

**Knowledge, Clusters and Regional Innovation:
Economic Development in Canada**

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FOREWORD

This volume brings together a selection of the papers presented at the Second Annual Conference of the Innovation Systems Research Network (ISRN) in May 2000. The ISRN began in 1998 as a three year experiment funded jointly by three federal granting councils, the Social Sciences and Humanities Research Council, the Natural Sciences and Engineering Research Council and the National Research Council. The initial mandate of the network was to share research results and analyses into the essential elements of the diverse regional systems of innovation across the country and to identify their points of commonality and difference with particular emphasis on comparisons between metropolitan and non-metropolitan areas. The network was also mandated to identify appropriate policy responses for the respective levels of government and to communicate the research results of its members to the academic community, policy makers, business leaders and relevant civic and community leaders.

Written by members of the network, *Knowledge, Clusters and Regional Innovation* presents a detailed picture of the varied and complex nature of the regional and local innovation systems found across Canada. Two of the key insights offered by the volume concern the highly differentiated nature of the country's innovation systems and the diverse range of settings in which innovation occurs, from multimedia and biotechnology in large metropolitan areas to more traditional sectors such as wood products, located in non-metropolitan settings.

Innovation is increasingly recognized as a powerful source of competitive advantage in modern economies. The ability to acquire, adapt and advance knowledge determines how businesses and countries innovate and, in turn, how well they compete. Innovation systems improve a region's capacity for sustained innovation and strong economic performance.

Technology-based clusters are rapidly emerging in regions that have achieved critical mass in the knowledge economy. In key speeches delivered to members of the international economic community in London and New York in early 2001, the Minister of Finance, Paul Martin, described the emergence of these clusters as a key to Canada's future economic prosperity. Anchored by strong research universities and public and private sector laboratories, these clusters play host to a wide range of innovative, thriving and entrepreneurial companies.

In its first three years of existence, research conducted by members of the Innovation Systems Research Network contributed a wealth of detail to our understanding of the nature and operation of regional innovation systems across the country. As the foreword to this volume was being written, members of the network were delighted to learn that the Social Sciences and Humanities Research Council (SSHRC) has extended our funding for another five years under its Major Collaborative Research Initiative program. The new funding will allow ISRN members to undertake a truly collaborative research program into the nature and operation of more than twenty industrial clusters from Halifax to Vancouver in both emerging, as well as traditional, industrial sectors, and in metropolitan and non-metropolitan areas. The MCRI grant will include a detailed and systematic comparison of these clusters as well.

Canada is one of the truly economic and social, as well as political, federations in the world. In the OECD, only Australia, the US and Germany come close to the unique structure and socioeconomic features that exist in Canada. Thus, unlike many other industrial countries, our system of innovation has different features. Consequently, Canada provides a unique laboratory for interdisciplinary studies on innovation. The ISRN's new study of cluster development will provide academic scholars, civic leaders and government policymakers with a range of insights into the dynamics of innovation and economic development in Canada. We look forward to

presenting the results of new research enterprise in future volumes that will document the process, barriers and benefits of innovation in our federation.

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INTRODUCTION

KNOWLEDGE, CLUSTERS, AND REGIONAL INNOVATION: ECONOMIC DEVELOPMENT IN CANADA

J. Adam Holbrook and David. A. Wolfe

The promotion of innovation is quickly becoming the touchstone for a wide range of government policies. This recognition is reflected in the attention focused on the preparation of the Innovation White Paper in the federal government. However, the intense debate over what policies should form the centrepiece of an appropriate strategy reflects the lack of understanding of the innovation process itself. Often equated with expenditures on research and development or with the spread of a knowledge-based economy, innovation is gradually coming to be understood as a more complex process. The capacity for sustained innovation is rooted in a complex set of relationships between internal firm dynamics and the broader setting within which they operate. Often these capabilities are sustained through regional communities of firms and supporting networks of institutions that share a common knowledge base and benefit from their shared access to a unique set of skills and resources. Together this complex set of institutions and relationships is referred to as a "regional system of innovation" -- the subject of most of the papers in this volume.

THE POLICY CHALLENGE

Since Confederation, the task of crafting an economic development strategy for the benefit of all Canada's regions has been one of the greatest challenges faced by the central government. From the 1940s to the 1970s, economic policy was conducted through the adoption of Keynesian demand management policies combined with support for consumption levels through the introduction of equalization payments to the poorer provinces to maintain common standards in public services, and shared cost funding of a range of new policies to support post-secondary education, health care and social security. This reflected Keynes' insight that maintaining a balance between the output capacity of the mass production system and social levels of consumption was the key to economic growth and stability. Political economists Vernon Fowke and Donald Smiley described this unique mix of macro-economic demand management, equalization payments, and social security as the "New National Policy."

The Keynesian policy paradigm was closely associated with a reassertion of the federal government's primacy in the areas of economic management and social policy. Corresponding policies to stimulate regional economic development proved less effective. Federal funds provided for extensive economic development in the poorer regions failed to alter the economic trajectory of most of these parts of the country. Michael Gurstein's paper in this volume describes the problems of developing innovative industries in Cape Breton, a landscape marked by failed public sector development projects. The centralized design for the federal state depended upon the buoyancy of federal revenues and the strength of its budget balance. Stagnating levels of output in the late 1970s, combined with the erosion of the federal tax base, dramatically reduced the flow of revenue from the tax system and undermined its ability to sustain the paradigm.

As the paradigm faded in the 1980s under the impact of the twin forces of globalization

and the revolution in information and communications technology, the federal government shifted to a neo-liberal policy paradigm focusing largely on trade as the key economic development tool and later on restoring its budget balance. The gathering clouds on the industrial horizon went unheeded, partly due to the significant loss of federal capabilities for industrial policy analysis and formulation. Policy responses to sectoral problems were piecemeal and often focused on resource issues (salmon fisheries, soft-wood lumber). The issue of innovation policy as it affects the services industries, and even worse, knowledge-based industries, was largely ignored (with the key exception of restoring the funding for research operations and infrastructure in the late 1990s).

The gathering clouds on the horizon went unheeded, not least because of the decade-long meltdown of federal capabilities for industrial policy analysis and formulation. Policy responses to sectoral problems were piecemeal and often focused on resource issues (salmon fisheries, soft-wood lumber). The issue of industrial policy, as it affects the services industries, and even worse, knowledge-based industries was virtually ignored. This was compounded by the federal nature of the country itself, as provinces and local communities began to experiment with their own economic development strategies. For the most part, these new initiatives have been interpreted as a new development *sui generis*, or as part of the growing decentralization and fragmentation of the federation - itself the result of the decline of state capacity in Canada generated by the broader forces of globalization and the ICT revolution. Policy discussions have failed to note the subtle, but important, shift occurring in Europe and the US over the past decade. Discussions of competitiveness and economic development shifted from industrial policy to the innovation process and began to see regional variation and local agglomerations as potential sources of strength, rather than weakness. This reflected a fundamental change in

understanding of both the process of economic growth, as well as the most effective points of leverage for policy to influence that process.

Recent attempts at formulating knowledge and services policies have bogged down in internal bureaucratic processes or resorted to equating “innovation” with “research and development.” Observations that Canadian productivity is falling relative to that of the United States (based on measurements which are themselves subject to criticism) are taken as proof that Canada is less innovative. The fact that Canada spends less proportionately on R&D (measured as a per cent of GDP) than other industrialized nations is taken as confirmation of this. But innovation and R&D are different. R&D is clearly a subset of innovation and industries may innovate even if they do not perform R&D. Many clusters within Canadian industry may enjoy competitive advantages based on factors other than the measurable performance of R&D.

The key question facing policy-makers is how best to create the conditions to stimulate innovativeness, and consequently, (Schumpeterian) competitiveness. There is a need to link innovation, knowledge management and human resource policies. Both federal and provincial policy makers need to address the issue of how to develop support and sustain regional systems of innovation that will be more effective in global competition than larger, more structured national systems. The comparison of the similar dichotomy between a large fixed assembly-line manufacturing operation and a manufacturing enterprise based on flexible manufacturing cells is worth noting.

CLUSTER DYNAMICS

Studies of the infrastructure of regional systems of innovation are based on acceptance of

the concept that geography is important and an institutional infrastructure is essential for creating the “untraded interdependencies” that shape and constrain the innovative capabilities and competitive dynamics of firms located in that region. Given the growing complexity of innovation in the knowledge-based economy, there is an increasing degree of specialization and interdependence among firms. This interdependence forces greater cooperation among firms located up and down the supply chain within geographically based clusters.

A proper understanding of the strengths and weaknesses of the innovative potential within a regional system of innovation requires a more detailed analysis and understanding of the nature of the linkages among firms within clusters and how the emerging division of labour among them both influences (and constrains) their innovation and growth potential. While the theoretical framework of innovation systems and clusters emphasizes the historical (and path-dependent) evolution of innovative production systems, there is a decided tendency in the work on clusters in the policy sphere to adopt a more static framework based on the compilation of lists of factors contributing to the development of innovative local economies. The methodologies employed in this applied work have been good at identifying the major elements of local clusters in a variety of regions, but less effective in capturing the dynamics of their formation and evolution.

The literature on clusters and regional innovation systems also suffers from a tendency to focus on the most celebrated case studies and engaging in ex post facto reasoning to “explain” their success. What is frequently missing from this analysis is a systematic comparison between more successful and less successful regions. Furthermore, this research has tended to focus on newer, more technology-intensive sectors.. The majority of cluster studies have focused on large metropolitan areas and emphasized knowledge-based clusters, to the neglect of those in

non-metropolitan regions. As has been argued, innovation processes are also key to the rejuvenation and growth of “traditional” economic activities in sectors such as resource-based products and cultural industries. In such cases, both national and regional innovation systems play a central role in stimulating and supporting the renewal process. These sectors, once rejuvenated, constitute a major component of the engine of growth for large metropolitan regions as well as non-metropolitan regions with smaller urban centres.

Research on the nature of clusters in Canada to date has been somewhat piecemeal. Studies have examined individual clusters in different metropolitan areas or regions of the country, usually presented as a snapshot of the state of the cluster at a specific point. They provide data that identify the extent of individual clusters and, in some instances, benchmark those clusters against similar ones in both Canada and the US. However they do not provide detailed insight into the internal dynamics and functioning of the respective clusters, nor do they examine the dynamic relationships between the clusters and the supporting infrastructure of economic and social institutions. More importantly, what have been the key interventions, from public sector initiatives, private entrepreneurship or community-based civic entrepreneurs that have stimulated the growth of successful clusters?

It is clear that clusters cannot be brought into existence merely by political fiat, but the basic conditions can be supported through appropriate public policies that make the emergence of strong clusters more likely. The public sector, has in the past, has tried to develop clusters directly: now it appears that its role may prove more effective in providing the infrastructure -- the substrate on which clusters can grow. In metropolitan areas this is more straightforward: investment in research and physical infrastructure (such as wideband Internet). In non-metropolitan areas (which is most of Canada) it is more complex. Governments can play a

role here by direct participation in the regional system of innovation, but only if there is a well-articulated local demand for assistance. The local cohesiveness that develops as a result of formulating a clear vision and lobbying governments is a key ingredient to success. In both metropolitan and non-metropolitan settings, however, public policies must be crafted with an eye to the broad array of “soft” factors, such as “social capital” and “civic entrepreneurship” that are a key part of the regional system of innovation and contribute to cluster development.

Academic research can contribute by exploring some of the questions that concern policy-makers at the regional and local level -- how to generate and promote the growth of cluster-based development within the context of their own local economies. To answer this question, both history and the degree of path dependency in the evolution of regional innovation systems and local clusters over time need to be explored. What factors have strengthened their innovative capacity in the current setting? Which interventions have proved effective and which have not?

OUTLINE OF THE BOOK

Every research program must have a beginning. This book marks the transition from the initial phase of work undertaken by individual researchers as part of the ISRN to a more integrated program of research as part of the new Major Collaborate Research Initiative. As such, while the research presented here was initially undertaken as part of an individual research program, the papers in this volume have been selected and organized with an eye to how they contribute to the collaborative research initiative.¹

David Wolfe sets the scene with a discussion of how social capital influences the

development of clusters in local and regional economies. It has been observed that the most innovative economies are characterized as learning economies. They have a strong capacity for reflexivity and self-monitoring, i.e., learning how to learn — characteristics which are critical for successful regional innovation systems and for promoting cluster development and thus which will grow quickly, while there are some developed economies that are in danger of slipping simply because they are unable to maintain their base of knowledge capital.

Jorge Niosi approaches the problem differently by looking the federal government's role in influencing the national system of innovation. He suggests that government can seed the development of regional clusters of competencies in emerging industries, such as information technologies, biotechnology and advanced materials, through decentralized and horizontal policies, including the creation of government laboratories and research universities. These institutions produce the basic inputs of the new science-based industries, namely highly skilled personnel and new ideas. Evidence is presented to document the key role of universities in biotechnology, and government laboratories and academic research in some areas of information technology in key Canadian clusters.

The study carried out by Pierre Therrien, an analyst at Industry Canada, presents data from the 1999 Innovation Survey to provide new information on the innovation process and to examine the factors that distinguish innovative firms from non-innovative ones. The chapter presents findings about the practices followed by innovative and non-innovative firms and uses econometric analysis to distinguish a successful innovator from an unsuccessful one.

John Britton introduces the regional perspective. Arguably the Greater Toronto Area is Canada's most successful economic region. Much of its growth has occurred since the implementation of the North American Free Trade Agreement (NAFTA). While attempts to

define the term high technology industries is always a matter of debate, such industries are by their very nature “learning industries” where the continual acquisition and processing of knowledge is key to their survival. An analysis of their success in the post-NAFTA environment is important, since it can lead to important lessons for knowledge-based industries in the rest of the country.

It is widely assumed that public sector research institutions play an important role in contributing to the innovativeness of a region, but that role has not always been well documented. Cooper Langford documents the leadership role of one of these institutions in Calgary in his paper that examines the impact of university research on innovation. The recent report of the expert panel on the commercialization of university research from the Prime Minister’s Advisory Committee on Science and Technology called for greater transfers of knowledge and technology from university laboratories to industry. However, the report overlooked the complex influence of the university on the regional system of innovation as a whole, by providing sources of knowledge, skilled workers and leadership for the process of innovation. This paper presents one of the first systematic examinations of this relationship in Canada.

Over the past two decades there has been a convergence of the manufacturing and the services sector. Nothing exemplifies this more than the multimedia sector. This sector almost defies classification in a statistical sense — it is a generic description that covers the production of materials, usually used for entertainment, but materials where the value of the input of knowledge and intellectual capital far exceeds the value of the physical product. This volume presents two case studies of activities within the multimedia sector that analyze the relationship between the industry, regional infrastructure, and governmental policies. Lisa Mills and Shauna

Brail look at the new media sector in the GTA, while Diane-Gabrielle Tremblay and her colleagues analyze the impact of some far-sighted public sector policies in Montreal.

Finally we start the process of untangling the relationship between industrial clusters, local economic development policies, and the broader political context that determines the overall policy approach. Neil Bradford presents a penetrating analysis of two conflicting policy perspectives that have shaped the government's approach to local and regional economic development in Ontario, and the broad philosophical assumptions that underlie them. Michael Gurstein takes us to the site of failed regional economic policies in Cape Breton Island and examines the factors that might yet still result in new growth for the region.

NOTES

1. The detailed research proposal and the milestones document for the project can be found at <http://www.utoronto.ca/isrn>