Looking at the Knowledge Economy: Some Issues on Theory and Evidence

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Abstract. Innovation activities contribute essentially to the regional dimension and growth. The technological infrastructure and innovation capabilities affect not only the regional growth, but also the whole periphery and economy as well. In the last decades, OECD /introduced some measures and indexes, concerning the Research and Development Expenditures, patents etc., that measuring the innovation activities. However, there are a lot of problems and questions regarding the measurement of innovation activities at a regional level. This paper attempts to analyze the whole framework of innovation statistics and in particular to examine the measurement and also the statistical estimation of innovation activities. On this context, it's also aiming to emphasize and to review the appropriate techniques, the most common methods and the particular problems.

Keywords: Innovation Activities, Knowledge Economy, Growth.

1 Introduction

The growing importance of technological change in world production and employment is one of the characteristics of the last four decades. Technological change is not only a determinant of growth but also affect the international competition and the modernisation of a country. The term "innovation" is somewhat ambiguous in common parlance it denotes both a process and its result. According to the definition proposed by the OECD in its "Frascati Manual", it involves the transformation of an idea into a marketable product or service, a new or improved manufacturing or distribution process, or a new method of social service. The term thus refers to the process. On the other hand, when the word "innovation" is used to refer to the new or improved product, equipment or service which is successful on the market, the emphasis is on the result of the process. This ambiguity can lead to confusion: when referring to the dissemination of innovation, does one mean the dissemination of the process, i.e. the methods and practices which make the innovation possible, or to the dissemination of the results, i.e. the new products? The distinction is important.

In the first sense of the term (innovation process), the emphasis is on the manner in which the innovation is designed and produced at the different stages leading up to it

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(creativity, marketing, research and development, design, production and distribution) and on their breakdown. This is not a linear process, with clearly-delimited sequences and automatic follow-on, but rather a system of interactions, of comings and goings between different functions and different players whose experience, knowledge and know-how are mutually reinforcing and cumulative. This why more and more importance is attached in practice to mechanisms for interaction within the firm (collaboration between the different units and participation of employees in organisational innovation), as well as to the networks linking the firm to its environment (other firms, support services, centres of expertise, research laboratories, etc.). Relations with the users, taking account of demand expressed, and anticipating the needs of the market and society are just as important - if not more so - than a mastery of the technology.

In the second sense (result of the innovation), the emphasis is on the new product, process or service. A distinction is made between radical innovation or breakthrough (for instance the launch of a new vaccine, the compact disk) and progressive innovation, which modifies the products, processes or services through successive improvements (e.g. the introduction of 32-bit chips to replace the 16-bit ones in electronic equipment, or the introduction of airbags in cars). New products, processes or services can appear in all sectors of activity, whether traditional or high-tech, public or market, industrial, agricultural or tertiary. Innovation may also concern services of general interest, such as public health, administrative procedures, the organisation of postal services or public education.

2 Knowledge-Based Economy

The increasing recognition by policy makers and academics of the importance of the emerting "knowledge-based economy" for future output and employment growth has yet to be reflected in any policy action. Of course. these positive employment outcomes achieved with a "painful" process of structural adjustment. Thus, the simple comparison, popular in many policy circles in the 1980s, of the United States' impressive and Europe's poor, experience in employment creation in the l970s and l980s, is now being complemented by trends in employment growth by educational category and accompanying earnings. However, different countries appear to have responded in different ways. In the U.S.A. labour market adjustment- has led to a substantial decline in real wages for the least-educated and least-skilled workers: in Europe it has led to much higher levels of unemployment in the unskilled labour force. The overall long-term tendency towards a more strongly knowledge-based economy, in terms of both input proportions and the nature of the output, is accelerating. At the firm level, this is reflected in the fact that the shift in the demand for skills is strongest in firms introducing information technology. The dramatic decrease in the cost of obtaining data and information produces a shock effect, while the decline in the price or information is at the core of a new wave of productivity growth. This is especially true for organisations and institutions strongly involved in the production, use and distribution of knowledge (education, research, development, but also firms as learning organisations). The measurement problem is probably as pervasive as information and communication technologies. Even individual firms' accounts are becoming increasingly unreliable. Not surprisingly the debate on trends in aggregate

productivity is strongly influenced by questions about measurement, not least because the decline in aggregate total factor productivity seems to be concentrated in the service sector and in conventionally measured capital productivity.

3 The Knowledge Economy: Knowledge Producers and Knowledge Users

There are two important types of knowledge industries to consider: First, there are those industries whose major product is knowledge itself; then there are industries that manage or convey information. The increased importance of knowledge means that the net stock of intangible capital (e.g., education and research and development) has grown faster than tangible capital (e.g., buildings, transportation, roads, and machinery).

In the New Economy, intangible capital has become at least as important as tangible capital, and a greater share of the value of tangible capital is based on intangible inputs. As we have become richer, we have increasingly consumed services and goods with higher value-added content. This trend is demonstrated by the fact that the economic output of the U.S. economy, as measured in tons, is roughly the same as it was a century ago, yet its real economic value is 20 times greater. In other words, we have added intangible attributes to goods and services, the most important being knowledge. One example is anti-lock brakes, which are the product of a generation of research and development, and are loaded with electronics. They don't weigh any more than conventional brakes, but they certainly provide a great deal more value to drivers. The Knowledge Innovation Assessment is an integrated design of ten diverse competencies essential in an innovation system:

Table 1. Knowledge Innovation Assessment

Collaborative Process	**Products/Services**
Performance Measures	**Strategic Alliances**
Education/Development	**Market Image/Interaction**
Learning Network	**Leadership/Leverage**
Market Positioning	**Computer/Communications**

It is a lack of investment in human capital, not a lack of investment in physical capital that prevents poor countries from catching up with rich ones. Educational attainment and public spending on education are correlated positively to economic growth. School quality measured, for example, by teacher pay, student-teacher ratio, and teacher education is positively correlated to future earnings of the students. Education is important in explaining the growth of national income. Life-long learning is also crucial. People with human capital migrate from places where it is scarce to places where it is abundant. "Human capital flight" or "brain drain" can lead to a permanent reduction in income and growth of the country of emigration relative to the country of immigration. We need more technical graduates. Research and Development ability to innovate a key competitive advantage.

4 Technological Framework and National System of Innovations

The analysis of system of innovations helps us to understand and to explain, why the development of technology is necessary in a certain direction and at a certain rate. We should be very careful in the definition of the "national systems" according to which sub-systems should be included and which process should be studied in the different countries. The government engages itself towards innovation policy because it has been considered that innovation is a key point for the national economic growth. In order to decide how the governments should decide to promote the innovations, it is useful to know the specific context in which the national government interfears. There is the concept of "national innovation system" itself. Each of the terms can be interpreted in a variety of ways and there is a question of whether in which technology and business are transnational increased the concept as a whole makes more sense.

Freeman first and Nelson after were the persons who had introduced and explained the use, the concept of national systems of innovations. Freeman in his book for Japan refers to the nation-specific organization of sub-systems and to the interaction between sub-systems. Freeman base in the interaction between the production system and the process of innovation. Nelson's work was based upon the production of knowledge and innovation and upon the innovation system in the narrow sense. Finally, the recent book of M. Porter was based in the following determinants of Firm strategy, factor conditions, demand conditions, and supporting industries that affecting the competitiveness of a national industry. The national systems of innovation presumes that nation states exist and this phenomenon has two dimensions:(a).the national-cultural (where all individuals belong to a nation which is defined by cultural, ethnical and linguistic characteristics), and (b).the etatist-political (where there is one geographical space controlled by one central state authority without foreign nationalities). In some cases, it is not even clear where locating the borders of a "national system of innovations". The first approach and definition of "system of innovations" is that, it's a social system that is constructed by a number of elements, while there is a close-relationship between these elements. These elements are "interacting" in the production, diffusion, and economic cycles. We can define "the system of innovations" from a "narrow" view. According to "the narrow definition" it includes organisations and institutions that of involved in searching and exploring the new technologies (such as technological institutes, and research departments). From the other side, the "broad" definition follows the theoretical perspective and includes the different parts of economic structure (such as the production system, and the marketing system). On international scene, when the large countries change the orientation of research activities, this is affects the small countries.

Figure 1 shows a simple model of national systems of innovations; in particular, we can see the information, communication, legal structures and congitive frameworks which influence all activities in the above diagram.

The "mechanisms" of technology and competition policies are usually complementary and both are aiming to increase the entrepreneur's creativity and to attribute the industrial and economic growth. It is important to harmonise the technology "mechanisms" with the competition policy. The competition policy that are related to research and technological activities have also an important impact in the market structure. If there is a healthy competitive environment in the market for goods.

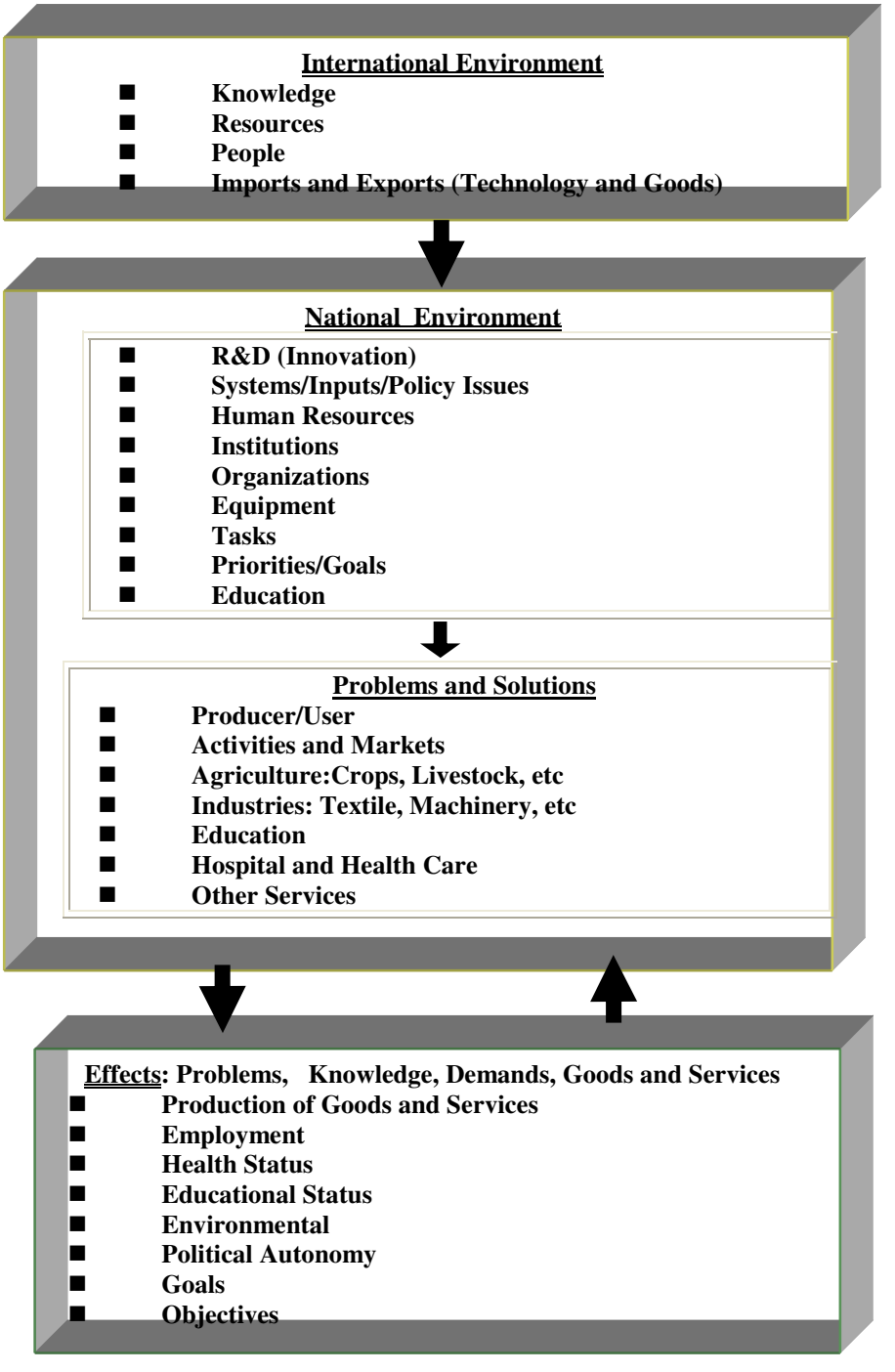

Fig. 1. A simple model of national systems of innovation

and services then the entrepreneurs have a greater incentive to develop new products and to invest in technologies and in research activities.

5 Knowledge, Innovation and Growth

The new theories of growth (known as "endogenous") stress that development of know-how and technological change - rather than the mere accumulation of capital - are the driving force behind lasting growth.

Table 2. Factors explaining the American and Japanese successes

Some of the factors explaining the American and Japanese successes	
United States	**Japan**
• A more important research effort	• idem
• A larger proportion of engineers and scientists in the active population	• idem
• Research efforts better coordonated, in particular with regard to civilian and defence research (in particular in the aeronautic, electronic and space sectors).	• A strong ability to adapt terchnological information, wherever it comes from. A strong tradition of cooperation between firms in the field of R&D
• A close University - Industry relationship allowing the blossoming of a large number of high technology firms.	• An improving cooperation University / Industry, especially via the secondment of industrial researchers in Universities
• A capital risk industry better developped which invests in high technology. NASDAQ, a stock exchange for dynamic SMEs.	• Stable and strong relationships between finance and industry fostering long term benefits and strategies.
• A cultural tradition favourable to risk taking and to enterprise spirit, a strong social acceptation of innovation.	• A culture favourable to the application of techniques and on going improvement.
• A lower cost for filing licenses, a single legal protection system favourable to the commercial exploitation of innovations	• A current practice of concerted strategies between companies, Universities and public authorities
• Reduced lead time for firms creation and limited red tape	• A strong mobility of staff within companies.

The meaning and scope of Innovation are defined in that Green Paper (COM(95)688. The Green Paper on Innovation opened up a number of pathways. For the sake of efficiency, this "*First Action Plan*" refers to a limited number of priority initiatives to be launched very soon at Community level and includes a number of schemes put into action or announced since the launch of the Green Paper, identified as essential to the innovation process.

On 20 November 1996, the Commission adopted the First Action Plan for Innovation in Europe following the wide ranging public debate stimulated by the Green Paper on Innovation. The Action Plan provides a general framework for action at the European and Member State level to support the innovation process. A limited number of priority measures, to be launched immediately by the Community, are identified. The plan also sets out those measures which are already underway or which have been announced since the launch of the Green Paper. Three main areas for action have been identified:

- *Fostering an innovation culture:* education and training, easier mobility for researchers and engineers, demonstration of effective approaches to innovation in the economy and in society, propagation of best management and organizational methods amongst businesses, and stimulation of innovation in the public sector and in government;
- *Establishing a framework conducive to innovation:* adaptation and simplification of the legal and regulatory environment, especially with respect to Intellectual Property Rights, and providing easier access to finance for innovative enterprises;

6 Conclusions

In knowledge-based economies, the efficient systems are those which combine the ability to produce knowledge, the mechanisms for disseminating it as widely as possible and the aptitude of the individuals, companies and organisations concerned to absorb and use it. The crucial factor for innovation is thus the link between research (the production of knowledge), training, mobility, interaction (the dissemination of knowledge) and the ability of firms, particularly SMEs, to absorb new technologies and know-how. The attractivity stems from three basic characteristics of the approach that deserve to be summarized here:

- *First*, it places innovations and knowledge creation at the very centre of focus, and goes beyond a narrow view of innovation to emphasize the interactive and dynamic nature of innovation.
- *Second*, it represents a considerable advance over the network school of innovation by a decisive shift in focus from firm to territory, from the knowledge creating firm to the knowledge-creating territory.
- *Third*, it views innovation as a social process that is institutionally embedded, and, thus, puts special emphasis on the institutional context and forms [i.e. formal and informal institutions] through which the processes of knowledge creation and dissemination occur.

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