OUTPUT MEASURES OF COOPERATIVE RESEARCH: 
THE CASE OF THE PULP AND PAPER RESEARCH INSTITUTE OF CANADA

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Applying various quantitative techniques, this paper attempts to describe and analyze the scientific output of a cooperative industrial research institute (Pulp and Paper Research Institute of Canada, PAPRICAN) by comparing its impact on the employment patterns of McGill graduate students who have done their thesis research under the auspices of the industrial laboratory with graduate students from the same departments who have not worked at PAPRICAN; and a comparison of the publication practices of three groups: PAPRICAN staff not associated with the university (McGill), the PAPRICAN staff who also hold academic appointments at McGill, and the faculty of the Chemistry Department at McGill who do not hold staff positions at PAPRICAN.

It is found that the academic association with PAPRICAN during graduate research has a significant impact on the number of students who go on to careers in industry. However, close examination of those who remain in Canada indicates that the impact is increasingly felt in only the Pulp and Paper industry. Different "macro" standards are applied to this "micro" example, and policy implications are discussed.

The publication record is again compared to various "macro" standards so as to judge various qualities of the scientific output of the different groups. The PAPRICAN staff performs as would be expected of industrial researchers and the McGill faculty show normal characteristics for an academic group. However, those who hold positions in both the industrial institute and the academic sector, reveal the special role they play in linking the "science" of the second with the "technology" of the first.

The problem of weak inter-sector links in Canadian scientific research

It is a generally accepted proposition that the Canadian scientific effort can be characterized by weak interaction between the various sectors, i.e. industry, universities and government. For Lithwick this is "...the most puzzling and potentially costly factor in the Canadian experience". (Lithwick, p. 103). The key role
for government policy makers is to open the pipeline between sectors. Lamontagne illustrates the same problem with a quote from Dr. Louis-Philippe Bonneau: "...the link between industry and the university is still non-existent. Herein lies the tragedy, I feel, if we want to call it that". (Lamontagne, p. 175.) A more recent report prepared for the OECD (Organization for Economic Cooperation and Development), reiterates the same point in dramatic language:

Inheriting two of the most aloof and inward-looking university traditions of Europe, the French and English one (sic), Canada has not been a favourable testing ground for industry-university links. Traditionally, industry and university in Canada have been, in the words of a Canadian professor, "two solitudes". (Caty, p. 126).

And looking specifically at the R & D effort in chemistry and chemical engineering in Canada, a Science Council Background Study complains that "... there is too little interchange and cooperation between industry, government and university ..." (Westman, p. XVII–XX).

**Sectoral distribution of the Canadian scientific effort**

In addition to this recognition of inadequate inter-sector interaction has been a concern about the sectoral distribution of scientific activity and employment in Canada, with an inordinate proportion taking place in university and government laboratories. (OECD; Boyd). Doern talks of the problems of "goal displacement" by the federal government granting agencies (particularly the National Research Council), in which an original mandate to support and encourage industrial innovation was degraded in relation to other tasks the agency had undertaken. He sees the essential political debate about the Canadian scientific community to be increasingly not "over what goals to pursue ... [but rather] over where science should be located". (Doern, p. 195).

**The case of PAPRICAN**

The Pulp and Paper Research Institute of Canada (PAPRICAN) contradicts these descriptions. From the earliest days of institutionalized research in Canada, the Pulp and Paper industry has maintained a model of inter-sector integration. (Sankey; Bates.) As such it is an attractive subject for investigation that may offer insights into the problems and necessary conditions for policies to overcome sectoral isolation and weakness in industrial research.