
Economists, Environmental Policies and Federalism

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Introduction

Canadian economists analyze environmental problems much as do American economists. They use the same tools. They are in abstract agreement with the goals of the American economists and their policy-making bosses. But there the agreement stops. Within the United States, economists presume that the selection and implementation of actual environmental policies and of tangible targets is a task for the national government. Within Canada, there is no consensus on whose task it is. Canadian economists are kept busy with plans or decisions made at provincial and at national levels of government. Sometimes this results in small-scale systems of regulation reflecting local notions about what is ideal and what is fair. Goals and standards may differ from place to place.

I have received generous help in my informal survey of environmental economics in Canada, but it is important to stress that my opinions are my own. Edmund Blewett, Robin Boadway, Louis Cain, Brian Copeland, Rod Dobell, Diane Dupont, Kathryn Harrison, John Livernois, Stephen McClellan, Andrew Muller, Nancy Olewiler, Peter H. Pearse, Roger Reid, Fred Riggs, John Robinson, John Sargent, Claude Simard, Rob Smith, Mark Sproule-Jones, C. van Kooten and Peter Victor have all provided useful information, as did those others who a few years ago provided material for an earlier paper on a related subject (Scott, 2000). Jennifer Wood efficiently helped me to locate materials.

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The standard literature reflects a large body of research and reflection by U.S. economists, forced to deal with problems of U.S. national policy and choice. As professionals, Canadian economists also become familiar with this standard analytical approach, one that leading economists constantly refine. Indeed they contribute to it. Yet they may find it only partly relevant to the actual diversity of problems, physical opportunities, preferences, distributional goals and constitutional powers facing the provincial decision-makers who look to them.

In 1985 and 1995, I reviewed the allocation of functions in a federation by examining the assignment of powers over the environment. I found that there was no reason why all the environmental powers should be assigned to one of two levels. Nevertheless, the various theories I discovered and tested suggested that when governments were competitive, there would be a tendency for the powers over one field to drift in one direction.

In this paper, I start from the other end: from public functions and policies, not from levels of government. To do this, I review some of the history of environmental activities in England, in the United States and in Canada. I then review what economists have had to say about these activities. This is followed by a review of what Canadian economists say and do, compared with what economists in the United States say and do.

Environmental economics is a young subject, only slightly younger than the environmental policy with which it is most concerned. Environmental policy is still in its infancy, especially policies dealing with pollution, in particular, global air pollution. The institutions in which policy is to be framed and enforced constitute one of its problem areas.

Policy Evolution

Britain. For centuries, efforts to escape from pollution required victims to push the doctrines of common law: nuisance actions dealt with inter-property flows of smoke and fumes, while property-law doctrines dealt with the changes in the quality of water flowing in streams. These two branches of the law were helpful mainly when there were only two parties: a single victim whose enjoyment of property was reduced by harmful effluents from a single identified mill or factory. Where several ordinary parties suffered from the effluents of many upstream factories, the common-law courts offered no remedy.

In the industrial revolution, to escape from this limitation, water-pollution victims bypassed the courts and appealed directly to Parliament. The Victorian politicians obliged, but only on a local scale: with public-health acts requiring reduction of urban sewage, and with fisheries-protection legislation banning stream pollution. But, when it came to making general doctrine about who had personal rights to pollute and who had rights to be free from pollution, the politicians seemed unwilling to go much further than had the courts. And when it came to enforcement, the government's statutes were weak. Thus, although in 1876 Britain did enact a water pollution law directed against everyone dumping wastes into rivers, the law had no national inspectorate. Local councils applied to local courts for an order to require a factory to stop polluting. The innovation was that the new law focused the courts' attention on the condition of the river not on the harm that was or was not suffered by selected victims.¹

Air pollution policy evolved differently. In the 1860s and 1870s, Parliament enacted the Alkali Laws,² a series of laws focusing attention on the standards in factories within alkali industries using soda and acid products and also in copper smelters (coal was not included). Just as significantly, it established a monitoring and enforcement body, the famous Alkali Inspectorate, whose report and observations and experiences provided bases for early changes in the laws. The standards that emerged under the Alkali Laws were aimed at reducing the harmful wastes from polluters' practices in the factories. They were not directly concerned with the property or health of victims of air pollution, nor with the air or water conditions. Only minor progress was made thereafter. Britain did not pass any smoke or smog statute to match the Alkali Laws. The Great Depression discouraged new legislation so that "smokeless zones" were postponed until after World War II and, after a devastating smog incident, a *Clean Air Act* until 1952.

¹Elworthy and Holder (1997, p. 64). Polluters could still rely on the defence that they were already using the "best practical means" available in that industry and place.

²See Elworthy and Holder (1997, pp. 62 and 217). The alkali industries, starting with salt, manufactured sodium sulphate, carbonate and hydrate, and various compounds of chlorine. Many of these were raw materials for other products, such as soap, textiles, explosives, paper and pharmaceutical alkaloids. The dangerous and unpleasant waste products included muriatic (hydro-chloric) acid and sulphur oxides.

United States. American water-quality laws steadily built on older common-law, fishery, and public-health and sanitation powers, somewhat as in Britain. All were at the state level (see Melosi, 2000; Cain, 1978).

We do not find the American federal government addressing pollution problems until after the Second World War. It started with a clean water program. Between the wars New Deal spending had been channelled into river-basin development, financing jobs and helping farmers, as was permitted by the Constitution. The projects chosen dealt with navigation, flood prevention and hydro power. Pollution, health and sewage were left to the states, and the “environment” was not considered (see Weiland *et al.*, 1997). This distribution of responsibility continued until, in the 1960s, almost suddenly, clean water and in-stream sewage dilution were included in the national legislation. The administration’s multiple-purpose, water-resource agency was authorized to make plans for improved in-stream aeration and diversion, and also to consider alternative projects for treating pollution emissions and preventing waste production. In a few years, the engineering search for river-basin projects was being transformed into a water-quality search for projects and policy instruments in aid of the “environment” with benefits for recreation, aesthetics, wildlife, and so on quickly included as national concerns.

A federal clean-air program came later. There had been a long-standing policy of leaving air pollution control in states’ hands (Dewey, 2000). Coal smoke and other industrial fumes and emissions had evoked complaints which gave rise to flurries of rudimentary local and state legislation and control activity. Although at one stage Chicago built on a common-law approach by declaring smoke to be a nuisance *per se*, the typical state legislative approach was to impose standards of plant equipment, materials or process (as with the British Alkali Laws). In the 1930s, St. Louis introduced rules about coal quality. This regulatory method was widely applied to heavy industry during and after World War II. It might be said to have reached reach a climax when California began to make car-exhaust standards, long before there was any national standard.

To deal with smoke and pollutants drifting across their borders, the states adopted agreements or “compacts” to deal with cross-border flows of industrial wastes. Federal clean-air acts left them to it until state activities fell far behind public opinion.

In the 1970s federal agencies were given powers to intervene within states, researching and identifying local problems and also imposing standards that the states would have to meet. As Andrew Thompson wryly observed in 1980, “With an English positivist tradition, the Canadian lawyer can scarcely credit as law a statute like the *United States National Environmental Policy*

Act, 1969 (NEPA) which merely declares a national policy and directs government agencies [including state agencies] to establish conforming procedures. Yet NEPA is law, and has had more influence in Canada than any Canadian statute” (1980, p. 15).

Canada. In Canada, the nineteenth century courts carried on with English common law on private nuisance, and riparian principles of property law on water quality.

The provinces adapted some of the British public-health laws, including those that would now be called pollution policies. They had jurisdiction over water quality in inland waters, but shared this with Ottawa when it came to boundary waters such as the St. Lawrence and the Great Lakes. They had jurisdiction over air quality, but in fact took almost no action against smelter and sawmill emissions.³

The Dominion government was excluded from most public-health functions. After the 1880s it could use its fishery powers to legislate against dumping “deleterious” substances into most rivers. Later, it also found that its powers over navigation were a possible legal base for pollution law-making.

Thus in the nineteenth century, legislatures and local governments in England, the American states and the Canadian provinces began to take over environmental-quality law-making from the courts. Long tolerant of fumes, smoke and chemicals, legislatures were eventually driven by concerns about sanitation, health, and fisheries, to aid municipalities to develop clean water supplies and to make simple rules about dumping wastes in streams. As for air pollution, change was very gradual. When legislation did come, it was similar to factory and safety laws, concerned with particular practices, materials and, especially, particular items of equipment. But in most jurisdictions, the neighbours of establishments emitting fumes and smoke just put up with dirty air until well into the twentieth century.

³Two well-publicized air pollution situations were that of the smelters at Trail, B.C. and at Sudbury, Ontario.

Reactions from Economists

Market Failure and Ideal Output

It cannot be said that these developments received much attention from economists or economic historians.⁴ Even those mid-Victorian writers who did take a broad interest in “social conditions”, such as Marx and Engels, Mill and Marshall, had little to say about the abatement of water or air pollution.

Sidgwick, Edgeworth and especially Pigou did mention pollution. Their references were incidental to their efforts to explain how a general equilibrium of the competitive market economy might produce a socially- optimal allocation of resources (“ideal output”). Their basic theory was that goods sold in a non-competitive market would be over-priced, bringing excessive profits to firms in such a market, so attracting excessive factors of production. Improving market competitiveness would lead to a re-shuffling of inputs and an increase in the value of total output. As a supplement to this idea of mis-allocation they considered a similar cause for a distorted allocation of *inputs* among goods and markets: excessive profits for firms that gained from “unpaid factors” and externalities or spillovers. The jobs of making markets competitive and of correcting spillovers should fall to government.

The economists rather casually mentioned pollution as an illustration of unpriced or unpaid inputs, and emissions taxes as remedies. But their writings do not suggest they had familiarized themselves with actual research on pollution.⁵ Pigou’s insistence on the market’s failure to make the best of the economy was reinforced primarily by his studies of monopoly and imperfect competition, not of the pricing or handling of water and air pollutants.⁶ These

⁴And my casual search of one-volume modern economic histories produced almost no mention of water supplies, water pollution, air pollution or the *Alkali Acts*. In France, the elite *Ponts et Chausees* institute may have developed analyzes from an economic point of view, as may its German equivalent, but I have found little trace of them in modern secondary materials.

⁵In 1950, K.W. Kapp made a valuable collection of the evidence on external diseconomies (“extra social costs”), directed at economists. It is striking that little if any of his material came from previous economists’ studies.

⁶Theorizing about the correction of externalities had passed its peak in the 1950s. Little of it came from economists’ studies. Ciriacy-Wantrup, foremost in dealing with natural-resource conservation and policy, in 1952 also referred briefly to pollution and other external

theorists usually had in mind the problems of markets in a simple two-level world of consumers and manufacturers.

But in the real world, external diseconomies and spillovers were encountered where there were non-homogeneous raw materials, uncertainty, exhaustibility and unsure ownership. In 1958, Bator pointed to non-price relationships as between producer and consumer, producer and producer, consumer and consumer, and employer-employee. A feeling for the working of these relations could not be gained by considering defects in just one kind of market. Practical knowledge, experience and measurement were necessary before anything very useful could be said about the society's ideal allocation of scarce inputs to waste disposal of heterogeneous, unappropriated, raw materials. Realizing this, the economists said very little about pollution.

In the mid-1950s, attention was directed from market behaviour and failure to the problems of collective choice. Paul Samuelson, with public-expenditure theorists, suggested models of the economy in which firm-consumer markets were only a part of the economic mechanism. At first government action had been regarded as an instrument to avert or repair the damage of market failure. The new group of theorists attempted to use the same economic principles as had been used to explain the supply and demand view of the marketplace to explain the joint-supply or collective-supply view of public organization. What kinds of goods; what kinds of persons; what kinds of production processes indicate a need for public supply? Considering all the modes of public supply, which modes could be predicted to be adopted for the production of each kind of good (regulation, subsidy, public production)? To these questions had to be added the old public finance or distributional questions: given a public supply, how should the tax burden be divided, and how should individual tastes for political and governmental systems be incorporated?

For those attempting to generalize about the place of government in the economy, the intricacy of these questions was discouraging. But for those who were increasingly alert to the problems of the environment, the new

effects, but concentrated on finding a role for government in resource conservation. It is interesting that, in the 1950s, he makes no mention of Pigovian taxes. One gathers politicians paid little attention to the marginal effect of taxes. They regarded charges as penalties for reinforcing regulation. Pigou's later discussion of "his" tax is disappointing (see *Public Finance*, 1947, pp. 99-100). In Baumol's 1952 thesis, the author argues that the state exists because various kinds of externality-distortion cannot be dealt with individually or in the marketplace. Although he quotes Mill, Pigou and especially Sidgwick, as prior users of natural-resource examples of environmental externalities (such as floods and pollution) to justify the collective actions of the state, Baumol himself rarely pauses to consider these problems. That is also true of most of the writings of late-1940s contemporaries in the "ideal output" debate: Kahn, Lerner, Myint, etc.

models were encouraging. They at least suggested that the same public-choice mechanism that determined the individual output of goods and services was involved in the output of jointly-supplied public services, and that these public services included the management and protection of the environment. Indeed, while early theoretical discussions of public goods often revolved around the creation of *man-made* facilities such as those for national defence or transportation, early quantitative exercises often centred on the preservation of *natural* sites, such as climate modification, hunting and fishing recreation, and wildlife preservation.

Benefit-Cost Analysis of Pollution

While the economists in the externalities debate were busy adding to the list of difficulties in identifying the ideal output of an economy, and the difficulties of obtaining consent on public goods, in 1936 the United States' administration and Congress developed a standard benefit-cost (b/c) approach to water-project selection. This was quickly adapted for projects having multiple purposes⁷ (not just flood control but also power, irrigation and navigation).⁸ William Baumol wrote that the economists involved in standardizing benefit-cost project comparisons were "doing the hard work involved in giving substance and application to the theory of externalities and public expenditure" (1969, p. 22).

Nevertheless, cleaning up a polluted river, the standard example in the externality literature, was left out of official federal benefit-cost analysis, as it

⁷Engineering evaluations of public-works projects were attuned to business investment evaluation methods, such as for railways, for example. Economists concentrated on the effect of decreasing costs and of monopoly (see Schumpeter, 1954, p. 949). In 1952, this procedure was heavily supplemented by welfare-economics (or national-income-maximizing) concepts. Probably similar reforms were being made in other countries, but the enormous scale of almost routine spending on American river-basin projects focused attention on U.S. federal procedures (see Prest and Turvey, 1967).

⁸To help with dating, it seems that in the planning of the American side of the St. Lawrence Seaway project, stretching from the 1930s to 1955, there was never a comprehensive comparison of the Seaway package of projects with possible alternatives (see Willoughby, 1960). However, some ten years later, both American and Canadian sides of the Columbia River Treaty negotiations (1958–63) were more sophisticated. Krutilla (1967, pp. 199–201) suggests that the Canadian team may actually have done more homework regarding the economic implications of various alternative river systems than the U.S. team.

was not one of the “purposes” of multiple-purpose river-basin development. Responsibility for public health, waste disposal, and sewage was still entrusted to the states and localities, not to the federal government. Consequently, it remained a subject for public-health and engineering experts, not economists.⁹

Although there may be other forerunners, much of the credit for the introduction of steady, detailed, quantitative study of water pollution policies into federal benefit-cost analysis must go to economists at Resources for the Future in Washington, DC.¹⁰ The story goes that in 1963 the Corps of Engineers proposed to create reservoirs in the Potomac River to augment low summer flows and to improve the sewage assimilative capacity of the estuary. The economists, all recreationists and canoeists, became alarmed as, in the course of the benefit-cost studies of this project, they learned the reservoirs would spoil white-water canoeing. This threat concentrated their thinking into looking for a wider range of approaches to water-quality improvement, including collective treatment, a process then beyond the Corps’ range of alternatives.

After 1960, the new environmental movement, spreading alarm about the capacity of nature to support economic growth, attracted economists. They considered regulation versus property (Coase, 1960), materials scarcity and growth (Barnett and Morse, 1963); natural limits (the Club of Rome 1972) and resources and growth (Solow, 1974) and the eclectic idea of sustainable development (Brundtland Report, 1987). And they began to apply analysis to toxic pesticides (Carson, 1962), ocean pollution, endangered species, acid rain, CFCs and global warming — each of these suggesting new twists on the measurement of benefits and costs of environmental policies.

It is not clear when Canadian jurisdictions began to utilize anything like benefit-cost analysis. I have the impression that after World War II

⁹There were economists specializing in local-government public finance who did work on civic enterprises such as sanitation, and Pigou and the Webbs in England did continue to consider urban enterprises. It is always a surprise for visitors from the United States and Canada to find that in the U.K. government it is to the municipal-affairs department that “environmental” problems have been assigned, reflecting the historical local-government focus on public-health policies (see Cain, 1978). In 1955, in his thesis, the splendid *Water-Resource Development: The Economics of Project Evaluation*, Otto Eckstein does not mention pollution, waste, sewage and so on. In the important Maass *et al.* report on their early 1960s work on design of water-resource systems, Maass and Dorfman do mention pollution abatement, but only in order to assume it away from their calculations and arguments.

¹⁰Including D’Arge, Kneese, Krutilla, Herfindahl and Fox.

politicians, treasury boards and their consultants all devoted their efforts to improving engineering-type studies of the costs of various scales of project. An informal benefit-cost manual was produced for Canadian use in 1962, and an official volume manual a dozen years later.¹¹ There were plenty of postwar opportunities, including the International Joint Commission's Columbia River projects, the St. Lawrence waterway projects, and the South Saskatchewan Dam. All of these were intensively examined, of course. But I suspect that only the Winnipeg project received anything approaching the kind of survey of "all, benefits, all costs, and all alternatives" urged in the public-finance and theory textbooks of that day.¹²

Minimal Economists: Environmental Impact Statements

The environmental impact statement or assessment (EIA) came to general attention in the United States when it was added as a requirement of the National Environmental Policy Act (NEPA) in 1969. It was intended to force an action from the agencies and states when NEPA was otherwise merely a statement of Congress' principles (Weiland *et al.*, 1997, p. 101). Those who submitted a project proposal were required to provide the information so that professional experts could judge the effect of the project on the environment.

Soon after the United Kingdom and other countries in the European Commission¹³ adopted a similar EIA requirement. In 1973 Canada also made an environmental assessment review process a main element of legislation. This step integrated environmental considerations into the government project-selection and policy-making process, whether or not the project or policy being reviewed had an "environmental" purpose. Some Canadian provinces also adopted their own EIA laws or procedures. In addition to its

¹¹The first Canadian guide took into account the U.S. water-resource benefit-cost rules that evolved through 1952 and the "Policies, Standards and Procedures" of 1962. They had been sponsored by the Bureau of the Budget, while the Canadian guide had no official standing. The Treasury Board Secretariat produced a benefit-cost analysis guide in 1976. There was then really no official Canadian doctrine to say that only increases or decreases in national income should count.

¹²See the report by Clarence Barber. Thanks to T. Shoyama and Robin Boadway for discussions.

¹³See Elworthy and Holder (1997, pp 388-421) for EIAs in the United Kingdom and the EC.

applicability to federal government projects, the Canadian EIA law had the surprising effect of imposing *federal* environmental concerns onto project proposals for provincial projects. For example, litigation forcing an embarrassed federal government to conduct EIAs of the Rafferty-Alameda dam (1989), and the Oldman River dam (1992) was significant in pointing out a wider federal environmental jurisdiction than the provinces or even Ottawa had realized.¹⁴

In many countries, making environmental impact assessments and giving them weight in project design and selection became routine procedures. Canadian jurisdictions were not as enthusiastic, as politicians in Ottawa and most provinces endeavoured not to lose detailed control over public-works spending.¹⁵ One time-honoured procedure was to appoint ad hoc Commissions of Inquiry or Royal Commissions. When a bridge, port, railway or other resource or environmental matter was under discussion, such inquiries could obtain information while helping to cool the disputants. One example was the 1975–77 (Berger) northern-territories pipeline inquiry, noted for its author's concern about communal and socio-economic impacts as well as purely environmental impacts. (It came quite soon after Quirin's 1962 business-like investment study of northern oil and gas prospects — one that, remarkably, had been able to avoid saying anything about social, community or ecological impacts.) Ad hoc reports such as Berger's were able to weigh social and environmental factors at some length, but they made a minor contribution to the building-up of a framework for environmental analysis — scientific, sociological or economic. I am not aware that environmental economists in Canada have given these studies, or the data in them, much attention.¹⁶ By their uniqueness they created no precedent: the author's personal conclusions, not his approach, are remembered.

¹⁴For an up-to-date account of this litigation and its aftermath, see Field and Olewiler (forthcoming, ch. 15).

¹⁵Most jurisdictions began to call for EIAs to consider public policy alternatives, and their effects on the region's resources. Some suggested merging benefit-cost analyses with EIAs. Of course, there were numerous difficulties. In good benefit-cost analysis, double counting is prevented by final-product or national-income (net) concepts. The environment, however, has no final product. Everything that is impacted is as important as anything else. Thus EIA is analogous to economic *impact* where every dollar change in sales is counted, even if that dollar is already included within another item.

¹⁶Compare the continuing reference by Canadian fisheries economists, to the reports of the Sol Sinclair, Pearse and Kirby fisheries inquiries.

Teaching and Research: Environmental Economics beyond Benefit-Cost Analysis and the EIA

Economists who taught the subject left environmental impact to “environmental scientists”. They had their hands full as old controversies about benefit-cost analysis gave way to a very wide range of topics, always including “pollution economics”. They concentrated on five or six main policy areas, all connected by the problem of a market and of individual property rights.¹⁷

Land use. This policy area is a natural, especially for economists and departments for whom it is simply a continuation of earlier work in land economics, agricultural economics, regional economics and urban economics. Today’s economists are busy in related fields such as recreation (and parks and reserves) and endangered species. Many of their fields of interest are shared with geographers. Pioneering institutions like Resources for the Future were manned primarily by land-use specialists. By now all policy areas in environmental economics have borrowed land-use valuation concepts such as irreversibility, option value, existence value, travel-cost and contingent valuation, and policy approaches such as safe minimum standards, transferable development rights and land-use reserves. Perhaps relatively fewer Canadians than Americans are in this field, though that is just an impression.

The environment, total output and economic growth. From Malthus to the Club of Rome to the Brundtland report, economists have participated in asking about the influence of resources on output and growth. Since the

¹⁷Most curricula also include the economics of exhaustible resources, such as the calculus of forest husbandry and mine development, although these are, mainly, traditional subjects that do not involve the special topics below. However, the availability of minerals and forests does play an important role in theorizing about long-run growth (as treated by the old conservation literature from Malthus to Jevons, Ciriacy-Wantrup, Scott and Barnett and Morse). As well, open-pit mining and clear-cut logging are often treated as sources of environmental degradation; and the rate of mining and of logging are important elements in greenhouse-gas calculations. Most classroom curricula also include open-access fisheries and their regulation. Indeed much of the second and third topics mentioned below were considered in fishery economics long before environmental economics had been invented: regulation; taxes, subsidies and individual trade rights. From about the Second World War, Canadian economists played important roles in developing concepts in fishery economics.

1960s, the condition of the environment, both as cause and effect, has attracted equal attention. The idea of “sustainable development”, advanced in terms that economists could understand, promoted these inquiries.

Materials balance and input-output. Early attempts to bring environmental economics, production and wastes together into a single “spaceship earth” model were popularized by Kenneth Boulding (1966). Peter Victor wrote an outstanding volume on this in 1972, with application to Canada.

Trade, growth and the environment. In connection with sustainable development, environmentalists like Herman Daly (1973) have expressed fears about influences of trade, globalization and foreign ownership on the environment, growth and sustainability. Their attacks have attracted a vigorous literature, perhaps more theoretical than empirical, in which several Canadian economists have been very prominent.¹⁸

Measuring growth (“green accounting”) Robert Repetto and Herman Daly represent environmentalists who argue that official economic growth data overstates the actual because the statistics do not take into account a country’s resource consumption (depletion). Textbooks lay some emphasis on this. Responsively, Statistics Canada has made impressive progress measuring changes in the value of certain resource stocks. Although some Canadian academics have been advisors on these measurement ventures, most write as though they did not exist.

Decision-making. Some economists make theoretical investigations of agreements, contracting, consent and voting, used to arrive at environmental decisions. Their work can be closely related to that in law and economics and in public-choice theory.

Game theory. Some regard the environment as a common-pool or no-property resource, and apply game theory to predicting the outcome of attempts to come to agreement on policy. This work has not progressed as far as that on water use or on fisheries.¹⁹ It would seem that Canadian political scientists and lawyers are ahead of economists in studies of the actual circumstances of environmental decision-making.

¹⁸For example, in a recent paper, B. Copeland, B. Antweiler and S. Taylor (forthcoming) set out a theory of how openness to international goods markets affects pollution concentrations, using trade theory and SO₂ data from the Global Environment Monitoring Project. Combining estimates of scale, composition and technique effects yields the surprising conclusion that freer trade appears to reduce overall pollution.

¹⁹See Ostrom *et al.* (1994). The authors’ very general, and informed, approach to common-pool “resources” has almost nothing to say about polluters or the environment.

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Costs and benefits. In Canada, making studies of economic “impact”, ranging from changes in local employment to changes in national income are the bread-and-butter of government economists, consultants and some academics. On the demand side, these make use of questionnaire techniques to predict utilization of proposed changes in land or environmental use. On the supply side, they make use of regional input-output techniques.²⁰ Although in Canada these evaluations are not usually combined into one all-inclusive benefit-cost assessment, each part may be used to support a finding on “feasibility” (more below).

Choice of instruments. Taxes, subsidies, marketable permits, access to nuisance and tort law, contracts, public undertakings, enforcement by damages versus enforcement by injunction, monitoring — these topics in environmental economic fields are outgrowths of similar economic studies in the fields of public finance, public expenditure, industrial organization, and law and economics.

Tort law. A number of economists, now expert in tort law, have investigated the history and modern applicability of common-law remedies for harmful pollution and land use (Deweese, 1995; Posner, 1977, ch. 13). Many provincial health, sanitation and environmental regulations have been drafted and even worded as updates of common-law doctrines.

Regulation. As already mentioned, since the nineteenth century, regulation has been seen as the practical answer to common-property effects on the environment. Pollution regulation takes the form either of control and monitoring of the processes and materials used by a polluter, or control of the amount of emissions themselves. Verification of compliance of the first is much easier than the second, and has long been chosen by local governments, already experienced with quarantine and sanitation controls. It was the low-cost, flexible method chosen to reduce smoke emissions, both industrial and residential. Deweese (1995) has studied equipment requirements by reducing SO₂ emissions from smelters; and Muller has examined pulp mill equipment standards. “Standards” may mean that such equipment regulations have been standardized as between different jurisdictions. Control of emissions is more direct, but more costly to enforce, initially.²¹ Many

²⁰Input-output is also used on the demand side, when there is an expected change in the amount or quality of an input.

²¹California, and later all American auto emission regulations imposed on manufacturers are an example of forcing a producer to adopt equipment regulations by setting aggregate emission regulations. For the earlier years of California’s regulations of auto

economists have contributed theory and empirical research on the results of equipment standards, which are similar to aspects of earlier public-utility and building standard regulations. These are valuable for themselves and for the light they throw on theories such as Stigler's that controlled agencies are vulnerable to being "captured" by the very industry they are set to control.

Taxes and compensation. Some economists who write about taxes are dealing with compensation: the lump-sum bribes, and settlements and charges that are paid when a person is deprived of a use of land or when a polluter is deprived of the use of a process. Others are dealing with fines. In theory, this subject applies to most branches of environmental economics, but in practice it applies mostly to land-use economics. It arises when a wildlife or endangered-species agency (or a voluntary "heritage" group) sets out to control, or acquire, land, marine reserve, seacoast or wetland for habitat conservation. This is an old subject for land economics and for law and economics.²²

Charges and incentives. In microeconomics, economists are trained to look for pricing, rather than rationing, to control the flow of anything and so minimize the costs associated with the flow. This point of view, extending Pigou's thoughts on using taxes to remove extra social costs, has led to economists' widespread enthusiasm for emission charges, or any kind of quantitative permit fee.²³ Like regulations, fees may vary with the location of the emission.²⁴ Most economists and their textbooks favour these, but there are few actual examples.²⁵

emissions, see Dewey (2000, pp. 57-83).

²²See Schwindt (1992, especially Appendix A-1) for a survey of compensation policies.

²³Ideally, both pollution charges and quotas vary among seasons and locations; and are flexible as information accrues and circumstances change. For air-pollution charges in Canada, see Baar (1995, pp. 102-103); see also sewage charges and graduated automotive clean-air charges. There is a serious theoretical literature on "prices versus quantities" under uncertainty.

²⁴For pioneering work by economists on water releases, see chapter by Dorfman in Maass *et al.* (1966, pp. 88-158 and 494-539); for least-cost removing of organic pollutants from river basins, see various writings by O. Herfindahl and Allen Kneese.

²⁵There do exist charges on emissions of industrial pollutants into rivers and estuaries in France, Germany, Holland, Italy and Australia, that vary according to the pollution load. Critics say these are set so as to capture the rent of the right to emit pollutants

Tradable pollution permits. Under the common law applying to water and to land, an owner may have established a reasonable freedom to use his own land, or the right to use the land of another, in a manner that pollutes the environment. Where this was so, the freedom could be bought and sold with the property right. This idea leads on to government-created pollution or emission rights, an influential and practical idea invented by John Dales in 1967, perhaps inspired by western appropriative water rights. The idea has been applied to some air emissions in the United States. In the United States, and even in Canada, there is also a voluntary trade in certificates of reduced pollution.²⁶ (The similar tradable-quota idea is old stuff in fishery regulation; introduced in New Zealand and Iceland in the 1970s it is today found in 40 Canadian fisheries.) Soon after Dales wrote, the idea of transferable *international* water-pollution permits was recommended in Organisation for Economic Co-operation and Development (OECD) advisory deliberations (see Scott and Bramsen, 1972, pp. 403-404; and Scott, 1976a, pp. 177-218). The OECD did not make much of that idea and proceeded with an agenda of distributional debates about whether polluter or victim country should pay. As a result, although domestic and international tradable air-pollution permit systems were subsequently introduced, tradable *water*-pollution permit systems are still rarely mentioned, even in jurisdictions that have tradable water-diversion permits.

Counting Canadian Environmental Economists

Environmental economists in Canada can hardly be said to form a group. Those who work with zoologists on fish habitat, those who work on smoky production processes and those who develop statistical indicators of sustainability rarely speak. This is partly because they are divided as between government service, consulting and academia.

We can start with those in provincial government service. They are relatively few in number, perhaps less than 35, coast to coast. Most of their jobs are in evaluation. Although most provincial laws do not explicitly call for economists' studies, they help decision-making about utilization and prices of Crown and private lands for endangered species, wilderness, parks, logging,

rather than to discourage pollution.

²⁶Tietenberg (1985) is rightly given credit for widespread understanding and acceptance of the mechanics of the idea among U.S. economists.

mining, roads and towns. Not only do they make estimates of likely utilization, impact and cost but also of mitigation and compensation payable.

Turn next to the federal government. I have made no real count, but would guess there are in Ottawa as many economists working on environmental economic questions as in the provinces. They are in five or six departments, notably Environment Canada and Industry Canada. As might be supposed, they are more concerned with the planning of policy or legislation than with application and enforcement, especially when the problems involve international cooperation, trade and productivity. More of their work is published or publishable than I was aware. Anyone would be impressed by Statcan's regular environmental and resource accounts and indicators, and by recent joint reports for the National Climate Change Process on costs and on emissions-permit strategies.

At both levels of government, senior economists from finance departments and treasury boards occasionally lend assistance on complex inter-governmental liaison and legislation issues.

A third category includes the private economic consultants. They are perhaps more relied on by environmental bureaux than by any other branch of government, involved in hearings, assessments and, perhaps especially, lawsuits. Some of them have outstanding capabilities for making survey-based estimates and predictions of willingness to pay, traffic, and so on.

A fourth category includes academics in Canadian economics, agricultural economics, business and public administration faculties.²⁷ They number about 90, perhaps 5 per cent of the total academic economics establishment.²⁸ Some belong to the Canadian Economics Association, some to the Canadian Association for Ecological Economics (a political-economy group) and some to the Committee for Resource and Environmental Economics (CREE), more for research-oriented economists. I reckon that of the 90, about 30 do environmental-economics research that shows up in specialized economic journals.²⁹

²⁷There are also energy, fishery, recreational, urban and forestry economists in various faculties, some of whom sometimes work/teach in environmental studies.

²⁸About 150 names are on the CREE mailing lists; it includes unknown numbers of non-Canadians, government officials and graduate students. About 65 people come to a CREE meeting. The 5 per cent number comes from comparing 90 with the up-to-2,000 members of Canadian academic departments, estimated by John Helliwell in Howitt (1993).

²⁹Browsing through the bibliographies of environmental monographs and textbooks, I found about a dozen Canadian names. The huge bibliography of one European book listed

What the Academics Work on

What do Canadian economists write papers about?

One way to find out is by consulting the programs of CREE for the period 1992–2000. I have scored the various subjects by assigning points to each paper according to the number of authors, co-authors and discussants who dealt with it. In the years from 1992 to 2000 the point total for all such papers was 475.³⁰ I have sorted them into four groupings.

First, by far the most popular grouping was of papers on more or less traditional land-management topics: fisheries, forests, water resources, mining and energy. Many, but a minority, of these were concerned with modern aspects of resource management, such as sustainable development and ecosystem integrity. (This whole grouping included 30 per cent of all CREE points.)

Second, following land management, came air and water quality and pollution abatement. Most of these papers treated their subjects theoretically (11 per cent of total). This grouping was hard to distinguish from others containing discussions of regulation, law, property rights and enforcement (6 per cent) and another set on tradable permits (5 per cent), (22 per cent altogether).

Third, following pollution, came a group of papers on valuation, specialist and expert reports on existence, option and recreational valuations. Many were by-products of user surveys, often processed by contingent-valuation and travel-cost methods; to these were related a group discussing experimental methods, (20 per cent altogether).

Fourth, well below the valuation grouping, was a set of papers on endangered species and wildlife diversity, along with wilderness and habitat (5 per cent). Related groupings contained papers on sustainable development and growth along with environmental indicators and green accounting (6 per cent), trade, mobility and location, primarily trade theory (5 per cent); and recycling (1 per cent), (adding up to 18 per cent for this group).

three hundred environmental-economic papers and studies, about 15 of them by Canadians.

³⁰At a typical CREE meeting, of those speaking and/or commenting, about 75 per cent were connected with Canadian universities or consultancies, about 20 per cent with U.S. (and overseas) universities and research institutes, less than 5 per cent with Canadian governments, a few with international organizations and none with any environmental organization, Canadian or otherwise.

These four research groupings account for more than 90 per cent of the activity at CREE meetings. In addition, there were several sessions describing current policies and problems by government economists, and others on federal and international institutions (8 per cent together).³¹

A tentative conclusion is that the single category that engages the largest number of Canadian academic economists is the analysis of the emission of air pollutants. They are, however, perhaps concerned more with contributing to the American and international literature on this global problem than with understanding or improving Canada's problems or policies. (In comparison, members of a group of Canadian "environmental" academics in political science and public administration know more and write much more about Canadian pollution policies.)³²

At the present time, there seems to be not much contact between Canadian academic economists and their opposite numbers in government. This is illustrated by the literature of the last five years on distributing and trading emissions permits. Some writers have Kyoto greenhouse gas (GHG) quotas in mind, but others are writing quite generally about trading any kind of emission permit. The academics build models and seek a high degree of generality. Looking for various kinds of efficiency under various assumed conditions, they are led to ask about the polluters' permit market when polluters know that there will be a future "adjustment" of the number of permits outstanding (and their price) when further knowledge becomes available. The authors make no attempt to identify their various sets of alternative conditions with any set of conditions actually existing among, say, pulp producers, oil refineries or car owners in Canada, or anywhere else. (At

³¹The total is 98 per cent, reflecting rounding. Papers were fitted into categories according to their titles, a rough-and-ready procedure. Category percentages may overweigh discussants relative to speakers.

Another, laborious, way to find out what Canadian environmental economists wrote papers about would be to consult their Web sites. Doing this for a few names told me, not surprisingly, that an able economist has the capacity to do many things: teach, supervise, write papers for CREE and for international conferences and journals, act as consultants, run institutes, and so on. To obtain a balanced picture of the professional lives of the whole community of academic environmental economists, however, was beyond my resources.

³²Consider a very recent political science book on Canadian pollution. In its substantial index of names, it cited only six economists, four of them Canadians. All are referred to as experts on the economy, none as sources or experts on any environmental question.

least, they do not do so in their published work.³³) The team of economists writing *Using Tradeable Emissions Permits 2000* do investigate and explain their ideas about how a stated number of polluters will bid for permits given their uncertainty about how others will respond to the new system. But these economists too do not seem to have come to grips with the uncertainty literature.³⁴

The Differences and their Explanations

In this section I examine, and offer some explanations for, the difference between the activities and contributions of economists in the United States and abroad and those of Canadian economists.

What are the Differences?

Specialization on theory. Relatively more Canadian academic specialists work on theory than in the United States. Much of this theory tends to be normative — some of it is about minimizing the cost of reaching selected environmental targets; and some of it tracing the effects of selected instruments.

Little Canadian Content. As already mentioned, my impression is that the topics most Canadian economists work on show little knowledge of actual or

³³For a contribution, with a short bibliography, see Kennedy (1999). A similar kind of uncertainty lies behind the “price versus quantity” debate about fishery catch quotas versus taxes on the catch.

³⁴In this particular example, the economists in the working group are drawn from a variety of sources, but are mostly from provincial and federal departments. Their work is tributary to the agenda of the confusing, multi-disciplinary, “national climate change process”, working on the “national implementation strategy on climate change” and related “business plans”. This “process” draws on 450 experts from industry, academia, NGOs and government, formed into 16 working groups, of which the group producing the emissions permits report is one. The report-producing work of the groups has been co-ordinated by a “national air issues coordinating committee (NAICC)”. One can sympathize with the economists trying to design, and explain, and publish a tradable emissions system report, written for individuals drawn from many disciplines. Sympathy aside, their hard work does help to illustrate that there is a gulf between academics and public servants.

proposed Canadian policy or issues. They are in tune with the literature, which more than anything reflects the interests of American environmental economists.

American academics *are* interested in United States' policy issues, partly because they get a good exposure to them: indirectly in their graduate schools and directly as consultants and advocates.

Minor Explanations: Theories about why our Economists Write Theory

Publication in international journals. One line of explanation has to do with the influence on young economists' careers of different kinds of research and publication.³⁵ Their professional success depends in part on the acceptance and publication of their research in journals recognized by their colleagues. This means, primarily, American journals. One correspondent put it to me that young Canadian academics find that American journals simply will not accept a paper about Canadian institutions or environmental problems. So the young economists write "theory" papers, which are more acceptable and interesting to any journal, especially those outside Canada.³⁶

Staying mobile. Supplementary to that line of explanation is a view that applies to all in the humanities and social sciences, not just economists of the environment. This is that academics in their first appointments prefer to follow research leads that will keep them mobile, and avoid research topics that will be deemed by prospective employers as being too specific.³⁷ One way to do this is to work on abstract subjects and methods that are welcomed

³⁵See Scott (1967, 1993), in connection with the international migration of social scientists (brain drain) and with the 1990s composition of the membership of the Canadian Economics Association.

³⁶"To get an article published in most of today's top rank economic journals, you must provide a mathematical model, even if it adds nothing to your verbal analysis" (Lipse, 2001, p. 17). The author adds that "several economists" have expressed agreement to this complaint.

³⁷See Scott (1993). Other contributors to the symposium tended not to disagree with the explanation.

in all departments in all countries. Those who work on international trade theory are said to be especially welcome in U.S. departments. For some this means simply continuing to work a vein already opened in a Ph.D. thesis in a U.S. graduate school; for others it means a more explicit selection of a portable field.

Impatience with Canadian data and institutions. A third minor line of explanation is that some Canadian environmental economists are impatient with what they know of Canadian environmental problems, policies and institutions. This is partly because data and description of Canadian phenomena have not been refined into terms that invite economic analysis. It is easier to join the profession in working over American endangered species and related legislation than it is to bone up on the problems and regimes governing polar bears or migratory birds.

Why are these “minor” explanations? To the extent that the explanations above are correct, they tell us something serious about environmental economics in Canada. These academic economists may be encouraged by their departments to tell their students about resources, the environment and related policy in Canada, but the incentives facing them are mainly for them not to do homework or real research on these matters.

Nevertheless, I call these “minor” explanations because they are actually encountered in most branches of economics in Canada. Getting data and doing research on Canadian topics is difficult, yet it is not as well rewarded as doing theory or research on topics that are welcomed in non-Canadian journals. In all economic fields new theory tends to be developed in unconstrained ways that may be tractable, but are empirically relevant only by accident (Lipsey, 2001, pp. 11 and 19). The question then arises, are there additional forces driving some environmental economists into “internally generated theorizing?” We are looking for what I call the “major” explanation.

Major Explanation: Canadian vs. United States Federalism

As promised, my major theme is that the nature of Canadian federalism puts an imprint on the nature of our environmental *policy* problems. In almost any branch of environmental economics, as the subject is conceived today, the research and theorizing of economists deal with American policy questions. They are questions that at one time were issues for an American government making choices among methods, procedures or policies (e.g., *Methods*: how

to value recreation in public land-use decisions. *Procedures*: how to get economic project decisions from the Corps of Engineers. *Policies*: how to deal with endangered species on public lands). Similarly, today's new policy questions for Americans are providing the agenda for the next generation of researchers and theorists.

In Canada, the physical environmental problems may be similar to those arising in the United States, but the range of policy choices is different. They seem to be aspects of the same old Canadian confederation trappings: dividing the roles with the provinces, the special position of Quebec, the balance of relations with the United States — all questions that stimulate political scientists but disconcert economists.

United States: federal jurisdiction over environment. As a long-run matter the federal government has picked up, and held on to, responsibilities for expanding the set of environmental functions, imposing participation on the states.³⁸ True Congress, more than once balking at assuming the regulatory functions of environmental policies, as in the Reagan era of the 1980s and 1990s, has allowed some impatient states to take their own paths. But these have been pauses, not reversals. When Congress musters all its powers, or when the administration addresses itself to all the tasks with which it has been charged, the states must fall in with federal policies and standards, especially if they are to be “funded” for doing so.

The general result is that Washington is the headquarters of environmental policy research. There large statutory agencies undertake the active supervision of air and water quality policy, management of public lands and parks, development of endangered-species policies, and, of course, the conduct of international environmental diplomacy. For economists interested in these matters — as for economists interested in, say, public finance — the federal government is *the* government.³⁹ They see only one. It enables them

³⁸These three observed characteristics of U.S. intergovernmental relations in the field of environmental policy, that distinguish it from Canadian inter-governmental relations, are identified by Kathryn Harrison (Fafard and Harrison, 2000, especially pp. 67-76).

³⁹For illustration that this has been the case for decades, see Russell (1979). In this conference volume, 31 social scientists, mostly economists, discussed the “new” public-choice theorizing and its applications to energy, environment, education and health problems. Some papers dealt with actual decision-making. In the latter, it is clear that *all* authors and their discussants thought of social choice research as being relevant for the central government. The word “state” hardly appeared. For example, references to the automobile industry/environmentalist debate over emissions’ regulation never mention California, which originated the regulations. References to international fisheries scarcely mentioned the states,

to treat government as unitary, its policies unique, emanating as it were from a black box. Pondering and proposing environmental policies, they have no more reason to consider the plurality of government than have colleagues specializing in policies for hospitals, museums, highways or naval bases.

Consequently, when economists apply welfare theory, they tend to translate the jargon words social and society as “national”, referring to the nation as a whole. When other social scientists analyze the social effects of an environmental policy, they write about the impacts on tribes, states or communities, whereas economists estimate the expected changes diffused throughout the nation and indicated by changes in the national product and its composition. They picture the Washington lawmaker as something like the “planner”⁴⁰ at the centre of some expositions of welfare economics, having all necessary reallocating and distributing powers to make progress towards the general (=national) efficiency optimum.

Canada: Shared jurisdiction. In Canada, things are different. Nearly all actual pollution management is carried out at the provincial level. When federal politicians take a deep breath and decide they must act in the matter of, say, pesticides, endangered species, or acid rain, they are usually bracing themselves to induce the provinces to act.

It is true that they can assemble an armoury of powers: spending, POGG, criminal law, commercial shipping fisheries and international-relations. But they have not felt that the mere existence of these powers provides them with a positive justification for taking over all waste emissions or disposal.

Their most widely-accepted function is to negotiate treaties and to see they are carried out.⁴¹ But the latter responsibility is not usually matched by requisite law-making powers. Ottawa is obliged to enter into bargaining and coordinating, just as if it were one of the provinces itself.⁴² Otherwise, the

which then exercised regulatory jurisdiction.

⁴⁰See *Economic Report of the President* for various years, especially 1994, by President Clinton’s Council of Economic Advisers, chaired by Joseph Stiglitz.

⁴¹However, the treaty agreements may merely formalize, or may extend, an agreement already made by a province with a neighbouring U.S. state. These are not unusual. See Alley (1998) and Hodge and West (1998).

⁴²For an informed discussion and description of the workings of federal and provincial governments in a situation — Hamilton Harbour — where Ottawa has many direct responsibilities, see Sproule-Jones (1993, pp. 125-249).

provinces perceive that the federal politicians could, by choice of standards, implicitly dictate how the burden of complying with international standards was to be distributed.

Some would say Ottawa's strength lies in its coast-to-coast jurisdiction, which enables it to make policies and set standards that apply everywhere, which are then uniform. This is not a unique power, for the provinces can by agreement also achieve uniform laws among themselves. The transactions-cost school would say that the assignment of the function is a matter of whether the political difficulty of federally enacting and enforcing uniform standards is greater than the provinces' bargaining difficulty of agreeing on them and enforcing them (Breton and Scott, 1978, chs. 7 and 8). But as against this approach, the Canadian practical-politics school would say it seems mostly to be a matter of whether federal politicians want to occupy the assignment of powers that already exists, or to escape from it.

Currently, federal politicians are not seeking to exercise wider powers. Instead, "harmonization", "consultation", "all-Canada accord", and so on all indicate their unwillingness to try to supplant the provinces.⁴³

Canadian provinces have long exercised powers not only to inspect plants; set safety, sanitary, and construction standards; and make property laws; but also to run the Crown's own lands, minerals, water resources, forests, parks, hunting and wildlife. More so than American states, they have experienced regionwide bureaucracies to do these things. Changes in environmental policy are, to the resource user and polluter, changes in continuing arrangements. The permits, certificates, leases and licences that symbolize provincial powers and ownership are the instruments in which ongoing, routine environmental policy will be embodied.⁴⁴

Consequently, although there are centres of advocacy and of research, there is no national centre having economies of scale in environmental law-making and enlightenment.⁴⁵ The economist who would understand and

⁴³See Harrison (1996), and the essays in Fafard and Harrison (2000), for these regimes.

⁴⁴See chapter by Cohen, Scott and Robinson in Scott, Robinson and Cohen (1995, p. 183), on the jobs of officers requiring them to reconcile, in the field, their departmental, financial and environmental responsibilities.

⁴⁵Many universities have interdisciplinary environmental or sustainable-development research institutes, recently working on a chosen ecosystem. Canada also has the IISD, the International Institute for Sustainable Development. It is indeed an international centre, giving much attention to environmental problems of the Third World. Canada also has its National Round Table on the Environment and the Economy, which concentrates on making Canadian

improve the country's environmental policies will not go to Ottawa to find a community of conceptualizers or researchers. The federal government's changing policies are unpredictably responsive to the buck-passing by provinces,⁴⁶ to pressures from other nations, and to industrial and environmental lobbyists.⁴⁷ Neither is policy-making in the provinces more stimulating. True, there is a long history of introducing and enforcing environmental policies. But if the introduction of any of these was much supported by economic analysis of the alternatives, it was done quietly.⁴⁸ There are good provincial environmental economists, of course, some working on pollution and some on related energy policies, recreation, logging and so on. Probably they work mostly with engineers, biologists, foresters, consultants, and financial colleagues in the provincial treasury, and rarely with each other or federal and international economists.

Is Canada's federal distribution of powers likely to follow that in the United States? Apart from negotiating treaties concerning global pollution, there seems nothing special about the environment that would lead one to predict an early transfer of powers from the provinces to Ottawa. I discussed aspects of this question in Scott (2000).

Here I briefly remind the reader of some frequently made political arguments regarding centralization of powers over the environment. In

growth more sustainable. The first of these does some in-house research and publication, but the second relies on consultants to help it explore chosen problems. Two environmental NGOs, Pollution Probe and the Suzuki Institution consistently do some research and writing in-house, often economic in approach. Beyond these, we should notice less-specialized groups like the C.D. Howe Institute, the Institute for Research on Public Policy, the Canadian Chamber of Commerce, the Business Council on National Issues, the Fraser Institute and the Atlantic Institute for Market Studies, and energy, petroleum, wood-product associations, unions, the Sierra Club, Friends of the Earth, the Canadian Wildlife Foundation. All occasionally commission studies with economic content to focus attention on some environmental problem. However, they rarely commission or undertake original research.

⁴⁶The title of Kathryn Harrison's 1996 study.

⁴⁷See Harrison (1996) and the authors in Fafard and Harrison (2000) for Ottawa's repeated cycle of engagement and disengagement, beginning in the 1970s.

⁴⁸Anita Kranjc (2000, pp. 122) and elsewhere says that the details of environmental policies of Ontario (and by implication of Alberta) are driven by emulating U.S. neo-conservatism. See her citations of other studies of provincial policies.

general, environmentalists favour centralization — to Ottawa — of powers over the environment. Industry is not united on the question, but firms do have several reasons for believing that they can escape from the burden if the provinces have the unnecessary powers. Governments do not necessarily seek powers to impose burdens on polluting industries, preferring to “pass the buck” to the other level of government. However, Ottawa may lose its attempt to not pass the buck, as its international relations’ responsibilities will keep it in the centre of the Canadian campaign to live up to the nation’s GHG responsibilities. If so, as this assignment of powers accumulates, we may be in for a centralized regime more like that in the United States. If so, Canadian economists may be able to assume that American generalizations about the role of “government” also apply here.

- Environmental NGOs and Green politicians favour centralization of powers. This seems sometimes to be a thoughtless desire to achieve the powerful position of their associated NGOs in Washington, who deal frequently with Congress and with a host of government officials and think-tanks. Such organizations, in Canada, complain that they have grave difficulties selling their arguments (e.g., about endangered species) in ten provinces instead of simply in Ottawa. While it is logically true that if the necessary power were centralized the pro-endangered-species-NGOs could attain their goal by winning only one battle, it is also true that with centralized powers the NGOs could lose the endangered species war by losing only one battle.
- Environmentalists and biologists are said to favour centralized policy-making because it results in uniform environmental conditions. This proposition needs much more analysis than space permits. Legislative centralization does not necessarily lead to uniform policies; uniform policies do not necessarily lead to uniform conditions; and uniform conditions are not environmentally healthy. Also, note the choice of administrative alternatives: politicians with centralized powers over the environment can choose within a wide range of achieving a given environmental condition: at one extreme they can themselves legislate environmental rules, laws and enforcement methods to be applied to each place within their jurisdiction; at the other extreme they can appoint and instruct expert officials to use their discretion in managing these places. All the combinations of these alternatives, and their outcomes and costs, can be achieved by a “centralized” assignment of environmental powers. Note, however, that many of them can also be achieved by a decentralized assignment, by agreements, among smaller jurisdictions.

- Industry is said to favour centralization and uniform regulation if they maintain fair competition among businesses in different provinces, if, that is, they prevent certain provinces from assisting local industries by removing high-cost environmental or pollution rules. Generalization is difficult, however: an industry that believes it can rely on relatively low-cost pollution rules from a certain government will be in favour of giving the necessary powers to a government at that level.
- Industry is said to favour a continued decentralization of environmental powers. It is said that this is because existing provincial enforcement of tenure regulations on Crown lands keeps industry officers in friendly daily contact with provincial administrators, and provincial politicians. For example, compare control over fisheries and over logging. Fishery businesses regulated by mobile federal government officials are visibly less comfortable than their logging colleagues who deal with resident provincial forestry officers. It is also said that local businesses can get more comfortably involved in long-term political alliances with provincial than with national politicians. (However, recent international negotiations show that it is possible for local business persons to work on friendly terms with federal trade, immigration and environmental officials.)
- Provincial and local governments (or some of them) are said to agree with industry in disliking a competitive “race to the bottom” of environmental standards. There is little Canadian research to indicate whether or not there is competition in easing environmental standards, or whether such competition would lead to the relocation of polluting industries. When one reflects that the large-scale polluting industries are oil and gas, pulp and paper, electric power generation and metal smelters, one does not expect much relocation among Canadian provinces.

However, Ottawa may lose its attempt to not pass the buck, as its international relations’ responsibilities will keep it in the centre of the Canadian campaign to live up to countrywide GHG responsibilities.

Examples. No wonder that in Canada environmental economists find themselves faced with a jumble of provincial environmental regulations, with no big economic controversy common to them all. Of course, in a federation like Canada, all provincial and local functions, not just the environment, are characterized by a diffuseness of policies. But it does help to explain why

Canadian economists, when they study the environment and its challenges, are lured into considering well-defined American policy frameworks.

Hazardous waste sites. It is easy for a Canadian economist to follow his or her U.S. opposite number in assuming that “government” has the choices that now face the U.S. Environmental Protection Agency and its Superfund. But to make this assumption is to duck responsibility for analyzing how Canada’s provincial and municipal institutions already deal with abandoned garbage dumps, industrial waste sites, radioactive sites, and seepage from mine tailings-pond seepage.

*Taxing emissions.*⁴⁹ Canadian economists sometimes follow European and American opposite numbers in promoting the efficiency of emissions taxes as against the present rough-and-ready regulations, even though, in Canada, the up-front costs of introducing several taxes in ten provinces would be costly. The responsibility would be that of the provincial finance ministers. They would find themselves collecting different taxes from apparently similar polluters, according to plant location, season, time, weather and so on. Each polluter’s assessment would change as these factors change. In my opinion, the provinces’ present political and fiscal arrangements could not handle the political pressure engendered by using this kind of tax as a corrective.⁵⁰ Almost certainly, it would fall back to being regarded as another revenue source, like the tax on alcohol.⁵¹ It is time that some Canadian economist,

⁴⁹This paragraph is about a textbook-type charge per unit of pollutant emitted. There are other “pollution taxes”, such as the proposed carbon tax (see Olewiler, 1990).

⁵⁰Parliamentary governments, especially provincial ones, are unlikely to take the path-breaking step of delegating tax-setting to administrators, for the change in the amounts to be paid by some polluters could be a politically-sensitive matter. As well, administrators will be unwilling to take responsibility for setting effective deterrent taxes. Of course, any parliament is supreme, and, subject to the written constitution, can legally delegate what it chooses. But it has never chosen to delegate the setting of the rates of other deterrents, such as excises on tobacco and alcohol, or duties on agricultural imports. So it would probably not choose to delegate the setting of an unpopular emissions tax on municipalities, factories or farms. This may also explain why the provinces collect percentage stumpages and similar resource incomes instead of flat-rate royalties.

⁵¹Provinces, however, do have peak-load prices and tolls on their utilities and highways, and these are analogous to deterrent pollution taxes. Indeed, there are surprisingly few purely regulatory or deterrent taxes at any government level, apart from those on certain imports and on alcohol and tobacco; and these are often regarded simply as revenue sources, with inelastic demands. Public-finance textbook authors, looking for illustrative examples of such taxes, often choose the non-existent pollution tax.

possibly one learned in the study of taxation, looked into how provincial budgetary procedures might handle charges designed not to raise revenue but to obtain information and to correct waste dumping.

A “*national*” *point of view*. Canadian economists thinking in terms of benefit-cost analysis for project selection are likely to follow the American practice of defining benefits and costs as measurable changes in the *national* income (or product): “all final benefits and costs to whomsoever they occur...” as long as they are within the United States. The United States Supreme Court also accepts this principle when, in adjudicating the sharing of a stream between two states, it may award water to the state where it will be used to produce the greater net benefit (from a national point of view).

If this doctrine were widely applied in Canada, it would produce very unfamiliar results. It would mean, when a province is selecting a project, that it ought to choose the one offering greatest national net benefit over one that provides more local income and employment. It would mean, as between upstream and downstream provinces, that they ought to allocate flows to whatever region promises to produce the greater net *final* benefit.⁵² I do not believe a *national*-income maximization principle of choice has ever been accepted in Canada. Where local or national governments call for a benefit-cost analysis they want a “multiple account” report revealing perhaps how the alternative versions of a project would affect the national income, but mostly how it would provide local jobs and how it would affect various financial funds and accounts.⁵³ As for interprovincial projects, Canadian selections usually emerge from intergovernmental bargaining, not from principles of national income maximization.⁵⁴ It is time for economists to think hard about what *general* rules ought to be recommended for project selection in Canada by provinces that want to do more than, say, mere local job creation.

⁵²Compare parallel accounts of river apportionment in chapters by Barry Barton and Ralph M. Johnson in Saunders (1986, pp. 238 and 253).

⁵³I suspect that this is also a reason why, although the making of EIAs is mandatory for nearly all federal undertakings, the making of a benefit-cost assessment is not.

⁵⁴An outstanding example is Krutilla (1967). The World Bank and other agencies has applied cross-border project selection in developing countries. For some theory, see Jones, Pearse and Scott (1980).

Right-sizing versus fragmenting powers over the environment. Canadian economists, thinking about externalities, seem to accept the simplistic idea that control over an ecosystem should not be “fragmented” among small political jurisdictions. In this they echo an older American opinion that, because the typical state⁵⁵ had too small an area to make laws and rules for all of a river-basin’s interconnected levels and flows, the basin’s hydrology and a region’s ecology ought both to be internalized within a senior government’s borders. Recently a similar view, that at least the source and the victims of pollution ought to be within the same jurisdiction, has been stressed (see Paehkle, 2001; and van Kooten and Scott, 1995). Taking these ideals at face value, they hardly apply to many Canadian problem ranges or ecosystems, which typically already are contained within one large province (at least, as the word ecosystem is bandied about in these discussions). For example, the Great Bear forest ecosystem(s) is/are entirely within British Columbia, the Canadian portion of the Great Lakes within Ontario, and even the vast Saskatchewan and Peace River basins each within three.

In any case the economics of the fragmentation complaint is a muddle. Coase’s theory of the firm reminds us that just as producers have a choice between integrating and contracting, so the system of government has a choice between handling spillovers within a jurisdiction created among several units at one level of government and handling it by assigning it to a single unit of government at a higher or lower level. We have decades of theorizing about whether to reassign functions to a supranational body, to the nation, to provinces, or to municipalities. All this theorizing tells us to compare the relative difficulty or transactions costs, at each level.⁵⁶ For example, to right-

⁵⁵This view seems to have been accepted by most water-resource economists. In his 1955 thesis, Otto Eckstein mentions dozens of U.S. federal agencies; scores of river-basin projects; four project purposes; and even one Canadian province. But he rarely mentions states, never as decisionmakers. The same is true of the highly influential Harvard water program of 1955–65, culminating in Maass *et al.* (1966). For contemporary papers that emphasize state water-resource powers and responsibilities see those collected in Smith and Castle (1964, pp. 341-445).

⁵⁶This is the theme of Breton and Scott (1978, chs. 6 and 7). For each province, costs of internalized administration can be balanced against costs of coordination. In general, there will always be problems about the sizes of jurisdictions. Assume that a jurisdiction is persuaded that a river basin or ecosystem should be under an integrated set of land-use controls. If its area is too “small” it will be forced into coordination with its neighbour. If it is too “large” it will be forced into fragmenting its own administration. Both responses have costs.

size an environmental policy, it can be ceded from provinces with small spans to their larger neighbours, to a joint multi-province body or to the central government or they can re-shape their policies so that citizens may disregard borders and litigate against pollution sources in other provinces.⁵⁷ One can invent still other devices for preventing jurisdictional borders from applying suitable policy to a problem.

Note, however, that getting the right area to be governed would not guarantee that a government would exploit this advantage; nor, if it did, that it would make appropriate environmental decisions.⁵⁸

Conclusion on federalism. The purpose of these examples has been to suggest how the differing federal structures of the two countries may explain why economics in Canada has not yet come to grips with the country's environmental policy problems. First, the absence of a central policy-making and policy-analyzing establishment has meant that many Canadian economists are in closer touch with United States and European environmental leaders than with each other. Second, those who do grapple with analyzing questions

⁵⁷Water pollution: in the 1960s, the Nordic countries began to give victims of pollution the right to ignore the border and to sue in the source country (see Scott, 1976b). Air pollution: recent informal trading in pollution permits in GHGs allows the benefit of an abatement in one province to be sold to a polluter in another. Doing this may involve class actions. Water jurisdictions: in both Canada and the United States constitutional, treaty or local legislation usually prevents citizens of one jurisdiction from acquiring and importing water from another jurisdiction. In the United States, interstate water compacts may govern the extent of private interstate transactions ("commerce") in water. See Huffaker *et al.* (2001) and related papers in bibliography and Web site.

⁵⁸See Breton and Scott (1978, p. 11); see also van Kooten and Scott (1995). Some aspects of the "fragmentation" of the Saskatchewan River ecosystem among the three prairie provinces was long ago taken care of by agreement among the provinces, with Ottawa as a minor partner. One of the first explicit official recognitions of an ecosystem-wide approach to resource management was that by the International Joint Commission, reporting on the pollution of the Great Lakes. The idea was accepted by the United States and after a few years embodied in the Great Lakes Water Quality Agreement of 1978. In my opinion, the ecosystem approach was needed because there were so many U.S. states with jurisdictions over activities affecting the lakes. In Canada, only the province of Ontario was of importance. If, say, only New York State had been involved in the United States, an ecosystem approach would have required only a state-to-province contract or agreement, with only nominal roles for the national governments. Indeed the fragmentation argument might well have been turned on its head, now asserting that Ontario and New York should each "fragment" their areas to produce smaller matching lakeside regional management units.

about the Canadian environment and its protection have to free themselves from many of the assumptions about policy-making now automatically adopted by United States analysts. There, most environmental issues have drifted into federal-government jurisdiction, and can be safely analyzed as if there were one all-powerful government. Here, the extent to which provincial environmental policies need to be made uniform or just coordinated, and by whom, are still open questions.⁵⁹

Governmental Questions for Economists and Economics Tasks for Governments

What Needs Work?

Canada's future environmental policy-making will be dominated by decisions about reducing the GHGs. Whereas in the past its environmental policies have been fragmented, in the future they will be interdependent. This is because the aim this time is not to get the right balance for each region between change in environmental quality and the cost of doing so, but to find the optimal way of making Canada's contribution to global GHG concentration.

I use the word "optimal" because, as has been seen above, Canadian governments are not agreed on any more specified criterion for project selection or environmental improvement. In particular, neither the provinces nor the federal government have adopted cost-minimization, national-income maximization nor employment maximization.

The study teams in the National Climate Change Process (NCCP) have merely sketched their alternative working suggestions about which industries will be called on to abate their GHG emissions, and, in particular, about how emission permits will be distributed initially. The implied invitation to analysts outside the public service to discover the advantages and disadvantages of the alternatives, and make recommendations, has not been followed up. The NCCP has made their data available, and no doubt there is plenty more in the files. Economists can now investigate more fully the regional and inter-industrial implications, and compare their results with published studies of

⁵⁹Thanks to Professor Fred Riggs, University of Hawaii, for suggesting to me the importance of the American division of powers (as opposed to the parliamentary system) at the federal level as an explanation of different kinds of policy. Under the heading of openness, this suggestion is also to be found in various political science studies, such as Paehkle (1989); and Fafard and Harrison (2000).

distributing fishery quotas, grazing permits, and U.S. acid-rain permit allocations.

The NCCP suggests that transferable permits be “grandfathered”, as is done with fisheries quotas, or auctioned. Should auctioning of permits be considered, there is time to compare the economics of emission-permit auctions with other government tendering and auctioning institutions. How much would it matter that in some regions, or for some pollutants, the number of bidders would be very small? Canadian economists have played a major role in studying the working of existing systems of auctioning natural-resource rights. Other economists have given some attention to the not-very-competitive “sales” by which oil permits, forest-cutting licences and other federal and provincial rights have been allotted. What is needed now is their expert prediction of the results of auctioning individual emission permits in Canada, both regionally and nationally.

Introducing provincial emission permits would involve a double change: not only from command-and-control to a market-like instrument but also from regulating production methods and equipment to regulating the allowable *quantity* of emission. Getting the required quantitative data and setting targets might actually be more difficult and costly than creating a system to allot percentages of these targets to private firms. This is only one of the questions about permits at the provincial level that need economists’ examination.

What are the consequences of the non-uniformity of provincial pollution regulations? Is there a role for Ottawa to make sure that policies (not just environmental assessments) are harmonized? Political scientists say the role might be justified by economic considerations, but economists have not said this. Scores of papers, like this one, have mentioned an intergovernmental downward race to the bottom, as governments ease environmental requirements to attract or hold industries. In such a race, the provinces might be urged on by industry, apprehensive of any threat of their competitive position, within Canada, if their rivals in other provinces secure a pollution-regulation advantage. These questions cry for actual case studies and fact-based generalizations.

The economics of interjurisdictional strategy and bargaining is studied by economists as between countries, but hardly between provinces. Yet provincial-level data are available for cross-boundary trade, cross-boundary pollution, and cross-boundary migration, in the presence of differences in pollution regulation. Research using these data would help with certain international-pollution studies, and also have relevance to provincial boundary issues. What would be the result if whole regions (or provinces) were allowed to bid for permits against other regions? What would be the costs if provinces

made interprovincial agreements to prevent such bidding, or in other ways prevent a permit drain from their industries to richer ones outside?

Can transaction and administrative costs of alternative regimes be measured? In most discussions of federal versus provincial jurisdiction, and of private litigation versus public regulation versus market-type permits, authors remark that much depends on the associated levels of transactions and administration costs (including those of information and enforcement). Economists give the impression that they know one control instrument is more “efficient” than others in the absence of transactions costs, but they obviously know very little about this when control instruments work imperfectly and also have unknown administration costs. Dewees and a few others have given us a sense of these costs — but more estimates are needed — of instruments used by governments at all levels.

More profoundly, those economists who are interested in public finance and the economics of federalism can use this kind of research to enter the constitutional debate. To what extent could the various powers over the environment be shifted to other levels of government, taking into account the resulting changes in performance, and also the usually theoretical changes in coordination, signalling, administration and mobility costs?

Economists can also contribute to choices about public choice by recognizing that the distribution of GHG permits among people, industries, regions, provinces, and so on, is akin to the distribution of wealth. To a certain extent, tradable permits for GHG emissions can make them the *same* distribution. For example, regions with wealth can buy GHG permits and so enjoy industrial growth. As well, they can buy up and retire permits to emit noxious fumes and local pollutants and so enjoy pollution-free air and water. Low-wealth regions may be in for stagnation. But permits may not be tradable. If so, the initial permit allocation is like an endowment of another kind of wealth, distinct from money. Recognizing this opens the possibility for a “constitutional choice” question of the kind discussed by William Baumol and by James Buchanan.⁶⁰ Under the rules of tradable emissions, the holder of a right in Area A will be predictably unwilling to donate it to an emitter in area B. But if the rules are not yet made, a person might support such a transfer if he knows that all similarly-situated persons will participate in it. The Canadian revenue-equalization system emerged from such a “constitutional” decision. Many economists have helpfully analyzed, criticized and defended this system. They should do the same for the various systems

⁶⁰See Baumol, 1969; Brennan and Buchanan, 1985, pp. 134-149. Amartya Sen similarly referred to an “assurance” principle of joint action.

by which GHG and other pollutant emission rights are to be initially distributed.

In this connection, some Canadian economists in the law-and-economics area have considered our expropriation laws and whether to entrench constitutionally the sanctity of property. Yet they have been slow to discuss governmental repossession or narrowing of private leases, etc. on Crown lands. Compensation is asked for, but the question is still open. Analysis is needed of this, and of the sequestering of strictly private lands inhabited by endangered species. This is a modern version of the older “betterment and compensation” land-use question: should private users pay, and should they be paid. In general, government can take either of two routes to improve private care of the Crown lands. It can fortify today’s property rights, giving them more exclusivity, transferability and security. Then it can use market instruments. Alternatively, it can continue with rights that have little of these characteristics, attaching to them stipulations and conditions about pollution and land use. Then it must inspect and enforce the conditions. Which is the least costly route? As each kind of land tenure has its own amount of exclusivity, transferability and security, the lesson is to take better care of the environment.

What Governments Can Do to Encourage Research on Canadian Environmental Questions

Most people would agree that Canadian environmental policy as a whole is both unpredictable and unstable. The rules are not as bad as those that macro-analysts once called “stop-go” but they have some of the same hesitancy about them.

Part of the reason is economists’ own public appearances. Policymakers and the public see that new proposals receive backing from environmentalists and opposition from hired economists. While they may know that from Adam Smith’s time economics has been friendly to the idea of public education and other social enterprises, they do not know that it is just as friendly to the idea of public investment in clean water, clean air and biosystem integrity. But economists do not bother to shout all that from the rooftops. They are on the whole allowing much of the field to be occupied by spokesmen who mostly cheer on environmentalists by finding bad guys for them to blame.

Unlike their experience with economists who specialize in health economics or in education and labour-force studies, reporters from the media are unlikely to find many economists they can telephone who will say, “yes I know about that policy proposal”. This ignorance is something that govern-

ment departments and administrators can do something about. They can hold seminars. Of course, there are committees on special questions that do bring economists together, including some outsiders and some from the other level of government. But these are more like business inter-departmental coordinating bodies than seminars or joint working parties. They can circulate their internal studies to a meaningful list of outside economists. They can support untied economic research grants (not the same as offering consulting or modelling jobs). They can offer temporary visitorships to academics and students. They can take a leaf from the book of the Fisheries Research Board of Canada, which long published an interdisciplinary journal that was respected among academics here and abroad. Both levels of government do some of these things for other sciences, but it is rare to find an economist who has seen the inside of an environment or industry department, except as a paid advisor or consultant.

Governments should realize that it is because of their policies that most academic teachers of environmental economics are little more aware of the grand sweep of environmental choices than is any reader of the daily newspaper. It is not enough that they have put some agreements, final decisions and working papers on the Internet. By their policies, they have failed to draw young economists into current concerns, much less encouraged or inspired them to look for research topics. Not surprisingly, many of these economists fall back on their textbooks and their graduate-school course notes for their teaching, and on papers in academic journals to get started on their research, with the results that I have suggested in the sections above.

Both levels of government can make these improvements. The federal government, already having a larger establishment of economists, can move faster and further. The provincial governments have most to gain from even modest steps towards making nearby economists familiar with their environmental problems, policies, available data and studies.

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