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Using the Region to Win Globally: Japanese and South Korean Innovations

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Using the Region to Win Globally: Japanese and South Korean Innovations

Fumi Kitagawa

How can the capacity for creating and exploiting knowledge in the context of Regional Innovation Systems be developed as a means to *constructing regional advantage*? This Hot Topic addresses this question, in reviewing policies and developments in Japan and South Korea. As well as explaining approaches to regionalism and innovation in these two countries the paper also invites reflection on how these East Asian approaches compare, and what they mean in particular for the countries of Europe and North America.

1 Introduction

Like many countries, Japan and South Korea are aiming to increase national and regional competitiveness in the global knowledge economy by tapping into institutional and local (sub-national) innovative capabilities and establishing new 'Industry-Science Relationships' (ISRs) (OECD, 2002). These new institutional settings, it is hoped, will in turn foster further knowledge creation and innovation. The range of interactions at international, national and sub-national levels is best understood by making use of well-informed geo-political and historical perspectives.

The recent popularity of concepts such as Regional Innovation Systems (RIS) and 'learning region' with policy-makers is closely related to a weakening of centralised 'one-size-fits-all' solutions, and a corresponding surge in regional innovation policies in many industrialised countries. In European literature, regional and local innovation systems rather than national or corporate systems stand out (Malecki, 2000). This is notable in recent years, given the policy emphasis on 'regions' in the EU context.

The important role that regions can play in mobilising research and innovation efforts to bring Europe into the knowledge-based economy has been emphasised in policy documents published by the Commission (e.g. CEC, 2001). The importance of the regional level is increasing with regard to diffusion-oriented innovation support policies (Lagendijk & Cornford, 2000), while central governments keep their key role in supporting basic, pre-competitive technologies which have spill-over effects that go far beyond the borders of regions. Regional economies within the multi-level governance system of innovation are seen as 'knowledge laboratories' (Cooke, 2004a), which promote further policy learning and innovation.

We need to refer to the institutional and organisational dimension of the innovation process for systemic analysis of technological development. Attention needs to be

drawn to the specific characteristics of national and regional policies, using geo-political and historical perspectives. This account provides Japanese and South Korean case studies of the emergence of multi-level governance of the regional innovation processes. It illuminates the instruments used, their impact on regional economic development, their level of organisational embeddedness in regions, and the ability of regions to coordinate innovation support policies. However, partly due to the lack of a systematic evaluation framework to compare policy instruments in the two national contexts, the analysis given in this paper is more descriptive than judgmental in relation to specific policy tools.

Science policy has traditionally been seen in a national context in many countries. However, a new set of regional or sub-national science policy institutions are emerging, creating the potential for new areas of contention and debate within science governance. These debates include implications for regional development through science & technology (S&T) exploitation, commercialisation through innovation policies, and the new linkages forged between the science base and regional industry. Both Japan and South Korea are known as traditionally centralised countries that favoured national industry-science relationships, exemplifying 'national innovation systems' (Freeman, 1987). In both Japan and South Korea, innovation and science policies have had a strong national rather than regional or local character until very recently.

Recent growing interest in the RIS notion and innovation support policies in the two national contexts reflects certain shifts in the current political and institutional landscapes of East Asia. The Japanese national innovation system has been gradually transformed with the implementation of this 'regionalisation' of science and technology policies demonstrated in the second Science Basic Plan (2001-5). In Japan, the RIS idea is relatively new and, compared to the situation in European countries, it is not so often referred to in policy frameworks. In South Korea, the Regional Innovation Systems concept has been recently adopted as a national policy agenda for 'balanced regional development' promoted by the Noh government since 2003. In both South Korea and Japan, local development based on technology parks has been proceeding, while more recently, the idea of industrial clusters has been taken up for local economic development policy for some time.

Currently many governments are implementing initiatives, with national industrial and S&T policies centred on strengthening university-business links. Changes associated with academic research commercialisation have been conditioned by the academy's place in the society relative to government and industry, and occur at multiple levels of interactions.

The question then is whether or not the re-positioning of universities as part of the wider society actually fosters the emergence of new national and regional

innovation systems, creating 'constructed advantage' as part of the global knowledge economy. Etzkowitz and Leydesdorff (1997) characterised such transitions as 'revolutionary', and the recent policy emphasis on university, industry and government links is named as a 'triple helix model of academic-industry-government relations.' Recent changes in S&T and innovation policies in Japan and South Korea are illustrated here, with current policies aimed at promoting research commercialisation and academic entrepreneurship as part of the regional and national economic development strategies.

How can the capacity for knowledge creation and exploitation in the context of Regional Innovation Systems be developed as a means to *constructing regional advantage*? The following supplementary questions are examined in this Hot Topic:

- In what ways does the 'top-down' regionalisation of science policy lead to a new regional governance structure of science policy?
- To what extent have different policy initiatives been co-ordinated at the local level?
- Does the policy emphasis on university-based entrepreneurship serve as a driver for the regional governance of science?

The discussion is organised as follows.

The next section gives a brief overview of literature comparing institutional and spatial development and policy directions in European and East Asian contexts. It considers the relationship between devolution of economic governance, science and innovation policies and regional development, with a conceptual and comparative framework for looking at multi-level systems of innovation, particularly from an international perspective. Transnational and cross-border regional initiatives are also growing in East Asia, and more research is needed from a comparative perspective going beyond the European framework. The account draws attention to the recent dynamics of the wider region and the emergence of new type of global cities in Asia, such as Shanghai, Hong Kong and Singapore as 'creative hubs' in the region. This poses a fundamental challenge to countries such as Japan and South Korea.

The third and fourth sections give an historical overview of the development of national and regional innovation systems in Japan and South Korea, followed by an analysis of the current political contexts in the two countries. There are similarities to do with the 'regionalisation' of science and innovation policies, and with the recent devolution of science and technology policies. These include cluster initiatives and policies promoting university-industry links.

Finally, in the concluding section, the nature and constraints inherent in Japanese and Korean multi-governance spaces of science and innovation policies are

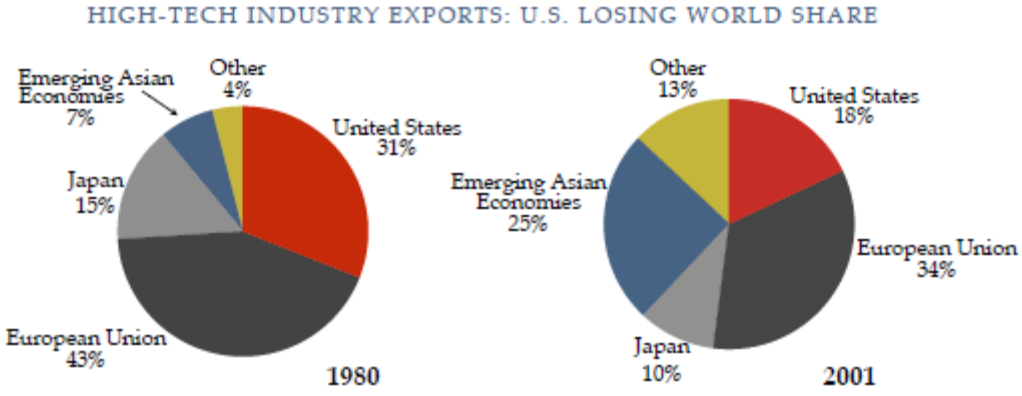
discussed, drawing particularly from a comparative perspective on notions of the *region* and the *governance of science*.

2. Constructing Regional Advantage in the East Asian Global Knowledge Economies

East Asia as knowledge-based economies compared with the European region

The global structures and financing systems of S&T and innovation activities are undergoing a profound change in the countries of East Asia. From 1995 through 2001, the emerging economies of China, South Korea, and Taiwan increased their gross R&D investments by about 140 percent. During the same period the U.S. increased its investments by 34 percent. The U.S. share of worldwide high-tech exports has been in decline for two decades. From 1980 to 2001 the U.S. share fell from 31 percent to 18 percent. At the same time, the global share for China, South Korea, and other emerging Asian countries increased from just 7 percent to 25 percent. Along with Japan, Asian economies constitute 35 % exceeding the European Union (Task Force on the Future of American Innovation, 2005).

Figure 1 (quoted from Task Force on the Future of American Innovation, 2005)



Globalisation has changed the spatial order of countries, regions and cities, while transnational organisations such as the European Union (EU) are playing an increasing role in urban and regional reorganisation. In the European context, the Lisbon strategy sets the economic agenda for the EU, and is aimed at closing the gap between Europe and its main global competitors, the US and Japan. Moreover, in the EU policy context, there is an attempted 'Europeanisation' of science and innovation policies. Questions are being posed as to whether, and to what extent a

supranational European innovation system can be assessed as a 'system' at the EU level (Borras, 2004), encompassing actors at sub-national, national and supranational levels. This means that there are various policy arenas at the national and European level, where policy actors from different levels cooperate in 'cross level policy networks' (Kaiser, 2003) within multi-level governance structures.

While the nation state provides the overall organising framework, recently, individual and often local institutional actors, operating in conjunction with nationally determined initiatives and strategies, comprise the new framework of multi-actor and multi-level governance processes of science policy, and new systems of innovation. The region and regional authorities are increasingly becoming arenas and actors of science, technology and innovation policies. As regional governments become more involved in S&T and innovation, a better understanding of the forces and dynamics behind regional innovation processes is needed.

As a conceptual framework the innovation system approach understands innovation as an interactive process: innovative organisations are supported, or hindered, by the institutional environment in which they are embedded. Analysing innovation processes by means of a systemic approach provides the advantage that differentiations in institutional, infrastructural or cultural conditions for innovation which exist among countries, regions or sectors become visible (Kaiser, 2003).

Concepts such as 'learning regions' and 'regional innovation systems' have developed mainly in European policy contexts. Comparative analysis of regional innovation systems has provided most guidance for policy-makers as 'policy-oriented innovation stimulation models' (Hassink, 2001). EU policy-makers have adopted some elements of the 'innovation systems' approach, as is evidenced in the broader view of innovation policy expressed in the 1995 Green Paper on Innovation. Increasing regionalism and regionalisation of policies has been examined and explained mostly with the influence of the EU level, and with the European Commission's emphasis on innovation-oriented policies. Attention has been drawn to the new role and impact of the public sector, and of policy support for innovation (see Asheim 2006), preferably in public-private partnerships.

In East Asia, however, there is very little literature on 'regional innovation systems'. What there is seems to have centred on national, rather than regional and local, levels until very recently. For example, Japan's post-Meiji transformation and subsequent reconstruction after the Second World War has attracted attention, reflecting in the characterisation of its national innovation system as resulting from 'techno-nationalist policies' (Fransman, 1999). Nevertheless, as the following sections show, recent years have witnessed an apparent devolution of economic governance functions from national to sub-national governments, accompanied by regionalising science and technology policy as a key national implementation

strategy. Consequently, there is a new and growing interest in Regional Innovation Systems (RIS) literature in East Asia.

In order to understand shifts in policy and academic literature, particularly in the context of East Asia, it is helpful to explain further the institutional background. Haggard (2004) identifies three development phases of Asian political economy spreading over several decades.

The first was the explosive growth of the newly industrialising countries (NICs) including South Korea, Taiwan, Hong Kong, and Singapore, known as East Asian Tigers, that began in the mid 1960s.[1]

The second development was the period of Japan's apparent economic invincibility throughout the 1970s and1980s. In Freeman's (1987) analysis of Japan's domestic context, extensive research had linked innovative performance with competitive and economic outcomes at the national as well as regional and industrial levels. Until the economic malaise of the 1990s, Japan's success in key industries from automobiles to electronics was taken as evidence of the superiority of its so-called dirigiste economic model.

The third development occurred after 1978, when China and Vietnam pursued a reform course.

More recently, the Asian financial crisis of 1997–98 sparked a controversy about East Asia's experience. Some of the causes of the financial crisis were attributed to the 'institutional failures' such as weaknesses in financial regulation and corporate governance (see for example, World Bank 1999). Not coincidentally, the post-crisis period saw a much more sceptical literature on the nature of institutions and growth in East Asia, including debates concerning

- the role of big institutions in capital accumulation and growth,
- the significance of industrial policy, and
- the nature of business-government relations (Haggard, 2004).

Contextualising Regional Governance of Science and Innovation

In light of the 'regional governance' of science policy and knowledge production, different *national* types of science and innovation policy-making can be distinguished. These include the extent of political devolution; geo-historical characteristics of regions; the knowledge infrastructure and knowledge transfer systems; as well as policies at national and local levels, and strategies adopted by

[1] These countries and territories were noted for maintaining high growth rates and rapid industrialisation between the early 1960s and 1990s. They took an export-driven model of economic development.

individual institutions - firms, innovation support organisations, universities and research laboratories.

The power structures in which these institutions are interacting affect how innovation systems operate regionally in the globalising knowledge economy. It is notable that although some powers and responsibilities related to science and research policy are devolved to regional governments, national (and trans-national) governments still tend to retain significant influence.

Different *national* types of science and innovation policy-making can be distinguished. In centralised countries such as France, UK and many countries in Asia, including Japan and South Korea, innovation policies have often been implemented using a top-down approach. In such cases, innovation policies are devised by national governments and either operated at the level of the nation state or implemented by regional and local actors. By contrast, policy-making in federal countries such as Germany is much more locally driven, and local innovation policies are generated in a more bottom-up way, involving close partnership of local actors working together in networks.

Even in centralised countries, more regionally-driven innovation systems are emerging. However, precisely what 'region' means varies politically, depending on national, sub-national and trans-national contexts. In the UK, although regional development agencies are now responsible for developing an innovation strategy for each region, centralising forces remain strong, and policy works to the detriment of peripheral regions (Charles and Benneworth, 2001).

In Japan, where there is no formal political administration at the regional level, the 'regional' and 'local' levels are sometimes loosely used as synonymous, whilst they are increasingly recognised as a strategic site of policy implementation (e.g. cluster policies). In South Korea the government is now trying to change the centralised structure by promoting the balanced national development idea, which encourages metropolitan cities and provinces to build its own Regional Innovation Strategies (RIS).

As Sanz-Menendez and Cruz-Castro (2005) point out, broadly speaking there are two models of policy approaches to innovation. The first is the 'academic approach', which is geared towards fostering academic research, and so mainly towards universities and public research centres. The second is the 'business approach' which attaches greater emphasis to applied research and technological innovation processes in businesses.

Both approaches seek to foster and increase the production of new knowledge and skills. While one aims to finance academic activities without direct connection to short-term results, the other aims to foster private investment and raise

companies' level of technology, and to tie public research to the transfer of results to the private sector.

There is a growing concern about 'knowledge-based entrepreneurship', which constitutes the third policy approach to innovation. The importance of technology-intensive industries in international trade, and the growth of entrepreneurial firms creating a high share of net new jobs, put focus on the role played by knowledge-based entrepreneurship in economic growth. High-tech firm formation from university research or 'academic entrepreneurship' has been encouraged in recent years, whilst there is evidence showing that corporate spin-off outnumbers university-spin-offs. [2] In promoting knowledge-based entrepreneurship at the regional level, the right balance between corporate and academic entrepreneurship needs to be struck within each innovation system, with an appropriate level of public support to R&D and entrepreneurial activities.

In considering the regional governance of science and innovation policies, a balanced policy support to innovation based on these models – 'academic approach' versus 'business approach'- and knowledge-based entrepreneurship - is needed. Four indicators can be identified that characterise regional policies, drawing on Sanz-Menendez and Cruz-Castro (2005) and Hassink (2002):

- the volume of the regional government's budget allocated to funding academic research and business research
- the nature and targets of the actions, such as plans, programmes and instruments
- the creation of regional research centres and infrastructures, in accordance with the nature of ties and activity between universities and industry
- the nature and the roles played by 'innovation support agencies', which can be supra-nationally, nationally or regionally initiated.
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A fundamental question remains: why are science and innovation policies getting more important, especially in a 'regional' context? The growth of global impact city-regions and cross-border regions raises a number of issues concerning economic order, coordinated governance, and institution-building (Scott, 2001). In recent years a number of East Asian countries, China in particular, have emerged as the 'world's factory' seizing top world production share for many products. The offshore shift of Japanese firms prompted a change in Japan's local economic structure, which has been characterised as the 'hollowing out' of the Japanese economy.

Chinese development to date has centred on those industries located in local Japanese and Korean cities, imposing challenges to the development of their local

[2] See Lindholm Dahlstrand, Å (2006) http://www.madeiraworldforum.com/files/pdf/presentations/ASA_LINDHOLM.pdf for discussion on the importance of regional knowledge entrepreneurship referring to the case of Sweden.

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 just started to shift their operations abroad (METI, 2002). However, this landscape may change, as the Chinese strategy for translocation of global 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, 2004b).

Local institutional processes of building innovation systems are invariably set against the wider international political economies of cities and regions. In cities and regions throughout East and South East Asia, competition to establish and maintain information and knowledge activities is becoming fierce. The race is on to attract global talent, and to compete for the mantle, status and wealth of 'creative hubs' in Asia. Cities in the region such as Shanghai, Hong Kong, Singapore, Kuala Lumpur, Jakarta, Manila and Bangkok are all competing to attract foreign investment.

While competition is intensifying among Asia's economic agglomerations, however, inter-linkages between these cities and sub-national regions are also growing, within and beyond Asia. Local innovation initiatives have already taken various forms, sometimes encompassing regions in neighbouring countries in East Asia, often with universities as main players. Cross-border cooperation is occurring in East Asia; examples include 'Greater China', the cross-border initiative of 'Sijori' between Singapore, Malaysia and Indonesia (Perkmann and Sum, 2002), and 'Fukuoka Silicon Seabelt' which connects R&D centres in semiconductor industry in Asia (Kitagawa, 2005b). Malaysia's effort to build a Multimedia Super-corridor (MSC) is unique, linking developing advanced technology for digital district in Kuala Lumpur, Silicon Valley and Hollywood (Indergarrd, 2003).

We now examine in turn the specific spatial and organisational contexts of Japanese and South Korean science and innovation policy-making. Some historical perspective is needed to understand well the recent policy emphasis on the regionalisation of science and innovation policies.

3 Regionalising the Japanese Innovation System

The responsibilities of national and local governments in Japan are as follows: the national government is responsible for formulating and implementing comprehensive policies for promoting science and technology; local governments are responsible for formulating and implementing policies for promoting science and technology corresponding to national policies and in accordance with the local characteristics. Local governments operate at sub-regional level, including prefecture and municipal levels.

The fifth National Institute of Science and Technology Policy (NISTEP) review of regional science and technology promotion policies shows that over 90 % of prefecture governments adopted at least one key action programme for science and technology: for example, 'regional council boards for the promotion of science and technology'; 'basic plans for the promotion of science technology'. Local authorities in Japan spent 20.2 % of the total public expenditure of S&T (Hassink, 2000).

There is no institutional mechanism operating at 'regional' level as such in research policy and funding terms. The only exception to this is the existence of nine METI regional economic bureaus which oversee economic and industrial policies at the 'regional' level across prefectures (see below). The nine bureaus are expected to develop plans, and become nodes to co-ordinate local networking and alliances. In light of the growing economic activities which encompass narrow 'local' areas, this can be regarded as 'regionalisation' of innovation policies in Japan. Significant initiatives are currently being undertaken jointly by some prefectural governments, and the central government's policy of developing regional research strength encompasses this level of government (OECD, 2003).

Japan has the reputation of being a highly centralised country. Lack of governance at the regional level seems to have had a negative impact on the development and regionalisation of innovation and university-business links in Japan. The structure of multi-level governance (MLG) which has been developed in Europe does not exist explicitly in the current Japanese political environment. It is up to individual local governments to take initiatives, but some of them are disempowered under the highly centralised innovation policy regime and corporate model.

In terms of the roles of national industrial policy alongside S&T policies in the development of an innovation system after the Second World War, Japan has had four separate phases:

- 'Catch up', after the Second World War to 1960
- From technology importer to exporter from the 1960s to the 1980s
- Exemplar of the national innovation system throughout the 1980s and early 1990s
- Transformation towards 'science-based innovation' from1995 to the present.

In terms of the role of science and technology policy in the context of regional development, Tsukuba Science City was established during the 1970s, followed by Kansai Science City during the 1980s. These were part of an effort to decentralise government science and engineering research institutes. In order to tackle regional disparities, several policy instruments such as industrial relocation promotion laws and factory location laws were enacted during this decade. Japan's Technopolis programme, led by the Ministry of International Trade and Industry (MITI) during

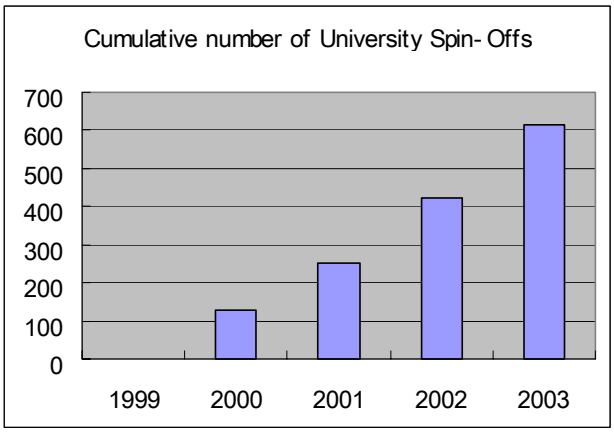
the 1980s, is an example of the use of technology-led development policies as a means of promoting the expansion of peripheral regions.
There is a large body of literature which examines the effects and constraints of Japan's regional high technology initiatives since the Technopolis Programme of the 1980s (e.g., Bass, 1998; Masser, 1990). Despite promising developments and policy aspirations, notably the triple-helix model of university-government-industry links, and systems of local innovation which might have underlined the policy thinking behind the Technopolis programme, this programme did not function well in practice, with the result that the initiative did not adapt well enough to the changing needs of society throughout its 15 years' existence.

In 1995, a significant turn was made in Japanese S&T policies. The Science and Technology Basic Law was passed by the Japanese parliament, and the first Science and Technology Basic Plan (1996-2000) was launched. This emphasised an increase in the Science and Technology budget, and enforced links between universities and industry. Consequently, the Japanese research system in general has undergone rapid transformation.

Prevailing global perceptions are that Japanese universities are inferior to their Western counterparts in terms of research, just as most advanced research in Japan is widely believed to occur not in universities but in the research laboratories of leading private firms (Fransman, 1999). Hoping to evolve into a nation based on science and technology, Japan has been promoting university-based ventures. In 2001 the *Hiranuma Plan* aimed at increasing 'venture businesses born in universities' was launched. This had the target to 'create 1,000 within 3 years'. As of 2003, the total number of spin-off firms from universities in Japan had reached 614.

Figure 2 below shows the rapid growth in the cumulative number of university spin-offs since 2000.

Figure 2



Source: *Tsukuba University Survey 2003* (adapted from Kneller, 2004)

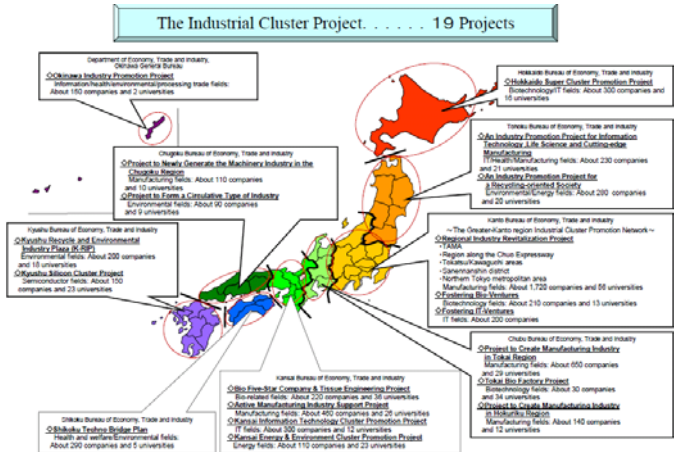
After the 1995 Basic Law, recent university reforms were accelerated to encourage further development of university-industry links which had hitherto been legally and structurally constrained in Japan. A legal framework to promote university-industry technology transfer was enacted in 1998, and 27 Technology Licensing Organisations (TLOs) had been established by April 2002. The number of filed patent application, patent grants, and licensing and option contracts all grew as a result of these government efforts. In some localities, so-called triple helix interaction (Etzkowitz and Leydesdorff, 1997) has been developing at the local level involving local industry, authorities and universities. Attention is drawn to an emerging role played by new 'technology-based firms' in transforming the national innovation system (Motohashi, 2005).

One aim of the second Science and Technology Basic Plan (2001-5) is to promote science and technology in each geographic region. Recent years have witnessed an apparent devolution of the planning functions of S&T policies from national to local governments, accompanied by the emergence of regional high technology policies. In 2000, the Local Devolution Law was enacted, whereby responsibilities given to local authorities were substantially strengthened.

Since the late 1990s, the emphasis of industrial policy has shifted to revitalising industry in order to overcome the hollowing out of the manufacturing base caused by the shift of production from domestic to overseas sites, located primarily in China and other Asian countries. Policies inducing regional industrial agglomeration to raise industrial competitiveness (e.g., cluster strategies) have emerged in this political economy. Since the end of the 1990s, through the implementation of local cluster strategies, complex patterns of inter-firm and inter-organisational relationships have been promoted at local and regional levels, with universities being recognised as key players in generating the industrial competitiveness of regions. National government initiatives since 2001, such as the 'Industrial Cluster Project' led by METI and the 'Intellectual Cluster Initiative' led by MEXT, rest on the conceptual cluster models developed by Michael Porter (1990;1998).

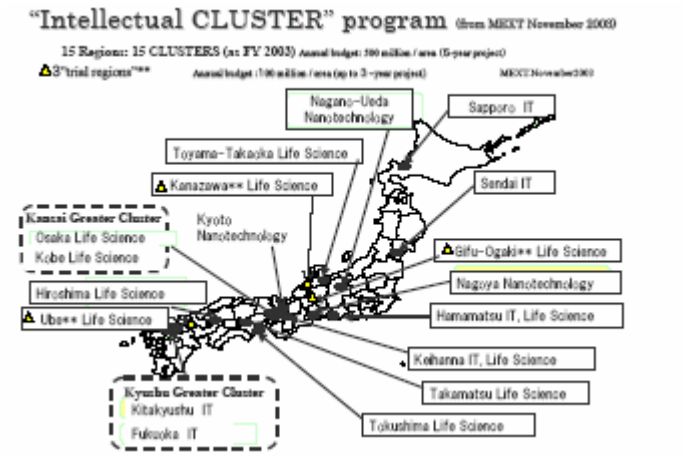
Questions may arise as to the relationship between these two cluster policies, which are planned, implemented and evaluated by separate ministries. In order to co-ordinate a science and technology agenda from a wider inter-ministerial point of view, the Council of Science and Technology Policy (CSTP) drew up a Regional Cluster Plan combining the two cluster policies, with the expectation that greater collaboration between them would lead to further innovation. For example, each region has established a Regional Cluster Promotion Association, consisting of representatives of both initiatives. METI regional bureaus also serve as focal points to link various actors in their regions.

Figure 3 Map of Industrial Clusters Source



Source: METI (cited from Angelino and Collier, 2004)

Figure 4 : Map of Intellectual Clusters



Source: *MEXT* (cited from Angelino and Collier, 2004)

Has the recent Japanese 'top-down' regionalisation of science policy led to a new regional governance structure of science policy, thereby constructing regional advantage? There is gradual development of multi-level innovation systems through the two cluster policies initiated by the two government ministries, which seem to be activating players at both national, 'regional' and local levels. Japan has had a reputation in strong innovation support policy at national level based on a 'business model'; more recently the national policy focus has shifted to enhance innovation support based more on 'academic model' at regional and local level; and the third model of policy support based on a 'knowledge-based entrepreneurship approach' has been emerging. However, lack of robust institutional mechanisms at work at 'regional' level makes coordination of various innovation support policies difficult as part of systems of innovation at both national and regional level.

4 Constructing South Korean Regional Innovation Systems [3]

South Korea has achieved spectacular economic growth based on its 'unbalanced growth strategy'. Those policies combined with the growth pole strategy have contributed to rapid economic development. This rapid growth has been achieved as a result of the government's strong commitment to aggregate economic growth centring on the Seoul Metropolitan area or the so-called Capital Region (Seoul, Incheon, and Gyeonnggi-do). Post-war revival took the form of dramatic, but regionally highly unbalanced, growth: the Korean miracle was in effect a greater Seoul miracle, and the disparity between the regions has persisted. To cope with these problems, the government has recently launched major decentralisation reforms and strong balanced regional development policies.

Table 1 below shows the concentration rates of firms, economic activities and higher education and hospitals in Seoul Metropolitan Area.

Table 1 Concentration in Seoul Metropolitan Area (%)

		1960	1970	1980	1990	2000
Business	# Firms	26.7	32.8	43.8	58.1	56.6
	Outputs	41.2	46.3	38.6	43.7	36.8
Finance	Deposits	59.7	68.2	69.8	65.5	67.9
	Loans	44.5	67.1	69.2	62.9	62.2
HE	# HEIs	52.9	56.3	49.4	45.8	41.8
	Enrollments	55.8	69.1	48.6	41.5	39.8
Medical	Hospitals	42	48.7	43.4	49.2	47.5

Source: National Census Data

South Korea's spending for R&D has already reached high levels at nearly 3 percent of GDP in 2003. However, the number of researchers in the public sector, and patenting performances, still remains below the OECD average, and there needs to be an increase in its share of indigenous innovation in R&D. Emphasis on R&D policy is not new in Korea. It dates back to the early 1980s when government policy shifted from industrial to technology policy.

In terms of the sub-national governance structure, South Korea is divided into nine provinces or *do*, which are then divided into counties, or *gun*. However, the weighting system designed to recognise large urban centres has reorganised this system into an array of units, with six metropolitan cities - *gwangyeoksi* - such as Busan (the largest other than the capital Seoul) and ordinary cities (*si*) which are

[3] Parts of these South Korean materials are drawn from a recent OECD/IMHE project with which the author was involved, "Supporting the contribution of higher education institutions to regional development"
http://www.oecd.org/document/35/0,2340,en_2649_34525_35602979_1_1_1_1,00.html

counties which have attained a population of 150,000 or more. The three cities with more than 500,000 inhabitants are then divided into wards (*gu*), the rest into neighbourhood areas ('dong'). The counties outside of the urban conurbations are subdivided into either towns or *eup*, or districts (*myeon*), with towns having 20,000 or more inhabitants. Both towns and districts are subdivided into villages (*ri*). South Korea has only one special city (*teukbyeolsi*), the capital Seoul, which is divided into 25 wards and a further 522 neighbourhoods.

In South Korea, where the central government has played a strong role in the process of national economic development, and regional innovation support mechanisms have not been seen to be embedded in the regions or provinces (Hassink, 2002), the current government is trying to change this by promoting balanced national development, encouraging each region to build its own Regional Innovation Strategies (RIS). According to the data in 2000, the South Korean provinces spent 7.6 % of the total public expenditure of S&T in South Korea, which is lower than Japanese local authorities which spent around 20 % of total S&T expenditure (Hassink, 2000).

The combination of innovation and balanced regional development policies has led the central government to implement a regionalised approach to promote innovation. In the 1990s, the government enhanced the SME-oriented innovation support policies in the provinces through promoting the innovation of SMEs and inter-firm networks. The central government also established a network of 37 Regional Research Centres (RRCs), and 20 Technological Investment Centres (TIC) located at universities across the nation, with a target to upgrade research facilities at universities. They offer services to SMEs in each region such as technological advice, joint R&D projects and scientific facilities.

South Korea's Technoparks have been developed and financed by a large number of participants, including central government, local and regional authorities and universities. There are a number of sources of public research funds and innovation support mechanisms such as the Technology Innovation Center, Techno Park financed by the Ministry of Commerce, Industry, & Energy (MOCIE), Science Research Center, Engineering Research Center, and Regional Research Center supported by the by Ministry of Science and Technology (MOST), and the IT Research Center by the Ministry of Information & Communication (MOIC).

In recent years South Korea's economy moved away from the centrally planned, government-directed investment model toward a more market-oriented one. The Asian financial crisis, which began in the autumn of 1997, severely affected the Korean economy. Some effects of the crisis are shown by per capita income decline (from US $10.6 thousand in 1996 to US $6.8 thousand in 1998); and the fall in the exchange rate against the US dollar from 845 won at the end of 1996 to 1,695 won by the end of 1997.

Korea's industrial structure, dominated by *chaebols*, and once considered to be the 'engine' of its economy, is now considered to be one of the major causes of the economic crisis (Lim, 2000). Chaebol are South Korea's business conglomerates. South Korea's economy was small and predominantly agricultural well into the mid-20th century. However, the policies of President Park Chung Hee spurred rapid industrialisation by promoting large businesses, following his seizing power in 1961. Government industrial policy set the direction of new investment, and the chaebol were to be guaranteed loans from the banking sector. In this way, the chaebol played a key role in developing new industries, markets, and export production, helping to make South Korea as one of the East Asian Tigers.

After the economic crisis of 1997, the previous Kim Dae Jung government succeeded in implementing a number of financial restructuring and liberalisation policies. The economy is changing profoundly, as a result of the structural reform programme launched after the 1997 crisis, with increasing integration within the world economy.

The Korean economy has recently benefited from strong external demand, particularly from China. International competition is growing. There is rising foreign direct investment especially in the finance sector, while the Korean manufacturing sector is facing severe competition with neighbouring countries, China in particular, which has abundant cheap labour. Consequently, the country is facing enormous economic and spatial challenges, both globally and locally.

In addition to these mainly nationally initiated mechanisms, local and regional authorities have become more active in the field of regional innovation support in recent years, accelerated by political decentralisation. In this light, Metropolitan Council and Kyongbuk Province are an exemplar of *constructing regional advantage*. The local authorities recently successfully lobbied the central government to partly support a large five-year programme, called Milano project, which aims at restructuring the Taegu textile industry from a low to high-tech value-added industry (Hassink, 2001; 2002).

Since 2003, the new Korean government has implemented various policies to achieve *Balanced Development of the Nation*. The context is one of political as well as economic liberalisation. The Korean government now attempts to promote regional development by inducing a policy shift from a centralised and concentrated approach to a decentralised and less concentrated one. The emphasis is placed primarily on local government-initiated development through endogenous development strategy, as opposed to the local government's heavy dependence on central government, especially in terms of financial allocation (Lee, 2004).

In order to achieve successful balanced development, the government has emphasised cooperation among local universities, enterprises, local governments and local public institutions. The new President's Committee approach implies serious commitment to having these policies enacted. But there is without doubt an almost universally shared problem about centralist traditions, an instinct for control, and a related problem of working in strong vertical silos with little effective horizontal collaboration, and little inter-portfolio sharing of power and responsibility.

The Presidential Committee on Balanced National Development was established in 2003. Its membership is drawn from 12 Ministries together with civilian members. They published *Vision and Agenda for Balanced National Development* in May 2003, in which operational strategies to achieve balanced regional development were schematised, such as the building of a Regional Innovation System (RIS). The Special Law on Balanced National Development was passed in December 2003. The new law requires the formulation of a Balanced National Development Plan (BNDP) every five years, based on the Regional Innovation Enhancement Plan, to be prepared by Seoul Metropolitan Government, six Metropolitan cities, and nine provincial governments.

In order to achieve successful balanced development, the government has emphasised cooperation among local universities, enterprises, local governments and local public institutions. Universities, so far, have not been seen as at all strongly collaborative and inter-connected with industry and the community within their respective regions. The quality of research at universities is relatively weak and productivity of R&D personnel is low in different universities. Only KAIST (Korean Advanced Institute of Science and Technology),[4] POSTECH (Pohang University of Science and Technology),[5] Seoul University and a few others conduct research at international level.

Most of the universities focus on teaching, and there is a fundamental lack of cooperation between universities and the private sector, with few technological spin-offs. In short, South Korean higher education has evolved into a dual system: a few elite organisations setting the benchmarks and operating outside the organisational boundaries of the established system, and 'mass' higher education.[6]

[4] KAIST was created outside the boundaries of the Ministry of Education and still reports to the Ministry of Science and Technology, its students are exempt from military service, education is free and everyone receives scholarships.

[5] POSTECH was a spin-off of POSCO, a leading Korean steel company, and was created in response to acute shortage of high-quality graduates.

[6] The higher education system in South Korea is diverse. The sector is big with a large number of private institutions: 182 universities (1.8 million enrolments each year); 18 Industrial Universities (200,000 enrolments each year);1 technical college (196 enrolments); 158 junior colleges (900,000 enrolments each year); 1 Air & corr. University (300,000 enrolments each year) and 17 Cyber Colleges & Universities (40,000 enrolments each year).

KAIST and POSTECH, the above-mentioned two most advanced elite universities are characterised by close university-industry linkages. However, other universities are not highly entrepreneurial in respect of industry collaboration and partnership. Nor are they as a rule strongly collaborative and inter-connected to one another within the region, or at any other level. Regions outside the capital tend to suffer severe brain drain, exacerbating the mismatch between demand and supply of highly qualified people in many regions.

Against such a background, the new Roh government launched a major new initiative, New Universities for Regional Innovation (NURI), along with other reforms of higher education at the national level, such as the Brain Korea 21 (BK 21) project.[7] The NURI project aims for the equitable development of the nation, by selecting and nurturing regional universities displaying excellence, by region. Specifically, the NURI project aims to develop college curricula in terms of specialised areas which are closely aligned to characteristics of the regional economy, thereby improving the relevance and competitiveness of colleges and universities.

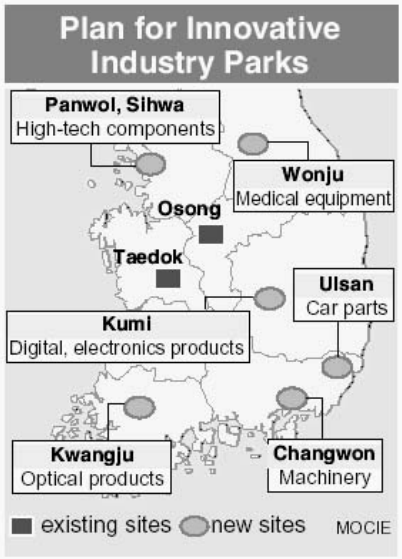
The NURI project also aims to promote regional development by training high quality manpower. The project will cultivate college graduates through various educational programmes that reflect the demands of the labour market as well as the needs of regional industries. The resulting highly qualified college graduates are expected to invigorate the regional economy. Another essential purpose of the NURI project is to establish the Regional Innovation System (RIS), in which HEIs, local governments, research institutes, and corporations build partnerships for mutual development and improvement (Lee, 2005).

South Korea is pushing to develop clusters of innovation centers around the country to help drive industrial growth. In 2004, the Ministry of Commerce, Industry and Energy (MOCIE) announced the creation of six innovative clusters in Korea (Figure 5). [8]

[7] Brain Korea 21(BK21) is a human resource development program recently initiated by South Korea's Ministry of Education with $1.2 billion proposal. The Ministry has targeted what it considers the seven most important fields in science and technology necessary to enhance national competitiveness in the 21st century. These are: information technology; biotechnology; mechanical engineering; chemical engineering; material science; physics; and chemistry. The objective of BK21 is to produce the next generation of world class leaders in these fields by upgrading research infrastructure and graduate-level training in Korea.

[8] http://times.hankooki.com/lpage/200406/kt2004060315561410160.htm June 2004

Figure 5 Innovative Clusters in South Korea



Source: *Korean Times* 03 June 2004

Currently, seven regions in the country - Changwon, Kumi, Ulsan, Kwangju, Wonju, Kunsan and the Panwol-Sihwa region - are to host pilot clusters, with businesses focussing on a variety of fields ranging across machinery, automobile parts, mining technology and medical equipment. Unlike normal industrial clusters, innovation clusters define roles for such services as consulting, research and development, and knowledge-based business activities, and focus on close cooperation between these sectors to generate value-added growth. It is expected that the expansion of the value-generating clusters will boost research and development, and generate closer cooperation between businesses schools and technology institutes. These developments can also boost employment, which the country sees as being a key part of growth.

In the case of South Korea, construction of regional innovation systems has been promoted by strong initiatives of the central government to decentralise and liberalise economic planning and policy implementation. As Park (2003) shows in the case of the South Korean automobile industry, there are forces at work, sometimes in conflict, at multiple geographical scales. With respect to a state-led economic restructuring project, contestation between national and local forces contributed to the government's liberalisation policy. Park argues that the globalisation of the South Korean industries in recent years was facilitated not only by the external forces of globalisation but also by an institutional fix by the nation-state (particularly the liberalisation of policy) to a regulatory deficit, which stemmed from the national-local tension.

The Regional Innovation System in Korea is a political dynamic process in which the negotiation between global, national and sub-national actors can enhance local institutional embeddedness of innovation. The process has just begun, and the future is conditioned by the global political-economy in which the state is embedded.

5 Towards Regional Governance of Science and Innovation?

This Hot Topic about national and regional innovation policies and their policy environments in two nations in East Asia highlights the fundamental transformation of their S&T and innovation policies.

S&T policies in these countries have shifted in emphasis over the past decades. The structure and financing has been profoundly changed in these two nation-states, hitherto characterised as centralised countries. Japan and South Korea have witnessed different forms of 'regionalisation' of innovation policies with enhanced local university-industry links.

In both countries, universities have become an integral and significant part of national/regional industrial and science strategies. They are also identified as important vehicles for accomplishing regional development.

However, what *region* means in each national context is substantially different, and the extent to which the RIS notion is part of the current policy thinking varies in each country. The structure of multi-level governance is evolving at a different pace - in both cases the processes are still incomplete.

We started with the following principal question: How can the capacity for knowledge creation and exploitation in the context of Regional Innovation Systems be developed as a means to *constructing regional advantage*?

Regional Innovation Systems around the world are at various stages of construction, conditioned by the different national innovation environments. Each innovation system needs to be considered and reconsidered in terms of the fundamental and unique role that firms, research institutes, universities and government organisations have played and are playing in the cumulative systems of knowledge generation and diffusion.

Japan and South Korea have both had strong private sector R&D, with strong geographical concentration to the Metropolitan capital areas, which have been one of the drivers for national economic growth. In East Asia, each national innovation system seems to have a relationship between the economic development stage and the types of *dirigist* innovation systems promoted by the central government.

Renewed attention now needs to be paid to the new role and impact of the public sector and policy support for innovation, including public-private partnerships. Governments may promote joint funding for projects, University-Industry cooperation centres and other commercialisation of research activities by different central government agencies, which may encourage further joined-up thinking in public innovation, support and induce private support in financing. New governance models of innovation and S&T, encompassing multiple spatial levels, need to be designed and implemented.

From a policy and institutional point of view, the following points are important in terms of the changing Regional Innovation Systems in Japan, South Korea, and across the East Asian national innovation systems.

First, the two nations have witnessed huge changes in terms of the relationships between central and local government as well as among local governments. South Korea is clearly is at the beginning stage of establishing regionally embedded innovation systems, whereas Japan may have developed more locally embedded innovation support mechanisms than South Korea (Hassink, 2002), but not with a governance structure at a regional level.

In both these innovation systems, issues remain in relation to balancing between market and administrative mechanisms which play an important role in resource allocation. The ability to finance locally, and fully articulated political commitment to decentralisation, seem to be the key factors which structure the regional governance of science.

Secondly, the current emphasis on academic entrepreneurship to construct regional advantage is a common feature in the two nations. There are two important policy issues here. One is how to optimaise public policy support to academic as well as corporate entrepreneurship activities; and the other is the importance of private financing available to different stages of academic entrepreneurship and how to ensure this. In terms of university-business links, structural and cultural issues are brought to bear in relation to current university reforms in each country. To a large extent, the success of university technology transfer and university-industry links relies on the quality of the local innovation environment.

Developing horizontal linkages within a country between industrial policy, SME support policy, higher education and S&T policies is an important issue for the two nations. In order to develop such university-business collaboration into a robust system of innovation, a longer-term perspective should be taken, following the stages of development of firms, university research and the organisational capacity of other intermediary organisations. The greater focus of funding R&D in technology-based SMEs, and linking academic entrepreneurs with private entrepreneurial firms, may increase entrepreneurial activity and facilitate

innovation processes. For universities, developing a staged series of interactions with low- and mid-tech SMEs may be achieved by using students and technicians as a first line of assistance, to conserve faculty resources for difficult cases and to expand the number of firms that can be assisted.

Reservations have been expressed about the role played by universities in geographically peripheral areas of Japan and South Korea, given the high concentration of existing R&D efforts in core academic institutions. Wider structural problems are also foreseen with regard to meeting skill shortages in peripheral regions, given the greater job opportunities that exist in the national industrial heartland.

The national government may take a more strategic and integrated approach, to enhance innovation at local and regional levels, by giving more incentives to universities and other research institutes, both public and private, to play more active roles, and by strengthening decision-making power and governance mechanisms at the regional level.

Especially in local contexts, policy-makers and innovation support organisations have to recognise and re-design the existing linkage between universities, public research institutes and local business, by consolidating vertical as well as horizontal partnerships. There is a need to train and incentivise people with coordinating skills who can act as 'animateurs' or 'boundary-spinners' across organisational and sectoral boundaries.

Thirdly, each national innovation system needs to be examined in light of the growing dynamics of economic linkages and human mobility throughout the Asian and Pacific economies. These encompass multiple spatial levels within the globalising knowledge economy. One factor encouraging inter-agglomerative linkages within East Asian regions has been the movement of multinational corporations into East Asia, including those of Japan and South Korea. In terms of constructing regional advantage in East Asia as a wider region, there needs to be a robust set of R&D data at the local, regional, national and trans-national levels, with internationally comparable indicators for global, national and sub-national policy-making.

At the same time, the transformation of each East Asian regional innovation system needs to be investigated in relation to emerging trans-national innovation systems in East Asia, with growing inter-cluster competition and partnerships. Issues of governance scales of innovation and S&T policies haven't been sufficiently discussed within East Asia, and there are lessons to be learnt from experiences of other trans-national cooperation in the EU and in South East Asia.

Local economic development is shaped by decisions taken at the national level, and increasingly influenced by international forces. Policy-makers and practitioners who manage economic development at the local level on a day to day basis work in multi-level structures of innovation processes. The interdependent and sometimes asymmetrical nature of such multi-scalar innovation systems needs to be borne in mind when formulating policy frameworks for the governance of science and innovation within globalising knowledge economies. Regionalising innovation policies at both sub-national and trans-national levels may be necessary for the more effective, sustainable and democratic future governance of innovation and science.

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