Quantitative Analysis and Public Policy Making*

C.M. DRURY

Analysis of public policy must be *relevant*: it must take into account the process of policy formation, and the nature of collective decision-making; it must emphasize the art of presentation (of complex results in meaningful ways) and the art of representation (of complex systems in simple forms preserving key features); it must marry institutional wisdom with esoteric models to yield insight. The paper argues that less second-rate theory, and more first-rate applied work, is necessary if planning, analysis and evaluation in the field of public policy are to be useful to the elected representatives who must exercise the ultimate judgement and make the final decisions in the face of incomplete knowledge and uncertain consequences.

Les politiques de l'Etat doivent faire l'objet d'une analyse *pertinente* qui tiennent compte de leur mode d'élaboration et de la nature du processus décisionnel, qui mette à profit l'art de présenter des résultats complexes de façon éclairante et l'art de représenter des systèmes complexes sous une forme simple qui retient l'essentiel, et qui allie la sagesse institutionnelle à des modèles ésotériques pour favoriser une compréhension en profondeur. L'article soutient que c'est en réduisant la théorie de second ordre au profit de travaux d'application de très grande qualité que la planification, l'analyse et l'évaluation des politiques gouvernementales pourront servir aux représentants élus à qui il appartient, en dernier ressort, de porter des jugements et de prendre des décisions en dépit de connaissances fragmentaires et de conséquences incertaines.

I wish to welcome the appearance of *Canadian Public Policy* and take the opportunity to share a few thoughts on the challenges this Journal and its contributors may face in discussing public policy in Canada. In particular, I have some observations on the role of quantitative analysis in policy making, an issue which I find interesting for several reasons. Firstly, this topic raises, I think, a fascinating confusion of contending ideas. Secondly, it brings to mind

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other questions of science policy, and the links between universities and government, about which we have had much recent discussion. Thirdly, some of my staff like to consider themselves engaged in the practice of quantitative analysis to support policy formation. Finally, perhaps, if you are successful in solving some of the problems I shall describe, my colleagues and I may find our own jobs easier in the future.

The plan of my remarks is this: from the analytically oriented disciplines as a whole I wish to split off the purely theoretical (the 'real' work, in G.H. Hardy's words), to be left with the 'trivial,' or applied work. From the applied fields, I then separate those in which the work, although important, is not an integral part of public policy analysis as I shall use the term. Remaining is applied quantitative work of a more recent vintage – systems theory, operations research, decision analysis, econometrics, applied statistics, mathematical economics, and so on.

In dealing with this remaining body of quantitative analysis, I want to challenge the article of faith, the unexamined prejudice, which underlies the academic literature and presumably the launching of this journal: that quantitative analysis helps in the process of policy planning. I know that systems consultants represent a sink of unbelievable scope for pouring money down. I know that planning and evaluation activity of a quantitative and esoteric sort now represents an immense overhead burden on our system of government. But one must question whether in fact this undeniable capacity delivers anything to the process of policy formation, anything of value commensurate with its costs. If so, what? If not now, might it in the future? How should the profession or the discipline be organized for better results in this direction?

In commenting on this issue, I would like to consider three contentious approaches towards defining the utility of mathematics, or analysis generally. I can pose the intellectual dilemma, I think, by putting in front of you three quotations. The first is drawn from G.H. Hardy's monograph *A Mathematician's Apology* (Hardy, 1969). You probably all recall the opening lines, the observation that:

> There is no scorn more profound, or on the whole more justifiable, than that of the men who make for the men who explain. Exposition, criticism, appreciation, is work for second-rate minds.

Hardy then goes on to conclude that there are two mathematics – the trivial mathematics, which is 'useful,' and the real mathematics, which is not:

> Such mathematics is useful as has no particular aesthetic merit – the real mathematics must be justified as art if it can be justified at all.

Finally, he notes that:

> 'Imaginary' universes are so much more beautiful than this stupidly constructed 'real' one; and most of the finest products of an applied mathematician's fancy must be rejected, as soon as they have been created, for the brutal but sufficient reason that they do not fit the facts.

These excerpts lay out the theme of the first approach: the only analysis really worth doing is an art form, a glimpse at beautiful but imaginary worlds.

The second approach is based on the contrary premise that mathematics evolves to describe various facets of reality, as required by the intellectual challenges of the age. Plane geometry meets the needs of surveying and land transactions on a flood plain. Newtonian mechanics served its age, but does not meet all the needs of ours; relativistic theories extend our capacity to deal with sub-atomic particles and radio astronomy. (Perhaps Keynesian economics is likewise due for an overhaul?)

This approach, however, risks falling into the view of expert as saviour. A quotation in *Business Week* for May, 1973, illustrates this idea, and countless consultants calling themselves systems experts expound on it every day. Headed 'Optimal control: a mathematical supertool,' the article suggests that:

> if optimal control theory becomes fully operational in economics in the next few years ... economists will have at their disposal a mathematical supertool that ... actually tells you what policy to use ... the best possible timing and dosage for each available policy remedy ... for problems of short-run economic stabilization or long-run economic growth.

While we may all have our occasional doubts about the advice offered by our traditional public servants, I am certainly not yet ready to trade them in on the strength of this promise!

The third point in our tangled triangle of contending claims is expressed more briefly. In his recent book, *The Best and the Brightest* (Halberstam, 1972), David Halberstam describes Lyndon Johnson's reaction to John F. Kennedy's first Cabinet:

> Stunned by their glamour and intellect, he (Johnson) had rushed back to tell (Sam) Rayburn, his great and crafty mentor, about them, about how brilliant each was, that fellow Bundy from Harvard, Rusk from Rockefeller, McNamara from Ford. On he went, naming them all. 'Well, Lyndon, you may be right and they may be every bit as intelligent as you say,' said Rayburn, 'but I'd feel a whole lot better about them if just one of them had run for sheriff once.'

Thus we have at least these three strands: mathematics as artistic creation of imaginary worlds; mathematics as mysterious supertool to be used by experts to save this world from the bungling bureaucrats and predatory politicians; and mathematics as the intellectual trappings of boy-wonders who have never met a payroll, never run for sheriff, and should not try to run a country. Undoubtedly, the same three views can be applied to analytical and theoretical work more generally.

The point at issue here is not the old debate about 'the pure' versus 'the applied.' Many Canadians carry with them the influence of a teacher or professor who successfully communicated the emotional or artistic impact of theoretical elegance; many may have found that influence a profound force in their intellectual life and in their day-to-day applied work. All this is admitted. I do not question that we, as a community, must support fully the work of

first-rate minds in free-wheeling pure research, and must take some risks to be sure of not limiting creativity or passing over some first-rate minds as yet unrecognized. I am concerned, however, that many people who could be doing valuable applied work are misplaced in areas of pure theory, where they pursue contributions marginal at best, and at the public's expense. I hope that this journal may, by illuminating some of the exciting and important issues at play in contemporary policy problems, draw in from the glamour of the purely theoretical work some of those who could labour more effectively in applied analysis.

Presumably applied analysis is intended to describe aspects of reality in a way that aids the taking of specific decisions in a complex world, and not just in a way that broadens one's intellectual horizons. If so, then it is important to know what kinds of reality must be captured by analytical constructions if they are to be relevant for policy purposes, and what kinds of analysis actually aid the taking of decisions. This journal must demonstrate the answer to the second question, but I have a few thoughts on the first.

With respect to this first issue, you can take it for granted that the analyst is not being asked to make decisions, but to describe options before the fact, and to figure how to implement decisions after the fact. Our community assigns the responsibility for taking decisions to a collection of action-oriented individuals, people who have run for sheriff – who are acutely aware, in a general manner, of where the country ought to go, but lack the detailed itinerary and the choice of means to go there.

These individuals are supposed to be served by an elaborate committee structure, a support staff largely paralyzed by the newly discovered inter-relatedness of it all, and an overworked layer of deputy ministers who generally exercise their judgment on the backs of envelopes or the fronts of table napkins. (Obviously that is all a caricature, but all models are caricatures of reality, and even this has a grain of truth.)

The point is that you must not assume that only the intellectual force of an argument matters in the process of policy formation. Optimizing models are one thing, but the structures of a bureaucracy and the processes of decision-making have dynamics of their own, and they are not irrelevant in taking decisions. The Rayburn view is a useful antidote to the claims for mathematical supertools as the saviours of the system.

The men who make policy do so under great pressure, and they do develop some impatience with those who want to talk about policy, explain, mount studies at length and in detail, and then present balanced sets of options which more often than not seem to offer no choice but the *status quo*. Analysis so often appears to be the enemy of action.

Partly, no doubt, this is because of the immense uncertainty which surrounds major policy decisions. And partly it is because in most cases, the analytical tools are not up to the demands upon them. In your hearts, I think you will admit that. (Engineers are perhaps more honest – they are willing to fly in the planes they design. But then, they have more predictable systems – and they also have more robust rules of thumb.)

The last ten years have seen an unprecedented emphasis on planning and evaluation. But I would be less than candid if I suggested that this effort has

proved its value. And I would be less than honest if I suggested that all Ministers wholeheartedly desire a comprehensive and logical approach to problems of social choice. Many might prefer that objectives not be too much elaborated and clarified, that constraints not be too explicit, and that choices not be too fully articulated. Given the uncertainties of data and analysis, of politics and coalitions, and of life generally, most Ministers may feel – probably rightly – that their programs will fare better in a more chaotic process of choice than an analyst would find palatable.

One of the facts of political life is that all existing programs serve a clientele, and proposed programs quickly acquire one. There is indeed a counterpart in public programs to the 'tragedy of the Commons' notion. The 'tragedy of the Commons' concerns itself with the congestion problems and misuse of common property resources that arise because the benefits of extending participation are reaped directly by the individual concerned, while the costs are distributed thinly over all those already involved. A similar 'tragedy of the Commons' can be seen in the fact that the benefits of reform or economy in government programs, though great, are diffused over many taxpayers, and appear small, while the costs are felt directly and sharply by individual interest groups or clienteles. Consequently the political force behind reasoned reform based on comprehensive analysis may not be strong.

All this may not be terribly satisfying, but it is part of the reality the analyst must understand in recognizing that analysis may illuminate policy choices, but can never establish a definitive case. Nor can a critical examination of past decisions fully capture the dynamics of the issue or the uncertainties prevailing at the time. The analyst as second-guesser, in other words, may have limited value.

Analysis of distributional consequences of government decisions, by contrast, may be vital. An emphasis on distributional issues, particularly the issue of distribution over time (which is to say, among generations), unfortunately, strains the limits both of available analytical technique and available data.

What is required to support the formation of public policy in Canada is *relevant analysis*. Not relevance without analysis: institutional wisdom, description, concern only for structure and process, *post hoc* explanation, desperate pragmatism lacking knowledge. Nor analysis without relevance: lofty, ethereal, charming in its elegance, but ignorant of the problem, the setting, the constraints either real or imagined (or imagined but very real despite that), the risks to be weighed.

What I as Minister seek from the analyst is information, not a lecture, a historical account, or a discourse on what 'might have been.' I want information – data, facts, statistics, observations – analyzed in an appropriate model so as to inform, provide guidance, suggest options and consequences. Information is power, and the role of the analyst or the official, as I see it, is not to husband that power so as to mystify and impress. From the analyst I want information ordered and organized, but not retained; data distilled, but not measured out with an eye dropper. I want judgment, but not necessarily wisdom.

We have in the public service many who have assembled, through experience, an overwhelming array of facts and numbers. We have also, both in the

public service and in the academic world, many who have mastered esoteric models unrelated to fact. This journal, as I see it, must show that relevant analysis is achievable – that from the marriage of an overwhelming array of data with an esoteric model can flow information or even insight.

At the same time, I am certainly not suggesting that students or working analysts should be taught unquestioning respect for constraints such as:

'You can't look at it that way – we've *never* looked at it like that.'

'You can't do that – it's been tried before and didn't fly.'

'That's just not on – Ministers will never buy it.'

'That's not invented here.'

These are constraints that paralyze creativity: they must be broken down. But we should recognize also that to be stable a large system must not respond too fast – it must not adopt every analyst's new ideas too quickly or it will oscillate until it explodes. On the other hand, it must move – and in public life it generally does, eventually.

What I am suggesting, therefore, is that one should not enter policy analysis with the expectation that his new improved Mark II models will sweep away all debate. He must be content to see his influence through the slow spread of new ideas, rather than through immediate impact on next week's decisions, and he must therefore recognize that his analysis is useful even when his conclusions are rejected. If this fact is not appreciated by analysts, they will be frustrated in government service or in work on public policy.

To answer part of the question with which I began, therefore, I conclude that:

– Few students of public policy will be 'first-rate' in Hardy's terms, well fitted to pursue esoteric theoretical work to any significant degree; the majority should be guided toward the challenge and potential of applied work and its role in decision-making processes in this country. This journal perhaps can help in this matter.

– One thing about the process of policy formation is clear: it is *not* a process of careful optimization toward agreed goals by a purposive and coordinated decision-making unit facing a well-structured and well-identified system. Some policy choices are not so much decisions that are taken as they are accidents that happen. More emphasis on robust guidelines and rules of thumb seems appropriate in this context.

– All relevant information about objectives and constraints is not available to an analyst, and cannot be communicated; more emphasis on descriptive analysis rather than elaborate optimizing models may be appropriate in these circumstances. Given the great structural uncertainties and data deficiencies inherent in any significant policy problem, does it really make sense to process the numbers as extensively as is often done?

– Key issues are the question of income or wealth redistribution arising from proposed policies, and particularly the longer-term generational conflicts implicit in resource management as transfer programs.

– The real challenges for public policy analysis are presentational (displaying complex results in a meaningful way) or representational (capturing a complex problem in an informative structure that highlights key issues), rather than mathematical or computational.

These, it seems to me, are some of the realities that must be reflected in analytical work on public policy. Let me turn briefly to some related issues.

There seem to be many disparate threads in the planning community just now: the Club of Rome, the International Institute for Applied Systems Analysis, the Commission on the Future, and many short-term and long-term forecasting programs or consultants. One thing my own Ministry of State for Science and Technology is doing to bring these strands together is to organize, through the Canadian Committee for the International Institute for Applied Systems Analysis, a conference on applied systems analysis in Canada. This conference, to be held in May 1975, has the goal of integrating some of this systems work having potential application to problems of social or economic policy. Perhaps this journal can also serve to link such efforts with the universities and with more immediate planning concerns in industry and government.

Other agencies are not ignoring this responsibility: perhaps the closest thing to a teaching program in policy analysis now operating in Canada is the Quantitative Analysis Course mounted by the Treasury Board Secretariat for its own training and research purposes, but open to participants from the rest of the government. This course, and indeed the whole Planning Branch of the Secretariat, is intended to serve as one mechanism for coordinating some of the work of the emerging planning community in the federal government, and as one channel of communication with mathematicians and analysts in universities or industry. In addition, other efforts to organize the processes of planning and evaluation within the government, and to place analytical work in the public domain for public discussion at an early stage, are continuing.

Finally, the spending estimates for the Treasury Board Secretariat for this fiscal year contain provision for a small group labelled the 'Temporary Assignment Pool.' This group will consist initially of two or three dozen highly skilled and highly mobile senior staff able to undertake special assignments involving policy analysis and evaluation, on request from departments or agencies, anywhere in the government. Its formation is a conscious attempt to meet needs for special studies and reviews without the creation of unnecessary continuing senior positions. It is also part of a deliberate effort to harness the existing analytical capability of departments and agencies more effectively to serve the needs of Cabinet decision-making.

These ideas – this pool, the course, the conference – are small steps, but they are deliberate initiatives to strengthen the role of policy analysis in the Government of Canada. Thus, though I stand by all the skeptical qualifications that I mentioned above, I also stand by the faith that in the long run we must have more and deeper policy analysis. We in the government must learn to use it better, and I believe that we are moving, though slowly, in that direction. You in the universities must learn to do it better: the scope for instruction in the area of policy analysis must be expanded and, it seems to me, oriented more toward concrete, pragmatic skills. Perhaps also some programs could be aimed at the education of a mathematically literate senior manager, who can rise to the responsibility of directing analysis, and keeping it relevant, judging the results and communicating them, and thus spanning the gap between the 'expert' and the 'leader'? An education in checkers, I am told, is no preparation for a life playing chess.

If you will permit me one final quotation, I will follow the lead of Paul Samuelson in a Presidential address to the American Economics Association, and summarize in the words of William Blake:

> Truth can never be told so as to be understood and not believed.

If you experts, you applied mathematicians, you systems theorists, can find some truths that fit the facts of our age and the dilemmas of our nation, and tell them so that they can *in fact* be understood, so that the important consequences of alternative actions can be made clear, then you will have your client and your audience. You may not initially have the applause of your academic colleagues, but you can help to shape the future of your community. I am convinced of that.

But do not tell me that it is simply a matter of getting the policy-maker to listen, or transplanting existing tools. The problems are hard and the task will take patience, infinite attention to the detail of institutional structures and the process of policy-making, and a willingness to live with inelegant, approximate, and *ad hoc* solutions. It also requires a willingness to see your cherished proposals, products of laborious hours, rejected on the judgment of some 'sheriff' who would not know an optimum from an integral.

And so, with the conviction that the opportunity to serve the cause of public policy in Canada (whether as an analyst, official, politician, or academic commentator) is a profound privilege, I welcome this new Journal in its inaugural issue. I challenge your readers to put their knowledge and skills to the development of analysis within the policy-making process in Canada, not to impress or mystify, not as experts bestowing favours, but as participants along with others having different skills, different responsibilities, different perceptions of the nation. To see the truth and tell it so as to be understood is perhaps an old idea, but it remains a worthy goal.

REFERENCES

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