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Common Trajectories of Regional Competitiveness in the Knowledge Economy: A European Investigation

by

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COMMON TRAJECTORIES OF REGIONAL COMPETITIVENESS IN THE KNOWLEDGE ECONOMY: A EUROPEAN INVESTIGATION

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ABSTRACT

This paper analyses a number of European regions that in the last decade, through a considerable change in their economic base, experienced a remarkable growth path and a significant increase in their competitiveness. The analysis was carried out with the aim of recognizing the main determinants (or factors) of territorial development behind each regional renewal process and capturing (in a necessarily stylized manner) a number of common trajectories of regional competitiveness. Interestingly, all regional 'success stories' are strongly dependent on the presence of a tri-polar regional innovation system 'gluing' firms, institutions and academia.

Keywords: regional innovation system, factors of territorial development, trajectories of regional competitiveness, regional development

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1 Introduction

The recent past has witnessed a growing interest on the part of both regional economists and geographers towards the phenomenon of geographical agglomeration of economic activity. One of the reasons may stem from the so-called *location paradox*, i.e. the fact that in a more and more globalised world, where distance should not be an obstacle and capital and knowledge should travel freely and at a high speed, we observe a tendency for the spatial concentration of economic activities.

The aim of the paper is to stylize the main factors of success of a number of European regions in their development into knowledge economies, i.e. economies which are directly based on the production, distribution and use of knowledge and information. The emergence of the knowledge economy concept, based on the recognition of knowledge creation and technical progress as important determinants of economic growth and competitive advantage at both national and local level, has been favoured, particularly in the 1990-2000 decade, by the rapid technical progress in the areas of computing, biotechnology, telecommunication and transportation. This has profoundly changed the way in which economies, organizations and governments work. Moreover, the marked growth in knowledge-intensive services coupled with the in-depth change in the nature of workplaces towards high-skilled labour seems to have signed the transition from the industrial to the post-industrial era. In this framework, regional economies – as seats of value added activities, institutions and organizations – benefit from synergies and interdependencies among territorial actors and need to maintain a high level of competitiveness and attention to local processes of change in order to support firms in their renewal processes.

In particular, we considered six European regions that in the last decade exhibited a significant shift towards knowledge intensive industrial sectors coupled with a remarkable increase in their competitiveness and growth. We then analysed the six regions' development process with the aim of capturing the main determinants behind each regional 'success story' and capturing a number of common trajectories of regional competitiveness.

The paper is organized as follows. Section 2 reviews the key features of the literature on regional economic development. Section 3 identifies the main factors of development for each of the six European regions under inquiry. Section 4 gives a

tentative generalization of the results above, suggesting a taxonomy of trajectories of regional competitiveness, each encompassing a number of development factors and suited for a sub-set of regions. Section 5 concludes the paper.

2 Review of the literature on regional economic development

The importance of regions and firms' location was recognized in the economic literature more than a century ago. In fact, Marshall developed the notion of *industrial district* in the *Principles of Economics* (1890) and in *Industry and Trade* (1919) studying the industrial configuration of the English region of Lancashire and establishing that the economic development of this area was driven by a network of small and very small producers operating on an optimal scale thanks to labour division. Marshall also introduced the notions of *agglomeration economies* and *industrial atmosphere* suggesting a three-fold classification of centripetal forces: labour market pooling, access to a great variety of specialised intermediate goods and services, knowledge spillovers. In his view, firms in clusters benefited from a better access to workers both in absolute terms and at a lower and recruiting cost, had easier and more efficient relations with suppliers and customers, and absorbed knowledge accumulated by other firms, suppliers, customers and workers via market and non market channels (Boente, 2003).

The debate on Marshallian externalities found new impetus in the 1970s and 1980s when, in addition to the perceived importance of *mutual trust* and *cooperation* among rival firms and to the recognized supporting role of *local institutions*, such notion was employed by a strand of scholars to detail the industrial organization and the economic structure of industrial districts (see, among others, Becattini, 1979; Brusco, 1982; Piore and Sabel, 1984; Pyke et al., 1990). Furthermore, the concepts developed by Marshall were taken on in the 1990s by the literature on local economic development to account for the success of a number of high-tech regions, such as Silicon Valley, Route 128 and Cambridge. The theoretical contributions in this area may be essentially grouped along two research streams differing for the territorial actor considered to be the fundamental engine of regional dynamics.

The first stream of research may be identified starting from the ideas of the *Groupe de Recherche Européen sur les Milieux Innovateurs* (GREMI), whose pioneering works date back to Aydalot (1986), Aydalot and Keeble (1988) and Camagni (1991). According to this school, local development must be interpreted in the light of the notions of *innovative milieux* and *untraded interdependencies* among firms ('modern versions' of Marshallian industrial districts and industrial atmosphere, respectively) and of the active role played by regional *processes of collective learning* **(**Camagni, 1991; Lorenz, 1992; Lawson, 1997; Lawson and Lorenz, 1997; Keeble et al., 1999). In particular, the notion of collective learning developed by this group refers to the ability of an innovative milieu to generate and circulate innovative behaviour by the firms which are members of that milieu. The local milieu may be defined as "a set of territorial relationships encompassing in a coherent way a production system, different economic and social actors, a specific culture and a representation system, and generating a dynamic collective learning process" (Keeble et al., 1999). The main argument of this school of thought is that interaction among local firms fosters local development by reducing the degree of uncertainty that firms face in a rapidly changing technological environment.

The second line of research is associated to the work of Asheim (1996), Morgan (1997a) and Simmie (1997), who developed the concept of *learning region*, and to the work of Cooke (1992), Cooke et al. (1997, 1998) and Braczyk et al. (1998), who studied regional dynamics based on the concept of *regional innovation system* (RIS). Innovation may be defined as the commercialization of original knowledge, i.e. the transformation of knowledge into novel wealth-creating technologies, products and services (Cooke et al., 2003). The region is viewed as the key jurisdiction for innovation given the social and often tacit nature of innovation, "animated as it is by the agglomeration of specialized and localized skills, knowledge, learning, public and private institutions and other resources that make up the region" (Cooke et al., 2003). In particular, the focus of the RIS approach is to determine a certain institutional configuration capable of promoting innovation within a region. The link of this second school of thought with the traditional literature on industrial districts may be identified in the common importance given to the 'institutional foundations' of regional competitive advantage.

We could therefore conclude that the main difference between the two modern strands of research on regional economic development is that the *collective learning* literature posits that local development is mainly powered by the networking activities of local firms, whereas the *regional innovation system* approach focuses on the key role played by local (private and governmental) institutions. In sum, from Marshall on and until a few years ago, the model of local development has always been bi-polar, built upon the two variables (*i*) *firms* and (*ii*) *local institutions* and the various theories on local development developed thereafter have differed from one another essentially for the relative importance given to each of the two basic elements of development.

In the last few years, parallel to the increase of empirical investigations upon European high tech clusters, the RIS literature opened to a further territorial actor besides firms and local institutions, i.e. the (technical and scientific) university, viewed as the primary source of knowledge creation and human capital formation, and the RIS model became tri-polar, or triple helix (Etzkowitz and Leydesdorff, 1999, 2000). Now, that universities are important sources of new knowledge and that their presence nurtures the local labour market with people with technical and managerial skills has been well known in the literature for a long time (see, for example, OECD, 1981) However, that university represents one of the chief components of local economic development by fostering innovation (through research collaborations with firms) and by stimulating local entrepreneurial spirit (through spin-off activities) is the outcome of relatively recent theoretical and empirical studies (see, e.g., Athreye, 2001; Gerszewski and Krieger, 2002; Paci e Usai, 2003).

3 Main factors of regional development in European high growth regions

Next, we considered six European regions that, through a considerable change in their economic base, experienced in the last decade a significant increase in their competitiveness and a remarkable growth path. In particular, our investigation focused on the transformation process of three small North European countries – Finland, Sweden and Ireland – two British regions – Scotland and Wales – and the area around the medieval British university town of Cambridge. We then analysed their change through the lens of the triple helix regional innovation system approach with the aim of

recognizing the main competitive factors behind each regional 'success story' and capturing (in a necessarily stylized manner) a number of common trajectories of regional competitiveness.

Finland

Finland occupies the extreme north-eastern part of Europe and has about 5 million inhabitants. More than 65 percent of its surface is covered by forests while only 8 percent is devoted to agricultural land and human settlements. Its geographical position has traditionally allowed the country to act as base to international trade among EU, Nordic European countries and Russia. After a very severe depression in the early 1990s mainly caused by a domestic financial crisis and the collapse of Russia, since the mid 1990s Finland emerged as one of the most flourishing, dynamic and competitive OECD countries. The average annual GDP growth rate increased from a -3.5 percent in 1991-1993 to an average 4.7 percent in 1994-2000. Unemployment dropped from 20 percent in 1993 to about 9 percent in 2000 (Blomström et al., 2002).

Traditionally dominated by the raw material based industry – paper, wood and metal products – the Finnish economy recovered by rapidly concentrating on high technology products, particularly telecommunication equipment. Nokia may be regarded as the chief engine and symbol of Finland's transformation process, having itself moved its core business from pulp and paper products to electronics and communications about a decade ago. Such shift was triggered by a peculiarity of the Finnish market, i.e. the fact that the telephone network was never monopolized by the State: the existence of a multi-operator telephone market, on one side, generated high competition for customers and hence contributed to fast technological change in the industry and, on the other side, allowed Nokia to set up business collaborations and 'R&D joint ventures' on international markets with a number of foreign ICT companies operating domestically. For instance, although the first GSM networks were launched by Nokia in 1991, the development of the first GSM network was realized in 1987 when Nokia set up an alliance with Alcatel and AEG. It is worth noticing in this respect that Nokia is the only European ICT firm that has pointed to the global market since the 1980s while other leading manufacturers such as Ericsson, Alcatel and Siemens restricted their operations within Europe, voluntarily staying out of the US, UK and

Japanese markets (Pulkkinen, 1997). However, Nokia's competitiveness is not only due to the company's ability to seize the opportunities of a rapidly growing market coupled with a marked international orientation, but also to its renown strategy aimed at improving human capital quality and managerial skills. Since the late 1970s, Nokia heavily invested both in specialized in-house training programs to raise the educational level of existing staff and in financial aids to Finnish technical and scientific universities to spread knowledge among young generations. Nokia University was founded in 1980. Today, Nokia is one of the world's largest corporations, with sales of 29.5 billion € (of which 98.8 percent is exported mainly to the US, UK, Germany and China) and a market capitalisation of 52 billion €, equal to more than 40 percent of the Helsinki stock exchange total market capitalisation.

Nokia's development drove the growth of hundreds of local suppliers, giving rise to a remarkable increase of the Finnish ICT sector: between 1990 and 2000 the share of production of the ITC cluster in the Finnish economy surged from 7.6 percent to 29.4 percent and the corresponding share of exports rose from 12 percent to 30 percent (IMF, 2001).

In addition to the key role played by Nokia and the ICT cluster, Finland's rapid increase in growth and competitiveness may be explained also through the effort of the government to raise research intensity in the economy. The government first area of intervention was that of science and technology with policies aimed at rising R&D investments: research collaborations between universities and industry were promoted; in 1983 the National Agency for Technology, TEKES, was founded with the objective to fund industrial and applied research; in 1987 the national Scientific Council was rethought and renamed Science and Technology Policy Council (STPC) with the function of think-tank among the main actors of Finland's economic, business and scientific communities. In those years the Government also took active moves in the liberalization of the financial sector, which in turn offered new financing opportunities to the most innovative high technology firms.

Both Nokia's mounting role within the ICT sector and the effects of public research enhancing public policies may be appreciated through the extraordinary increase in investments in R&D that Finland has experienced since 1985. Considering both public and private investments, R&D expenses as a percentage of GDP rose from

1.55 percent in 1985 to 2.17 percent in 1993 up to 3.40 percent in 2001. Nokia itself represents almost 30 percent of R&D investments: more than one third of its 51,000 employees works in a research division in one of its 55 centers and labs located in 15 different countries. However, even excluding Nokia, Finland's R&D investments in the year 2000 would have topped 2.4 percent of GDP, a higher share than the OECD average (Blomström et al., 2002).

Sweden

With 8.9 million inhabitants and more than 60 percent of land covered by forests, Sweden shows a 'success story' in many respects similar to the one highlighted for Finland. Sweden was severely hit by a domestic real estate and financial crisis that spread to all sectors of the economy during 1991-1993 but rapidly regained productivity and competitiveness: exports rose from 30 percent of GDP in the early 1990s to almost 50 percent of GDP in 2000 (Blomström et al., 2002). As for Finland, the development of Sweden was led by the ICT sector, in turn headed by Nokia's Swedish competitor Ericsson.

Unlike Nokia, Ericsson had deep roots in the telecommunications business when the modern mobile phone technology emerged in the 1970s as the company was founded already in 1876 to manufacture telephones and switchboards. In the development of the Swedish mobile phone industry, Ericsson had a key partner, the state-owned company Televerket, who had started to invest and work on mobile systems (viewing them as a 'public good') since the 1950s. Cooperating with Televerket allowed Ericsson to share the long-term financing of R&D costs of mobile related technologies at their early development stage, when the business was highly risky and its outcomes uncertain. In particular, Ericsson and Televerket (together with researchers from four Swedish technical universities) set up a research group in 1977 to develop the specifications for GSM network. Interestingly, this research group that would have made Ericsson a world player was not recognized by the top management until the early1990s when, with the breakthrough of the GSM technology, the company finally understood the group's work and the importance of mobile handset production. As for Nokia, the key to Ericsson's success was the management's international orientation. By adapting his production to the various countries' different standards, it started to

rapidly expand abroad. Ericsson succeeded in entering the US market very early and by the late 1990s Ericsson became one of the world leading cellular infrastructure suppliers, with 30 percent of the US market and competitive positions in the UK, Germany Italy and Japan (Blomström and Kokko, 2002). Today, Ericsson has operations in 140 countries, sales of 117.7 billion Krona (12.9 billion €, of which 95 percent is exported), more than 51,000 employees and a market capitalisation of 335 billion Krona (36.8 billion €), equal to a share of almost 20 percent of the Stockholm total market capitalization.

As for the case of Nokia, Ericsson's performance and the rapid growth of the ICT sector in Sweden must be considered within a wider frame so as to include the role of government institutions and public policies in supporting knowledge creation and diffusion and contributing to the improvement of the business climate. First, public policies were put forth to encourage Swedish firms' R&D investments. For instance, tax deductions were introduced for R&D spending and in 1968 the National Board of Technical Development, STU, was funded to support private projects of applied technical research and to plan incentives to firms' research spending. As a result, Sweden has been one of the world's leading countries for research intensity already since the 1960s. In 1993 Sweden became the first country in the world with a share of R&D investments over GDP of 3.27 percent and has maintained the top position ever since reaching a share of 4.28 percent in 2001.

Investments in higher education represent another important factor that supported Sweden's recent development. Relative to other OECD countries, in fact, at the beginning of the 1990s Swedish manufacturing industry revealed a low ratio of professionals with third-level education to total employment, particularly in technical and scientific disciplines. This phenomenon was certainly due to the high and progressive income tax burden but also to the limited supply of most university programs. In response to this lack, measures were taken by the government to expand academic courses and programs and various adult education schemes were put into place by firms with governmental aid.

Ireland

In the last 15 years Ireland has lived a structural transformation, moving from a slow pace low-skill low-pay economy to a dynamic high-skill high-pay economy based on knowledge intensive industries. Between 1987 and 1996 GNP grew at an average annual rate of 5.4 percent. Unemployment, the country's structural problem since Ireland's establishment in 1922, significantly dropped from 19.1 percent in 1987 to 10.3 percent in 1997 (Sweeney, 1998).

The key factor of what is often referred to in the literature as the 'Irish miracle' was the ability of the region to attract substantial foreign direct investments (FDIs) through attractive packages of public grants, concessions and tax incentives in favour of foreign investors and through the establishment of a regional development agency, the Industrial Development Agency (IDA). This policy of FDI support has always been maintained by the various governments that ruled the country in the last 15 years generating a climate of certainty and trust which is crucial for location choices of multinational enterprises. As a result, foreign direct investments surged from 7.2 percent of GNP in 1990 to 14.4 percent in 1995, up to 68.2 percent in 2000.

The Industrial Development Agency was founded with the specific aims of pursuing industrial development policies and policies aimed at attracting FDIs. Since the 1970s the Agency pointed at industries such as electronics, pharmaceuticals and chemicals and targeted the strongest companies in these industries as potential sources of FDI projects. The US was also chosen as preferred country for incoming foreign investments. As a result of the pro-active role of the IDA, several multinationals such as Apple, Verbatim, Intel, Microsoft, IBM, HP and Kodak set operations in Ireland. This organization has been a major force for Irish industrial development and it is considered among the world's best agencies to attract foreign investments (O'Connor, 2001).

Central to the identification of Ireland as location choice for FDIs is the high education of the workforce. More than 40 percent of the workforce has a third-level education (against the EU average of 20 percent) and more than 80 percent has a secondary school diploma. Since the 1990s the Government has been pursuing a strategy of investments in science, technology and innovation, devoting substantial funds to these sectors. In particular, Programs in Advanced Technology were started

between 1989 and 1991 thanks also to EU funds and represent a unique combination between firms and university.

Both investments in education and the presence of multinational companies supplied Irish workforce and managers with high skills and competences. Further, many of the highly educated Irish emigrants came back to Ireland with experience and skills acquired abroad: 39 percent of over-40 years old workers holding a university degree left Ireland and came back after gaining a job expertise abroad (Colombelli, 2003).

Wales and Scotland

Also the British regions of Wales and Scotland, with a population of 3 and 5 million people (representing 4.9 percent and 8.5 percent of the UK population) respectively, experienced in the last twenty years a profound transformation in their industrial structure, moving from an economy dominated by declining sectors such as coal and mining and steel to higher growth and more profitable high tech and service sectors. Wales and Scotland's regional development may be associated with that of Ireland for their industrial renewal was largely driven by inward investments. Looking at the regional shares of new jobs associated with foreign direct investments within the UK since the 1980s, we establish that Scotland and Wales were the foremost destinations of overseas projects. In particular, Scotland has the longest tradition in foreign enterprise ranking first almost invariably throughout the 1980s and the 1990s, whereas Wales gradually achieved competitiveness being able to attract in the 1990s up to 20 percent of total UK inward investment projects (Tewdwr-Jones and Phelps, 2000). In Wales, in particular, following the 100.000 job losses during the 1970s and 1980s due to the crisis of the coal and mining sector, new overseas investments generated 160.000 jobs and unemployment rate dropped from 7.3 percent in 1989 to 5.3 percent in 2001. Also, Scotland has exhibited a declining unemployment rate since the 1980s by virtue of FDI attraction, even if the unemployment rate in 2001 was still somewhat higher than the UK average (6.6 percent against 5.1 percent).

The recent economic development in Scotland and Wales crucially depended on the pro-active role of the two regional development agencies – the Scottish Enterprise (SE) and the Welsh Development Agency (WDA) – in attracting and supporting foreign investors. As Morgan (1997b) quotes, "in less favoured regions, where private

institutions are often thin on the ground, public sectors agencies invariably have to assume the leading role in animating economic development". In the first years following their inception, these agencies were essentially engaged in ensuring the basic conditions for the location of foreign enterprises in Scotland and Wales, such as the assistance in the search of building sites, and administrative and financial advice. In the following years, the role of the Agencies became more significant as the needs of foreign investors were continuously developing and required more and more social infrastructures, skilled labour and the presence of networking activities with other firms. As a result, the Agencies began to participate to the definition of regional development strategies in cooperation with the other key elements of the local system – local authorities, other institutions, universities and the business community – contributing to the process of regional institutional thickening and formation of interdependencies among territorial actors in Scotland and Wales. The key role played by these institutions was soon recognized by the central Government and in 1999 regional development agencies in the other British regions were established.

Beyond 'institutional capacity', other important factors explaining Wales and Scotland's ability to attract inward investments are the thin regulation of the labour market, the presence of skilled work, and – last but not least – the English language.

Cambridge

The *Cambridge Phenomenon* is a term coined by Segal, Quince and Wicksteed in 1985 to describe the mushrooming of over 300 high-tech firms in the Cambridge region, roughly defined as encompassing settlements within a ray up to 25 kilometers around the university town of Cambridge. This number has grown steadily over the years and today the region hosts almost 1,000 firms employing more than 52,000 people and operating in various technology-based sectors (R&D, computer hardware, computer services, electrical and electronic, chemicals, instrument engineering).

What caused a high technology cluster of firms to locate in a rural area, poorly served in terms of infrastructural services and communications links and historically far from the country's primary centers of industrial development? In other words, and directly to the point of our study, which are the key factors that allowed the Cambridge

region to become so competitive as to be often referred to as the European Silicon Valley?

First, there is little doubt that the active role of the University of Cambridge was central to the emergence of the Phenomenon. In addition to the university reputation for excellence and prestige (certainly important for the attraction of human capital of excellence), the key factor in the transformation process of Cambridge was the liberal policy of the university towards faculty members, who are free to engage in outside work and commercially exploit their know-how and skills (Segal, Quince and Wicksteed, 1985, 2000; Keeble et al., 1999; Druilhe e Garnsey, 2000; Athreye, 2001). Such policy encouraged academics to start-up businesses or become technical and scientific consultants to the high tech firms of the region: as a result, 30 percent of the firms of the cluster directly originates from the university, even if the university may be considered, directly or indirectly, as the source of all cluster firms (Segal, Quince and Wicksteed, 1985). The cooperative climate between university and industry may also be assessed by the extent of research collaborations that have been put forth since the 1990s: world giant corporations such as Microsoft, Oracle, Unilever, British Petroleum and Hutchinson Whompoa heavily financed the setting up of research laboratories and centres to be operated by Cambridge University researchers and scientists.

A second important factor adding to the Phenomenon was the availability of private financing. In the late 1970s the Barclays Bank took the strategic decision to open an office in Cambridge to finance first-time high tech entrepreneurs and help them develop and implement a business plan. Since then, a large number of banks and venture capital firms along with a wide array of other business support facilities (among which the British Patent Office) settled in Cambridge and helped local high tech businesses to start up and prosper (Segal, 1992).

A third important reason of the Cambridge Phenomenon lies in the marked entrepreneurial motivation and talent, in turn triggered by the excellence of the human capital attracted in the region, but also stemming from an additional factor: the absence of an industrial past. The fact that in the Cambridge area there has never been heavy industry and unionized labour force “has helped create a labour market and a general attitude in which flexibility and individualism have never been suppressed” (Segal, 1992).

Last but not least, networking activities among local firms played an important role in developing a cooperative and supportive business environment within the emerging cluster. For instance, the Cambridge Network was established in 1997 among Cambridge IT firms and set up a website, Cambridge Connect, with the aim of fostering member firms' external visibility and promoting business support facilities available within the region (Athreye, 2001).

4 Common trajectories of regional competitiveness

Based on the investigation above, we identified a number of factors driving regional competitiveness and divided them in three groups, one after each territorial actor encompassing a triple helix regional innovation system: firms, university, regional (public and private) institutions.

Among the factors referable to firms, we included networking activities among firms (i.e. firms' belonging to associations, organizations and formal or informal networks), managerial skills, international openness / export orientation and entrepreneurial motivation, the latter being made up by a number of individual characteristics of the entrepreneur such as personality, skills, values, background and training (Herron and Robinson, 1993).

Moving to the regional competitiveness factors related to university, the analysis carried out on the six European regions established the importance of the presence of a local university for the qualification of the local labour market. The analysis also highlighted the relevance of industry-university links that in the regions inquired took up a variety of means such as research collaborations, the setting up of research centers and laboratories, the promotion of academic and business committees aimed at fostering regional visibility. Spin-offs from university was found to be another extremely relevant factor representing a direct measure of the contribution of university to new firm formation and, hence, to regional economic growth.

Last, we identified a set of regional development factors related to local 'institutional thickness' (Amin and Thrift, 1995). Within with set, we first divided private from public institutions and then split financial from non-financial support schemes, thereby obtaining four main regional development determinants: access to

private financing (such as banks and venture capital), presence of other private business support services (such as consulting firms), access to public financing / fiscal incentives (so important in the policies of FDI attraction and support), availability of other public business support services (such as development agencies).

The grid of regional development factors by territorial actor of reference is summarised in Table 1.

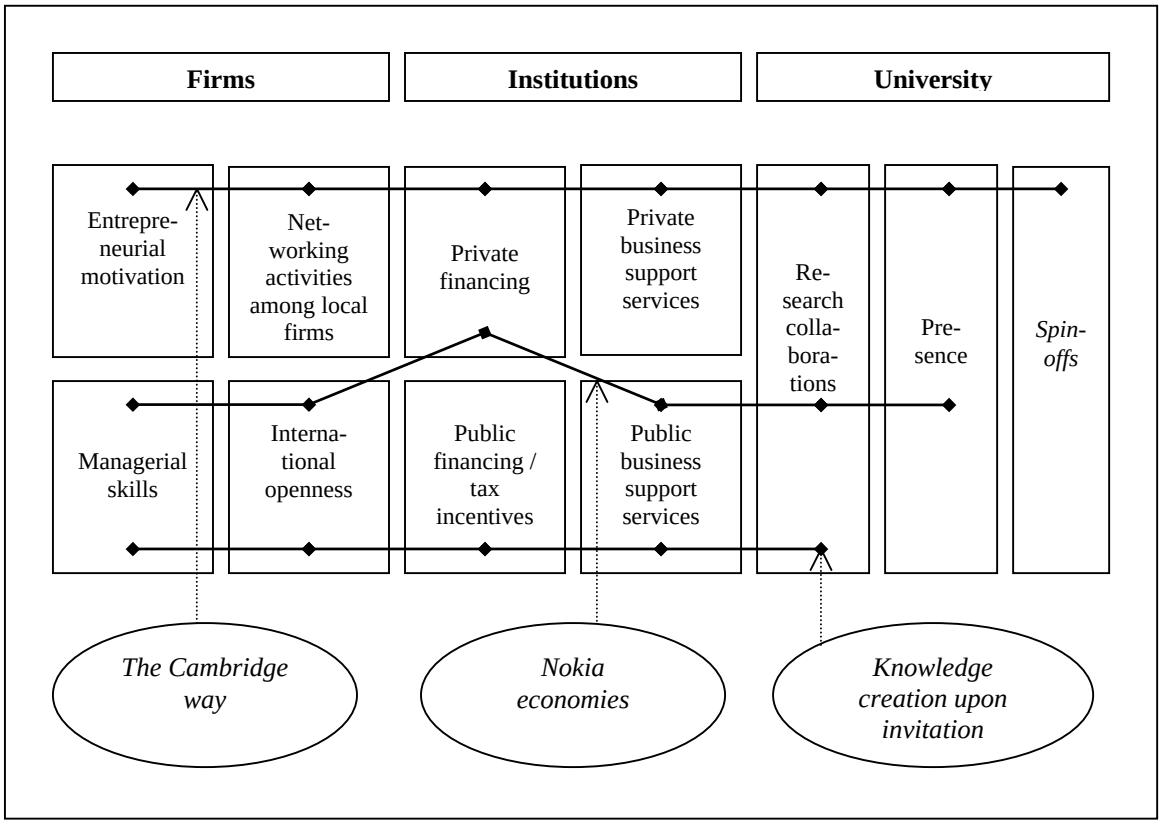
Table 1 – Main factors of regional competitiveness by territorial actor

Territorial actor	**Factors of regional competitiveness**
Firms	Networking activities among local firms Managerial skills International openness / export orientation Entrepreneurship
University	Presence Industry-university linkages Spin-off activities from university
Institutions	Access to private financing (banks, venture capital) Other private business support services (consulting firms) Availability of public financing / tax incentives Other public business support services (development agencies)

By reviewing the main factors driving the transformation path of the six European regions under scrutiny, we were able to spot three trajectories of regional competitiveness: (*i*) the *Nokia economies* trajectory, (*ii*) the *knowledge creation upon invitation* trajectory and (*iii*) the *Cambridge way* trajectory. These trajectories, along with the factors of regional development which they insist on, are depicted in Table 2.

In particular, the factors of regional competitiveness (depicted in the table as squares) are grouped by territorial actor of reference – firms, institutions, university – following the regional innovation system approach to local development. The trajectories of regional competitiveness are represented by the solid lines which 'cross' the territorial poles: each trajectory is characterized by a specific combination of factors of competitiveness and all trajectories are characterized by the simultaneous presence of factors related to all three poles of the model, giving evidence to the systemic character of regional competitiveness.

Table 2 – Trajectories of regional competitiveness



The *Nokia economies* trajectory includes the Nordic countries of Finland and Sweden, recently boosted around two giant companies, namely Nokia and Ericsson, capable of gaining a world leading position in ICT and driving the growth of hundreds of satellite suppliers. The leading factors of development of these regions can be brought back to the successful development strategies of Ericsson and Nokia, in turn based on excellent managerial and organisational skills and a strong international orientation. Moreover, these countries crucially benefit from a supportive system of government policies aimed at increasing domestic research intensity. Furthermore, it is important to signal the key role played by the University system in both countries and specifically in the technical research collaborations with Nokia and Ericsson.

The second trajectory of regional competitiveness refers to Ireland, Scotland and Wales, characterized by an 'industrialisation upon invitation' type of growth based on foreign direct investments. The policy of FDI attraction is largely supported by public incentives in the form of grants, concessions or tax incentives for foreign investors and

owes its success to the leading role taken up by regional development agencies in improving regional visibility and defining regional industrial and development policies in strict connection with the other territorial actors.

The last trajectory of regional competitiveness, the *Cambridge way*, relates to the high tech cluster of Cambridge, emerged and developed essentially thanks to the active role of Cambridge University in nurturing the cluster with human capital of excellence and in allowing the faculty members to commercially exploit their skills and technical know how. Central to the development of the cluster is the access to bank financing and the availability of other business support services. The development path of the Cambridge high tech cluster is often associated to the one of Silicon Valley: in fact, the literature has highlighted a number of similarities between the two local economies such as the active role of the university and the absence of any state intervention but also a number of differences essentially related to the absence of large firms in Cambridge and its smaller scale (Athreye, 2001).

The literature agrees on the importance of the systemic and regional nature of economic development processes. In particular, the regional innovation system approach posits that innovation processes are both systemic, in that they arise from interaction among territorial actors (Freeman, 1987; Lundvall, 1992; Nelson, 1993), and regional, the region representing the appropriate level of economic coordination for the achievement of competitive advantages in a global competition framework (Cooke, 1992; Storper and Scott, 1995; Braczyk et al., 1998). Moreover, in a recent work aimed at identifying possible scenarios of economic development for a number of Italian highly industrialized regions based on a benchmark of European knowledge economies, Brioschi et al. (2004) corroborate the centrality of the systemic component of regional development processes.

However, taking a 'provocative stand', we might want to disentangle the system organization and maintain that each trajectory identified in the paper has a territorial actor of reference. In this case, we would unquestionably associate the *Nokia economies* trajectory to firms, Nokia and Ericsson in particular, capable of guiding the Finnish and Swedish ICT sectors respectively up to the first position at national level both in terms of production and export shares. The *knowledge creation upon invitation* trajectory might be linked to institutions, given the central role played by regional development

agencies in promoting FDIs and fostering regional competitiveness in Ireland, Scotland and Wales. Finally, the *Cambridge way* trajectory should be related with the presence in the region of the highly prestigious Cambridge University.

5 Concluding remarks

We analysed a group of selected European regions which in the last decade have gone through a process of industrial, organizational and institutional renewal leading to a significant improvement of their competitiveness, with the aim of highlighting their driving factors of development. In particular, our analysis focused on the transformation process of three small North European countries – Finland, Sweden and Ireland – two British regions – Scotland and Wales – and the region around the British university town of Cambridge. Based on the above analysis, a number of factors driving regional growth were identified and three trajectories of regional competitiveness, each characterized by a subset of the above factors, were detected: (*i*) the *Nokia economies* trajectory, (*ii*) the *knowledge creation upon invitation* trajectory and (*iii*) the *Cambridge way* trajectory. The *Nokia economies* trajectory explains the development model of Finland and Sweden, recently emerged as two of the most flourishing, dynamic and competitive OECD countries by virtue of globally competitive ICT sectors. The *knowledge creation upon invitation* trajectory suits the development path of Ireland, Scotland and Wales, able to attract substantial overseas investments in knowledge intensive industrial sectors thanks to the pro-active role played by regional development agencies in formulating policies of FDI promotion and regional competitiveness. Finally, the *Cambridge way* trajectory fits the regional growth model of a cluster of relatively small high tech firms mushroomed since the 1980s around the British university town of Cambridge.

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