

MAPPING THE REGIONAL INNOVATION SYSTEMS

INTRODUCTION

Around the globe, economic growth depends increasingly on ‘innovation’ and on ‘regions.’ The relationships between innovation and economic development have been addressed in sundry reports. On the other hand, regions are going to acquire ever increasing role in the contexts of national innovation strategies. This report concentrates on the cross-section of the two fields; i.e. the role of regional innovation systems in the context of the national (comprehensive) systems of innovation.

During the last decade the ‘National Systems of Innovation’ have been under study of sundry papers. Consequently, there exist a wide range of studies on the national systems of innovation. In this context three people, as the most prominent figures, stand on top: Christopher Freeman, Bengt-Akt Lundval and Richard Nelson.

Christopher Freeman, is a well-known thinker and researcher on ‘innovation.’ He has published numerous articles on ‘innovation and economic development’ as well as ‘national systems of innovation.’ Freeman (1987¹) considers ‘the national systems of innovation as the ‘network of institutions in the public and private sector whose activities and interactions initiate, import, modify and diffuse new technologies’. ‘National systems of technological innovation involves those institutions the determine the rate and direction of technological development, the rate at which local or foreign innovations are commercialized, and learning process².’

The concept of ‘national system of innovation’ is much wider than a network of scientific and technical institutions. It also involves the production system and a continuous process of learning. For a whole variety of cultural, linguistic, historical, economic, geographical and institutional reasons, a great deal of learning (by educating, by training, by doing, by using, by interacting) is conditioned by national and local circumstances.

Freeman (1992³) argues that ‘the concept National Systems of Innovation may be used in two senses: in a *broad* sense it encompasses all institutions which affect the introduction and diffusion of new products, processes, and systems in a national economy; in a *narrow* sense it encompasses that set of relationships which are more directly concerned with scientific and technical activities. Freeman (1994⁴) goes further to add that national systems of innovation describes the ‘complex mixture of institutions and policies which influence the innovative process at micro-level in any particular national economy.’

Lundval, another researcher on innovation believes ‘a system of innovation is constituted by

elements and relationships which interact in the production, diffusion, and use of new and economically useful knowledge⁵. Then he continues ‘a national system of innovation encompasses, but not limited to, the elements and relationships either located within or rooted inside the borders of a national state.’

Lundval (1992⁶) indicates that ‘the national system of technological innovation is larger than the R&D system. It must, for example, include not only the system of technology diffusion and the R&D system but also institutions and factors determining how new technology affects productivity and economic growth. At the same time, the system of technological change is, of course, less comprehensive than the society as a whole.’

Freeman, admitting the role of Bengt-Ake Lundval as the first person to use the expression ‘National Systems of Innovation’, argues that ‘*The National System of Political Economy*⁷’, published in 1841 by Friedrich List, ‘might just as well have been called ‘The National System of Innovation’ since it covered many of those topics such as technology accumulation, transfer of technology, education and training, strategic industries and trade policies which are at the heart of more recent analysis.’

Theo Roeland (1996⁸) in a recent study on the nations innovation systems underlines that ‘the key question for analyzing the effectiveness of national systems of innovation concentrates on the impact of knowledge diffusion on the economic performance of the national economies.’ John Alic (1994⁹) argues ‘the national systems of innovation are also embedded within the international economy, linked with one another through flows of capital and labor, goods and services. One of the key questions for analyzing any national system therefore include its capacity to absorb and utilize knowledge from outside.’

Innovation, is a system that deal with technological innovation, learning (education and training), as well as economic development. Innovation, as socio-technical system, comprises two main divisions: “social innovation” (social structures, human resource development) and “technological innovation” (technical development). Based on this approach, the interface between technological change and human resources development is critical for the prospective survival and growth of systems of innovation, at national or regional levels. The dynamic relations between learning and change are crucial when it comes to moving rapidly ahead for innovation.

It should be emphasized that we must also be concerned with the nature of the whole system in which the socio-technical system of innovation is embodied, such as financial and monetary policies and legal matters.

NATIONAL SYSTEMS OF INNOVATION IN A FEDERAL CONTEXT

The existing documents on the national system of innovation are mainly, but tacitly, consistent with the central government structures, (such as UK or France) where the national (central) government holds the overall administrative role in the country, and regions are creatures of the national governments. This approach may not be fully applicable to the federal structures of Americas where the national (federal) governments share the administration power with the

other tiers of government (State in the US and Province in Canada). In such countries, the national systems of innovation is probably more attached to endeavors of the combination of the federal, provincial (states) and sub-provincial (local) governments rather than only the national (federal) government. Innovation is broad enough to embrace the jurisdiction of the all the levels and tiers of a government structure. Consequently, the national systems of innovation in a federal structure is not exactly the same as in a central structure.

Most of the existing documents have studied the national systems of innovation in the context of central governmental structures such as UK or France or Denmark. In central administrative systems all the authorities originate from the central or 'national' government. This structures may not fully applicable in the federal structures such as Canada and US, where federal (national) tier of government share authorities with state or provincial governments.

The new trend in the European Community (EU) as well as new role of regions in classical central structures (for instance the distinct role for Scotland in the New Labor administration) may be better interpreted as a tendency towards more roles for the regional governments, than the classical central governments. The 'comprehensive systems of innovation' has been proposed as an expression to embraces the overall systems of innovation in both the 'central' and 'federal' structures.

The papers and reports on the national systems of innovation have rarely studied the relationships between the 'federal' and 'regional' systems of innovation. The present paper is going to address this topic. This study, however, does not intend to advocate a specific strategy or to support a particular policy, rather to generate better questions on the role of regional systems of innovation in the context of the national (comprehensive) systems of innovation and to expose an alternative approach to the overall systems of innovation.

CANADIAN SYSTEMS OF INNOVATION

In Canada the distinction between the 'federal', 'provincial' and 'regional' innovation system is more vivid than many other countries. The division of responsibilities on the education systems is an example in this respect. Pre-school, school and high-school education are the domain of regions, defined by the provincial government. Post-secondary and higher education is the realm of the provincial governments. However, thorough budgets and projects the federal government has a wide range of endeavors on all, however, indirectly. In Canada the provincial governments are not creatures of the federal government, rather the two tiers of government have shared and separate jurisdictions. In addition, there exist local governments, which are creatures of the provincial governments, but are in direct charge of many activities.

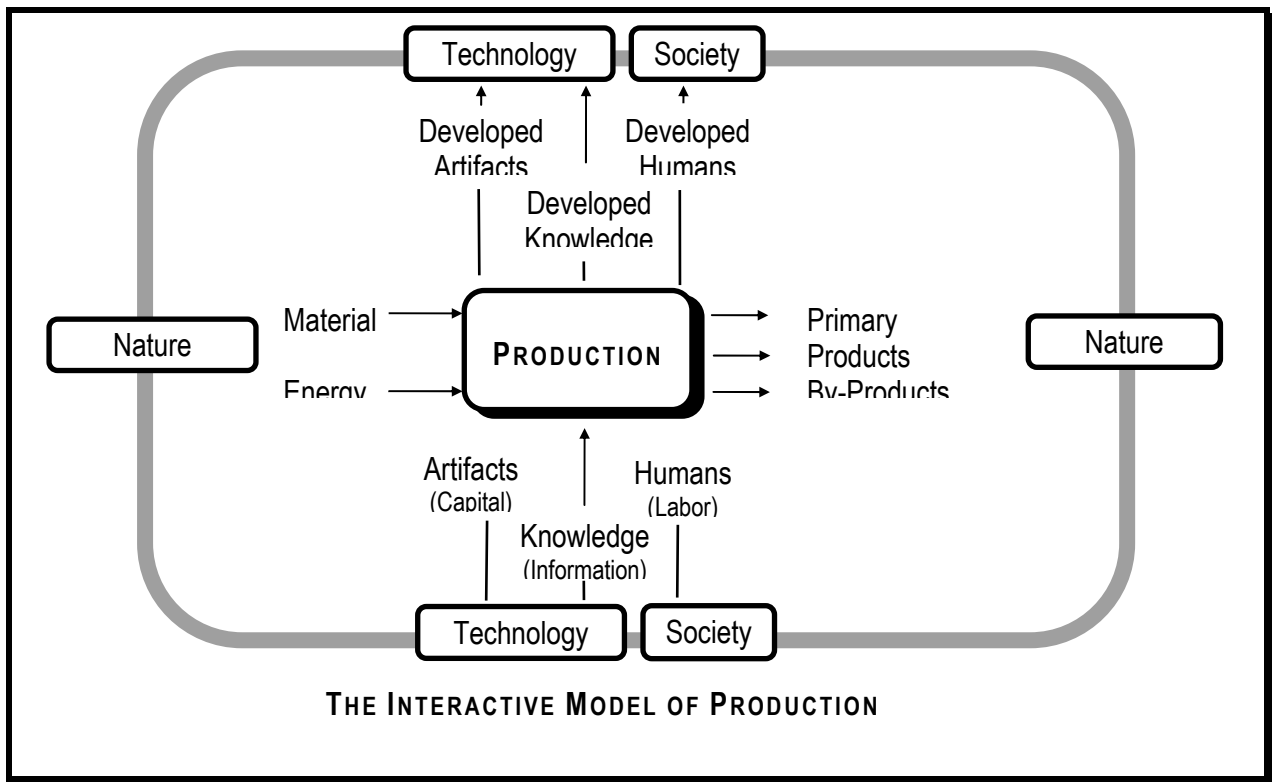
'Science and Technology for the New Century; A Federal Strategy'¹⁰, is a recent report related to innovation. The following points from this report are relevant to the present discussion. Innovation is as much regional and local, as it is national. A climate for innovation is created by the leadership and drive of clusters of firms in an industry, along with the financial institutions serving them; responsive education and training institutions; local research bodies; boards of trades, municipal, territorial and provincial governments; entrepreneurs; and many others. ... We must take a more deliberate approach to building the Canadian innovation system, by

understanding how it functions. ... This will be a cornerstone of the federal government's strategy in building a more innovative economy.

The Manitoba 'State of Innovation Report' states that 'the Canada's national system of innovation is made up of a number of regional and provincial systems of innovation'^{11c}. Obviously this report does not look to the federal activities even as part of the Canada's national system of innovation!

A DIAGRAM OUTLOOK TO THE SYSTEMS OF INNOVATION

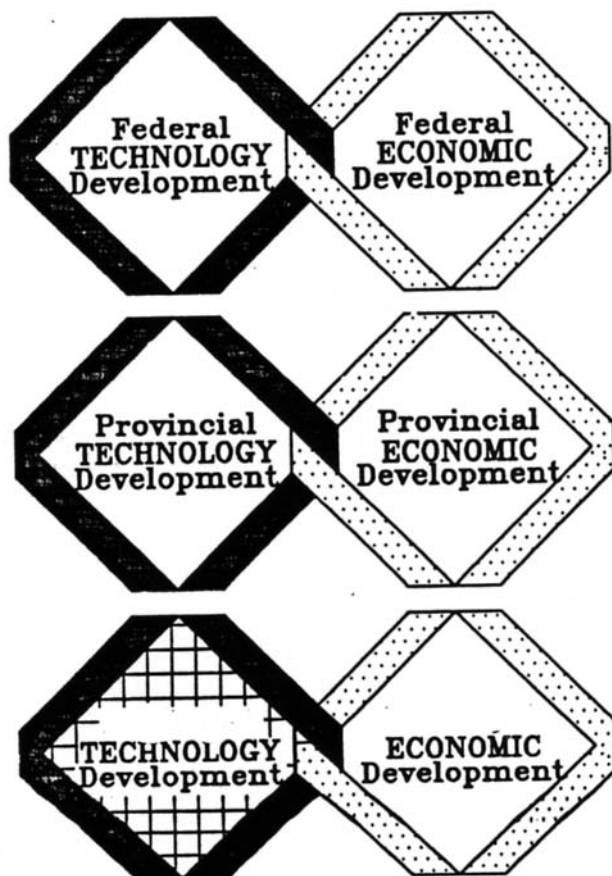
As it was discussed in 'Social Innovation', another report of this series, innovation as a socio-technical system, comprises two main structures: "Social Learning" and "Technological Innovation (Development)". On the other hand, "technological innovation" and "economic development" are also connected to each other. Consistent with this outlook, the interaction between technological innovation, social learning and economic development is crucial for the survival and growth of the systems of innovation, at the national or regional levels. The dynamic relations between learning and change are crucial when it comes to moving rapidly ahead for innovation. The interactive model of production, studied in "Dynamic Model of Production" of this series, is being used as a base to provide an outlook for the systems of innovation.



The Interactive model demonstrates the main inter-connections between three systems: Society, Technology and Economy. To facilitate the study of a national system of innovation, the inter-relationships between technological and economic systems are being presented as in the next diagram.



Pending on the political structures, the main relationships in the national system of innovation may be perceived as a structure embracing all the levels of a government; federal, provincial and regional. Consequently, the national systems of innovation, as a matrix with three tiers (federal, provincial and regional) and two systems (economic and technological) is being depicted as in the next diagram.



The above diagram indicates that the national systems of innovation integrate an interactive structure between learning, technology innovation and economic development at all the levels and tiers of governments. We must also be concerned with the nature of the whole system in which the national systems of innovation is embodied, such as financial and monetary policies and legal matters. The national systems of innovation can not be limited to the technological

innovation or programs aimed at increasing the expenditure on the research and development.

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¹⁰ Government of Canada, 1996, **Science and Technology for the New Century; A Federal Strategy**, Industry Canada, Ottawa

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¹ Last update: July 23, 1998: