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Start Ups . . .

Knowledge-Based Growth: The Implications for Policy

Government and university representatives gathered for a **planning session** in Ottawa on July 7, to launch Industry Canada's Knowledge-Based Growth project. The project involves an examination of the implications for micro-economic policy of new thinking about the role of knowledge in economic growth.

Participants predicted that the relationship of innovation to economic growth will occupy an increasingly prominent place in the international agenda and that governments will find it necessary to incorporate new insights on the relationship into policy development. Change is a permanent fact in a progressive society and as such, policies must be located within the context of the technological and institutional changes taking place.

The program included a discussion of topics nominated as the subjects of papers in this project. The concept and measurement of knowledge, the inter-relationships between factors accounting for innovation and growth, the implications of knowledge-based growth for total factor productivity growth and framework policies, international best practice as a guide for policy formulation, the design of R&D policies, industrial clusters as a growth strategy and the impact of the global telecommunications revolution on Canada will be the subject of authored papers by leading experts in the field.

Also examined in the session was the issue of international R&D spillovers and the complementarity of human capital development, notably training, to innovation and technological change. As well, participants sought to nail down definitions of knowledge-based industries and the human ramifications of knowledge-based growth.

Professor Peter Howitt of the University of Western Ontario, has been invited to oversee this major research project and to serve as General Editor of the volume of papers it will generate.

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Canadian-Based Multinationals: Researchers Review Study

A June policy seminar in Ottawa was the setting for the release of *Canadian-Based Multinationals*, the fourth volume in the Industry Canada Research Series. MICRO's Spring edition previewed the Volume.

In presentations to the seminar, **Professor Steven Globerman**, General Editor of the volume, and **Dr. André Raynauld**, Rapporteur for the research project's mid-point peer review conference, outlined the main research findings and their policy implications.

Speakers at the seminar found that the influence of Canadian-based multinationals (MNEs) has been positive, as demonstrated by the following effects:

- ▶ Canadian MNEs have helped to advance the specialization of production in Canada and, in so doing, have contributed to the country's productivity and real income performance;
- ▶ Research findings refute any suggestion that Canadian direct investment abroad (CDIA) contributes to increased unemployment in Canada or to a reduction of net exports. Indeed, activities of Canadian MNEs are found to stimulate trade flows, and exports more than imports;
- ▶ On labour market impacts, the evidence is that CDIA is more likely to affect the structure (industry, occupation and skill mix) of employment, rather than the total number of jobs in the economy - triggering a shift to higher-knowledge-based, and hence higher paying, jobs. Professor Globerman commented that without outward investment - and the trade and productivity gains that it engenders - major Canadian companies would be less competitive and more jobs would be lost at home.

Speakers also addressed the concern that Canadian corporations tend to enter into international strategic alliances less often than their U.S., European and Japanese counterparts. Research conducted for this project suggests that this is not a problem requiring government intervention. Canadian firms are less prone to be joiners because they do most of their international business in the United States, a market which is extremely open to majority-owned foreign direct investment. In this situation, the preferred route is not a strategic alliance but establishment of a foreign affiliate.

"We must work towards a more open economy ... protectionism does not protect anything ... in the new global economy in which we are living."

The overall conclusion was that there is little reason for Canadian governments to attempt to discourage outward investment; and many reasons to encourage it. Having made that point, the study clearly does not advocate deliberate government action in this regard. In Professor Globerman's view, the Canadian economy is best served by continuing government efforts to promote the international reduction of barriers to foreign direct investment. This effort would make it increasingly possible for MNEs to respond to market forces and direct investments in ways that would maximize total factor productivity.

***Getting the Green Light:
Round-table papers now available***

In June 1993, Industry Canada hosted a round-table discussion on investment and the environment; a relatively new field of inquiry and one that involves many disciplines. A compilation of the papers that emerged from the event is now available from the C.D. Howe Institute under the title *Getting the Green Light: Environmental Regulation and Investment in Canada*.

The papers are the work of three researchers: **Jamie Benedickson** of the Faculty of Law at the University of Ottawa, **Nancy Olewiler** of the Department of Economics at Simon Fraser University, and **Bruce Doern** of the School of Public Administration at Carleton University.

"Environmental protection requirements and other elements of an environmental law regime are now among the considerations that many investors wish to incorporate into their decision-making calculus."

Jamie Benedickson surveys the legal and regulatory aspects of environmental considerations that affect investment decisions in Canada. He concludes that the latter can be affected not only by legislation which is uniquely environmental, such as assessment and enforcement regulations, but by elements of safety and labour laws which have arisen from environmental concerns also. Focusing on pure environmental legislation only, the author says, will result in an underestimate of true environmental costs. He concludes by noting that there is constant change in environmental law and that the forms of environmental regulation vary across jurisdictions. This, he says, makes comparing jurisdictions very difficult.

Nancy Olewiler refutes the notion that environmental law in one jurisdiction may promote the establishment of "pollution havens" in another. In fact, international trade and investment flows do not appear to be significantly affected by environmental regulation. There is empirical support, the author says, for the argument that environmental protection be enhanced, not diminished, in countries attempting to be competitive. She does, however, point to the need for new empirical studies of the impact of environmental regulation using more recent data.

"Clearly, it is important to know what the tradeoffs are between environmental quality and economic activity in this country. I do not believe that we have the data or the analysis yet to make informed judgements about these tradeoffs."

And finally, Bruce Doern, in examining the linkages between trade, investment and environmental policies, finds that they no longer exist as three solitudes — increasingly, policy-makers in any one of these fields are influenced by developments in the other two. Doern points to a growing interrelationship between domestic and international policies. He concludes that multilateral institutions should pay greater attention to environmental issues, and incorporate the contributions of environmental organizations. He recommends that Canada use guidelines, codes, and persuasion and avoid using trade penalties as devices to ensure compliance with investment, trade, and environmental regimes.

Infrastructure and Competitiveness

Jack Mintz and Ross S. Preston, Editors
John Deutsch Institute

Can public spending on bridges, airports, electronic highways, training and other elements of infrastructure pay off in increased economic growth, and productivity? And if so, how much, how quickly, and for how long?

These and related questions are discussed in *Infrastructure and Competitiveness*, a compilation of papers presented by leading Canadian and U.S. economists at a June 1993 seminar sponsored by Industry Canada and the John Deutsch Institute of Queen's University. The volume is edited by **Jack Mintz**, University of Toronto, and **Ross S. Preston** and is forthcoming from the John Deutsch Institute.

The following are the three major themes of the Volume:

- ▶ infrastructure needs to be defined in terms broad enough to encompass physical capital, the technological network needed for development and transfer of knowledge, and human capital;
- ▶ spending on infrastructure creates large externalities which are difficult to measure. Recent estimates of the extent of the impact (return) of infrastructure investment on output appear to converge in the neighbourhood of 20 per cent. These estimates are substantially lower than the previous estimates of Aschauer that claimed returns to infrastructure investment of up to 100 per cent. However, measuring the economic and social value and costs of individual projects is essential for making efficient spending decisions among alternative projects; and
- ▶ there are a number of options available to policy makers for efficient delivery and maintenance of infrastructure. Woven into this part of the discussion was the message that the most important question about infrastructure is not necessarily how

to invest but what projects to support, and how, and who should pay.

The seminar convened against the background of a lively ongoing debate amongst economists on the relationship between public sector investment in infrastructure and private sector productivity.

Appropriately, the keynote address to the seminar was made by **David Aschauer**, the U.S. economist who is generally credited with opening the debate in the United States in the 1980s. He has argued that a large part of private sector productivity growth is related to the size of the accumulated stock of infrastructure investment, and to annual investment in it.

"I am still a believer in the principle that public capital is productive ... I'm less of a believer in the principle that increases in public investment will have a significant, positive effect on long-term growth."

- David Aschauer

In his Ottawa address, Aschauer presented the results of some of his more recent research. In a nutshell, he is now less certain that spending on infrastructure can influence the **long term growth rate** of output per worker. He argues that the impact of infrastructure depends, among other things, on the marginal productivity of the public investment and the way in which it is financed.

In her paper, **Catherine Morrison** of Tufts University uses cost equations rather than Aschauer's production functions, to shed light on the contribution of infrastructure to productivity growth in the United States. Her estimate of the return to infrastructure is much less than Aschauer's original work.

The seminar reflected a trend in which more and more economists appear to favour cost-benefit analysis. In their paper, **Charles R. Hulten** and **Robert M. Schwab** of the University of Maryland argue that macro-economic modelling overstates the impacts of infrastructure investment and cannot sufficiently weigh its true costs and benefits.

Another advocate of cost-benefit analysis, **David Lewis** of the Hickling Corporation, concludes that public sector spending on infrastructure has its greatest impact when it supports high-yield, productivity-oriented projects aimed at growth objectives. In his view, when cost-benefit analysis is buttressed by studies of industrial logistics and risk analysis, it enables decision-makers to pick those projects which deliver the greatest economic benefits. Analysts tended to agree, however, that cost-benefit analysis is challenged by the requirement to measure social benefits.

Applying the debate to Canada is central to **Carl Sonnen's** paper. Using the demand-oriented econometric forecasting model employed by Informetrica Inc., he offers insights into the potential effects of infrastructure spending on employment, deficits, output, prices and productivity. This paper estimates Canadian infrastructure spending requirements that range from 3% to 4.9% of GDP.

"... there was agreement that knowledge, whether classed as human capital or as technological infrastructure should be the object of equal attention to traditional bricks and mortar."

- John Helliwell, Rapporteur

Other papers seek to redefine and broaden the concept of infrastructure to fit current realities. **Roger Miller**, Professor of Technology Management, Université du Québec à Montréal, and University Partner, Secor Inc. focuses on

technological infrastructure and the need for a systems approach to it. He argues that just as the production cycle requires its inputs, the development process requires different levels of facilities and support — and these needs have to be weighed in determining infrastructure requirements.

Another "new" area of infrastructure concerns the supply and quality of human capital. **Noah Meltz**, of the University of Toronto, deals with this facet of infrastructure. He argues that infrastructure itself is undergoing a structural change and requires new and more advanced skills for its creation and maintenance. He points out that the complementarity of human and physical capital is significant and often overlooked. Analyzing "service" infrastructure, which consists of the health and educational sectors, Meltz points out that there are long planning frameworks involved in the education and training of workers. He also identifies a universal underlying requirement for general mathematical and scientific training for all occupations, not only for professionals in those fields. Finally, Meltz considers the psychological infrastructure, that he defines as the relationship between stakeholders (government, management, organized labour and other workers), their motivation and commitment and the contribution of those attributes to productivity growth and competitiveness.

Examining the current trend in contracting out government services, **Michael Trebilcock** and **Ronald Daniels** of the University of Toronto examine three cases: airports, waste management and education. They conclude that contracting out works best when applied to government products and activities (e.g. waste management) that are well-defined and measurable. Further, the prospects for matching the policy instrument precisely to the job at hand are brightest when decision-making is transparent, and when political constraints are taken into account.

R&D Benefits: An Analysis of Spillovers

A distinctive feature of investment in research and development (R&D) is that its rewards do not flow exclusively to those who put up the money, but tend to spill over in all directions. Some of this unintended largesse delivers benefits to other firms and industries. And, as globalization progresses, a growing share of the positive benefits flow internationally.

In a forthcoming technical paper, **Jeffrey Bernstein** of Carleton University and the National Bureau of Economic Research, provides a framework for examining international spillovers of R&D investment between industries in Canada and the United States.

The paper explores three main topics:

- ▶ the importance of domestic and international spillovers to the production structure of the Canadian and U.S. economies;
- ▶ the productivity growth gains associated with international benefits of R&D ; and,
- ▶ the private and social rates of return to R&D capital.

Bernstein's analysis distinguishes between domestic and international spillovers. The domestic category encompasses positive benefits that flow between different industries within a national border. The international kind comprises benefits flowing within the same industry but across national borders.

Comparing impacts, Bernstein finds that of the two categories, international spillovers tend to exert the greatest influence on production costs, and factor intensities (i.e. capital-output, labour-output and material-output ratios) .

Examining Canada-U.S. manifestations of this phenomenon, Bernstein reaches two main conclusions. One is that international spillovers happen more frequently than the domestic variety. The other is that more R and D benefits get spilled from the United States into Canada than vice versa.

Indeed, as depicted in this survey, the north-south, south-north differences are dramatic. Positive benefits from R&D spending in the United States are noted in all industries in Canada except rubber and plastics. Spillovers from Canada to the United States are identified in only seven of the eleven industries studied.

The impacts are also dramatically lopsided in favour of Canada. The cost reductions that accrue to Canadian industry as a result of U.S. R&D capital spending are 2 to 20 times larger than those realized by U.S. industry as a result of Canadian R&D spending.

Another major finding is that R&D spending in one country can increase the intensity of R&D in the other country. This effect is observed in all industries except electrical products, transportation equipment, rubber and plastics and petroleum industries.

Bernstein's paper also assesses the effect of external R&D benefits on total factor productivity (TFP) growth. TFP refers to the productivity of all the inputs in the production process. He concludes that in most industries, the positive benefits flowing from R&D increase TFP. But in some respects, the effects are different on opposite sides of the 49th parallel. In Canada, international spillovers contribute more to TFP growth than domestic spillovers. In the United States, domestic spillovers are the main contributors to TFP growth.

The paper concludes with a discussion of social rates of return to R&D spending, which generally surpass the private rate of return of the R&D performer. Canadian social rates of return to

investment in R&D range from a low of 32 percent in transportation to a high of 162 percent in non-electrical machinery. The higher social rates of return indicate that at current R&D levels, there is substantial under-investment in R&D. This under-investment is a function of the positive external benefits that are created by investment in R&D.

Competition at Home Competition Abroad A Study in Complementarity

Interest in the design and application of competition policy has been fuelled in recent years by the development of new forms of business arrangements in response to increasing globalization and technological change.

Looking at these issues in relation to the new environment, a forthcoming Occasional Paper by **Bureau of Competition Policy Staff** at Industry Canada, highlights the relationship between the competitiveness of industries in international markets and the state of competition in their home markets.

Titled *Competition Policy as a Dimension of Economic Policy: A Comparative Perspective*, the study concludes that competition policy is complementary to other policies, particularly international trade and industrial policies, to the extent that they are designed to foster an efficient industrial structure.

The paper examines the design of, and experience with, Canada's present competition legislation, the *Competition Act* of 1986. It notes several features of the Act that are conducive to efficient corporate restructuring.

A survey of economic policy in Canada and other major industrialized countries suggests that in all jurisdictions, competition policy appears to be an

increasingly important aspect of the economic policy framework. There has also been at least a partial convergence toward economic efficiency as the core objective of competition policy in the OECD economies. The authors conclude that Canadian competition policies appear to be no less liberal with respect to industrial restructuring than those of other countries.

"Globalization has not removed the need for an effective competition policy in a modern industrial economy."

Looking down the road at emerging competition policy issues in Canada, the paper examines:

- ▶ the links between competition policy and other economic policies;
- ▶ the application of the *Competition Act* in regard to industrial restructuring and new forms of business arrangements;
- ▶ institutional and process issues relating to competition policy; and
- ▶ the relevance of Canadian competition law and policy as a model for emerging market economies.

In conclusion, the authors note that competition policy is playing an increasingly central role as a dimension of wider economic policy — in Canada and in the other leading industrialized countries. Canadian competition legislation, policies, and institutions, they conclude, are generally well adapted to meet the challenges that come with this trend.

Local Economic Seminar Series

The Micro-Economic Policy Analysis Branch of Industry Canada is launching a new Local Economic Seminar Series this Fall. The intent of the Series is to provide Industry Canada economists with an opportunity to hear economic research results from colleagues through out the Canadian government. The Series will focus on econometric research and economic analysis of major micro-economic problems. This Fall the series will feature speakers from Industry Canada, Statistics Canada, the Bank of Canada, and Finance Canada. Topics will include wage differentials and efficiency wages, unemployment insurance, disinflation and regional convergence.

Distinguished Speaker Series

The Industry Canada Distinguished Speaker Series picks up again this Fall. Speakers confirmed at press time include **Steven Globerman** who will kick off the Series in September with a presentation on the major research findings and policy implications of the recently released Industry Canada Research Volume, *Canadian-Based Multinationals*. Professor Globerman served as the General Editor for that volume. **Dr. Marcel Boyer** of the Centre interuniversitaire de recherche en analyse des organisations (CIRANO) in Montreal will speak in December on Choices of Technological and Organizational Flexibility in a Strategic Context. In January **Professor Paul Romer**, University of California is scheduled and in March, **Professor Elhanan Helpman** of Tel-Aviv University is tentatively scheduled to speak. Later in the Spring, **Dr. Sylvia Ostry** of the Centre for International Studies, University of Toronto, will speak on The New Trade Agenda, Post Uruguay Round. MICRO will report on other Speakers as they are confirmed.

Release of the World Investment Report 1994

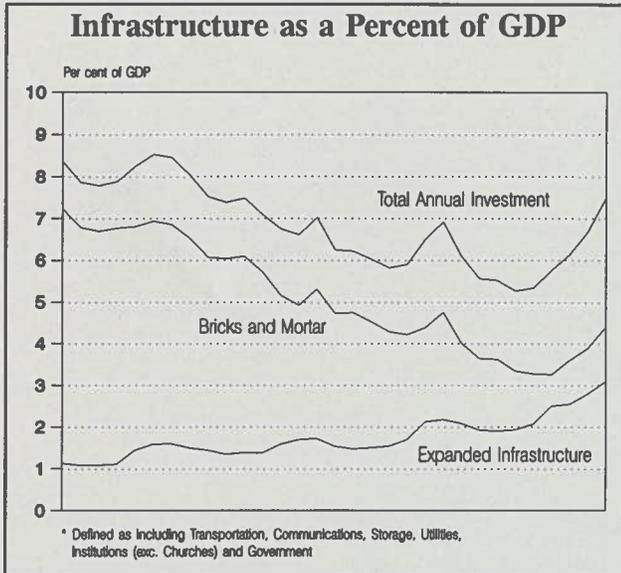
Industry Canada and the Centre for International Studies at the University of Toronto co-hosted a press briefing on the *World Investment Report 1994: Transnational Corporations, Employment and the Workplace* on August 29, 1994 in Toronto. *The World Investment Report* is released annually by the United Nations Conference on Trade and Development and is generally recognized as the most up-to-date and comprehensive information source available of data and analysis on foreign direct investment at the global and regional levels. **Dr. Sylvia Ostry** of the Centre for International Studies and **Alan Nymark**, Assistant Deputy Minister, Industry and Science Policy, Industry Canada made presentations on the significance of the *Report* findings. The *Report* discusses the implications for the quantity, quality, and location of jobs caused by the increasing transnationalization of firms and the emergence of more complex corporate strategies.

Industry Canada Partnering with Financial Research Foundation of Canada

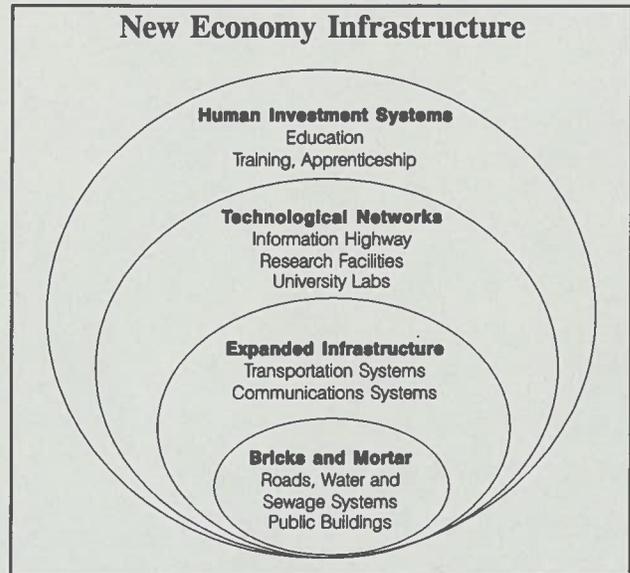
Industry Canada and the Financial Research Foundation of Canada (FRF) have joined forces to expand the number of topics under study in the major research project on *Corporate Decision-Making in Canada* (highlighted in Project Start Ups in the last edition of MICRO). **Paul Halpern** of the University of Toronto and **Vijay Jog** of Carleton University will be the points of contact for the FRF's contribution to this major research volume for which **Ron Daniels** of the University of Toronto and **Randall Morck** of the University of Alberta will be the General Editors. Among other subjects, the specific research topics that the FRF will fund include institutional activism, governance and financial system supervision, performance and corporate governance structure, and outside financial directors and corporate performance.

FROM THE COMPETITIVENESS NOTEBOOK

The Importance of Infrastructure



Source: Statistics Canada



Source: Industry Canada

- Infrastructure is the foundation which supports economic activity. The new economy demands infrastructure that goes well beyond traditional bricks and mortar. Infrastructure exerts positive external benefits on efficiency and productivity, both domestically and internationally.
- Recent studies based on Canadian data estimate that the rate of return to investment in public infrastructure can be between 30 to 70%.
- Estimates of expanded infrastructure investment declined from a peak of 8.5% of GDP in 1966 to a low of 5.3% in 1986. The overall decline was primarily due to relative decreases in the construction component. From 1986 it grew annually to reach 7.5% in 1991. During this last period, infrastructure investment increased as a result of expenditures in communications, airports and marine facilities, involving for the most part, federal government funding.
- Canadian investment in expanded infrastructure slowed significantly during the 1980s. On a per capita basis it grew at an annual average rate of 2.0% between 1961 and 1981 but slipped to 0.6% from 1982 to 1991.
- Roads, bridges and buildings will still remain important parts of Canadian infrastructure, but emphasis is shifting towards non-physical components such as education and skills development systems and technological networks.
- The shift toward the knowledge-based economy raises dependence on human resources and the ability to use and create technology more than on natural resources. Examples of new economy infrastructure include the information highway, and Industry Canada's on-line access to databases and analytical information.

PUBLICATIONS

NOW AVAILABLE

Industry Canada Working Paper Series

No. 1 - *Economic Integration in North America: Trends in Foreign Direct Investment and the Top 1,000 Firms*, Micro-Economic Policy Analysis Staff, January 1994.

No. 2 - *Canadian-Based Multinational Enterprises: An Analysis of Activities and Performance*, Micro-Economic Policy Analysis Staff, June 1994.

Industry Canada Occasional Papers

No. 1, Vol. 1 - *Formal and Informal Investment Barriers in the G-7 Countries: The Country Chapters*

No. 1, Vol. 2 - *Formal and Informal Investment Barriers in the G-7 Countries: Summary and Conclusions*

Research Volume Series *

Volume III - *Multinationals in North America*, General Editor: L. Eden, 1994

Volume IV - *Canadian-based Multinationals*, General Editor: S. Globerman, 1994

Joint Publications **

Getting the Green Light: Environmental Regulation and Investment in Canada

(with the C.D. Howe Institute)

Jamie Benidickson, G. Bruce Doern and Nancy Olewiler

FORTHCOMING

Industry Canada Working Paper Series

International R&D Spillovers Between Canadian and U.S. Industries

Multinationals as Agents of Change: Setting a New Canadian Policy on Foreign Direct Investment

Competition Policy as a Dimension of Economic Policy: A Comparative Perspective

Joint Publications

Infrastructure and Competitiveness
(with the John Deutsch Institute)

Editors: Jack Mintz and Ross S. Preston

Information on all Publications mentioned above can be obtained from: Corinne Nolan, Micro-Economic Policy Analysis, Industry Canada, 5th Floor, West Tower, 235 Queen Street, Ottawa, Ontario, K1A 0H5. Tel: (613) 947-2068, Fax: (613) 991-1261.

* Research Volumes are available from the University of Calgary Press, tel: (403) 220-7578, fax: 1-800-668-0821.

** Joint publications can be purchased through Renouf Publishing Company Ltd., tel: (613) 741-4333; fax: (613) 741-5439.