is, how various types of industrial activity are related. Beginning with firms in the industry where we find the main producers of primary goods, the cluster also embraces supplier firms and industries providing various types of specialised inputs, technology, machinery and associated services, as well as certain important customers and, more indirectly, related industries. There is much to be said in favour of this way of approaching the systemic nature of economic activity. It opens up a scope for analysing interactions and interdependencies between firms and industries across a wide spectrum of economic activity. The cluster approach tells us that if we want understand long-term innovative power and competitiveness, we should not look at individual firms or industries, but rather at systems of similar and interrelated firms and industries.

Furthermore, Porter's model of the determinants of competitiveness in clusters, the 'diamond model', identifies a number of mechanisms proposed to foster industrial dynamism, innovations and long-term growth. Essentially, the model is built around four sets of intertwined forces related to factor conditions, demand conditions, related and supporting industries, and firm structure, strategy and rivalry, respectively.

First, in relation to factor conditions it stresses the importance of specialised factor conditions and factor upgrading – smart money, specialised skills, dedicated and advanced infrastructures – which are

developed historically to fit the needs of a particular economic activity, rather than given by nature. These are important location factors because they are difficult to move and difficult to imitate in other regions. Another, perhaps more original, idea is that of the roles of selective factor disadvantages in promoting dynamism and long-term growth: a regional economist's version of the old idea that 'necessity is the mother of invention'. Shortcomings in conditions such as labour shortages, high wages, scarce natural resources, expensive electricity, and strict public regulations can actually trigger technological and institutional innovations that will in the longer term be much more important contributors to the competitive success of firms.

Second, regarding the demand side, Porter's cluster approach argues that it is the sophistication of demand that matters for innovation and long-term competitiveness, rather than access to large markets as such. According to this view, firms with location advantages are those that are in a position to receive and react to signals from sophisticated demand, rather than simply the one which is blessed with 'many customers' in the local market.

Third, local rivalry is seen to increase competitive and innovative pressure to firms by adding an intensity and emotional dimension to competition that can be harder for actors to perceive in dispersed global markets. Firms that carry out similar business in a local milieu tend to develop relations of rivalry, where benchmarking in relation to the neighbours is more direct, partly for reasons of local prestige, and partly because direct comparison is more straightforward - it is much easier to see if your neighbour has a better car than you. It is certainly easier to monitor the performance of a neighbouring firm than a competitor far away. In addition, if one firm displays superior performance, it is obvious to everyone that this cannot be 'blamed' on different external conditions, since these are, in principle, identical for all firms in the local milieu.

On all these points, it should be acknowledged that the cluster approach has contributed to genuine progress. Sophisticated customer demand, and local rivalry have enriched our understanding of why conditions in a local milieu, and agglomerations of similar and related firms might promote superior firm performance.

### **Cluster Confusion 1: Proximity or Interaction?**

While having brought some progress to economic geography there are also some serious problems with the cluster concept and approaches (cf. Markusen 1999, Martin and Sunley 2003). One main source of confusion is related to whether clusters and clustering should be seen to be primarily functional or spatial phenomena. On this particular issue Porter himself has contributed to the conceptual mess by presenting quite different basic definitions over the years (see Malmberg and Power 2006 for details).

Originally the cluster was defined as an interrelated industrial system (that is, a functionally defined cluster), and it was then asserted that spatial agglomeration seemed to strengthen the dynamic and innovative power of such systems (Porter 1990). Later on geographical proximity did become incorporated in the very definition of the concept (Porter 1998, 2000). Clusters became defined by geographical proximity, even though the precise scale of this geographic concentration was rarely specified. This gradual slide in the definition of the cluster concept is unfortunate and main source of confusion.

Why is this distinction important? While there is an obvious point in adopting a systems approach to analyse interactive processes of learning and innovation, it is equally obvious that (functional) industry clusters will not normally be confined to, or contained within, any narrowly defined and spatially bounded scale (Malmberg and Power 2006). On the contrary, most functionally defined industrial systems will have widespread global connections and if we would be able to identify their boundaries in spatial terms, the spatial scale would in most cases certainly not be just an urban region. For instance, dynamic and innovative high-tech firms (for example, the pharmaceuticals giants) will most likely look to find the best technological and scientific partners irrespective of where they are located. By making spatial configuration and the degree of agglomeration an attribute of an industrial cluster, rather than part of its definition, one could establish a platform for more fruitful analyses of how 'geography' comes into play in the overall process of industrial competitiveness, growth and transformation.

In other words, rather than trying to 'squeeze clusters' into narrowly defined regions (where they rarely will fit in), we should research hypotheses such as those found in the diamond model regarding the role of proximity and local milieu on the proposed mechanisms leading to

competitiveness. When it comes to spatial agglomerations of similar and related economic activities, that is localised clusters in the terminology proposed here, there are also reasons to believe that firms in such settings are less interrelated than Porter and others have led us to believe.

### **Cluster Confusion 2: Real Clusters or Cluster Initiatives?**

The way the cluster concept tends to be used today indicates that there are at least three different dimensions or defining criteria that should be present for a true, fully-fledged, cluster to be said to exist. The first two were discussed in the previous section: those of spatial proximity and functional inter-linkage.

As the cluster approach has become increasingly popular as a policy tool and found itself being adapted for practical purposes, a third dimension of what a cluster is has become prominent in both policy initiatives and academic research. This is based on the existence and links between identity, self-awareness and policy action. According to some observers, the institutionalisation of some common idea or purpose is a necessary ingredient of a true cluster. For a cluster to be said to exist, some actor (often employed by a public institution rather than a private company) has to identify it as a cluster, whether existing or 'dormant' (or 'potential', or 'emerging'), give it a name, and start acting in order to consciously develop it (Lundequist & Power 2002, Rosenfeld 1997, Raines 2001).

Thus, in policy circles clusters have become more or less synonymous with the existence of a policy programme and a number of more or less concerted policy actions. This could be seen as a discursive definition of the cluster concept where a cluster has come to refer to a specific policy initiative. Such clusters might or might not have a resemblance with the functional and geographical dimensions already discussed. In our view, cluster-based policy programmes could preferably be referred to simply as cluster initiatives; as indeed more policy oriented work is already doing (see for instance Sölvell 2008).

### **Cluster Policy Impact**

The state of the art of "cluster knowledge" can, I would argue, be summarised in four bold statements:

1. Spatial clustering of similar and related firms does seem to contribute to regional growth and prosperity.
2. Spatial clusters are often less locally integrated than many have believed – they often display, and benefit from, strong global connections.
3. Local rivalry and labour market dynamics are often more important than inter-firm collaboration.
4. The more developed their global links, the more successful clusters tend to be.

Furthermore, it is essential to uphold terminological distinction between clusters (as really existing spatio-functional industrial systems) and cluster initiatives (policy projects in order to create, nurture or strengthen clusters).

Although ideas of spatial clustering have been in circulation since the beginning of the 1990s, the breakthrough of the notion of clusters amongst policy makers and practitioners in Europe came almost a decade later (Rosenfeld, 2001). Nevertheless, since the end of the 1990s Porter's cluster concept has been adopted by government agencies all around the world as a model for promoting regional competitiveness. Legendijk and Cornford (2000) argue that by building a strong link between clusters and the notion of 'competitiveness', and by presenting graphic cluster maps, Porter's book on the competitive advantage of nations "paved the way for the successful career of 'clusters' as a regional development concept."

Countries and regions across Europe, North America and beyond continue to increase their efforts to promote cluster development and competitiveness. Still we know relatively little about the impact of these initiatives. To assess the impact of cluster policy measures is a significant challenge since there is a considerable time lag between policy implementation and potential results as well as the difficulty in finding a control group. In addition, the ability to really be able to identify causality is hampered by a significant number of macroeconomic factors, especially in truly global industries. This challenge is further exacerbated in knowledge intensive industries such as the life sciences where products may take a decade or more to come to market. However, this is not to say that efforts should not be made to measure the impact of cluster policies.

## **A Swedish Example**

Cluster-based economic development seems to have moved away from narrowly focused firm-based strategies to a more holistic approach to regional economic development. This trend is evident in the examples of regional cluster initiatives in Sweden. In considering what amounts to a ‘policy shift’, Lundequist and Power (2002) stress that the recent emphasis on cluster-building has brought with it a new form of economic governance. This emphasises the synthesis of traditionally separate policy fields and approaches to regional development, and focuses on policy objectives to be worked with in a cooperative long-run dialogue involving a wide variety of actors and stakeholders.

In Sweden this new form of economic governance has recently been manifested by policy-makers’ attempts to extend the cluster approach by incorporating the concepts of regional innovations system (Cooke et al., 2004) and the so-called “triple helix” (Etzkowitz and Leydesdorff, 2000). These partly overlapping strands of research emphasize the value of analysing interaction and interdependence between universities–industry–government in order to understand the dynamics of modern, knowledge-based economies.

A prominent Swedish example of a cluster initiative drawing on the notion of triple-helix – including close collaboration between local government, industry and universities – is the ‘Regional growth through dynamic innovation systems’ initiative, the VINNVÄXT programme. While there are differences between clusters and regional innovation systems, there are also many similarities. Groups of similar and related firms (including large and small suppliers, service providers, customers, rivals) comprise the core of the cluster, while academic and research organizations, policy institutions, authorities, financial actors, and various institutions for collaboration and networks make up the innovation system of which the cluster is a part. Both concepts have as their point of departure that innovation and industrial transformation are the result of interactions across sets of actors, and they both adopt a geographical starting point by emphasizing that this interaction takes place in a spatially defined territory.

Based on monitoring of the Uppsala Bio – the Life Science Initiative since 2003, a number of lessons on cluster initiatives can be reported. Uppsala Bio is a ten-year cluster initiative organization focused on promoting the competitiveness of the Uppsala region in the life sciences. The Swedish city of Uppsala is located 65 kilometres north of

Stockholm and is one of the most intensive and dynamic biotech regions in the world. It hosts “a wealth of biotech knowledge and competence, both industrially and academically, and as such is a globally recognized node in the field” (Waxell and Malmberg, 2007, p. 138). Uppsala Bio puts a great deal of effort into commercialising university research in the field of biotechnology.

Uppsala Bio’s focus is on early innovations responding to life science needs in programmes connecting academic research, life science industries and society. It builds on a long tradition of cross-border cooperation, transforming research results into benefits for healthcare. Its contributions to the growth of the region's life science sector is focused on interactions between industry and academy, grouped around four action areas:

1. Cross-disciplinary research in fields close to application.
2. Uppsala Innovation Centre, including incubator for university spin-offs.
3. A skills and training programme.
4. Local network creation.

Representatives from the life science industry, the universities and the city of Uppsala take part in the Uppsala Bio initiative. Today it has over 30 members and partners. The Uppsala Bio Team draws on a background from the biotech industry, research and business development. A steering Group, comprising leading names from industry, academia and the region, ensures that the initiative develops in line with the sector’s needs and with other related ventures.

### **Cluster initiatives: General Lessons**

Based on experiences from Uppsala Bio, as well as the result of some broader-based surveys of cluster initiatives throughout the world, some general observations can be made.

The first is that cluster initiatives can indeed have an effect, and that one should be aware of the proportions of the resources put into the initiative. Uppsala Bio, which in many ways constitutes a flagship project in Sweden, receives government support amounting to roughly 1 million Euros per year, matched by an equal amount raised locally. However, this support of 2 million Euros should be compared with the roughly 1,500 million Euros annual turnover of the life science sector

in Uppsala. In this sense, the cluster initiative is indeed a “tail that tries to wag the dog”. Even if the Uppsala Bio initiative only marginally increases the innovation, drive and dynamism of the cluster, the money would be well invested.

The second lesson is that the most important effects of the initiative are long-term and sometimes diffuse effects, for example through changing attitudes, promoting mutual learning and network creation. Meanwhile, it is still extremely important to deliver short-term and concrete results – measured by new firm formation, attraction of venture capital or foreign direct investment, and new jobs - in order to keep up enthusiasm and momentum.

The third lesson is that if a cluster initiative is to be successful, it helps a lot to have a cluster to start with. In other words, the idea to that a cluster initiative should be able to create a cluster “from scratch” is normally not viable. On the contrary, most real clusters have deep historical roots and even “new clusters” have antecedents in the local milieu.

### **Cluster initiatives: Lessons Regarding Spatiality**

When it comes to the spatial aspects of cluster initiatives there are a number of things to take into account. The first is that even local milieus that appear to be dense and dynamic are as a rule intimately linked to the outside world. This creates a dilemma. While the core actors of the innovation system, that is the companies and academia, are highly globalised, public policy is national or even local in scope. This dilemma has been highly visible in recent attempts to design policy measures to prevent the extinction of important industries in the wake of the global slump.

Second, there are indications that the presence of global firms is important for both clusters and cluster initiatives to prosper, since they induce pressure to improve quality both of the cluster and the cluster initiative.

This is also related to the third lesson. When designing cluster initiatives, openness is key. Too narrow regional delimitations restrict project potential. In the Swedish context, many of the most impressive cluster initiatives were born out of the wish to attract investment, people and knowledge from abroad into Swedish clusters.

## **Conclusion**

This chapter has argued that clusters do play an important role in fostering learning and innovation as well as competitiveness in general. However, the existence of cluster advantages should not make us believe that similar and related firms that agglomerate in certain places are predominantly inward-looking systems. On the contrary, it is the ability to combine inflows of resources, knowledge and skills with outflows of products and services that make for cluster excellence. This has implications also for cluster policy and cluster initiatives. They should build on existing strengths in the region – if not necessarily existing firms and industries so at least the competencies and skills that can be derived from those. Alongside attempts to built strength through local networking, they should also be geared towards linking the local cluster with the outside world.

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# European Approaches to Regional Innovation Policy

Claire Nauwelaers

Over the past two decades, innovation policies have risen on national and regional policy agendas across Europe. Increasingly, European Structural Funds are targeting knowledge-based activities and the promotion of innovation. Formal and informal networks of innovative regions in the European Union, in which public authorities and agencies interact to identify good practice, are but one symptom of the growing importance of this new policy domain. Within the European Union, dozens of regions are developing innovation plans, strategies and instruments, sometimes within a sound strategic framework, but more often on an ad-hoc trial-and-error basis.

Determining the ‘right’ content for innovation policy, appropriate to a region’s needs, is not a straightforward matter. It demands effective strategic governance at the level of authorities in charge of designing and implementing the policy (OECD 2005; Leon et al. 2008).

This chapter surveys the key features of a modern innovation policy as it can be observed today in Europe. It provides some specific examples of current practice and concludes by identifying future challenges facing regional innovation policies.

## **The Changing Framework for Regional Innovation and Innovation Policy**

Innovation policies are relatively new and have had to be invented from a blank sheet of paper. The temptation has been to develop innovation policy purely in relation to the known fields of R&D or technology

policies. However, innovation policies are much more complex, and their translation into effective interventions tend to lag behind. Innovation is different from R&D. First and foremost it is a business-led process, based on matching new ideas with market opportunities. New ideas might be based on research results or new technology developments, but not necessarily so. There is a whole spectrum of innovation processes, from science-based to organisational innovations that display great variety in their connection with the science base and new technology developments. Hence, policies aiming at increasing the quality and quantity of R&D, and at technology transfer and diffusion, are only relevant for some innovation processes.

A second reason is that innovation essentially takes place through interactions between a number of actors, essentially between firms and other, freestanding organisations such as universities. The fluid and free flow of knowledge is an essential asset in developing innovation practices. Innovation policy is justified by systemic failures arguments, for example to compensate for market failures in R&D, and to ensure the free flow of knowledge in the system (Kuhlmann and Smits 2004).

A third lesson from innovation studies relates to the diversity in innovation 'ecosystems' and to the role of informal institutions. Innovation systems are shaped by norms, behaviours, informal as well as formal rules, culture and traditions, and a wide array of institutions, which give these systems their specific profile. This presents a challenge for policies to be fine-tuned to their individual needs and circumstances. Far more than R&D policies, innovation policies need to be tailor-made for their target groups. It is the choice of the right combination of a variety of instruments which presents the most difficult challenge. There is no such a thing like a standard innovation policy portfolio (Toddling and Tripp 2005).

Fourth, because of the importance of learning and creativity for innovation, access to and exploitation of tacit knowledge embedded in human beings becomes a key performance factor for innovation systems. This element, together with the idiosyncratic character of innovation ecosystems, explains why there is still a role for 'places' in the globalise world, and for a variety of regional innovation systems. This also means that policies that ensure an adequate human resource base for innovation are a key component of any innovation policy portfolio.

Finally, the term of 'globalisation' has been coined to indicate that two

seemingly antagonist phenomena are at play: the localised nature of (tacit) knowledge spill-overs which are responsible for agglomeration of knowledge-based activities, and the importance of global connections. Regional innovation systems are place-specific nodes in global networks, and both dimensions, the local and the global, are equally important for their performance.

In addition, there are wider challenges that are external to innovation per se, but which press for the development of new policy approaches. Societies in the developed world are ageing. This requires promoting young and creative talent in these regions, more effective education (learning to learn), but also for new attitudes towards lifelong learning. This reinforces the the need to place human resources-oriented policies at the core of innovation policy.

Another issue is that the sustainable development imperative has become more visible, politically relevant and needs to be placed alongside competitiveness and employment creation when developing regional innovation policies. What is remarkable is the speed of change in all those areas. Taken together, they mean that we should understand innovation policy as ‘activating knowledge’. This entails moving from:

- ‘Raising resources’ to ‘promoting change’.
- ‘Best practice’ to ‘context-specific’ solutions.
- ‘Standard’ policy-making to policy ‘learning processes’.

The novelty of these approaches, the lack of “best practices” references, and the context-specificity of any innovation policy, generate a need for more strategic intelligence in policy-making.

### **State-of-the-art Innovation Policy in the EU**

Faced with these radically new orientations for innovation policy what do we observe in reality in the regions of the European Union? The key conclusions reached by several studies policies can be summarised as follows.

- The innovation policy scene is still very much dominated by linear tools, addressing inputs in the innovation process rather than the functioning of the system, and providing support to firms in isolation rather than to networks of actors (Asheim et al 2003). That is to say, the ‘systemic’ character of these policies is still under-developed,

despite the wide diffusion of concepts such as interactive innovation and innovation systems. Policy-making suffers from inertia and it looks like policy-makers are only paying lip service to these concepts.

- Policy instruments addressing changes in behaviour and dealing with strategic, information, and the organisational needs of companies, are still rare and immature. Most of the instruments are focused on provision of financial resources, addressing market failures in R&D, rather than other types of failures within the innovation process.
- Associated with these findings, is a lack of strategic approach to policy-making. The policy feedback loop is often broken somewhere in the journey starting from identification of regional innovation system gaps and strengths, determination of broader policy goals, operational objectives and evaluation. Policy designers and implementers need a high degree of understanding of the innovative firm's behaviour, self-reflexive capacity and openness to evaluation.

Against such a pessimistic diagnosis, one should recognise that many recent experiences at regional level testify to an evolution towards more 'systemic' policies. The need for bridging initiatives between actors in innovation systems has been recognised beyond the narrow linear idea of one-way technology transfer. This takes the form of clusters programmes, competitiveness poles models and regional growth initiatives.

However, these genuinely systemic instruments often suffer from poor conceptualisation and lack of strategic monitoring and evaluation. The danger is that they are dressed up as systemic instruments, but in reality hide quite ineffective approaches for stimulation of dynamic systems. A 2005 OECD study on innovation systems governance identified the following four blocking factors for an evolution towards truly systemic and integrated innovation policies:

- Competing approaches across policy fields and different schools of thoughts in policy areas relevant for innovation, complicate the design of integrated policies.
- Short-termism in resources allocation stands at odds with innovation promotion objectives, since these investments yield returns in longer time spans than electoral periods - cluster policy is a good case in point.
- Innovation is still very much a 'homeless' policy, falling in-between, or crossing over, traditional policy domains. Division of labour within ministries and agencies causes policy fragmentation and prevents the development of synergetic approaches and instruments.

- Individual ambitions often conflict with widely publicised grand visions.
- The gap between policy statements and actual decisions is a widespread phenomenon.

In the wake of the EU Lisbon strategy an expert group established by the European Commission has examined the National Reform Programmes produced by the Member States. These programmes were meant to take an integrated view on policies towards knowledge economies in which innovation was deemed to play a key role. The conclusions of the expert group concur with those of the OECD analysis. In general there is a need for improved governance of innovation systems:

- Policy implementation is done on an administrative rather than strategic mode: follow-up and monitoring is oriented towards funds consumption rather than impact maximisation, and there is insufficient learning in the policy cycle.
- There is a limited role of indicators to monitor policy success and policy evaluation does not appear prominently in the programmes.
- Internationalisation trends are still marginally taken into account. Policies are thought and designed within the confines of national borders with little integration of possible synergies and complementarities across borders. The Open Method of Coordination which is supposed to support such more geographically open policy process, has so far produced weak results so far.
- There is a gap between policy declarations and implementation.
- New coordination structures have been established in the wake the Lisbon strategy but their impact in terms of design of truly integrated instruments is not (yet) visible.

Overall, the reality of policy practice in the field of regional innovation is that much remains to be done if these policies are to respond adequately to the challenges of moving towards innovation-oriented societies.

## **Regional Innovation Policy Approaches in Europe**

### **1. Regional Innovation and Technology Transfer Strategies (RITTS)**

This programme was initiated by the European Commission in the mid-nineties to support strategic regional innovation. The programme was a frontrunner, at a time when innovation was barely considered as

a legitimate policy area, and when the widest confusion concerning the concept itself was still prevailing in regional policy circles.

Even though the programme was developed in a rather linear fashion - with the idea that technology support services would need to match demands, both defined on a regional scale - it has been instrumental in introducing innovation as a new policy field. It also introduced the idea of innovation as an interactive process, and promoted a more reflexive and inclusive policy-making processes. As a result, remarkable changes in perspective occurred in regional policy portfolios. The somewhat revolutionary features of new instruments introduced in the wake of the RITTS are:

- Their conceptual background rests on the idea of interactive innovation.
- They focus on networks of actors and are system-oriented rather than individual actor-oriented. The numerous cases of clusters in the RITTS regions illustrate this interactive approach to policy-making.
- They involve enhanced coordination and synergy between policy instruments, rather than single-goal and isolated tools.
- Their target and shape is informed by an understanding of SME needs. They are bottom-up, rather than centrally determined by managing agencies. An example was the introduction of a voucher scheme in Uusimaa (Finland), which stems from the acknowledgement of the need for an evolution towards more demand-led policy instruments.
- They include a behavioural additionality dimension: their aim is not only to provide sufficient financial resources, but also to influence behaviours and strategies towards greater innovation. The Spiegel (Mirror) project in Limburg (The Netherlands), a support for innovation coaching in SMEs, illustrated a new emphasis on improving strategic thinking in SMEs. This had been identified as an important, non-technological bottleneck in the regional innovation system during the RITTS.
- They involve learning in policy making. They also involve robust assessments of innovation needs and potential. Lessons are drawn from their implementation, and fed back into policy practice.

These characteristics suggest that the RITTS intervention has resulted in an evolution towards a 'modern' innovation policy model, with a broader perspective on innovation systems than the previous R&D and technology policies.

## 2. Science and Technology Parks

Science and Technology Parks are a key component of regional innovation policy portfolios. As with cluster policies, a large variety of initiatives are labelled with the same name. Table 1 below illustrates the change in perspective when such an instrument is designed and implemented under the old and new paradigm. The different perspectives between these two frameworks suggest that the assessment of the performance of such instruments would differ widely according to the option chosen.

**Table 1:** *Science and Technology Parks under the old and new innovation paradigm*

	<b>OLD</b>	<b>NEW</b>
<b>Target</b>	Technology transfer	Dialogue creation, network building
<b>Concept of knowledge flows</b>	From source to recipient	Multilateral exchanges, co-creation of new knowledge
<b>Geographic scope</b>	A specific place	A node in a wider system
<b>Range of support available</b>	Focused support	Multiple support
<b>Nature of support available</b>	Material	“Learning-oriented”
<b>Location of support</b>	In-house support	Clearing house, centre of a network of support
<b>Innovation bottleneck addressed</b>	Technology gap	Technology... and managerial gap

### **3. EU Structural Funds for the Knowledge Economy**

A third example refers to the strategies put in place for the use of EU Structural Funds for the knowledge economy. A recent evaluation for the period 2000-2006 has identified the following bottlenecks for an effective outcome of research, technological development and innovation (RTDI) measures under these programmes. They bear close similarities with the general conclusions reported in the previous section concerning wider analyses of innovation policy governance:

- An administrative, rather than strategic management of RTDI measures.
- A lack of expertise at national and regional levels in managing RTDI measures adopted under the Operational Programmes.
- A continuing dominance of supply-side and technology-oriented measures, with poor relevance to specific regional innovation systems.
- A limited interest for many 'softer' demand-side measures aimed directly at enterprises.

Accordingly, the challenges for the future use of Structural Funds for building knowledge economies have been identified as follows. First of all, policies will need to be based more strongly on sound and robust analyses of the regional innovation systems, and incorporate actions and instruments that fit the needs of these systems. This will give rise to much more differentiated policies than is the case hitherto.

A shift towards demand-oriented policies is also warranted, but this is even more demanding in terms of strategic capacities for policy design and follow-up. A better acknowledgement of all forms of innovation, beyond purely technological innovation, needs to inspire policies. Most importantly, since the role of Structural Funds is to contribute to competitiveness and catching-up of regions, preference should be given to those actions and initiatives which are most likely to generate economic value. Prioritising 'downstream' research developed for the needs of markets is needed in such programmes.

### **Regional Innovation Policy Challenges**

The starting point of this chapter was that innovation policies conducted at sub-national level should take into account the increased speed, and the changing nature of globalisation of innovation. This raises the question whether regional innovation policy practice is in need of a more radical shift.

From the perspective of developed countries in the “old core” of Europe this is indeed the case. A new approach to regional innovation is needed takes into account the global challenges faced by EU regions. The importance of the role of the regional level in a globalised world is linked to the potential of ‘places’ to foster non-market interactions and innovative environments with cumulative impacts on innovation.

What is needed, more than in the traditional approaches of Italian industrial districts or French localised productive systems models, is to combine the benefits of localised innovation with access to, and exploitation of, innovation opportunities in the global market.

In summary there are five flaws in contemporary regional innovation policies which place them at odds with the challenge of globalisation:

1. Confining innovation policies, confined to regional boundaries, with a lack of knowledge links between domestic and foreign firms.
2. Absence of a truly systemic view in policy-making: for example, (i) policies have a focus on organisations rather than on functions in the system; (ii) evaluations analyse single instruments’ effects rather than goals achievements; and (iii) the broader, socio-cultural, regional environment is underplayed.
3. A continuing dominance of a technology-led development model, with a neglect of creativity potential, organisational innovation, and demand-side policies considered across all sectors and in particular in services.
4. Clusters, poles and various ‘local agglomeration’ initiatives are justified by arguments of static efficiency and not strategically managed. This is very dangerous in the present context, as it might foster lock-in into dead-end activities.
5. Path-dependency and inertia in policy systems, which prevent swift adaptation to changes. Deficiencies in strategic intelligence in policy-making further emphasises that problem.

Facing those contemporary flaws, future-oriented regional innovation policies will need to display four key characteristics:

1. Work with “policy mix” approaches, attracting knowledge-based activities and talent demands much more than R&D, technology and innovation policies, but extended over a broad spectrum of policies.
2. Use more strategic intelligence to assess effectiveness, particularly of new types of policies. In particular, shorter product life cycles need to be taken into account when assessing viability and innovation potential of poles;
3. Re-think localised clusters/growth poles strategies: These will need to acquire a stronger knowledge dimension and be linked to knowledge sources, both locally and globally.
4. Recognise more fully the diversity in possible regional development paths. Traditional ‘triple helix’ types of analyses are not sufficient. They should be supplemented by analyses of the ‘fourth factor’ in regional innovation systems, covering the socio-cultural regional environment and the extent to which the forming of coalitions at regional level contributes to the creation of ‘constructed regional advantages’.

All this presents a difficult and rich agenda for regional policy-makers. Along with expanding sources and platforms of knowledge and expertise on innovation policy-making, experts and policy-makers need to acquire new skills. Greater mobility between policy practitioners and policy researchers would help in this respect.

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# Urban Transition in China

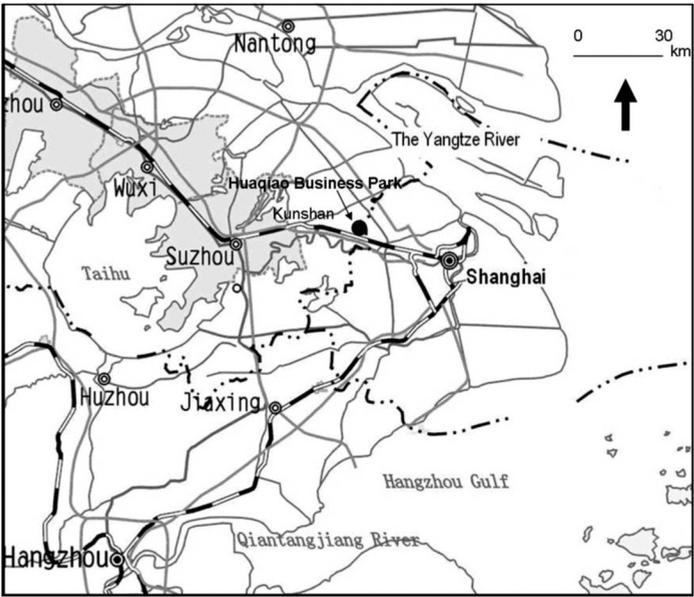
Fulong Wu and Fangzhu Zhang

Market oriented economic reform marks the failure of socialist regional policies and the rise of urban entrepreneurialism in China. Under urban entrepreneurialism, local governments become market-friendly agents and compete with each other to attract investment. Competitiveness of entrepreneurial cities is thus largely based on individual cities. At the scale of the city, the government builds an alliance with capital, which becomes a powerful driving force to foster the downscaling of governance. In this aspect, China's urban entrepreneurialism is not too much different from 'neo-liberalisation' in the West. However, there is also an opposite dynamic to upscale governance in recent years. Fierce inter-city competition has led to a series of infrastructural, social and environmental crises. Inter-jurisdiction competition exacerbates the problem of the lack of coordination in infrastructure development. Land development and encroachment led to ecological degradation. Social inequalities build up tensions. This chapter examines the transformation of Chinese urban and regional governance towards one based on city-regions. We emphasize the change as the political economic process of scale construction rather than a natural shift under global production.

Chinese cities and their regions are growing very fast. However, the fastest growth has occurred at the margins of metropolitan areas. This could not be explained simply by urban expansion or suburbanisation. Several factors attribute to rapid growth at the margin. First, economic globalization revitalizes the vast hinterland of the metropolitan region, which opens up a new space of production. In China, the regime of 'world factory' has been established, in which production factors of foreign investment, migrant workers and cheaper land are combined at

the periphery of the metropolitan area. The world factory regime is a necessary global city-region. Second, local entrepreneurialism under economic devolution partially contributes to the redistribution of population and production activities to the margin. The emergence of cities in the region is driven by some new governance originated from inter-city competition. Third, with the development of inter-city and regional transport infrastructure and further development of metropolitan economies, a division of labour between the core city and its region has been built up. Fourth, with increasing inter-city competition, the upper level of government (in particular the central government) begins to use strategic spatial plans to re-regulate regional governance. This consolidates the formation of the urban system. This study uses the case of an emerging city in the Yangtze River Delta region, the city of Kunshan near Shanghai, to show how these forces are developed in the context of market transition and economic globalization (see Figure 1). It will also refer to the experience of the Pearl River Delta region around Guangzhou and Hong Kong. In addition to Beijing-Tianjin city-region, these are the three major regions within China. Our major research question is how the city-region governance evolves out of the dynamics of urban and regional transformation.

**Figure 1:** *Yangtze River Delta region*



## The Chinese Story

The Chinese story is essentially an urban and regional one. Since the economic reform, we have seen the demise of socialist redistributive regional policy, and consequent emergence of entrepreneurial cities. However, this urban entrepreneurialism has its limitations. A new round of rescaling towards city-region governance is a response to the problematic entrepreneurial cities that compete without cooperation.

By all appearances the Chinese model seems to confirm the theory of governance under globalisation. China seems to follow the export-oriented development model in East Asia, notably the flying geese model (Kojima 2000). But this explanation does not pay enough attention to Chinese specificity, because China was a socialist country. Its history of strong regional policies casts a long shadow. On the other hand, China's marketisation is pervasive and even radical. In his book *A Brief History of Neoliberalism* (2005), David Harvey uses China as a special case of neoliberalism, that is, 'neoliberalism with Chinese characteristics'. While this kind of explanation is useful at the national scale, there is a need to understand urban and regional dynamics to appreciate how macroeconomic policy changes affect the cities and regions.

With China's entry to the World Trade Organisation and speedy growth into a world factory, it seems plausible to believe there is a new régime of accumulation in China, namely a 'world-factory régime' which turns the socialist legacy into the instrument for economic competition. Rural migrants in the coastal cities form a large and cheaper pool of labour force. Around the production of global commodities, regional economies are built in the Pearl River Delta, the Yangtze River Delta and Beijing-Tianjing metropolitan regions extending along the Bohai Bay. Within these regional economies, urban entrepreneurialism is an essential driver for economic growth.

A conceptual framework thus can be drawn to describe different stages of regional governance, as shown in Table 1.

The development of regional governance can be divided into three major stages. In the first stage of state socialism between 1949 to 1978, the governance was dominated at the national scale, with strong statehood of socialist state. There was a hierarchical system of planned economy, through which regional coordination was achieved. The rationale was managerialism which dominated governance. The rural and urban areas

were managed separately, leading to an urban-rural dualism. The second stage is an early market reformist regime between 1979 to 2001. At this stage, there was economic devolution which led to rising localities. Large cities became dominant in economic landscapes. Urban entrepreneurialism appeared along with the fiscal autonomy of local governments. Planning control was either abandoned or downscaled. The municipal government became the actual controller of state land. The consequence is fierce inter-city competition, and uncoordinated city-based growth and redundant infrastructure development.

**Table 1:** *the changing regional governance in China: a conceptual framework*

<b>Historical formation</b>	<b>Form of state spatial selectivity</b>	<b>Form of urban-regional regulation</b>	<b>Major conflicts and contradictions</b>
<b>State socialism 1949 - 78</b>	The national scale of statehood as overarching governance	Managerialism achieved through (i) hierarchical planning; (ii) coordination of the planned economy.	Urban-rural dualism
<b>Early market reformist regime 1979 - 2001</b>	Rising localities The dominance of large cities	Urban entrepreneurialism Devolution of planning control	Fierce inter-city competition Uncoordinated and redundant development
<b>Post-WTO market society 2001 - present</b>	Up-scaling towards the city-region, but this scale is only a layer of 'soft institution' without legislation or administrative power	Spatial plans, especially the centrally-initiated coordination plan for larger city-regions. Building regional soft institutions such as the mayors' meeting, joint regional forum/councils.	The city-region as an 'imagined community' continuing conflicting and diverse interests.

Since China joined the WTO in 2001, the development of regional governance has entered the third stage of post-WTO market society. Production under economic globalisation is essentially characterised by the rising regions. That is, the global economy is manifested in places as interconnected regional economies. Moreover, entrepreneurial cities are competing on their own and do not help to form 'regional competitiveness'. As a result, there has been a trend of up-scaling governance towards the city-region scale. However, on this scale, there is no substantial regional government or agency as, for example, the regional development agencies in the UK. Rather there is only 'soft institution' or regional association with the attempt to coordinate developments. More specifically, there are two aspects of this emerging city-region governance: formulating spatial plans, especially through the initiatives under the central government.

Coordination plans are prepared for larger city-regions. Second, regional soft institutions are built to form, for example, mayors' associations and regional forums. However, the city-region is largely an imagined community. There is no substantial participation or democratic representative mechanism to incorporate diverse and conflicting interests. Neither is there an enforcement mechanism. In this sense, the new city-region governance remains soft and incomplete.

In the remainder of this chapter, we will trace the development process to describe the internal dynamics of emerging city-region governance.

### **Entrepreneurial Urban Governance**

Economic reform initiated in 1979 started a series of market oriented developments. The key parameter of the economic reform is the 'growth first' mentality. The Chinese Communist Party has shifted its mission from ideological purity and class struggle to economic development. In the organisation aspect, economic devolution laid down the institutional foundation of entrepreneurial urban governance. The process of devolution has led to the hardening of the 'soft budget', a phenomenon unique to the socialist planned economy (Walder 1995).

The soft budget initially describes a situation of state-owned enterprises in which the state has to bear the ultimate financial responsibility, while individual enterprises could ask for more investment to expand production regardless whether the products suit

the needs. Because the products are taken by the state under economic planning rather than being sold in the market, there is a lack of market discipline. The soft budget concept means local government is merely an agent of the upper level government without the need to be concerned with its own budget.

Economic devolution led to some fiscal autonomy of the local government which now needed to face a much more defined budget line. Local government had to balance its budget, and was allowed to retain more revenue for local use if it managed to gain additional revenue. In rural China, this led to so-called local corporatism. Some economists argued that post-reform China was operating a de facto federalism (Qian and Weingas 1997). In the 1990s, there was a proliferated literature on China's changing central and local relations, especially their fiscal relations (Wong 1991, Zhang 1999).

In terms of urban governance, there has been a trend of consistent down-scaling towards urban districts within the municipality. Because the municipal government is responsible for managing the state land and land revenue became an important source of local revenue, a pro-growth coalition is built up in land politics. The local government is thus becoming an entrepreneurial agent.

The growth of a county-level city near Shanghai is a good example of entrepreneurial urban growth. It shows how the new round of economic development driven by local entrepreneurialism has gone beyond a single city towards the development of city-region. The emerging world factory regime in the Yangtze River Delta is built upon city-regions.

The city of Kunshan is a county-level city beneath the municipality of Suzhou. Until 1990 Kunshan was a largely rural county. It began its development by setting up a self-funded industrial development zone in 1985. This was illegal at the beginning but soon received state approval because of its economic success. Kunshan was granted city status in 1989. Subsequently this rural county was transformed into an industrial district through an export-oriented development strategy.

The city was located in southern Jiangsu, known for its 'southern Jiangsu model' characterised by collective rural economies. However, Kunshan was not really at the core of rural industrialisation. In southern Jiangsu, township and village enterprises (TVEs) are the major driving force for

bottom-up urbanization. However, Kunshan ranked last among six county-level cities in the Suzhou municipality. Hence, it had a nickname of the ‘little sixth’ (Wei 2002). TVEs collapsed in the 1990s under massive privatisation. After the 2000s, the new thrust of growth came from foreign investment. Using the advantage of locating near Shanghai and the available high-quality and cheaper land, Kunshan is leading in export-oriented growth. Kunshan has seen a cluster of IT industries, especially enterprises funded by Taiwanese investors.

Figure 2 shows the rapid growth of gross domestic product (GDP) in Kunshan, divided into three stages:

1. An initial stage of rural industrialisation from 1979 to 1989.
2. Rapid industrial development between 1990 and 2000, benefiting from the opening of Shanghai Pudong as a new development area.
3. World factory régime from 2001 to present, accelerated by China joining the WTO in 2001.

**Figure 2:** *Rapid Economic Growth in the City of Kunshan near Shanghai*



In Kunshan, there were 1,100 ICT companies in 2007, with investment of \$14 billion. The assembly and production of notebooks accounts for 40 per cent of the total world production. It became a major ICT production base. Since 2006 Kunshan began to explore further

development opportunities in producer services and has an aspiration to become a business hub of Shanghai city region. At the border with Shanghai, Kunshan converted a previous rural town Huaqiao into the Huaqiao Business Park. With an area of 50 square kilometres, the Huaqiao Business Park is to accommodate a total population of 300,000 and create 160,000 office jobs by 2020. The slogan for the Park is to become a 'business satellite town for the international metropolis of Shanghai'. The new town is to accommodate modern logistics, regional headquarters of manufacturing industries, and information technology outsourcing.

In short, since the 1990s hierarchical control under the planned economy has been weakened. City-based entrepreneurial governance has been built upon the increased autonomy over land asset. The post-reform economic landscape is consistently characterised by economic devolution and rising local entrepreneurialism, which leads to fierce inter-city competition.

### **Crisis of the Entrepreneurial City**

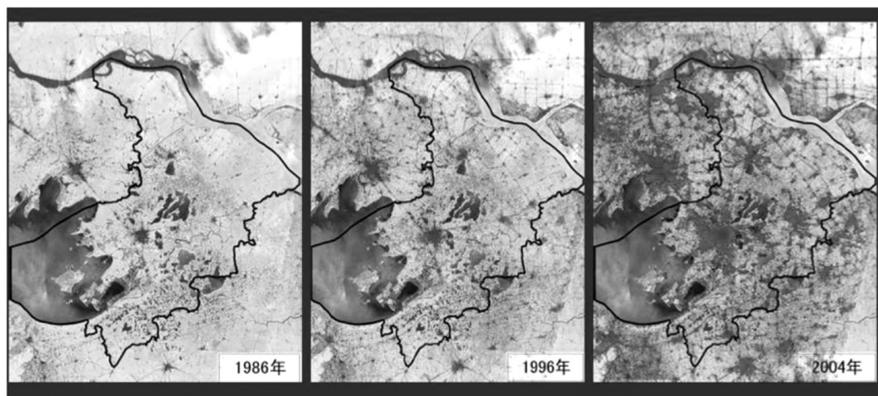
After China's entry to WTO, export-oriented industries boomed in the Yangtze River Delta, the Pearl River Delta and other coastal cities. Along with China's transformation into a world factory, the limitation of the entrepreneurial city began to show. Inter-city competition causes redundant infrastructure construction and environmental degradation. Cities all pursue similar industrial growth without giving full consideration to local conditions. For example, in the Yangtze River Delta, 11 out of 16 cities chose automobile part manufacturing, eight petrochemical industries, and 12 IT and communication equipment production. In order to attract investment, they were racing to the bottom and aggravating economic fragmentation.

The problem of fierce inter-city competition can be exemplified by a rivalry relationship between Shanghai and Kunshan. In response to rapid industrial development in Kunshan and other nearby cities, Shanghai municipal government launched a campaign under the name of 'Project 173' which sounded like a military project during the Cold War. Because it believed that Kunshan attracted industrial projects by providing cheap land, especially ICT enterprises, Shanghai designated an area of 173 square kilometres in the counties nearby Kunshan to offer virtually free land to investors.

To counter the move, Jiangsu province immediately announced the designation of 1,730 square kilometres surrounding Shanghai as an ‘industrial belt’. The aim was to retain competitiveness by providing cheap land to encourage investment and boost GDP growth. The enthusiasm for GDP growth, or ‘GDPism’, was driven by a system of cadre promotion which evaluated the performance of local cadres based on the GDP growth rate of their areas.

As a result the border between Shanghai and Kunshan became a battlefield, with the main casualty the environment. Rapid growth led to an encroachment of rural land. In the lower Yangtze River Delta, urban and industrial expansion rapidly occupied premier agricultural land. Figure 3 shows rapid land expansion in the area near the Taihu lake. The city of Wuxi near the Taihu lake suffered a serious outbreak of blue algae in June 2007. There are similar water pollution events in many cities. In the Pearl River Delta, the urban built-up areas expanded by three times in just 12 years from 1995 to 2002. Because of rapid urban expansion, the city of Shenzhen has used up all its development land and has to find new space outside its municipal area. There is also a deterioration of air quality in many Chinese cities.

**Figure 3:** *Rapid land expansion in lower Yangtze River Delta*



### **Development of City-region Governance**

With the crisis of entrepreneurial governance, regional coordination has become a major issue. Problems of inter-city competition are recognised

by both competing city governments and the central government. The city-region governance is thus emerging. Recently we have seen the strengthening of regulatory control over development. For example, land management is strengthened by designating ‘basic agricultural land’ to protect it from development. Some plans are made to achieve better coordination. For example, in the Beijing-Tianjin-Hebei region, a new urban and rural spatial development plan has been drafted with a special chapter for sustainable development. In these plans, we see the return of public policy.

There is also an upward scaling of governance towards the regional scale. This is a recognition that the failure of previous ‘regional policy’ was due in part to the down-scaling of governance to the city. Under economic devolution, GDP growth targets are disaggregated and allocated to local governments. The local governments are required to fulfil their allocated target and their performance is assessed accordingly. The promotion is closely tied up with the achievement of GDP growth targets. The local government is also given incentives along with discretionary power. Such down-scaling hinders inter-city coordination, as each locality wants to develop its own base for growth.

### **Formulating Spatial Plans**

In order to achieve regional coordination, a new type of plan emerged from previous ‘entrepreneurial city plans’. City plans in China have experienced some important changes, the first accompanying urban entrepreneurialism (Wu and Zhang 2007). Traditional city master plans were abandoned by local governments. Instead, local governments commissioned a more flexible non-statutory plan depicting a vision of city growth aimed at positioning themselves more favourably. These essentially visionary plans are known as ‘conceptual plans’. Rather than providing the technical guidance of statutory plans, they are used to justify entrepreneurial strategies of local government. For example, they help the central city consolidate its position and open up the space for development in its metropolitan area.

The development of conceptual plans changed the two-tier planning system (master plan and construction plan) in China. As non-statutory plans, they provide an outline justification for development. Some elite planners thus become planning consultants rather than government planning professionals. For example, the 2002 Guangzhou conceptual



The development of spatial plans originates from the central or provincial government's need to re-establish regional governance. For example, the National Development and Reform Commission evolved from previous Planning Commission, the powerful organization in charge of the planned economy. It has rejuvenated the Five-Year Plan to include a regional development strategy. So now the five-year plan has a territorial development section. Rather than being driven by local entrepreneurial thrust, these plans are now prepared in a top-down manner, reflecting the concern of the central government over sustainability, the urban-rural divide and the building of the 'harmonious society'.

Development of these plans helps strengthen regional governance. They are largely operated by the provincial or central governments rather than municipal government. To some extent, it facilitates coordination which was absent for a long time under entrepreneurial city governance.

### **Building Regional Institutions**

Fierce inter-city competition is harmful for regional competitiveness. There have been spontaneous bottom-up initiatives among cities themselves to build alliance and strengthen coordination between them. At the same time these local initiatives have been largely overshadowed by top-down regulation. Yet these top-down directives ran against economic evolution and could not be effectively implemented. The central and provincial governments also wanted to strengthen inter-city coordination. In both the Yangtze River Delta and the Pearl River Delta regions, we see a trend towards 'regionalisation'.

The initial effort of enhancing inter-city coordination started as early as 1982 when the State Council decided to set up a Shanghai Economic Region which includes ten cities in the region. In 1983, a Planning Office was established. In 1986 the region expanded to embrace five provinces together with the city of Shanghai. The Office prepared a Development Strategy, imposed regulations, and played a major role in the treatment of Taihu lake pollution. However, the dominant trend in the 1980s was economic devolution. The Office could hardly achieve its purpose of coordination between cities in different provinces. Individual cities became the basic unit of decision making. The Office had no direct regulatory power over them. In 1988, the Shanghai Economic Region

was abolished by the National Economic Commission.

However, regionalisation the need for coordination persisted was revived in the 1990s. In 1996 a Coordination Association of Urban Economies was established in the Yangtze River Delta. The association, led by Mayors of the major cities involved, coordinates transport, tourism and human resource management. In 2000, the Forum of Economic Collaboration was formed between Shanghai, Jiangsu and Zhejiang to provide a channel of communication between senior officials of the provincial level governments. Since 2005, it focused on comprehensive transport system, science and technology, and environmental protection.

In the Pearl River Delta regionalization reached a new height when the so-called 'Pan-Pearl River Delta' was set up. This includes nine provinces (Guangdong, Guangxi, Yunnan, Sichuan, Guizhou, Hunan, Jiangxi, Fujian and Hainan) and two special administrative regions (Hong Kong and Macao). Hence the Pan-Pearl River Delta is also known as 9+2. It covers one fifth of land area and one third of population in China, accounting for 40 per cent of national GDP and 58 per cent of Chinese foreign direct investment (Yeung, 2005).

However, the Pan-Pearl River Delta is largely a brainchild of former Guangdong province Chinese Communist Party secretary Zhang Dejiang, while the central government holds a very ambiguous position towards it. The mechanism is not formalised in the plans prepared by the National Development and Reform Commission. In essence, Pan-Pearl River Delta remains an Guangdong initiative rather than a level of regional governance. Because its scale is so large, it is impossible for the central government to formally recognize it as a substantial regulatory power.

Indeed, the Pan-Pearl River Delta is a collection of loosely assembled local governments. It lacks the binding and enforcement mechanism. It is therefore neither an upscale regional government nor a downscaled regional agency of the central government. When Zhang was promoted to the central government in Beijing, his successor, Wang Yang, emphasized a more inward-looking scenario, involving coordination within Guangdong province and a more balanced development pattern together with better coordination with Hong Kong and Macao, rather than seeking an expansion towards the hinterland of the region. As a result, the Pan-Pearl River Delta faces some uncertainty.

Both the Yangtze River Delta and the Pan-Pearl River Delta show the limitation of building soft institutions. There is no development agency to coordinate regional development. The landscape of devolution means decision-making is decentralised. Even the provincial government cannot effectively coordinate developments within its territory, let alone establish a development forum or association.

## **Conclusion**

China's rapid urban and regional development has been driven by economic devolution. The city has become the autonomous fiscal agent after economic devolution. This has laid down the institutional foundation of urban entrepreneurialism. However, devolution has also triggered fierce inter-city competition. Recently, there has been a new trend towards up-scaling of governance at the city-region level. This chapter has examined the emergence of regional governance in China in an effort to shed light on the complex relationships between central and local governments. Whereas devolution and decentralization have certainly been a dominant trend in the past three decades since economic reform, the tide is now changing towards re-centralization.

In the Chinese context, regional governance has emerged in response to two interrelated forces: the often competing demands of 'regional competitiveness' and 'regional governance'. With the deepening of globalisation, the world factory regime was formed. Increasingly, production extended from the city to the wider region. For example, comparisons were made between the Yangtze River Delta and the Pearl River Delta rather than between individual cities within these regions. A new discourse of 'regional competitiveness' was put forward by policy makers. They argued that competitiveness had to be built upon a larger scale than cities. In this way urban entrepreneurialism was extended to regional competitiveness.

Secondly, 'regional governance' emerged as a reaction to the crisis of the entrepreneurial city. Increasingly, urban entrepreneurialism demonstrated its limits. New efforts were made to reconstruct a regulatory space in the city region. For example, previous entrepreneurial plans were changed and turned into a new kind of 'spatial plan' in order to achieve better coordination between cities. Cities also built alliances to form 'soft' regional institutions. This new regionalism thus reflected the state's desire to find an appropriate scale to manage economic growth.

Although the tide is turning from devolution to regional cooperation, or city-region governance, we have yet to see substantial and full-fledged governance based on participatory mechanism. To some extent, we see an endeavour to regulate at the regional scale by the central government. But this is much weaker and not really comparable with the establishment of regional development agencies in the UK. While China retains a system of decentralised economic governance, this is in the context of a strongly centralised political landscape.

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# Industrial Clustering and Spatial Inequality in India

Sharmistha Bagchi-Sen

In recent years, technology and innovation-led development have caught the attention of policymakers around the world. India has been an interesting case to study the effects of technology-led development in an era of globalisation. India is not new to having science and technology policies. In fact, after independence and in the pre-1991 reform period, India's focus on science and technology was very much led by public laboratories, which were spread out throughout the country, with focus on a variety of problems. However, the lack of private sector or privatisation incentives prevented technology transfer and innovation commercialisation, except in few sectors. For example, need-based drug development proceeded given India's patent protection for processes and not products.

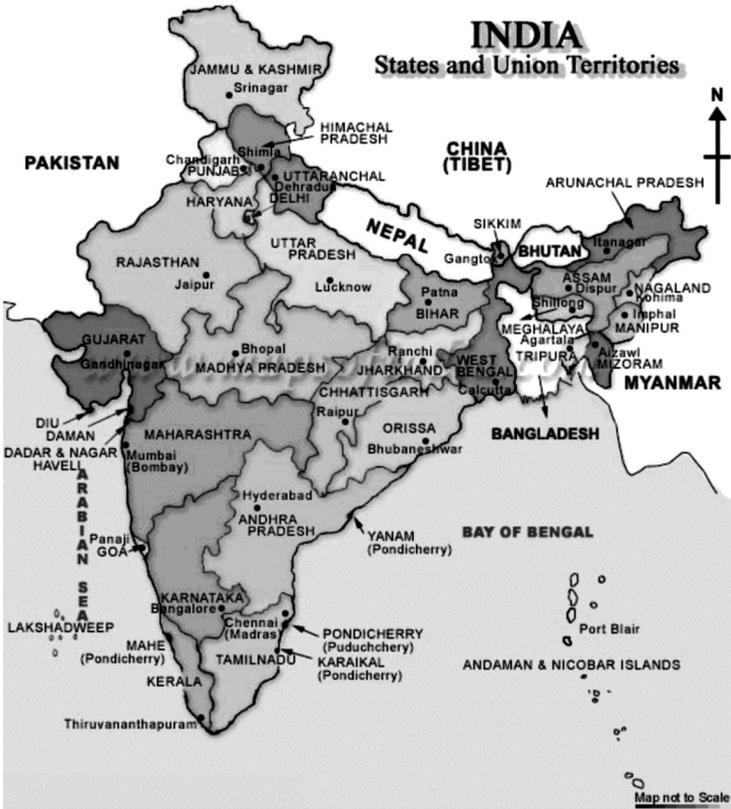
The post-reform era of privatisation saw a change in industrial development: a thriving private sector, increased foreign direct investment and international trade, compliance with product patent policies, and greater involvement of individual states in fostering local institutions. Without government leading the location of industries, the market now determined industrial development and new forms of agglomeration, industrial clustering, regional and intra-regional disparity, and in some places eventual slowdown in implementation of reforms came to be noticed. For example, Bangalore and Hyderabad took off as technology centres while old manufacturing towns such as Ahmedabad and Mumbai lagged behind. Not all states benefited from reforms given differential regional absorptive capacity. The purpose of this chapter is to examine some of the industrial clusters in auto, IT, and pharma-bio within the context of national and regional innovation systems. A few examples of underdevelopment are also offered such as the coal belt of Jharkhand.

## Background

National and regional innovation systems are the underpinning concepts used to explain patterns of industrial clustering in high technology sectors. The evolution of high tech clusters show that resilient areas have thriving interaction between firms and other organizations, for example research institutes, universities, venture capital, financial organisation, labour organisations, industry associations, and government and non-government agencies.

They are also characterised by serial entrepreneurship over time in various sectors such as those found in California (agri-food, aerospace, information technology, biotechnology, wine, greentech) and Bangalore (aerospace, information technology, biotechnology). One important aspect is the changing role of policy – from either centrally driven Research and Development or Strategy and Technology policies to the recognition of endogenous factors.

### India: States and Union Territories



In India the Strategy and Technology policy environment focused on the stimulation of basic research, in particular the creation of the Council for Scientific and Industrial research, with less emphasis on policies conducive to innovation, such as entrepreneurship, intellectual property and knowledge exchange.

Emphasis on innovation-led development and industrial clustering can be traced to Porter's work on the conditions for competitive advantage in a region or a nation — demand and supply conditions, competition, and the presence of related industries. Porter (1990) focused on co-location and interdependency among firms within related industrial sectors in a geographical area. Regional innovation goes beyond firm interaction to cooperation among firms and other elements of the knowledge economy such as universities, research labs, and non-profit organizations—in other words, embeddedness of the firm and its supporting institutions at various geographic scales and value-chains (Edquist 1997).

In the above concepts, the territory within which knowledge formation takes place or capabilities evolve are acknowledged as the key region. These regions often negotiate their own paths vis-à-vis the nation through the regionalisation of the national innovation policy. An example is Karnataka's biotech policy. Local capabilities and networks further facilitate the agglomeration effects, although problems can arise when regions adopt 'off-the-shelf' best practice or assume that regional policy can be 'one size fits all'. This has been demonstrated with the biotech policies developed by other states in India based on Karnataka's experience with Bangalore.

### **Struggles of the Old Industrial State:**

#### **Jharkhand and Jharia Coalfields**

Jharkhand, the 28th state of the Indian Union which was brought into existence by the Bihar reorganization Act in 2000, is famous for its rich mineral resources. These include coal (32 per cent of India's reserves), copper (25 per cent of reserves), and iron, uranium, mica, bauxite, granite, gold, silver, graphite, magnetite, dolomite, fireclay, and quartz. The first iron and steel, explosives and methane gas factories in India were established in its industrial towns of Jamshedpur, Ranchi, Bokaro, and Dhanbad-Jharia-Sindri. Forests and woodlands occupy more than 29 per cent of the state.

In recent years, the Jharkhand government has granted 206 leases for coal which continues to be an important economic activity. The state derives 92 per cent of its total mining revenues from coal. The Jharia, Bokaro and Karanpura coalfields started in the 1856. The opening of coal mining in Jharia area during the second half of the 19th century and the establishment of the Tata Iron and Steel company in Jamshedpur in 1907 marked the beginning of industrialization. Bharat Coking Coal, Tata Iron & Steel Company, and Indian Iron & Steel Company are the three largest companies operating in the coalfield's 450 sq km area. Between them they own 50 per cent of the land, with the remainder mostly owned by various government agencies and departments.

One of the major problems in this area is the spontaneous combustion of coal, which has resulted in the loss of 42 million tons of India's best coking coal, with consequential environmental and social impacts. This region is also the homeland of Mundas, Asurs, Santhals, Oraons, Ho, and Kharias aboriginals. Most of these communities live in a state of semi-starvation throughout the year.

### **Economic Development in India**

The Planned Economy *Old Model* was government-driven in which the state was the entrepreneur and regulator. Private sector regulation was through controls, such as industrial licensing, import quotas, use of foreign exchange, financial markets, and pricing structures. Limited incentives were provided for enterprise formation, and the state directed resources to backward areas to reduce regional economic inequality.

The post 1990-1991 reforms *New Model* is based on regulatory reform, including the end of industrial licensing. It is private sector driven industrial development with a lesser role of the state. Collaboration between government, research institutions, and universities is encouraged. Although state protection is offered to certain territories such as Nagaland and Mizoram, it is acknowledged that the private sector is attracted to areas with developed infrastructure. Agglomeration is promoted which reinforces spatial inequality between core and peripheral areas. Aiyagiri (2007) offers three phases of Strategy and Technology policy in India:

### **1947-66: Nation's Trust in Science and Investment**

Power of science to solve real life problems.

Investment significantly beyond the means of a developing nation.

### **1967-86: Nation's Demands on Science and Delivery**

Science and technology provided viable solutions.

Self-reliance (includes the nationalisation period).

### **1987-2006: Challenge and Introspection**

Use of knowledge for generation of wealth and development of the economy.

India is broadly divided into five regions: North, South, West, East, and North East. Regional as well as intra-regional and urban-rural inequalities are quite acute:

- Electricity - Almost 100 per cent of households in Himachal Pradesh and Punjab (North) have electricity compared with just 50 per cent in West Bengal (East), Orissa (East), Jharkhand (East), Bihar (East), Assam (North East), and Uttar Pradesh (North).
- Housing - 84 per cent of families in Kerala (South) own a 'pucca' (permanent) house compared with 12 per cent in Tripura (North East).

Sachs et al. (2002) offer an analysis of some regional factors in sectoral growth (see Table 1).

Regional differences reflect differences in marginal productivity of investments by sub-sectors:

- Urban areas as well as ports do better than other locations. The ports of Mumbai, Kolkata, Chennai and Kandla in Gujarat all benefit from international trade.
- Rain-fed agricultural regions are lagging behind due to low agricultural productivity.
- Some benefit from international remittances - Punjab, Haryana, Kerala. However, industrial progress is slow in Kerala, in part due to long-term communist government, labour unions, and resource-based development.
- Within-state variation is less in Punjab, Haryana, Karnataka, and Kerala (which also has high literacy rates despite lagging behind in industrial progress).
- There is intra-regional disparity within Andhra Pradesh, Madhya Pradesh, and Maharashtra which experience high rural

to urban migration.

- The poorest states are Bihar, Madhya Pradesh, Rajasthan, and Uttar Pradesh (BIMARU).

**Table 1: Some Regional Factors in Sectoral Growth**

Sectors	Key determinants for future growth	Favoured states	Time period	Current contribution to growth
Agriculture	Climate, agricultural technologies	Punjab, Haryana	Green Revolution 1970s-1980s	Low
Manufacturing	Urban, coastal, major port facilities attracting foreign direct investment	Maharashtra, West Bengal, Tamil Nadu, Gujarat	1980s onward with rising importance in the 1990s	High
Tourism	Historical, cultural, and natural attractions, proximity to major ports of entry such as Delhi and Mumbai	Rajasthan, Maharashtra	1980s onward	Moderate
High-Tech (finance and ICT)	Urban, skilled labour force, universities	Maharashtra, Tamil Nadu, Karnataka, West Bengal	1990s	High

Source: Sachs, Bajpai and Ramiah (2002, p. 32), Table 6.

## **Industrial Clusters**

Examples of auto clusters and high tech clusters reveal the pattern of industrial clustering in India. However, industrial clustering is also common for small-scale industries, those started with some location-based advantages or local markets and evolved into recognised territories of specialisation in a variety of sub-sectors.

## **Automobile Clusters**

Starting in 1957, an *import substitution strategy* encouraged the manufacture of indigenous automobiles in India. The companies and the locations were Birla's Hindustan Motors in the outskirts of Kolkata, Doshi's Premier Auto in Mumbai, Standard Motors in Chennai, Ashok Leyland (heavy vehicles) in Chennai, and TATA in Jamshedpur. Until the mid 1980s, FDI was restricted in the auto industry (see for example 1963 Monopolies and Restrictive Trade Practices policy). In the mid 1980s, a joint venture with Suzuki Motors was the first major initiative to a move away from the strict import substitution strategy (Okada and Siddharthan 2007).

*Chennai Auto Cluster* – The TVS group (in business since 1911) set up an industrial enclave (parts and components) in Padi outside of Chennai in the post-independence period. It now has 29 companies. Its original international collaboration started in 1960 with Dunlop-UK. One of the most noted collaborations for motorcycles was with Suzuki but the Japanese company ceased to be a shareholder in the early 2000s. Political connections helped in that local firms were supported by state politicians in getting industrial licenses during the pre-reform era.

Firm-level agglomeration included TVS, MRF, Ashok Leyland, Standard Motors, and the Rane Group. The evolution of MRF, for example, developed as follows: MRF's start was in a toy balloon plant in 1946 in a Chennai suburb; in 1952 it started rubber manufacturing; in 1961 it established technical collaboration with the US Mansfield Tire and Rubber company; and in 1967 it started exporting to the US with access to ports including the all-weather port of Tuticorin helping its international trading efforts.

In recent years, the Chennai auto cluster has received foreign direct investment from Ford, Hyundai, and Mitsubishi.

*National Capital Region Cluster* - In 1982, Maruti Udyog, a joint public sector venture with Suzuki, launched an auto cluster in the National Capital Region as a greenfield operation. A second plant was established in the same location (Gurgaon) in 1992, and a third in Noida in 1999. In 2003, a foundry plant Suzuki Metal was established as well. Maruti's suppliers are clustered in the same region. It is now the largest manufacturer in the auto sector.

In the 1990s, both Daewoo and Honda invested in the National Capital Region, although Daewoo failed and Honda only started production in 2000-2001. The Region has some distinctive characteristics compared with the Chennai cluster: central government is in partnership with a foreign investor; there is distinct local content requirement; sales are focused on the domestic market; the venture attracted domestic suppliers such as the TVS group; the investment was facilitated by exchange rate differentials (increased value of Yen in early 80s); and the location pattern is an example of the application of the just-in-time system. It is an anchor firm led planned cluster development with the government as a partner whereas the Chennai cluster evolved over many decades based on the entrepreneurship of local groups and the support of local politicians. Both regions have access to skilled labor force but Chennai has been more successful in attracting and retaining foreign direct investment.

Other auto clusters are found in locations near the city of Kolkata (West Bengal state) and in Pune (Maharashtra state – few hundred kilometers from Mumbai). Recently, West Bengal received a lot of publicity when TATA Motors planned to invest in Singur on land acquired by the state government from local farmers. This was an attempt to bring industrial prosperity to a state which has failed in attracting either domestic or foreign private capital since independence. However, farm land acquisition for private enterprise provoked political controversy and in 2008, TATA decided to withdraw and focus its investment in the state of Gujarat instead. Opposition party complaints about land acquisition and improper compensation to peasants stalled the TATA efforts. (Even so, the Calcutta High Court decided that the acquisition of 997.11 acres of land was legal for public purposes.

### **New Technology Clusters**

*Information Technology* - In terms of firms and location, there has

been a move TATA and Mumbai to newer indigenous entrepreneur-led developments in Bangalore. Table 2 shows the shift in firm development and also the importance of global connections in the IT sector in recent years.

**Table 2: *Origins and Growth of the Software Industry in India***

<b>Rank</b>	<b>India HQ 1980</b>	<b>India HQ 1990</b>	<b>India HQ 2004</b>	<b>Founder</b>
1	TCS Mumbai	TCS Mumbai	Infosys Bangalore	Kanodia MIT
2	Tata Infotech Mumbai	Tata Infotech Mumbai	Infosys Bangalore	Murthy
3	Computronics Mumbai	Citibank- Mumbai	Wipro Bangalore	Premji Stanford
4	Shaw Wallace Kolkata	Datamatics – Mumbai	Satyam Hyderabad	Raju Ohio U
5	Hinditron Mumbai	TI- Bangalore	HCL Delhi	Nadar
6	Indicon System Mumbai	DEIL - Mumbai	PCS Mumbai	Patni MIT
7	ORG Mumbai	PCS Mumbai	i-Flex Mumbai	Hukku Citicorp
8	Systeme – Mumbai	Mahindra- BT-Mumbai	Mahindra- BT– Mumbai	Mahindra Havard
<b>Mkt (%)</b>	90	65	38	

Source: Dossani 2005

A recent in-depth analysis of the future of the IT sector concludes:

“... greater specialisation in software production and exports in the domestic economy (with or without differentiation of the industry) are constrained by precisely those factors that probably account for India’s relative disadvantage in manufacturing, viz. poor and inadequate investment in physical infrastructure, communications and basic education. Thus, while software development offered a window of opportunity provided by a large stock of underemployed engineers, it is a narrow window of opportunity. Furthermore, software has not played the traditional role of a leading sector in India’s economic growth, at least partly because of its poor linkages with the rest of the economy. This poor linkage is itself a consequence of the ‘service’ rather than ‘product’ nature of the industry, and its external rather than inward orientation - facts lamented by previous analyses of the industry” (Arora and Athreye 2002).

Despite impressive growth, the impact of IT on the Indian economy does not extend beyond a few states or sectors. This limits its potential for reducing spatial inequality in terms of industrial growth and development.

*Bio-Pharmaceuticals* - Pharmaceutical firms are mainly located in Maharashtra, Gujarat, TamilNadu, and Andhra Pradesh. This sector has its roots in multinational companies and in indigenous efforts. Some of the highlights are as follows (Okada and Siddharthan 2007):

- Glaxo established its operation in 1924 in Maharashtra and now has a plant in Karnataka. One of Glaxo’s original investments was in baby food.
- Cipla, an Indian company, was established in 1935 in Maharashtra with a focus on bulk drug production.
- Nicholas Piramal, established in Maharashtra-Gujarat in 1947 has now also invested in Tamil Nadu and Andhra Pradesh. In 1947, it was a subsidiary of British Schering but was acquired by Piramal in 1988.
- Ranbaxy was established in the National Capital Region and Punjab in 1961. It had a joint venture with Eli Lilly.
- DRL or Dr Reddy’s Laboratories started in 1984 with investments in Andhra and in London (and now in Yorkshire, Goa, and Pondicherry) – this company has strong in-house R&D with a strong focus on innovation.

The evolution of biotechnology in India is supported by a regional innovation system: science, markets and institutions (Bagchi-Sen and Lawton Smith 2008). Bangalore's IT cluster is characterised by:

- Integrated chip design, telecom and system softwares with worldwide clients and reputation.
- Local but world-renowned educational and research institutions, for example the Indian Institute of Science. There has been investment in biotech parks at Bangalore's University of Agricultural Sciences, Karnataka University, and Dharwad (a marine biotech park).
- Venture capital.
- State support in the form of tax breaks, uninterrupted power supply, electricity tariff, permissive labor law (employing women at night), and the provision of forming a single window agency to clear projects.

The state's Millennium Biotech Policy facilitated a Vision Group of Biotech and taskforces to improve institutional support. In India, sectoral specialization includes genomics, biofuels, contract research, bioinformatics. Companies such as AstraZeneca, Biocon, Cadilla, Wockhardt, GlaxoSmithKline are in the forefront. Hyderabad is an equally important location in the state of Andhra Pradesh. Other states have followed both Karnataka (home of Bangalore) and Andhra in setting up biotech policies to attract investors.

### **Small Scale Industry Clusters**

As well as supporting local employment a large of India's exports comes from the Small Scale Industry (SSI) sectors. The industrial origin is mostly market or resource based, but in recent years some SSI is infrastructure-based especially in the electronics, software, floriculture, and biotechnology fields. The main sectors are machinery, cotton textile, chemicals, metals, hosiery/garments, food, non-metallic minerals, electrical machinery, wool-silk-synthetic, and transport equipment. The locations are mainly in the industrialised urban areas of the Northern and Western states (Maharashtra, Gujarat, Punjab, Rajasthan, Uttar Pradesh, Haryana, Himachal Pradesh). Some clusters are found in TamilNadu (South) and West Bengal (East).

In addition, artisan-based clusters are as important for local development as the SSI. These producers have low energy use, local markets, and are often exporters. One-third of India's exports come from:

- Gems and jewelry – Surat.
- Textiles – Panipat.
- Garments – big cities.
- Leather – Agra.
- Handicrafts – Moradabad.

These clusters are supported by government-funded institutions, the Indian Diamond Institute in Surat; a custom office in Panipat; the National Institute of Fashion Technology in Delhi; Footwear Design and Development Centres in Agra; the Central Glass and Ceramics Research Institute in Calcutta; and the Central Leather Research Institute in Chennai.

The role of institutions in addition to resources and markets cannot be ignored. Many institutions have been set up to ease financing, provide training and marketing for SSI. India has a separate provision for non-modern small units, for example the small Industries Development Bank of India. At the state level, institutions exist to provide infrastructure, finance, export and technical assistance, and training such as entrepreneurship development. At the district level, further help is provided through the provision of clearances, licenses, and certificates under one roof (for example, District Industries Centres). These clearances are needed for meeting domestic and as well as international standards.

One of the main barriers to development is the provision of financing for local entrepreneurs. State Financial Corporations and State Industrial Development corporations have been set up to cater to long-term needs and to participate in ventures through equity stake, with refinancing support from the Small Industries Development Bank of India. The state units can also generate their own funds through state governments and commercial borrowings. Both national and state institutions now provide working capital. Like commercial banks, state financial corporations have remained a source of credit for small- and medium-sized enterprises.

## **Conclusions**

In the post-reform era some old industrialised states have strengthened their position and new territories have emerged. In the auto sector, Chennai (the old cluster) is doing well while a new cluster has emerged

in the National Capital region based on collaboration between the central government and Suzuki, a Japanese company. In IT, Mumbai has lost its dominance to Bangalore. In pharmaceuticals, Mumbai is still important but Bangalore and Hyderabad are capitalising on their regional innovation systems. Almost every state has a biotech policy to develop regional innovation systems. Urban areas are doing better compared to rural (mainly because agriculture has been left behind in the reform era). In general, regions which attract foreign investment are expected to do well.

National and regional innovation system coordination is important for development in India. Given the current economic downturn, policies at the regional level should focus on:

- Investment in physical infrastructure, human capital, health and education, and finance to raise productivity especially in backward states such as Chattisgarh.
- An acknowledgement that, though difficult to engineer, clusters provide competitive advantage.
- A need to focus on sector/cluster-specific services emphasizing whole business systems. These include information provision, technology support, and cluster-specific credit/financing for example for those dependent on seasonal fluctuations in raw material supply.

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# The Silicon Sea-Belt: Regional Innovation Systems in East Asia

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This chapter examines the evolution of inter-regional strategic research alliances within the East Asian political economy. R&D collaboration in different forms have played an important role in the economic success of East Asian countries such as Japan, Taiwan, South Korea, Singapore and China, whereby various forms of collaboration is increasingly seen as ‘a strategic tool’ (Dodgson, et al. 2006). It has been observed that one result of the internationalisation in R&D has been to shift the ‘geography of science and innovation’ to the Far East (Edler, 2008). There is also a growing tendency for innovation to be created within global networks of firms and research organizations leading to the ‘internationalisation of innovation systems’ (Carlsson, 2006). The patenting and publishing involving multiple countries, together with rising shares of foreign students in higher education systems all indicate that knowledge is becoming more and more internationalised.

At local and regional level, the ‘internationalisation of clusters’ has been on the policy agenda, with trans-national inter-cluster initiatives being implemented in recent years. However, while scholars have recently started to emphasise the significance of external relationships for knowledge sharing, most of the literature does not reveal ‘specific extra-regional spatial structure of cluster relations’ (Wixted, 2006), and still continues to emphasise the local factors in cluster development, or tend to emphasise the emerging dichotomy between ‘local’ and ‘global’ knowledge. There is a dearth of literature which studies interactions and interdependencies of industries across national and regional borders and examines these in light of changing innovation systems.

In cities and regions throughout East Asia — South Korea, China, Taiwan, Singapore and Japan — competition to establish and maintain information and knowledge activities is becoming fierce. For example, Singapore, referred to as a business hub, is facing intense competition from other nations. While competition is intensifying among East Asia's economic agglomerations, inter-linkages between these regions are also growing.

This chapter highlights the recent emergence of some city-regions in East Asia as focal points for new technology, new product creation, and more generally for strategic governance of science and innovation at an international level. In particular the chapter will examine the experience of the *Fukuoka Silicon Sea-belt Project*, an initiative taken by the region in Japan to promote trans-national R&D networks in East Asia. Formerly a declining industrial region dependent on coal mining and steelmaking, Kyushu is diversifying into the automobile, semiconductor, and environment and recycling industries. In the process it is transforming itself into a new international hub of converging technologies in East Asia. Consequently, it may have some lessons for Wales.

With the so-called 'hollowing out' of Japanese manufacturing sector East Asian production and R&D networks have been changing. Globalisation has provided new opportunities for latecomers such as China to enter international trade. In turn this is shaping the processes of trade patterns and production networks in Asia, with implications for future Asian regional integration and moderation of international trade imbalances. One factor encouraging inter-agglomerative linkages within East Asian regions has been the movement of multinational corporations into East Asia, including those of Japan. In recent years, a number of East Asian countries, and China, in particular, have emerged as the 'world's factory' seizing top world production shares for many products. The offshore shift of Japanese firms prompted changes in Japan's local economic structure with a number of organisational and spatial transformations and policy challenges through internationalisation in R&D activities.

The broad research questions asked in this chapter are as follows:

- What can we find about the *internationalisation* of regional innovation systems in East Asia?
- How does *local, national* and *trans-national governance* impact on the relationship between the firms, universities and their regions?
- What are the lessons for Europe from Asia and *vice versa* for Asia from Europe in terms of *constructing 'international regional advantage'*?

The following section provides a review of the literature highlighting the new geography of collaborative knowledge production in East Asia including the new roles of sub-national governance in constructing spaces of science and innovation. The third section focuses on *Fukuoka Silicon Sea-belt Project*. The final section identifies future research agendas, policy implications and challenges for East Asia as a new *transnational space* of research and innovation.

### **Emerging Global Production Networks in East Asia**

Countries in East Asia are very different in terms of their scientific capabilities, resources, and stages of economic growth. Emerging economies such as China and Taiwan Recent years have adopted ‘catching up’ strategies in recent years. The critical role that *regions* play in determining national economic success has been increasingly highlighted. Policy makers have sought to promote university-industry links as a means to stimulate regional economic growth through local cluster initiatives. New mechanisms of university-industry linkages are being forged and various institutional strategies of universities are emerging to enhance regional innovation-based growth.

Taiwan is an exemplar of combining international R&D collaboration with regional development. An overwhelming proportion of Taiwan’s manufacturing industries, 98 per cent, are small and medium-sized enterprises (SMEs). To survive and to thrive, they have developed collaborative networks to form partnerships. These have promoted connections with the US market and persuaded Taiwanese and Chinese engineers and entrepreneurs working in the USA to return home. The Taiwanese case suggests that regions need to pay attention ‘not only to the creation of an infrastructure of institutions that funds and supports new firms but also to the *facilitation and promotion of financial, technical and technology connections* among Taiwanese firms and also between Taiwanese firms and institutions in other regional communities like Silicon Valley’ (Castilla, 2003; emphasis added).

The rise of China as a global export production base especially for mobile communications and digital consumer devices, has been well documented. drawn policy, business and academic attention. At least 750 multi-nation Enterprise R&D centres had been established in Beijing, Shanghai, Guangzhou, Chengdu, and other Chinese cities by mid-2005. The Chinese government has transformed the national system of

innovation and used technology policies to promote indigenous R&D and foreign technology transfer. It is vital for countries like China to create stronger links between local clusters, foreign technology sources and national and regional innovation systems.

At the same time there is a built-in conflict between regional or localised development on the one hand and the rapid concentration of industrial and technological activities on the other. In the last decade, three IT industry based clusters, at Beijing, Shanghai and Shenzhen have emerged in China. While Beijing, and to a lesser extent Shanghai, do represent the greatest concentration of technical manpower, research institutes, and universities, a number of other cities (including Guangzhou, Nanjing, Hefei, Wuhan, Chongqing, Chengdu, Xian, Tianjin, Shenyang, Dalian, Changchun, Harbin) are also growing as centres of research and innovation activities.

In China, local governments have become more active in developing these resources. Over the course of the 1990s spending on science and technology by local governments grew more rapidly than those of the central government, albeit from a much smaller base. Local government spending on science and technology accounted for almost 37 percent of the national expenditure by 1999, compared with 28 per cent in 1991 (Suttmeier, 2002). These constitute the 'intra-country spatial dynamics' of China (Chen and Vang 2008) which in turn influence the location decisions of multi-nationals and innovative capabilities of the regions. Local officials are increasingly powerful in the process of decentralisation and devolution in China, creating space for localities to experiment with different organizational structures and policy approaches (Segal, 2003).

China's economic relations with neighbouring South Korea and Japan have been developing rapidly as a result of foreign direct investment (FDI), entailing R&D functions as well as manufacturing. Japanese, South Korean and Taiwanese firms have all established R&D-units in China and, to a lesser extent, in India. Before the mid 1990s, Japanese electronic firms undertook little R&D in their subsidiaries in East Asia, while leading competitors in the US, Europe and Korea 'have aggressively moved aggressively ahead with R&D outsourcing to tap into the region's vast lower-cost pool of human resources and specialised skills' (Ernst, 2003). However, the number of Japanese R&D affiliates in China increased from 13 in 2000 to 28 in 2002.

Competition between distinct national business models is no longer so distinctive, as in recent years, firms of diverse nationality compete and collaborate within ‘multi-layered global networks of networks’ of marketing, production and innovation. The concept of the Chinese Economic Area (CEA), referring to the economic integration of a geographic area encompassing China Mainland, Hong Kong, Macao and Taiwan, is becoming widespread. The process has been driven by the ‘entrepreneurship and self-interests of business sector’ rather than promoted by political initiatives and intergovernmental coordination (Sigurdson, 2004).

Ernst argues that the key to ‘successful alliances’ with Asian partners is “hybridisation” of business organization including both intra-firm and inter-firm transactions and forms of coordination beyond national models, where firms adopt ‘successful features of East Asian firms’, as part of ‘East Asian Production Networks’ (EAPN). This involves constructing strategic space of innovation, building value chain into a variety of ‘discrete functions’ with locations wherever ‘they can be carried out most effectively, where they improve the firm’s access to resources, capabilities and knowledge, and where they are needed to facilitate the penetration of important growth markets’(Ernst, 2003).

Questions arising from this brief examination of the literature include:

- How to make *global* and *regional* (trans-national), *national* and *regional* (sub-national) innovation networks meet.
- How to link such networks to the ‘local capability formation’ (Ernst and Kim, 2002).
- How *intra* and *inter*-organisational cross-boundary learning happens as part of such innovation networks operating on widely different territorial scales.
- The role of public policy in developing effective institutional mechanisms to promote *East Asian* innovation networks.

Following the bursting of its bubble economy in 1991, Japan experienced macro-economic stagnation which contributed to weak home demand for manufactured products. Combined with growing competition from nearby Asian countries, this led to an ongoing restructuring and internationalization of the Japanese economy, with large firms moving production overseas and cutting domestic SMEs out of their supply chains. In the post ‘bubble’ era of the 1990s and 2000s, increasing global competition put pressure on all segments of the Japanese national

innovation system to be more productive. Traditionally, Japanese research had been concentrated in-house within large *keiretsu* groups, but this feature declined throughout the slow growth period as a ‘hollowing out’ process went on (Schaede, 2008). Meanwhile, there has been little expansion of foreign firms’ R&D-labs in Japan. For example, in 2007 Pfizer shut its drug discovery operations in Japan.

Consequently, throughout the 1990s and 2000s, the Japanese innovation system went through widespread reform, a distinctive features of which was the ‘regionalisation of innovation policies’ (Kitagawa and Woolgar, 2008). Throughout the 1990s the Japanese central and local governments actively promoted various types of *cluster initiatives*. One was the *Knowledge Cluster Initiative* supported by the Ministry of Education, Culture, Science and Technology, based on the so-called ‘academic approach’ to innovation policies. Another was the *Industrial Cluster Initiative* implemented by the Ministry of Economy, Trade and Industry, based on the so-called ‘business approach’. Both aimed at revitalising regional economies and promoting industrial accumulation through creating new businesses as a result of collaboration between industry, university and public research institutes.

In 2007 the Ministry of Education, Culture, Science and Technology decided to nominate six regions for its second stage Knowledge Cluster to promote ‘*internationalisation*’ as well as connecting local clusters to wider areas. As of June 2008, nine initiatives had been selected : Sapporo Biocluster, Sendai Cluster for Creating an Advanced Preventive Health Society, Nagano area for smart devices based on nanotechnology materials, Hamamatsu Optronics Cluster, Tokai Wide area manufacturing technology cluster, Hokuriku Health Creation Cluster, Kyoto Environment-related nanocluster, Kansai Wide area biomedical cluster, and Fukuoka advanced systems LSI development cluster. There is an earmarked fund more than 50 million Japanese Yen a year per region for connecting the region to wider area including overseas partners.

Recent Chinese development has centred on those industries located in nearby Japanese cities, imposing challenges to the development of Japanese local and regional innovation systems. As far as Japanese firms are concerned, manufacturing and sales clearly comprise the bulk of offshore operations, while in the R&D sector, companies have only just begun to shift their operations abroad. However, this landscape may change as the Chinese strategy for translocation of global information and

communication technology (ICT) production and R&D into the Beijing, Huamgdong (Shanghai) and Guangzhou (Shenzen-Guangdong) regions has borne fruit, significantly on the back of an investment in engineering talent (Cooke, 2004).

Nevertheless, having been the most economically advanced nation in East Asia, city-regions in Japan may find themselves in a strategic position to develop ties, especially in terms of creating further 'knowledge value chain' links with East Asian economic agglomerations.

### **The Fukuoka Sea-belt Development**

The *Fukuoka Silicon Sea-belt Project*, a recent development in the Kyushu region of Japan, which the world's biggest supplier of semiconductor engineers, is an exemplar. The project aims at promoting R&D exchange activities with South Korea, Taiwan, Singapore, and other semiconductor development hubs in East Asia.

Local authorities within the Fukuoka Prefecture have given strong leadership to promote regional innovation with growing trans-national R&D links with other regions in Asia. The rationale behind the establishment of the Silicon Sea-Belt Project was a realisation that broader alliances were required in technology development, human resources, and market expansion both nationally and internationally. To facilitate the project, a Promotion Committee for the Fukuoka System LSI Technology Development Hub was organized in 2001 with the cooperation of industries, academia and government agencies. The committee has been engaged in five tasks: R&D support, human resources development, venture creation and support, promotion of networking and collaboration, and cluster promotion. Together Asian regions including Gyeonggi in Korea, Kyushu in Japan, Shinchu in Taiwan, Shanghai, Beijing in China, Hong Kong, Singapore and Bangalore in India collectively form a vital centre of excellence characterised by strong partnership among industry-government-academia and industries for semiconductor design through manufacturing (see Figure 1).

This project aims at promoting R&D exchange activities with South Korea, Taiwan, Singapore, and other semiconductor development hubs in East Asia, and reflects rapid technological growth and innovation in this region. It marks a new phase in the evolution of technological globalisation linking nodes of excellence in *inter-cluster networks*

animated by large firms, university research, smaller specialist firms and government support across space to recover and enhance global competitiveness. The Kyushu region also has a strong auto industry, which has been expanding recently. There are some possible connections between System LSI design and embedded electronic systems for vehicles. Another strong area is environmental technology.

The Kyushu region encompasses an area with a radius of about 200 kilometres and a population of 13 million (in 2005). Its economy used to be dependent on coal mining and steel industry, which declined over the last decades. The establishment of semiconductor plants started in the late 1960s and by the late 1980s accounted for more than 10 per cent of the global semiconductor market. As a result Kyushu came to be known as a ‘Silicon Island’. However, since its R&D function was not so strong, it was also referred to as the ‘brainless silicon island’ (Tamura, 2004).

**Figure 1:** *Fukuoka Silicon Sea-belt*



Source: [www.investfk.jp/industry\\_02.html](http://www.investfk.jp/industry_02.html)

Taiwan also became known as a silicon island during the 1990s as its semiconductor industry developed rapidly during that decade. It was only in the mid 1990s that Kyushu started to upgrade its R&D functions. Today many of the semiconductor plants have R&D and design

functions and work with local universities. Some firms, including Sony, have recently set up their R&D headquarters in Fukuoka city, aiming to build a world class comprehensive operational system based in Kyushu.

With regular daily flights to major cities in other Asian countries, Fukuoka is located in an ideal and strategic place for promoting business with Asian manufacturers. Mass production facilities have been leaving Kyushu for other Asian nations providing cheaper labour, while R&D functions have strengthened in Kyushu. In recent years, Taiwan, Korea, Singapore and China have all strengthened their positions as bases of semiconductor technology development and manufacturing.

More than 50 per cent of world production in the semiconductor industry occurs within the 'Silicon Sea-belt'. Fukuoka Airport is a major hub facilitating this concentration. Professor Yamazaki of Kyushu University points out that Fukuoka Airport now ranks third among international trading airports in Japan, reflecting the rapid increase in semiconductor exports (Tamura, 2004).

Fukuoka is now home to a semiconductor cluster comprised of R&D divisions of major semiconductor manufacturers such as Sony, NEC Electronics, Toshiba, Hitachi and Panasonic, as well as start-up companies with groundbreaking technologies. As of 2008, 156 semiconductor companies were operating in Fukuoka. The University of Kyushu has developed a critical mass of research excellence which was strengthened in 2001 with the creation of the System LSI Research Centre.<sup>1</sup>

There is also a growing number of spin-off venture firms from universities. Reflecting the growth of electronics used in cars, Fukuoka exploits an additional LSI market through a strong automotive industry in Kyushu region. Indeed, alliances with semiconductor firms will be vital to the production of next-generation cars. The automobile industry, including Nissan, Daihatsu and Toyota, is bigger than semiconductor industry in Kyushu.

<sup>1</sup>The Centre was founded to develop the design and application technologies of system LSI's, that is semiconductor integrated circuit technology. This is a complicated system of millions of transistors on a tiny silicon chip comprising components such as processors, memories, digital circuits, analog circuits, sensors, radio frequency interface and software. System LSI's have ever-growing applications, including mobile phones, portable computers, digital still cameras, and increasingly the automotive industry.

The first Silicon Sea-belt summit was held in January 2003 in Fukuoka with over 500 opinion leaders exchanging ideas on industry–academy collaboration, human resource development, market creation, and technology development. A second summit was held in March 2004, when discussions centred on industry–government–academia and region-to-region alliances in the semiconductor industry. Hosting of future summits will rotate among the participating regions. At the 2007 Summit, Wataru Aso, Governor of Fukuoka Prefecture, emphasised that ‘the prefecture will create a dynamic economic engine for the future through the combined power of the semiconductor industry supported by the prefecture and the automobile industry’.

These developments must be seen in relation to the number of policy initiatives at both national, regional and sub-regional levels. The recent ‘Silicon Cluster Initiative’, designated by the Kyushu Economic Ministry regional bureau, builds on the semiconductor industrial agglomeration which has been growing in the region over the last three decades. There are a number of financial, technological and operational support schemes to System LSI-related venture companies, and other related R&D firms to create frontier businesses. Moreover, the government has invested 3.5 billion yen (\$31.5 million) in establishing the Fukuoka System LSI Total Development Centre (Tamura, 2004).

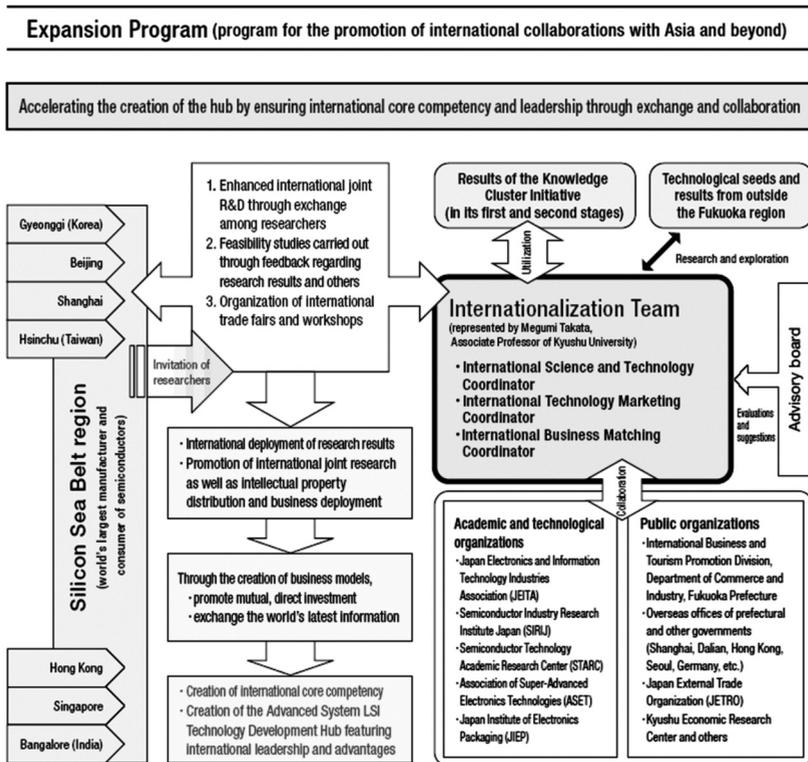
Universities, firms and the government have been making collective efforts to promote R&D for System LSI, using a variety of human and economic resources. Thirty universities are concentrated in Fukuoka, 11 of which have science and engineering faculties providing graduates majoring in these disciplines. Taking advantage of their proximity firms collaborate with leading System LSI design researchers at Kyushu University, Kyushu Institute of Technology, and other post-secondary institutions located in Fukuoka. The scale of academic concentration in System LSI design in Fukuoka is second only to that found in the Tokyo metropolitan area.

Using Scotland’s Alba Innovation Centre as a model, a joint initiative between the prefectural government, universities and industry produced the ‘Fukuoka System LSI College’ in 2001. It was opened to serve as a training facility for the continuing professional development of LSI engineers. The aim of the college is to retain well-experienced LSI engineers in Fukuoka and provide them with the state-of-the-art technology. A professor of Kyushu University, serving as a nodal point

due to linkages to a number of innovation support organizations in Kyushu, serves as principal of this College.

In 2002, the Ministry of Education, Culture, Sports, Science and Technology (MEXT) initiated the 'Knowledge Cluster Initiative' through which the neighbouring cities of Fukuoka-Kitakyushu region were designated 'knowledge clusters' based on research related to System LSI, micro-nanotechnology and environmental technologies. Major R&D hubs, such as the Kitakyushu Academic Research District with research institutes of international standard and prominent university faculties, constitute the critical mass of research and innovation.

**Figure 2: Conceptual Model of Internationalisation of Cluster in Kyushu**



Source: Fukuoka IST [www.lab-ist.jp/english/139.html](http://www.lab-ist.jp/english/139.html)

In the last five years, at least 10 billion Yen has been invested from the national budget in Fukuoka through various schemes such as the Knowledge Cluster Initiative. This has promoted building infrastructure, organisations, and attracting experts to create a local innovation cluster. In 2007, Fukuoka was designated as one of the six MEXT second stage Knowledge Cluster initiatives aiming to promote *'internationalisation'* as well as connecting local clusters to wider areas (see Figure 2). The project aims to conduct 20 joint R&D projects with overseas organizations between 2007 and 2011. For example, in November 2008 the Fukuoka Cluster Initiative signed a Memorandum of Understanding on future R&D collaboration with the Fraunhofer-Gesellschaft Institute in Germany.

Development of the local semiconductor R&D cluster in Fukuoka has been successful due to the presence and proximity of leading companies and entrepreneurial individuals who have acted as nodal points connecting firms, local governments and academic sector. Concentration of research universities supplemented by international research institutes and new training provisions such as Fukuoka System LSI College, and a new business school at Kyushu University provide the region with human resources and professional skills which serve as prime regional assets in Fukuoka, Kyushu. In the private sector, most of the large firms' R&D headquarters are concentrated in the Tokyo metropolitan area. Regional and prefectural government and support organizations consider creating further incentives to attract large R&D firms as well as encouraging venture capital firms which supplement the activities of large firms. Despite these initiatives there are some outstanding concerns:

- A need for 'total coordination across a broader area of policy measures'.
- The 'accumulation and vitalisation of brainpower in industries' (Tamura, 2004).

A new model of university–government–industry alliances and entrepreneurship in Asia may be under construction. Innovation support and technology transfer organisations will need to be designed so as to strategically link science and industry; as well as foster knowledge exploration and exploitation systems, which create spaces for innovation extending beyond the national framework. This multi-level innovation system governance model represented in the Silicon Sea-belt strategy, marks a new phase in the evolution of technological globalization whereby local nodes of excellence link in inter-cluster

networks animated by large firms, university research, smaller specialist firms and government support across space to recover and enhance global competitiveness in specific advanced technologies.

## **Conclusion**

This chapter has examined the evolution of inter-regional strategic research alliances in the East Asian political economy. Spatial dynamics within East Asia with linkages developing between Mainland China and Taiwan, China, Korea and Japan, and also *intra spatial dynamics* between city-regions in China were illustrated, illuminating the diverse nature of East Asia as an emerging *space of innovation*. As Sigurdson (2004) points out, these regional inter-linkages have been driven by the entrepreneurship and self-interests of the business sector, rather than promoted by political initiatives and intergovernmental coordination. This is one of the main features of internationalisation of innovation systems in East Asia, making a stark and dynamic contrast to that in Europe.

Two simultaneous processes have been highlighted: ‘regionalisation’ of science and innovation policies, especially through cluster initiatives funded by the central government, and ‘internationalisation of R&D and production’ with the corporate R&D shifting to East Asian countries (mainly China) as ‘hollowing out’ of the Japanese economy continues. The transformation of Japan’s innovation systems needs to be investigated in relation to emerging transnational innovation systems in East Asia, with growing inter-cluster competition and partnerships.

The Japanese national innovation system has been highly centred upon the Tokyo metropolitan region. In order for regions to compete with growing economic powers in Asia such as Taiwan and Korea, public support for human resource and skill development and financial provisions underlying regional innovation are needed. The national government may take a more strategic and integrated approach to enhance regional innovation capacities of regions to make them meet international standards.

The Kyushu region is an exemplar of a region which is transforming itself from being heavily dependent on coal mining and the steel industry to becoming a transnational hub for new converging technologies. The chapter highlighted efforts made by Fukuoka Prefecture in Kyushu to construct regional advantage by building international R&D hubs and

networks through international ‘triple helix’ linkages. From a public policy perspective, constructing ‘knowledge hubs’ set within a wider framework of transnational regional innovation systems is of key importance. After the ‘lost decade’ of the 1990s when the Japanese semiconductor industry lost market share and Asia’s chip industry shifted toward Taiwan and China, Japanese companies are now once again investing heavily in semiconductors.

*The Fukuoka Silicon Sea-belt Project* illustrates efforts to connect sub-national cluster building to emerging Global Production Network of semiconductor industry encompassing different city-regions in East Asia. It remains to be seen if the new strategic alliances between firms and universities and the local government with close collaboration with national government will lead into transnational innovation system in a wider East Asian region. A closer investigation is needed to see if the internationalisation of R&D activities will lead to ‘local capability formation’ in Kyushu region and also, other city-regions in the emerging and developing economies in East Asia. As Ernst and Kim point out:

Network participation may provide new opportunities for effective knowledge diffusion to local firms and industrial districts... *provided* appropriate policies and support institutions are in place that enable local suppliers to exploit the opportunities and pressures that result from network participation (Ernst and Kim, 2002, p.1428).

The nature of these policies, institutions and strategic alliance formation at multi-scalar level needs to be studied further. More empirical studies are needed in these fields and there are a number of policy and theoretical lessons to be learnt cross-nationally and cross-regionally.

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# Venture Capital and Business Development in Israel

Dafna Schwartz

Many countries implement policy measures to encourage the formation of a venture capital industry for the development of start-ups in their country. The assumption underlying this policy is that a market failure may occur that hinders the development of the venture capital industry, particularly in the first phases of its development, and especially in more developed countries. Key arguments in this chapter are:

- Government intervention can be effective in overcoming market failure by supporting the initial formation of a venture capital industry in a country, assuming the existence of basic economic conditions such as a high level of physical infrastructure and human resources.
- This policy, however, may have an unintentional negative side effect in terms of increasing regional inequality. The reason for this is the special role of the venture investors in the development of start-ups.

Israel has adopted a policy of supporting the formation of a venture capital industry. The emergence of the industry in Israel is considered to be the most successful example of diffusion of the Silicon Valley model of venture capital outside of North America.

The chapter has four parts: Part 1 addresses role of venture capital in the development of start-ups and the factors determining the location of start-ups backed by venture investors. Part 2 analyses the impact of the Israeli government initiative 'Yozma'. Part 3 analyses the spatial implications, while Part 4 looks at the practical implications.

## **Role of Venture Capital investors in the Development of Start-ups**

For start-ups to develop into successful companies, they undergo a complex process to transform an invention into a successful commercial product. This requires more resources than are generally required in a new company that is not technology based. Start-ups frequently have difficulties in obtaining financial capital. Debt financing is usually not an option since they are characterised by high risk and they lack tangible assets.

Beyond financial capital, start-ups need non-financial resources. The founders of start-ups are often innovators who have the technical skill, but not the business and managerial skills, experience and networking which are more crucial to the start-ups' success.

The venture capital industry is composed of different types of investors: venture capital funds, investments companies, corporate venture companies, business angels and other private equity entities.

Venture capital funds play a pivotal role due to their institutional characteristics and the structure of their networks. They are not merely suppliers of capital but also act as business entrepreneurs and managers. They invest in start-ups through equity and therefore become a partner. Their expertise is in their ability to select firms with growth potential and to improve their quality by providing them the needed resources as well as by improving their accessibility to external resources – financial and non-financial. Both sides – the venture investors and the start-ups – benefit from their business relationship. Each side provides the needed resources for the start-up's development and success.

Start-ups are part of the high tech industry and therefore have a tendency to cluster, primarily around metropolitan locations and in the satellite urban ring around the main metropolitan area. The location of start-ups is also dependent upon the venture investors' considerations and therefore may lead to a higher level of concentration of start-ups, as compared with high-tech activity.

Since venture investors, as partners in the venture, act as entrepreneurs and managers in addition to their role as capital providers, the location of their investments in the case of start-ups depends on factors that influence location of capital on one hand, and on factors that influence the location of entrepreneurship and management on the other.

Capital is relatively more mobile than other production factors, and is attracted to the location of high-tech activities with the highest return. Entrepreneurship and management are subject to a much lower level of mobility.

Geographical proximity of the investors to the location of the start-ups they back is an important factor. Investors want to remain in frequent contact with the start-ups they back in order to maximise the return on their investment. Costs associated with frequent visits and intensive involvement are likely to be reduced if venture investors are close to the firms in their portfolios.

Proximity is also important because of the asymmetric information between the investors in the start-up and the need of the investors for control, in order to reduce the uncertainty of their investments. Proximity is essential due to the tacit nature embodied in the venture investors' activities. Venture investors are actually considered to be "tacit information brokers through a constant process of interaction and observation" (Zook, 2004).

Syndication between several investors in each start-up is quite common, and thus venture investors tend to invest close to each other. The development of a start-up is an ongoing process of rescue finance from various entities, and it is common that financing involves a 'syndication' of two or more venture groups and the involvement of each investor in several start-ups. The proximity between the investors facilitates not only these interactions, but also the ability of the investors to be close to the start-ups they are backing.

These findings, culled from a trawl of the literature lead to two broad conclusions:

- (1) Government intervention can be effective in encouraging the formation of a venture capital industry in a country and consequently encourage the development of the start-ups sector.
- (2) This policy may have an unintentional negative impact in terms of regional inequality. The special entrepreneurship and management role of the venture investors may lead to concentration of start-ups in the metropolitan centres of states, leaving the remote periphery far behind the centre of the country.

## **Israeli Experience of the Yozma Program**

Avnimelech and Teubal (2006) have analysed the process of the emergence of Israel's high tech cluster in terms of a cluster life cycle comprising of four phases of development:

- Background Conditions (1969-1985).
- Pre-Emergence (1986-1992).
- Emergence (1993-2000).
- Post-Emergence (since 2001).

A significant event in this development process was the successful emergence of the venture capital industry, which took place during the years 1993-2000. In 1993 the Israeli government decided to encourage the formation of venture capital industry through a special programme called Yozma ('initiative' in Hebrew), with an allocation of \$100 million.

Although the country enjoyed a relatively high level of R&D, with both civilian, military and government R&D support programmes, the overall conditions were not ripe for venture investments. Under the Yozma initiative, ten venture capital funds were formed as well as a Yozma direct investment arm (see Table 1). Each was a partner of a leading Israeli financial institution with leading foreign venture investors. The government's share was a maximum of 40 per cent and the private investors' 60 per cent. A major attraction of the Yozma programme was the private investors' option to buy out the government's share at a pre-determined price over a period of five years.

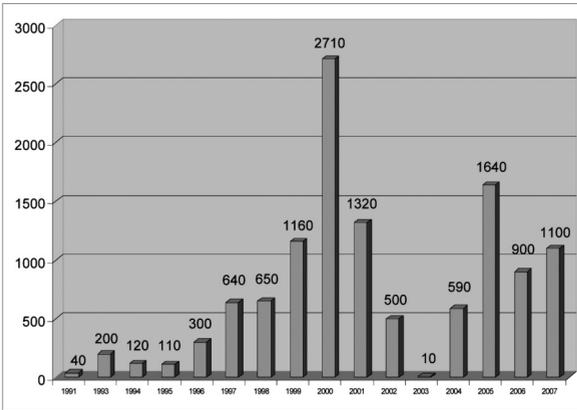
**Table 1: *The Yozma Funds***

<b>Fund</b>	<b>International Investors</b>	<b>Country Origin</b>
Eurofund	Daimler-Benz, DEG (Germany)	Germany
Gemini	Advent (USA)	USA
Inventech	Van Leer Group (NL)	Netherlands
JPV	Oxton (US/Far East)	USA
Medica	MVP (USA)	USA
Nitzanim-Concord	AVX, Kyocera (Japan)	Japan
Polaris (Pitango)	CMS (USA)	USA
Star	TVM (Germany) & Singapore Tech	Germany
Vertex	Vertex International Funds (Singapore)	USA, Singapore
Walden	Walden (US)	USA
Yozma – direct investments	None	Israel Government

So the Yozma programme did not simply supply risk sharing to investors, it also provided an upside incentive for private investors to leverage their profits through acquisition of the government shares. The Yozma programme immediately proved to be extremely successful, with 15 direct investments made by Yozma itself. In addition, major international venture investors were attracted from all around the world – from the USA, Germany, Japan, Netherlands, and Singapore (see Table 1). Nine of the 10 funds exercised their option and bought out the government's share. And nine out of the 15 Yozma investments enjoyed successful exits, either through initial public offering or through acquisition.

The Yozma programme was the catalyst for the development of the venture capital industry in Israel and for the development of the start-up sector. Prior to 1993, there was only one venture capital fund operating in Israel. Today there are about 80 venture capital funds ([www.iva.co.il](http://www.iva.co.il)). The capital raised by the venture capital funds grew from \$40 million in 1991 to an annual average of \$1.1 billion during 1999-2007 – see Chart 1.

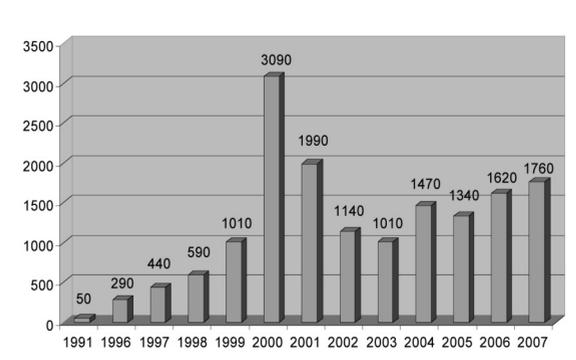
**Chart 1: Capital Raised by Israeli Venture Capital Funds by Year, \$M**



Source: Iventure Capital Online database

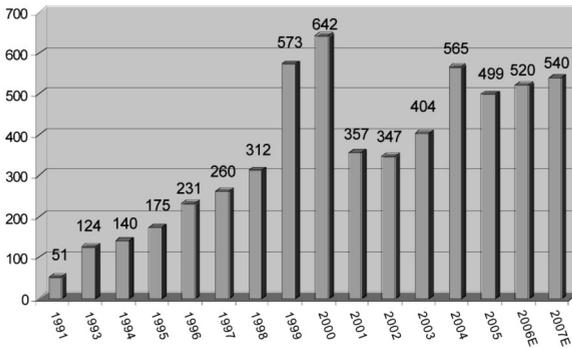
The creation of the venture capital industry supports the development of start-ups in Israel, as shown in the Charts 2 and 3. The capital that was raised by the high-tech companies, most of them are start-ups, from the venture capital investors rose dramatically, from less than \$50 million in 1991 to an annual average of \$1.6 billion during the period 1999-2007 – see Chart 2. In the first half of 2008, the capital raised was \$1.08 billion. There was also a dramatic growth in the number of new start-ups that were created each year – from 51 in 1991 to about 500 each year in the period investigated.

**Chart 2: Capital Raised by Israeli High Tech Companies by Year - \$M**



Source: Iventure Capital Online database

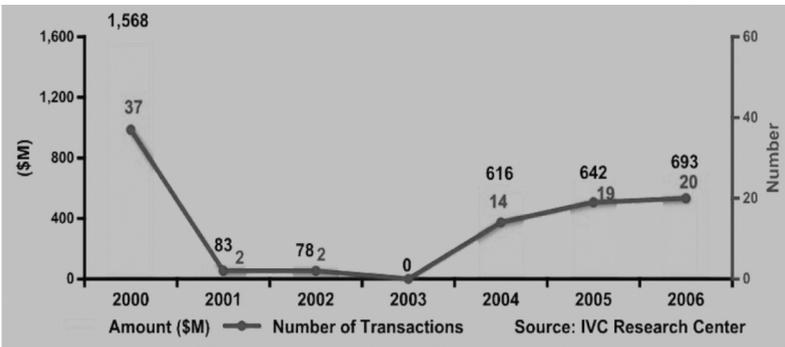
**Chart 3: Number of Start-Ups Created by Year**



Source: Iventure Capital Online database

Another measure of the success of venture capital industry development is the relatively high rate of start-ups that went to Initial Public Offering (IPO). Until the end of the 1980s, only a small number of Israeli start-ups undertook IPO in Nasdaq or in other foreign markets. The number of Israeli high-tech companies that went to IPOs jumped in 1993 (see Chart 4). Today Israeli or Israeli-related companies traded in the US are the third largest group, only behind the US and Canada. Moreover, many Israeli high-tech companies are also traded on European stock markets, such as the London market.

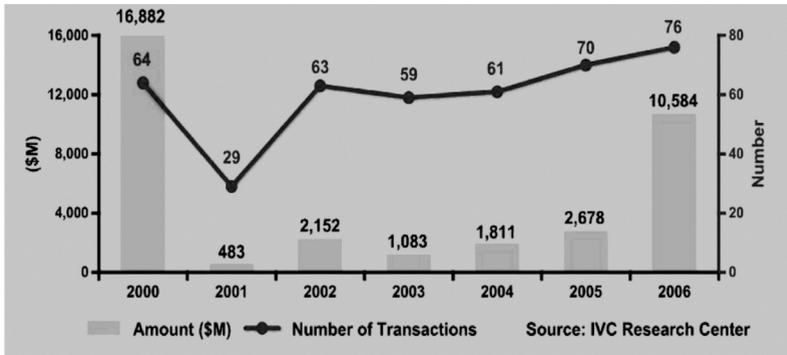
**Chart 4: Capital Raised in IPO of Israeli High-Tech Companies**



Source: Iventure Capital Online database

Similarly, the number of mergers and acquisitions of Israeli start-ups has also grown dramatically since the 1990s. Merger and acquisition activity involving Israeli companies that were either acquired or merged totaled \$3.2 billion in 2007 in 75 deals, as presented in the Chart 5.

**Chart 5: Capital Raised in Mergers and Acquisitions of Israeli High-Tech Companies**



Source: Iventure Capital Online database

These statistics demonstrate the success of the Israeli government’s initiative in establishing a successful venture capital industry and supporting the development of the start up sector.

**The Spatial Implications**

This section analyses the location pattern of start-ups backed by venture investors. It was asserted earlier that the encouragement of a venture capital industry has an unintentional negative side effect in terms of regional inequality. The analysis in this section is based on a study conducted by Schwartz and Bar-El (2007).

The study includes employment data at three levels: in all sectors, in high tech sectors, and in start-ups that were financed by venture investors during the period 1995-2004. The employment data were presented at district and sub-district levels. Israel is divided into six districts and 15 sub-districts. Two of the districts are in the periphery – the Southern and the Northern districts; two in the core of the country – the Tel Aviv district, which includes the metropolitan urban

centre of the country, and the Central district, which is the ring around it; the last two are the Jerusalem and Haifa districts.

In their 2007 study, Schwartz and Bar-El compared for each district the share of employment in start-ups backed by venture investors with the share of the district in total employment and with the share of employment in high-tech sectors. Their findings are presented in Table 2.

**Table 2: *Employment Distribution by District: Total sectors, High Tech Sectors and Start-Ups (backed by venture investors)***

District	Employment Distribution (%)		
	% Total sectors	% High Tech sectors	% Start-ups
Jerusalem	10.9	7.4	8.0
Northern	13.7	9.6	8.8
Haifa	13.7	11.0	7.3
Central	21.9	32.6	37.1
Tel Aviv	27.7	29.9	36.5
Southern	12.2	9.5	2.3
Total	100.0	100.0	100.0

Source: Schwartz and Bar-El (2007), Table 1, pg. 634.

As expected, the findings show heavy concentration of high-tech in and around the metropolitan districts, and low levels of concentration in the peripheral districts. Districts with a relatively high activity of high tech enjoy an even higher concentration of start-ups. As the Schwartz and Bar-El study puts it:

“The concentration of the start-ups is mostly in the districts of Tel Aviv and the center – about 73 per cent of all start-up employment is in the two districts of Tel Aviv and the Center, compared to 63 per cent for high-tech and 50 per cent for total employment. There are much lower frequencies in the other urban centers and in the peripheral districts, especially in the relatively remote Southern district. Only 2 per cent of the start-up employment is in the Southern district, compared with almost 10 per cent of high-tech and 12 per cent of total employment” (Schwartz and Bar-El, pg. 635).

The study also shows that the concentration of the start-ups is distributed in a few focal points, mostly in the centre of the country, leaving the peripheral districts far behind. However, the findings show that even so, focal places in the near periphery may offer a potential location for start-up activity under certain conditions.

These results, demonstrate the strength of the influence of “entrepreneurial” factors on the location of venture investments, much beyond the high-tech location factors. There is a clear concentration of venture investments, but they are mostly found in focal places, as a function of the needs of the venture investors. The cluster of start-ups enables the investors to collaborate in the control and management of their portfolio on one hand, and to collaborate with other investors who invested in the venture or are potential investors.

### **Conclusions**

This brief analysis has demonstrated that government policy to encourage the formation of venture capital industry can be effective. It can act as a catalyst for the development of start-ups, assuming the existence of basic economic conditions such as R&D infrastructure, and agglomeration of high tech activity.

At the same time this policy may have an unintentional negative side effect in terms of increasing regional inequality. The findings show a heavy concentration of start-ups backed by venture investors in comparison to high-tech activity. The pattern is a concentration in a few focal places and not necessarily with a continuum between them. This may lead to changes in the geographical mapping of high-tech activity and possibly to the increase of regional gaps.

Therefore, a policy to influence the spatial distribution of such activities should be considered. This could include joint public programmes with venture capital investors, with a focus on specific concentrated locations in the periphery that have a growth potential. Other options are the creation of a regional venture capital fund and technological incubators.

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## Chapter 7

# Turning Green in Denmark, California and Wales<sup>\*</sup>

Phil Cooke

Wales missed out on the financial derivatives boom in 2007 as it did the dot.com bubble in 2000 and preceding high tech stock market peaks in the 1980s and 1990s. But Wales always seems to catch the fall-out from the succeeding crashes. In this chapter a way in which this vulnerability may be moderated is examined. It suggests that in a globalised world market, economies such as Wales must evolve industrial activities that make sense of what evolutionary economists call ‘path dependence’ or what might otherwise be called ‘its history’.

It is now clearer that Wales and its economy suffered from two very different kinds of distortion in its industrial and economic history. First, as a pioneer of the industrial revolution and, as many economic historians have observed (for example, Dodd, 1972; Davies, 1994), Wales

<sup>\*</sup>This chapter has been assisted to fruition by numerous institutions and individuals. Only the research reported on Wales was directly funded – by the European Union’s Framework Programme 6 for Science & Technology in a project on Regional Trajectories to the Knowledge Economy: a Dynamic Model (EURODITE). Carla de Laurentis has been my very able Research Associate on this project. The Danish research arises from my Adjunct Chair at Aalborg University, the world’s leading Innovation Studies institute and with excellence also in Green Innovation & Governance. Soeren Kerndrup, Arne Remmen, Birgitte Gregersen, Bjorn Johnson and Jesper Christensen are a few of the many deserving acknowledgement for their help and interest. The EU Dynamics of Industries and Markets in Europe (DIME) Network of Excellence facilitated a workshop at Aalborg in November 2008 on Climate Change and Eco-innovation: Regional Perspectives where many issues in the chapter were aired. The Californian research is ongoing and was begun with a mini-sabbatical in 2007 funded through Cardiff University’s Centre for Advanced Studies.

developed a highly specialised, indeed over-specialised, dependence on the integrated but sectorially narrow coal and steel industries. There was relatively little value-adding secondary manufacturing to give variety to that inheritance. Up to the mid-twentieth century the Welsh economy was 'colonial' in the sense that natural resources were excavated inland (for example, the Glamorgan uplands), transported down valleys to a transshipment point (Pontypridd) and then exported to the world through a burgeoning port city (Cardiff). The same occurred, with slightly different mixes of exports for Newport, Swansea and Llanelli, and with more exotic mixes for the Gold Coast (Ghana) and Gold Rush towns and cities like Ballarat and Bendigo through Melbourne in Victoria.

The classical, or more correctly, neo-classical economic palliative to over-specialisation of this kind in the post-depression, post-war decades was to swing the pendulum back in the opposite direction. Diversification of regional economies that had depended on narrow staple goods was the order of the day. Thus, around the remnants of what had at least been moderately integrated coal and steel industries, were placed transplanted factories producing toys, furniture, cosmetics, domestic appliances, clothes, car parts, rubber goods and aircraft maintenance.

Later, this inward investment policy was further promoted by the 'Field of Dreams' economic development model practised with the building of 'advance factories' in the hope that 'if you build it, they will come'. And, for a time it worked, as we remember those brand-new Asian incomers like Hitachi, Panasonic and Lucky Goldstar following Sony, the pioneering (1974) electronics transplant making *Trinitron* TV screens in Bridgend.

Building 'supply chains' to service these global giants was the mantra of the day, and where indigenous firms were not up to scratch, more foreign suppliers were attracted to fill the gaps. Much of the Asian invasion has now retreated to eastern Europe and China, leaving suppliers 'headless' and searching around to supply other industries. But because of the new problem of over-diversification of the economy, that was not an easy task to achieve. In any case, by the early 2000s Wales, like other parts of the Atlantic Arc which had also been recipients of transplanted industry - from Scotland, through Ireland to Portugal - were no longer competitive production locations for serving the EU and more distant consumer goods markets.

Scotland and Ireland went headlong into the global financial derivatives

markets, which for a time buoyed their economies up alarmingly, before both teetered disastrously into semi-nationalisation in 2008. Wales, for once, seemed at least to have avoided the indignities experienced by the likes of the *Royal Bank of Scotland*, *Halifax Bank of Scotland* and *Bank of Ireland*, the last a takeover target of Citicorp before that predator had itself to be bailed out by the Bush administration.

Indigenous niche firms like the *Principality* and *Admiral* remained uncontaminated by the toxic derivatives incubus. As political and corporate stomachs turned queasy at the excess they had allowed through neo-liberal deregulation of financial markets, a fresh landscape became discernible on the economic horizon of Wales and the World.

Here, we'll call it the 'Green Turn,' which is rooted in the recognition that deregulation and the global greed instinct it fomented nearly destroyed western capitalism. For where lay the origins of the recent crisis? Precisely in a mortgage lending industry that recklessly promoted sub-prime 'sprawl' dwellings and a bank lending industry that facilitated the purchase of 'gas guzzling' off-roaders to reach them. It is sometimes said that the modern economy essentially concerns houses and cars. All that food, all that steel, all that oil mostly ends up servicing those two, one way or another. But we have been appallingly wasteful, especially in the neo-liberal era, in our consumption of the planet and now, despite the recession, the 'peak oil' era is probably with us. 'Green innovation' is defined as:

‘... diverse new and commercial products, technologies and processes which, through improvements in the clean energy supply chain from energy source through to point of consumption and recycling, result in reduction in greenhouse gases’ (Cooke, 2008).

In what follows, I first report some interesting and somewhat curious facts that arise when the 'tipping point' of awareness or consciousness reaches the 'green turn'. Second it is shown that some regional economies and, it may be added, some city governments, have been alert to and acted upon the green turn to the point where they appear as 'lighthouses' to a post-excess socio-technical landscape. Finally and gratifyingly, Wales has taken advantage of the 'green turn' and is shown to be prominent in evolving an integrated green economy where 'green innovation' by mostly indigenous actors place Wales firmly in that more benign and sustainable landscape.

## Green Epiphanies

John Doerr is America's leading venture capitalist. He is head of Silicon Valley's top investor, *Kleiner, Perkins, Caufield & Byers*. In a lecture to a Californian 'green technology' forum *TED.com* in 2007 he reported how at supper one evening his fifteen year old daughter berated him and the rest of the venture capitalist industry for their contribution to the destruction of the planet, and, by the way, what was he going to do to put things right?

Judging from the lecture (downloadable at *TED.com*), this seems to have caused Doerr to experience the kind of epiphany more normally associated with religious conversion. He immediately starts networking among his community of high tech investors and entrepreneurs. He gets some of the smartest brains he knows to lobby the California legislature on tougher emissions controls. He takes his network to Brazil to see its successful bioethanol industry. He even goes to Wal-Mart, arch-discounter of consumption goods, to observe the implementation of its new green strategy. He discovers how petrol can be made from algae, subsequently leading the charge, in harness with Al Gore's green investment fund, *Generation Investment Management*, to back numerous such Californian biofuel start-ups.

Yet as each scene of this narrative closes, Doerr assesses the likely outcome of all these niche activities, declaring 'I don't believe it's going to be enough' - that is, to save the planet. Eventually, he breaks down on-screen at the thought that he has been complicit in irretrievably poisoning the earth's atmosphere, leaving the prospect of his daughter's generation having to survive in a world that only has that one source of oxygen. I have shown this performance to numerous audiences including hard-bitten environmentalists, and the consensus is that 'he may be a venture capitalist, but he's a hell of a good actor'.

To which I now respond to the effect that whether he's acting having spotted a great market opportunity, or genuine in investing in a new 'green moral economy,' does it really matter? Doerr has visibly changed his practice and evidently interacted with many of his peer-group, including persuasive Al Gore, to do the same, as Figure. 1 on the following page shows.

What is theoretically interesting and important about the data in Figure 1 are the following. First, clean technologies of the kind these investors

and entrepreneurs are keen to become involved in are convergent. Convergence here means that innovations in numerous apparently not too closely related industries may open pathways to entrepreneurship in industries displaying what we may call ‘revealed related variety.’ We will see later how this operated in Wales, where revealed relatedness among organic food producers, biofuels producers and theme park tourism – not normally considered close business bedfellows, produced a successful developmental outcome.

Second this relatedness works because of two important, subsidiary concepts. These are, first, ‘absorptive capacity’ and second, ‘knowledge spillovers.’ In regional economic development terms, absorptive capacity is lateral, whereas in industrial economics it is vertical. Lateral ‘absorptive capacity’ means that entrepreneurs in adjoining and/or ‘revealed relatedness’ industries can understand each others’ business models and focus and apply tacit knowledge or even ‘routines’ from the one business type or model to their own. In this way innovations might cross-fertilise and migrate from one industry to a related or revealed related one.

Figure 1: *Recent Moves by California ICT Entrepreneurs into Clean Technologies*

### 25 Who Moved from ICT to Cleantech, 2008

• <a href="#">Shai Agassi</a> (SAP), Founder, CEO Project Better Place, Palo Alto, SV	• <a href="#">Martin Eberhard</a> , Founder, former CEO Tesla.
• <a href="#">Vinod Khosla</a> , Founder Khosla Ventures.	• <a href="#">Martin Roscheisen</a> , Founder, CEO Nanosolar.
• <a href="#">Bob Metcalfe</a> Partner, Polaris Venture Partners, CEO GreenFuel (Camb.MA)	• <a href="#">Martin Tobias</a> , Former CEO Imperium Renewables.
• <a href="#">John Doerr</a> , Partner KPCB	• <a href="#">Manny Hernandez</a> , CFO SunPower.
• <a href="#">Sunil Paul</a> , Seed investor, early stage cleantech, Nanosolar, Oorja.	• <a href="#">Jonathan Gay</a> , CEO of GreenBox
• <a href="#">Elon Musk</a> , Chairman, Tesla, Chairman, CEO SolarCity	• <a href="#">Jeff Skoll</a> , Founder Skoll Foundation, investor in Tesla, Nanosolar.
• <a href="#">Steve Jurvetson</a> , Partner, Draper Fisher Jurvetson.	• <a href="#">Mitch Mandich</a> , CEO Range Fuels.
• <a href="#">Bill Gross</a> , Founder Idealab	• <a href="#">Bill Joy</a> , Partner, KPCB
• <a href="#">Ray Lane</a> , Partner, KPCB	• <a href="#">Larry Gross</a> , CEO of Edeniq.
• <a href="#">Steve Westly</a> , Founder The Westly Group.	• <a href="#">Bruce Sohn</a> , President First Solar.
• <a href="#">Dan Whaley</a> , Founder, CEO Climos.	• <a href="#">David Kaplan</a> , Founder V2Green.
• <a href="#">David Cope</a> , CEO of PurFresh.	• <a href="#">Raj Aturu</a> , Partner, Draper, Fisher, Jurvetson
• <a href="#">Al Gore</a> , founder, Generation Investment, Partner KPCB	

Source: earth2tech

The means by which such cross-fertilisations occur rely upon ‘knowledge spillovers’ – external economies that spill over accidentally from firms located in geographical proximity that have the absorptive capacity to translate such tacit knowledge into explicit, codified, usable and repeatable knowledge in a new business context. Where a regional economy is over-diversified, as that of Wales became by the turn of the millennium, there are few knowledge spillovers and little absorptive capacity except of the generic kind that was promoting, for example, the virtues of outsourcing to ‘supply chains’ in a context of ‘lean production.’

Such generic knowledge is by no means useless but nor does it offer specific opportunities for novelty since it is available to all competitor firms. Equally, where it is over-specialised everyone is so familiar with the fundamentals that knowledge spillovers are ubiquitous but absorptive capacity absorbs less and less novelty accordingly. Michael Porter’s example of the alloy golf club head cluster in Carlsbad, California is an example of such an over-specialised, by now not especially innovative sub-sector dominated by *Calloway*, the firm that once conceived innovative opportunity from aerospace materials to revolutionise the last bastion of wood in the drivers of that Royal and Ancient game (Porter, 1998).

### **From Clusters to Economic Development Platforms**

The idea of a regional ‘platform’ as a basis for mobilising regional evolution connects directly to the related variety argument of the previous section. Neither over-diversified nor over-specialised, and with opportunities present for revealed relatedness in ‘new combinations’ of innovation at interfaces between industries, the accomplished regional economy works with agility and flexibility to meet increasingly user-driven demand.

That is not to say that innovation does not continue to be an interactive process between user and producer, rather it recognises that innovation studies in the past, perhaps echoing aspects of the practice of innovative businesses, have been overly ‘productivist’. That is, during the years of excess firms competed on the basis of disruptive innovation (Christensen, 1997). Thus the greatest novelty was the prize that competitors in ICT, from personal computers (PCs) to software, DVD and *BluRay*, *iPod*, *iPhone* and *BlackBerry* have sought in their quest to dominate markets.

That many of the ‘bells and whistles’ installed by the higher priesthood of software and systems engineers was scarcely used by most consumers and not understood by many was of little consequence. Following the credit crunch and widespread condemnation of the excess it bred in financial and technological innovativeness, the green turn signifies a new privileging of listening to consumer demand for more usable, less over-engineered, more sustainable goods and services.

So innovation remains interactive but the asymmetry between demand and supply is re-balanced. This means that regional policies will have to change their colours accordingly. In the decades when ‘supply-side economics’ ruled the roost, the role of policy became that of subsidising instruments to aid producers. Enterprise zones were an early exemplar, followed by other kinds of tax-free trade zones, subsidised technology parks, incubators and the like. Often these de-regulatory measures did little to promote robust regional development. Instead, they simply offered low-rent havens to out-of-town retail warehouses or lay empty.

In the user-driven green economy subsidies are increasingly to be found being made to consumption rather than only to production. Probably the most celebrated case of the success of consumer subsidy as a successful policy regime is to be found in the history of Denmark’s world-leading wind turbine industry. From the beginning in the early 1970s, government subsidies were made available not to the producers but the users of first generation wind turbines. This sustained the industry, initially based largely upon domestic demand, and enabled the north and mid-Jutland-based cluster to out-compete its main rivals in California.

The user subsidy stimulated experimentation, knowledge spillovers, and niche market evolution in regionally ‘path-dependent’ trajectories in both Jutland and California. But Ronald Reagan jettisoned his predecessor Governor Brown’s subsidies while in Denmark they continued until a right-wing coalition entered government in 2000. By which time the Danish design had evolved considerably from its roots in agricultural and marine engineering where the plough and the ship’s propeller were the inspiration. Meanwhile the Californian design atrophied around its inspiration, propeller driven aircraft. Already something of an anachronism, the two-blade, pointed upwind turbine design proved inferior to the three-blade, point it downwind Danish solution and for once Californian ingenuity was defeated.

*Vestas*, Denmark's national champion has 40 per cent of the world wind-turbine market and has been joined in its Aarhus-Aalborg cluster by the likes of Germany's *Siemens*, acquiring the other main Danish companies, *Suzlon* from India and *Gamesa* from Spain. Including home market production of turbines in Germany and Spain, these European producers, along with Denmark have 70 per cent of world turbine production capacity with employment of 133,000 and global demand far from saturated.

To continue with small-country, moderately peripheral Jutland a little longer, it is instructive to find that, interspersed within the wind turbine cluster is another with a comparable 1970s 'alternative energy technology' genealogy. This is its solar thermal cluster consisting of some twenty firms of varying sizes and types, ranging from manufacturers of solar-powered water pumps for use in developing countries to consultants designing massive solar power stations and those that simply supply heating systems for communities, factories, offices and individual homes.

One of these is *EnergiPlan*, whose founder Per Alex was one of a number interviewed by this author about the green energy 'platform' in North Jutland. *EnergiPlan* designed one of the first local solar power stations at Skorping, near Aalborg, for a communal housing scheme of some thirty houses. It is a simple mirror-collectors, pipes and covered swimming pool arrangement that supplies communal free heat and power for nine months of the year.

Thereafter the commune, which operates communal dining and laundry facilities, resorts to the local biomass District Heating station in the village, which commune members can access at a discount. Per Alex described how in thirty years these combinations of distinctive alternative energy technologies have helped evolve one of the first 'green regional innovation systems' in the world.

The demanding customers for District Heating in Denmark are the municipalities, most of whom run local energy supply companies, and some 60 per cent of Denmark's citizens rely upon it. Municipalities seek a balanced supply and order customised mixes of biomass, biogas, wind, solar and marine energy depending on location and the type of solution required. Enormous export markets for District Heating have opened up in mature and emerging markets faced with Climate Change and 'peak oil' constraints.

Within north Jutland is a community of some 100-150 specialist renewable energy firms, many of which are innovative. He cited the case of *Logstor* a District Heating company in north Jutland that had innovated a pre-insulated dual pipe system that minimised heat loss by fitting the cold water input pipe inside the hot water pipe. Together, the District Heating firms, municipalities, university laboratories and technology transfer agencies created an association entitled *Innovative Region: Flexible District Heating* with characteristics described in Figure 2.

This echoes the 2007 reorganisation of Denmark's administration into five regions, one of which is North Jutland. It warrants the regional innovation system designation precisely because it consists of a commercialisation sub-system and a knowledge generation sub-system. The former consists of networks of firms in supply chains focused around the District Heating engineering platform while belonging to distinctive renewable energy business segments. Nevertheless, these are capable of being system-integrated by lead 'aggregator' firms such as solar thermal specialist *Arcon*, biogas contractor *Xergi*, green engineering firm *Grundfos* or consultants *NIRAS* into consortia for plant assembly.

Figure 2: *North Jutland's Green Regional Innovation System*



Source: Centre for Advanced Studies

Supporting this sub-system is a knowledge and enterprise support sub-system consisting of public laboratories, regional development agency,

municipalities and technical agencies such as the Danish Technological Institute. In 2008 the Business Office of Aalborg had taken responsibility for leading a €5 million platform bid to the Danish Growth Fund *Vækstfonden* for ‘user-driven design and innovation’ support (Ministry of Foreign Affairs of Denmark, 2008).

Finally, it should be recalled that the regional platform described above has evolved from the earlier development of a number of clusters such as those focused on wind turbines, solar thermal and photovoltaics, pipework and green engineering. With the cross-fertilisation of innovative ideas such clusters<sup>2</sup> offer, the rise of a green regional innovation system based on the convergent and related variety platform described can be expected, as in California. Both have strong aspects of ‘collective entrepreneurship’ in the form of the venture capital and entrepreneur networks ‘mutating’ from ICT to *GreenTech* in the former, while in the latter there is a greater emphasis on communal associativeness among firms and support organisations with a pronounced degree of ‘informal investment’ by successful entrepreneurs in interesting start-up businesses.

The tenacity of entrepreneurial practice in north Jutland’s ‘green’ regional innovation system is testified to by the activity of *Grundfos*, one of the ‘aggregators’ mentioned above. The company is among the world’s largest manufacturers of pumps, employing some 15,000 to produce 16 million pumps a year. In 1992 *Grundfos* embarked on an innovation initiative to improve the performance and energy efficiency of circulation pumps used in household heating and cooling systems. *Alpha Pro* is the result, an ‘intelligent pump’ with sensors to assess current heating requirements, the performance of the pump is adapted according to the actual heat demand.

By 1998, determined to commercialise this technological innovation, *Grundfos* embarked upon a political lobbying process to seek a ban on the least efficient circulation pumps on the market. Lobbying was conducted through *Europump*, the European Association of Pump Manufacturers in order to reach a wider regulatory audience. Through *Europump*, *Grundfos* raised their issue at the highest EU levels and simultaneously lobbied Danish politicians to raise it in their EU

<sup>2</sup>They are known as ‘Jacobian’ clusters, after Jane Jacobs’ stress on variety in economic innovation and growth; Jacobs, 1969.

dealings. The EU Directorate General for Energy took an interest and commissioned studies under the EU Specific Actions for Vigorous Energy Efficiency (*SAVE II Programme*). This resulted in a pump energy efficiency classification scheme based upon energy consumption in use, formulated as an Energy Efficiency Index (EEI). When the Classification Scheme was launched in early 2005, *Grundfos*, as we have seen, had a product ready for market launch.

### **A Green Turn in Wales?**

The preceding account demonstrates three key features of probably the world's two leading green regional platforms, with Jutland, if anything, the premier of the two due to its systemic aggregative capabilities at related variety business interfaces.

First California, with its benign green innovation support regime and climate, is less concerned with communal heating and more with substitutes for oil. In Sacramento, home to Governor Schwarzenegger's California Fuel Cell Partnership, a collaboration between numerous infrastructure suppliers and the major vehicle producers, has burgeoned since 2005. Here exacting users like the State of California fuels its fleet of hydrogen fuel cell (HFC) vehicles at this station, or at nearby partnership member University of California, Davis. This is part of the governor's Hydrogen Highway initiative. It is indicative of the renewable automotive fuel emphasis that underpins much of the federal and regional subsidy regimes for renewables in the US. However, informed judgement suggests hydrogen fuel cells will not be the preferred alternative to hydrocarbons in this market.

Second, although many US municipalities run fleets of cars and buses fuelled by hydrogen, indicating the role of city and county administrations as lead markets for niche renewable products and services, 'plug-in' electric hybrid vehicles of the kind Shai Agassi (Figure 1) builds through his *Better Place* company in Israel, are a better bet. Silicon Valley start-up *Tesla* is also a leader in the electric car market (Figure 1). But, third, announcements in 2008 by *General Motors* regarding a hybrid *Volt* car, hitherto an HFC prototype, and *Ford* that its new low emission, higher mileage *EcoBoost* engine is to be built at Bridgend were in the balance, given the Bug Three's request for a \$25 billion bailout from the US government to stave off bankruptcy.

In Wales, there has long been a close relationship with hydrogen fuel cell technology, the predominant motive force in rocket engineering, since it was invented by Swansea scientist William Grove in 1857. Accordingly, Wales is identified as one of Europe's top sixteen hydrogen fuel cell technology regions in research by Nygaard (2008). Among achievements warranting that status are the prototype *Tribrid Bus* developed at the University of Glamorgan, the *H2Wales* network based at Baglan Energy Park, Port Talbot and the car-design work of *Connaught Engineering* and the *Naro* car company.

But hydrogen fuel cell technology is not the most prominent technology design in the Welsh renewable energy equipment spectrum. That accolade probably belongs currently with the production of energy from biomass. Here is a sphere in which Welsh research is at the global forefront, mainly through its grassland research institute IBERS (formerly the Institute of Grassland and Environmental Research – IGER) which since 2008 has been part of Aberystwyth University. In 2004 IGER opened a biofuels research and commercialisation division due to its evolving expertise in understanding improving the calorific content of feedstock plants by experimenting with ryegrass, short rotation willow, and *miscanthus* (Asian elephant grass). This connects to the earlier point regarding 'revealed related variety' because this research institute manages to combine innovation at interfaces among organic food, biofuels and tourism, promoting indigenous entrepreneurship in three industries on which Wales has been path dependent for centuries.

IGER conducts much industrial contract research and advisory activity. This interweaves with the three noted sectors in the following ways. First, IGER advised the tourist theme park business *Oakwood Leisure* in Pembrokeshire on a green tourism plan for a new leisure complex named *Bluestone*, after the uniquely coloured stone quarried nearby of which many Neolithic monuments like Stonehenge are composed. The €130 million leisure park consists of 340 sustainably sourced wooden chalets and a Celtic village of 80 adjoining buildings part-located in the Pembrokeshire Coast National Park. Additional facilities include a snowdome, waterworld park, indoor tropical garden and sports centre. It houses 2,000 residents and receives 5,000 day visitors.

*Bluestone* directly employs 600 catering and hospitality staff and indirectly supports 100 jobs with its suppliers. By offering a 'green tourism' solution *Oakwood* finally achieved planning permission to go

ahead with such a development, which included building on two fields that were inside the National Park boundary. The project was grant aided by the national park authority through its Sustainable Development Fund and by DEFRA's carbon-neutral crops scheme. Bangor University's Centre for Alternative Land Use (CALU) was also consulted. IGER advised *Bluestone* on its renewable energy strategy, which consists of 3MW of biomass burning combined heat and power (CHP) units. Initially IGER favoured *miscanthus* but opted finally for short-rotation willow wood chips as the main fuel source. These are grown by 50 farmers in a localised supply chain managed by an energy company called *Pembrokeshire Bioenergy*.

Completing the green symbolism of this tourism project is the *Bluestone* culinary strategy, which is to supply tourist food from a localised food network of mainly but not exclusively organic farms. Among its suppliers are successful food 'aggregator' firms such as *Castell Howell Foods* based at nearby Cross Hands Food Park, a major west Wales centre for food processing and packaging. One of *Castell Howell's* affiliates is a meat supply firm called *Celtic Pride Ltd*. This firm specialises in premium Welsh-grown meat supply and is a joint venture between *Castell Howell Foods* and *Wynnstay Group plc*, Wales' largest quoted agricultural supplies company. A regional network of 85 farmers supplies Welsh beef to *Celtic Pride*. The IGER connection is important for its advice on an innovative, consistent feed quality system called *Celtic Pride Feed*. In co-operation with *Wynnstay* this resulted in an oil-based cattle feed, important since protein balance must be correct for the last 60 days before slaughter. Thus high vitamin E is known to give best colour and texture to meat and increases the shelf life. Matured for 21 days before consignment, the product is born, reared, finished, slaughtered and processed in Wales, warranting the European Union PGI (Protected Geographical Indication) brand, achieved by the joint venture in 2003.

Wales now has fifteen biomass power stations, including two in the pipeline and three co-firing arrangements with large coal burning power stations. Amongst these is Europe's first commercial scale biomass power station in Port Talbot, where construction work started in July 2006. The £33 million station was scheduled to be fully operational by June 2008. Producing 13.8 MW of renewable energy the station will generate 104 GWh per year, sufficient to meet the needs of around 31,000 homes. The Cardiff-based renewable energy company *Eco2* designed and

managed construction of the power station, for a project originally proposed by the *Western Log* group, which secured planning permission in 2004. The plant is fuelled with 16,000 tonnes per year of clean wood which has come from sustainable, managed forests and saw mills. With trees drawing carbon dioxide from the atmosphere as they grow, the carbon dioxide produced in combustion results in no net increase of the gas. By generating electricity in this way, some 47,000 tonnes of equivalent fossil fuel carbon dioxide emissions are avoided. This will help reduce the negative effects of global warming.

*Eco2* is probably Wales' number one eco-innovator business and a global leader in tidal energy systems. Most of Cardiff-based *Eco2*'s contracts are with UK and increasingly European clients. Interviews conducted with David Williams, CEO of *Eco2* reveal the company to have a business model said to be common in eco-business, whereby the firm calls on a group of ten or so investors to fund projects and take a return subject only to capital gains rather than corporation tax. This is realised when the project is sold or a project client makes final payment. This enables *Eco2* to be a tax-efficient, knowledge based research, development and innovation vehicle.

Amongst its clients are the *Sleaford Renewable Energy Plant* which received the go-ahead for a straw-fired power station in late 2008. *Eco2*'s first such plant, generating 38MW was built at Ely, Cambridgeshire for *Energy Power Resources Ltd.* The new one is the UK's largest straw-fired biomass burner and first in *Eco2*'s new £1bn programme to develop up to 10 biomass facilities across Europe. It will create 80 jobs, bringing £6m a year to local farmers in fuel supply contracts and £20m for local construction firms. It will power the equivalent of 65,000 homes, one quarter of all houses in Lincolnshire. Having begun in the wind farm business, of which the firm owns a number with two awaiting planning permission, wind energy has now scaled up beyond *Eco2*'s capacity, hence the move into biomass.

The company's most recent development is in tidal energy as it partners fellow Cardiff firm *Tidal Energy Limited* to develop *DeltaStream* - an innovative technology designed to generate electrical power from tidal stream resources. A 1MW tidal energy turbine is currently being trialled in Milford Haven, Pembrokeshire in partnership with *Carbon Connections Ltd.* along with Cardiff and Cranfield Universities.

## Conclusions

The experience of Wales as an emergent green innovation location echoes that of California and Jutland in displaying the three key theorised elements for successful economic development in the era of convergence around post-hydrocarbon technologies. The first of these, it will be recalled, is to seek to build an economy on grounds that are familiar and in some degree *path dependent* upon traditions that have meaning for citizens and antecedents in earlier industrial expertise.

It is noteworthy that California's *GreenTech* expertise in biofuels not only grew from its biotechnology and ICT clusters but also from its agro-food and even oil-refining traditions - as a land with major ports and, in its Central Valley, some of the most fertile soil in one of the most benign growing climates in the world. With its 'ahead of the curve' car design tradition, but also one of the most malign experiences of the car's associated atmospheric pollution, California also *leads* the US 'car culture'.

California's clean technology industries build on the platform of agro-food (including organic agriculture and consumption, in modern times pioneered there), wine, ICT, wireless telephony and biotechnology clusters that concentrate in San Francisco and San Diego. Even the Los Angeles film cluster gets a look in since eco-documentaries, notably Al Gore's *An Inconvenient Truth*, Morgan Spurlock's *Supersize Me*, and Leonardo Di Caprio's *The Eleventh Hour*, are an integral part of the new green paradigm.

In Jutland, established agricultural and marine engineering traditions remain important for the wind turbine, solar thermal, biomass and biogas District Heating segments of the clean technology platform. The agro-food industry also displays a key interface both as a source, from plant and timber waste, of biomass energy inputs, but also in the form of animal waste from the region's intensively industrialised dairy sector, which fuels many domestic biogas power stations.

Wales relies for its new 'green turn' on the three traditional sectors of agro-food, energy and tourism that have sustained its economy since the onset of the industrial era, albeit now with an innovatively sustainable profile evident in each.

It was argued that modern regional economic development is facilitated

significantly by the possibilities offered where industries display and benefit from 'related variety'. Without repeating the evidence, it is clear that related variety broadens and deepens the gene pool of innovative opportunities available to any regional economy. There can be no more telling instance of the advantages conferred by variety than the perhaps unusually convergent and platform-like industries and industry clusters that support green innovation. However, it is likely that it was ever thus except in the era of building 'branch plant economies' since evolutionary research by the likes of Klepper (2002) and Boschma and Wenting (2007) show that was precisely how the US and UK car industries grew historically.

Finally, a stress was placed on the importance of proximity, if not geographical then at least relational, such that knowledge spillovers through which innovation, green or otherwise is often stimulated, may reach the absorptive capacities of entrepreneurs and managers. Nowadays their job is to turn such tacit knowledge into codified products and processes, often with support from university or other research laboratories.

The role of IGER was crucial in enabling the nascent Welsh green platform to find, alongside judicious public procurement, its green market *niches* (Geels, 2006). These according to the main theory of green 'transition' in society as a whole, later coalesce into an intervening green *technological regime*, when, for example hydrocarbons no longer dominate energy production. This is then the prelude, perhaps in a generation, to the co-evolution of scientific and technological systems and their associated cognitive frames, with the political, social and economic systems into a green *socio-technical landscape* that, it must be hoped, is the aspiration of all.

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# The Governance and Policy of Local Innovation Systems

David A. Wolfe

Recent theoretical and empirical research on innovation systems describes city regions as key drivers of economic growth and prosperity. This literature underlines the importance of agglomeration economies and proximity as key factors that facilitate the transmission of knowledge among the leading edge sectors that are increasingly concentrated in urban regions (Wolfe and Bramwell 2008).

In the context of rapid technological change and concerns over global competition and production, this focus on the regional and local dimension underlines how key elements of innovative sectors are locally rooted. Complex systems of technology, production processes, industrial organization, and their supporting infrastructures of social and political institutions, frequently exhibit distinctive spatial characteristics. In addition, innovation in a technologically complex and knowledge-driven or 'learning' economy is a *social process*. It involves regularised interaction that builds new competencies and skills, a process which occurs effectively at the regional and local scale. The importance of this dimension flows from the fact that:

...the making of a regional economy involves not just the development of a productive apparatus on the basis of the atomised decisions of firms and workers, but also a 'politics of place', or in other words, the social construction of those institutional-regulatory structures that must be present in order to secure economic order and continuity. Some of these structures are within the domain of the nation state. Others

belong more properly to the level of the region as such (Scott and Storper 1992, 19).

### **New Forms of Governance**

The ability to create better linkages among relevant institutions and associated actors at the local and regional level has been recognised as a key factor in the development of effective policy and its implementation. Collaboration by local governments with a wide range of community-based actors is integral to the effective coordination of economic policy in knowledge and innovation intensive economies.

Yet, recognising the importance of collaboration and coordination for effective policy development is only part of the challenge. Better coordination requires an understanding of the conditions that contribute to its emergence and development. This may require the devolution of authority and responsibility for some aspects of economic policy to a range of local organisations capable of providing the required services or programmes. Of necessity, it involves a more decentralised, open and consultative form of governing. It also requires a broad conception of policy learning that focuses on the capacity of institutions in both the public and private sectors to sustain growth and facilitate the adjustment process to those activities associated with the emerging knowledge-intensive economy.

This form of shared or networked learning assumes that neither the public sector nor individual private enterprises are the source of all knowledge. Instead, the process of innovation and institutional adaptation is an interactive one in which the means for establishing supportive social relations and of communicating insights and knowledge in all its various forms are crucial to the outcomes. Challenging economic and social policy issues that cross-sectoral, spatial, and jurisdictional boundaries cannot be managed by top-down government action or market mechanisms alone.

This reality leads to a growing focus on the role of governance, as opposed to government activities. It involves recognising that policy outcomes depend on the interaction among a wide range of social and economic actors, including sub-national and local governments, the private sector, voluntary, business and not-for-profit organisations. It also reflects a broader shift in governing relations from a hierarchical

pattern associated with the bureaucratic state-managed mode of development in the post-World War II era, to a more heterarchical set of relations in the current era.

Distributed governance entails a dispersion of power towards localised decision-making, as well as over a wider variety of actors at all levels (Paquet 1999, 5). It requires the combined resources of governmental and non-governmental actors in the form of horizontal, autonomous, self-organizing and “self-governing inter-organisational networks” (Rhodes 1996, 659–60). Central to the concept is the development of styles of governing in which the boundaries between public and private actors and even across different levels of government have become blurred. For Peters and Pierre, the underlying novelty of this concept is the emphasis placed on the processes of governing, rather than the exercise of formal authority through institutional structures. The common element underlying these perspectives underlines “the process through which public and private actions and resources are coordinated and given a common meaning and direction” (Peters and Pierre 2004, 78).

The appeal of this model of governance derives from the fact that it emphasises institutional structures and learning. It involves the devolution of greater degrees of autonomy and responsibility for the policy outcome onto those organisations that will both enjoy the fruits of the policy success, or live with the consequences of its failure. The adoption of an associative model does not imply an abandonment of a central role for the state, but rather a rethinking of its role. The state is viewed as one of the institutions of the collective order, working in relationship with other organisations, rather than operating in its traditional hierarchical fashion.

The state continues to establish the basic rules governing the operation of the economy, but it places greater emphasis on the devolution of responsibility to a wide range of associative partners through the mechanisms of ‘voice’ and consultation. This approach to policy design and service delivery seeks to “break away from the constraints of the traditional dual choice between market-centred and state-centred approaches”, and emphasises the development of “governance capability across, and between, a broad range of institutional fields of economic life” in the form of institutionalised local governance structures based on “networks of organisation and representation” (Amin 1996, 309).

A key challenge for the public sector to operate in this mode of governance is to both establish the conditions under which key actors at the community level can engage in a consultative and interactive fashion with government authorities, as well as learn to collaborate with these actors under a more distributed pattern of authority. The ability to operate in this mode of governance may involve the delegation of certain tasks from formal government agencies to accredited business associations or community organisations. The latter possess relevant assets, such as knowledge of, and credibility with, their members, which the public sector needs to enlist in order to ensure the effectiveness of its support policies. The dispersal of power to this broader range of actors creates the opportunity for more meaningful dialogue to take place at the regional and local levels. This is important because dialogue or discussion is central to the process by which parties come to reinterpret themselves and their relationship to other relevant actors within the local economy (Nauwelaers and Morgan 1999).

Another aspect of this evolving pattern of governing relations is the importance of learning. The emerging knowledge economy places a premium on the ability to acquire, absorb and diffuse relevant knowledge and information throughout the various institutions that affect the process of economic development and change. In response to this shift, organisations need to become more reflexive and adaptive, by tapping into the knowledge and capabilities that their members possess. Increasingly, the challenge for both public and private organizations is how to structure knowledge and intelligence in social ways, through social learning, rather than to access them on an individual basis (Paquet 1999; Gertler and Wolfe 2002).

Learning is defined as the capacity to improve present performance as a result of experience through a redefinition of the organisation's objectives, and the modification of behaviour and structures as a result of new circumstances (Paquet 1997, 31). Learning is fundamentally a social cognitive process that depends upon the interaction of geographically proximal actors to develop new processes of adaptation and reflexivity (Cooke 1997).

### **Multi-level Governance**

A related concept, that of multilevel governance, is derived from a term pioneered by Gary Marks in his work on the relations between levels of

government within the European Union. It represents a new model of political architecture where political authority and policy making influences are dispersed across the different levels of the state as well as to non-state actors. While the governance literature focuses on the integration of a broader array of non-governmental actors into governing processes, the idea of multi-level governance emphasises the need for greater cooperation across different levels of government which share overlapping or competing spheres of jurisdictional responsibility across a related set of policy areas.

At the core of the idea is a recognition that the national level no longer monopolises policy-making and instead engages in collective decision-making with other levels of government and relevant actors, and in so doing, cedes up control over some aspects of the policy-making process. Decision-making competencies are therefore shared among a range of governmental actors, with no one level exercising a monopoly over another. Accordingly, sub-national levels are said to be interconnected to national, and at times supra-national, arenas rather than nested within the national state (Hooghe and Marks 2001).

In North America, where federalism is the norm, the concept of multi-level governance helps us recognise that relevant areas of jurisdictional responsibility have long since ceased to be the 'watertight compartments' they are conceived as in classical theories of federalism. The interdependent nature of governmental roles and jurisdictional responsibilities, as well as the role of informal actors not explicitly recognised in the constitutional division of powers, is of increasing importance in achieving successful policy outcomes.

Sharing of decision-making with lower levels of government promotes a process of interactive learning, not just within state agencies, but among firms, industry and community associations, as well as other public institutions, that is essential to economic success at the regional and local scales. Regional and local actors are a necessary source of knowledge in local learning networks, assisting in the process of collective learning vital to the success of knowledge-intensive firms. For this type of learning to be effective, such processes of institutional learning must extend across, and include, key actors in both the public and private sectors at all three levels of governance.

This view is endorsed by Scott et al. who suggest that governance is now

widely deployed to describe the multifaceted aspects of social and economic coordination in an increasingly interdependent world where various tiers of government must collaborate with each other, as well as with a range of nongovernmental actors to achieve their goals. They point out that the governance of city regions in particular, must be viewed as part of a larger issue of coordination across multiple geographic scales and jurisdictional levels. This “sense of the term sees governance as involving a set of complex institutional reactions to the broader problems of economic and social adjustment in the emerging global-local system” (Scott, Agnew, Soja, et al. 2001, 22).

### **Governance and Civic Capital**

A critical factor in the success of these new models of governance at the regional and local levels is their ability to build trust and cooperation among the relevant set of community-based actors. The character of the relationships between actors in a region is often referred to as a product of social capital in the region, which is defined as the “social relations among agents, resting upon social institutions that allow for cooperation and communication” (Lorenzen 2007, 801). It refers to various features of the social organisation of a region, such as the presence of shared norms and values, which facilitate coordination and cooperation among individuals, firms, and sectors for their mutual advantage. An important distinction is made between the business and civic realms of social relations. Business relations include technological learning within the firm and inter-firm trade and knowledge exchanges. Civic relations include those that exist between people in a community who interact with each other through their involvement with schools, various cultural and leisure activities and other civic associations. Lorenzen argues that the civic dimension of social capital is particularly sensitive to geographic distance because many of the activities that enhance the strength of civic relations are based on the specific catchment area of a civic association or membership in a cultural organisation. These relations frequently entail face to face meetings that are limited by distance as well (2007).

Building on this distinction between the business and the civic dimensions of social capital, we have formulated the concept of civic capital to analyse the contribution that more cooperative forms of behaviour make to the success of local and regional economies (Wolfe and Nelles 2008). Civic capital is defined as a set of relations that emerges from interpersonal networks tied to a specific region or locality

and contributes to the development of a common sense of community based on a shared identity, set of goals and expectations. It comprises formal or informal networks among individual actors or associations at the community level and between members of the community and regional or local governments (Wolfe and Nelles 2009).

The basis of civic capital is its regional orientation and the key role played by civic leadership within these networks. Civic leaders, or civic entrepreneurs, are critical in articulating this regional orientation and intensifying and formalising collaborative networks within and between communities. Civic entrepreneurs are bridge builders and help to connect localised networks and different communities of actors with one another. These leaders understand the importance of collaboration and coordination and through their leadership bring various groups of actors together to negotiate regional goals.

Recent experience suggests that local communities can formulate strategies to alter their economic trajectory and improve their prospects for economic development. What is required is the presence of an 'economic community' – places with strong, responsive relationships between the economy and community that afford both firms and the community a sustained advantage. These relationships are mediated by key civic leaders and organisations that bring the respective economic, social and civic interests in the community together to collaborate on strategies for the community. The scope for individual agents and local politics to influence local and regional outcomes would seem to be considerable, since these relationships are mediated by key people and organizations that play a leadership role in bringing the economic, social and civic interests in the community together to collaborate (Henton, Melville, and Walesh 1997).

The concept of civic capital provides insight into the processes and dynamics that contribute to more successful regional governance. In regions characterised by higher degrees of civic capital, the coordination required to sustain regional cooperation tends to result in more effective governance. Collaborative institutions often embody values and attitudes that are intrinsic to the region and help build civic capital. Successful regional economies benefit from the presence of collaborative institutions, which help communicate the respective needs of different community actors to each other, establish local and regional priorities for economic development, and build effective bridges across different segments of the

economic community that might not otherwise be linked.

These relationships are mediated by key people and organisations that bring the respective economic, social and civic interests in the community together to collaborate on collective strategies. Above all, they contribute to the articulation of a shared vision for the economic community and the local economy and build a consensus among key civic actors and associations around that vision (Porter, Monitor Group, ontheFRONTIER, et al. 2001, 75). In doing so, they build civic capital by creating relationships and developing collective institutions that benefit the community, identifying common strengths or mutual needs and contributing to the development of a common economic agenda. Civic capital can be created, and the basis for doing so is the establishment of collaborative networks between various elements of the business and civic communities.

The ability to enhance civic capital at the regional and local level and foster better governance mechanisms are critical elements for helping cities respond to the cascading shocks currently buffeting the global economy. Advocates of an urban-centred approach to policy-making maintain that a broad range of policy problems are best addressed at the local level, and require “place-sensitive modes of policy intervention – strategies constructed with knowledge of the particular circumstances in communities, and delivered through collaborations crossing functional boundaries and departmental silos” (Bradford 2005, 4).

The theoretical foundation for this argument rests on the governance theories outlined above which emphasise the potential benefits of collaboration across different levels of government, and between public and private actors at the local scale, as the most effective way for achieving better policy alignment and sustaining urban economic growth. Taking city regions seriously as the focus for economic development initiatives has a number of key consequences for the design and implementation of these strategies, “Greater emphasis is placed on territorial rather than sectoral approaches; on the need for policy coordination and improvements in governance; and on bottom-up participatory approaches” (Rodríguez-Pose 2008, 1033).

The resulting emphasis on flexible, associative forms of governance and bottom-up participatory approaches has been influential in encouraging experimentation with different locally driven collaborative governance

mechanisms based on partnerships across OECD countries. Empirical research on the variation in the governance arrangements and best practices from these experiments is beginning to emerge (OECD 2006).

### **Strategic Management of Urban Regions**

While local factor endowments strongly shape the trajectory of economic change within local and regional economies, the arguments presented above about the role for political agency at the local level suggest that cities have a measure of control over the direction of economic and social change (Simmie and Wood 2002; Clarke and Gaile 1998). The response taken to the growing trend towards knowledge-intensive production on a global scale suggests the need for an increased focus on ‘strategic management policy’ at the regional and urban level. At the heart of this approach is “the development and enhancement of factors of production that cannot be transferred across geographic space at low cost” (Audretsch 2002, 174).

Communities and regions, like companies, need to adopt strategic management approaches to remain competitive. As a result, successful cities and regions must be able to engage in strategic management exercises that identify and cultivate their assets, undertake collaborative processes to plan and implement change, and encourage a regional mindset that fosters growth. The successful adoption of a strategic management policy at the urban level requires not just a new category of policy, but a new style of policy development, deploying what Gertler and Wolfe term “local social knowledge management” exercises (2004).

Regional economic development processes involve, at their most fundamental level, *socially organised learning processes* involving learning by individuals, by firms, and by institutions. These processes can only succeed if the prevailing structures of urban governance are conducive to the effective generation of local social knowledge management exercises. The goal, then, is to establish effective systems for *social knowledge management* at the local and regional level. This approach to regional economic development is characterised by both ‘how’ it is done, and ‘what’ it focuses on. Experience indicates that successful strategic management exercises are:

- Demand and opportunity driven.
- Promote innovative ideas in all aspects of regional economic activity.

- Facilitate relationship-building and create buy-in.
- Ongoing, iterative and non-linear.

Successful strategies build upon past efforts to learn from what has succeeded and what has failed. They are reflexive in that they use their past experience to create a more effective process – in other words, they involve social learning processes.

Such exercises are concerned with identifying a city region's unique jurisdictional assets that can support the development of its urban economy (Feldman and Martin 2005). These can include knowledge economy assets (such as workforce skills, knowledge and research development, creativity, advanced telecommunications infrastructure, quality of place, and financial capital); collaborative institutions and organisations (such as regional development organizations, professional networks, research consortia, and entrepreneurial support networks); and the regional mindset (values and attitudes). The leadership for these exercises need to create a broad buy-in from the relevant elements of its regional and local community.

### **The Waterloo Region: Strong Civic Networks, Strong Governance**

The industrial cluster in the Kitchener-Waterloo-Cambridge (Waterloo) region, located an hour west of Toronto, is one of the most dynamic sources of high-tech activity in Canada. Geographically, Canada's Technology Triangle (as the region is also known) encompasses the municipalities of Waterloo, Cambridge, and Kitchener. Overall, the region boasts 455 companies involved in the high technology sector, spread across four subsectors: information and communication technology, scientific and engineering services, advanced manufacturing, and the life sciences biotech and environmental subsector. Of these, information and communications technology accounts for 62 per cent of the high tech firms and employs 13,000 people or 45 per cent of the total in the high tech sector (Bramwell, Nelles and Wolfe, 2008).

The region is marked by both relatively strong regional governance and dense civic capital, which has grown and intensified over time. From the founding of the University of Waterloo to the establishment of CTT Inc. and Communitech and the recent initiation of the regional

Prosperity Forum, the private sector has played an instrumental role in the economic development of the region. The process of intensification has occurred in three stages. The first two involved civic entrepreneurs formalising ties within the high tech community and between local governments with the creation of Communitech and Canada's Technology Triangle Inc. As the organisations matured bridging ties began forming with other community actors. The third stage built bridges between associations, between local and regional governments and economic and social actors through multi-stakeholder associations such as the Prosperity Forum.

Communitech was established in 1997, though its roots stretch back to the early 1990s to an informal group of twelve chief executives, called the Atlas Group, whose goal was to facilitate the exchange of ideas and improve networking relations between high technology companies. This partnership originally formed as the participants discovered that they were facing similar challenges stemming from the weak state of the regional ICT infrastructure. An oft-cited benefit of Communitech membership is access to a pool of shared experiences and support by providing a variety of services to its members. This has led to partnerships between technology companies, service firms, academic institutions, business support organisations and government and a role as one of the most visible organizations for regional economic development in Waterloo.

The association currently supports the tech community with a number of services such as Peer2Peer networking events developed to provide a forum to discuss best practices for industry leaders, management and technical professionals. In addition to providing these direct services targeted at its members, Communitech also plays a much larger role in supporting non-members in the tech community as well as in local economic governance (Bramwell, Nelles, and Wolfe 2008).

Within the Waterloo region, there has historically been strong cooperation around the issue of regional marketing. Canada's Technology Triangle Inc. (CTT Inc.) is the regional marketing association of the Waterloo region and widely regarded as one of the keystone organizations of the region. CTT Inc. remains primarily a marketing corporation. However, its vision has expanded to include issues of regional economic development, such as land use and infrastructure development. The evolution of Canada's Technology

Triangle demonstrates the extent to which civic capital has intensified in the region. From a loose and narrowly based marketing partnership, the ties between municipalities have deepened. The breadth of local partners and board members reveals the bridges that have been built between the various communities, institutions and associations in the region. Indeed there has been a greater degree of cross-fertilization, as CTT Inc. is a member of several of its partner associations including Communitech.

The Prosperity Council is a relatively new venture in regional governance. Where the creation of the CTT brought governments closer together and Communitech brought industry members together, both of these associations have partnered with local governments and associations to formulate a coherent regional vision. The Prosperity Council is “a federation formed to collectively create an environment that supports opportunities for prosperity in Waterloo region”. It is comprised of representatives of the above two organizations plus the local Chambers of Commerce. Together these organisations represent more than 3,000 businesses in Waterloo region. Its goals are to:

- Build a collaborative regional vision.
- Brand and market the region as one successful area for business, arts and lifestyle.
- Enhance regional health institutions.
- Strengthen local post-secondary institutions.
- Create and fund a regional arts and culture development and promotion body.

The Prosperity Council has been active recently in organising to promote the regional arts and cultural agenda. A meeting in the fall of 2008 established several strategic research priorities, which will underpin the region’s cultural agenda. This activity is indicative of the willingness of the private sector to support regional cultural initiatives, as well as a public willingness to let groups such as the Prosperity Council drive the cultural agenda at the regional level. Although concrete action on regional culture has yet to emerge the coalition of actors and support networks are in place to implement the governance vision once it is established.

Civic capital in the Waterloo region is relatively strong. The region is characterised by a high degree of associative activity, civic engagement, personnel overlap and well-developed organisational linkages. Indeed,

most members of the region interviewed took a great deal of pride in the high levels of engagement – public and private – in the region and its prosperity. While political linkages are fairly well developed, civic capital is most highly developed outside of the public sector. Leaders, groups and initiatives that have been most influential in linking and promoting the regional agenda have emerged from the private and higher education sectors. But all sectors of the region readily acknowledge the high degree of networking and interaction that exists across the various sectors – both public and private – concerned with the economic future of the region.

## **Conclusion**

The preceding analysis outlines an emerging paradigm for economic development policy based on the underlying principles of associative and multi-level governance focused on the local and regional scale. The coordinated approach to economic development policy requires a more integrated and joined-up approach to policy planning at the ‘governance’ level, rather than a new round of institutional renovation at the national, regional or local levels. The case study of the Waterloo region shows evidence of a growing interest in, and willingness, to cooperate across jurisdictions and between the public and private sectors. Individually, no one case can provide a clear and unambiguous guide of the way forward. Nonetheless, both the case study and the broader conceptual approach outlined in this chapter provide valuable insight into how new governance models can be used to achieve a greater degree of policy coordination to promote economic development at the local and regional level.

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