Ex Ante Policy Evaluation: A Unified Approach

John A. Graves

Vanderbilt University

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Evaluation of policy change is the lifeblood of applied economic research. Often, evaluation is retrospective: a policy changes, data are collected, and researchers evaluate impact on welfare-relevant outcomes. This exercise is frequently conducted in service of a greater goal—namely, to make predictions based on theory about economic behavior, and to use policy change as a lens through which these predictions are tested. Knowledge produced through this exercise is then (ideally, but not always) applied to future policy to improve efficiency and human welfare.

The primary focus here is on a related but inverse exercise: ex ante policy evaluation. Under this approach, empirical estimates serve as inputs *to* rather than outputs *from* the policy evaluation process. Typically, a model of economic behavior is conceptualized around an existing theoretic scaffold (e.g., utility maximization in a model of discrete choice). This framework is then coupled with data on individuals, firms, and other decision-making entities. Combined, these elements constitute a simulation model of human behavior or some other policy-relevant decision-making process (e.g., the progression of a disease or the adoption of a new technology). The model is further adorned with structural and behavioral parameters from existing evidence or, in cases where the empirical literature has not yet rendered reliable estimates, from judgment calls consistent with the underlying theory. Policy reforms are propagated through the model by simulating responses to changes in price, choice sets, health technologies, tax schedules, etc. Modelers then aggregate an array of policy- and welfare-relevant outputs (e.g., changes in demand for goods and services, quality-adjusted life expectancy, changes in health insurance coverage and premiums, changes in federal tax revenues and outlays, etc.). These outputs are (again, ideally, but not always) disseminated to inform policymakers' decisions on the design and/or adoption of a particular policy.

In the United States, the Congressional Budget Office (CBO) is the most important practitioner of ex ante evaluation. It would be difficult to overstate the CBO's importance in shaping the trajectory of federal policymaking over the last generation. For example, one Senator famously characterized the recent history of U.S. health reform as Congress "sending health legislation off to the Congressional Budget Office to die."[1]

[1] Most recently, Congressional attempts to repeal and replace the 2010 Affordable Care Act (ACA) were hampered by public outcry after the Congressional Budget Office (CBO) projected that upwards of 23 million people would become uninsured. The twists and turns of earlier debates over the ACA—and before it, the Clinton health plan, also were

Ex ante policy evaluation also plays an important role in determining the availability, pricing and reimbursement for goods and services worldwide. Entities such as the National Institute for Health Care Excellence (NICE) in the United Kingdom commission simulation analyses of the cost and quality-adjusted life year impact of new health technologies. Results from these simulation studies are used to determine coverage policy within the National Health Service. Microsimulation models have also been developed by government and non-government agencies to project the consequences of changes to tax and transfer policy, education policy, and food policy, among others (TK CITES).

Despite the important role played by simulation modeling in the policymaking process, scant formal attention has been paid to the theory, design and integration of ex ante evaluation within the broader economic research enterprise. The one exception is health technology assessment, where rigorous standards for conduct, methods and reporting have been put forth by the Panel on Cost-Effectiveness in Health and Medicine.

To the extent there are explicit linkages between ex post and ex ante evaluation, they are usually relegated to simple, back-of-the-envelope counterfactual policy evaluations that appear at the tail end of empirical and theoretic research manuscripts. Rarely do these exercises draw on a formal approach to comparative welfare analysis (Hendren 2019). Even more rarely do they grapple rigorously with the role of estimation and structural model uncertainty in guiding both policy decision-making and the direction of future research (Hendren 2019).

These shortcomings extend to ex ante policy modeling as well. For example, microsimulation models often produce an array of welfare-relevant outputs and leave it to policymakers to weigh these factors when making decisions (Finkelstein, Hendren and Shepard 2018; Finkelstein, Hendren and Luttmer 2019). This is particularly true in U.S. health policy, where federal policy decisions based on costs and cost-effectiveness are prohibited through both legislation and administrative rulemaking. But even absent a

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shaped by modelers' assessments of how reform would affect insurance coverage, premiums, health care spending, and government costs.

specific legislative or regulatory decree, the CBO and other modelers have generally shied away from producing comparative (overall) welfare assessments.

Compounding these shortcomings are three related challenges. First, while simulation models often draw on standard economic theory and a shared empirical evidence base, the underlying evidence is estimated with uncertainty (and possibly with bias) and is not always in uniform agreement. Models also differ in their structure, underlying data sources and assumptions. It should come as no surprise that models produce varying projections of the same reform proposal.

Second, despite recent efforts at greater transparency, the opacity of microsimulation models makes it difficult for researchers to know whether and how their work can inform modeling efforts. Finally, the development, execution, and maintenance costs of microsimulation models are considerable. Combined, these factors contribute to high barriers to conducting rigorous ex ante policy evaluation and a muddled sense of how the economic research enterprise could be further refined to improve both modeling efforts and policy decision making.

This study outlines an approach to ex ante policy evaluation that addresses many of the above shortcomings. The first contribution—which is related to recent and ongoing work on *ex post* policy evaluation by Hendren and Sprung-Keyser (2019)—is the linkage and development of theories related to the Value of Information (VOI) and the Marginal Value of Public Funds (MVPF) for ex ante policy modeling. Intuitively, VOI quantifies the opportunity cost of policy decision making under uncertainty. At a given policy efficiency threshold (e.g., a MVPF value of 0.8, above which a policy might be desirable but below which it may not), modeling uncertainty may or may not affect "optimal" policy choices (i.e., choices that maximize relative comparisons of benefits to costs). If decisions based on comparative assessments of MVPF are insensitive to varying parameter values, then the value of uncertain information is low—i.e., it is not worth additional research effort to reduce parameter uncertainty since the same decision would be made today as it would if we had better information. If decisions are sensitive to this uncertainty, however, then VOI methods quantify the opportunity cost of making policy decisions based on *current* information versus if we had perfect information on uncertain parameters. Variation in modeled outputs can be further decomposed to identify the relative degree to which specific parameters contribute to the overall value of perfect information. These assessments, in turn, can provide guideposts for refining and prioritizing future research to focus on domains where the value of information is high.

To showcase these methods, I turn to a specific application germane to ongoing debates in U.S. health policy: whether or not to further expand health insurance coverage and if so, through what means (expansions of public or private insurance plans). To do this, I develop a generalized ex ante modeling approach based on a discrete time and choice framework. I demonstrate that this overall modeling framework can encompass many existing approaches to health policy microsimulation, including elasticity-based and utility maximization-based models.[2] Critically, however, the approach also facilitates simple yet powerful counterfactual policy assessments based on reduced form estimates. That is, the framework provides researchers with a simple tool to investigate the coverage and cost impacts of reform alternatives without the need for a detailed individual-level microsimulation model.

As a proof of concept, I demonstrate how difference-in-differences evidence on the impact of Medicaid expansion on coverage take-up (Graves, McWilliams and Hatfield 2019), combined with estimates on take-up of subsidized private health insurance derived from regression-discontinuity estimates (Finkelstein, Hendren and Shepard 2019) can be harnessed to model the coverage and cost impact of further expansion of coverage via public programs versus via increased subsidies for private coverage. I then embed calculations of the MVPF within this framework and conduct probabilistic sensitivity analyses to assess how estimates of benefits and costs vary when allowing *all* model and MVPF parameters to vary. The parameter values and outcome results of this probabilistic sensitivity exercise are primary data inputs into a "metamodel"—that is, a statistical regression model that isolates the degree to which outcomes change as individual model parameters vary. This metamodel is then used to produce VOI estimates that isolate and rank-order model parameters in terms of their importance to the overall degree of uncertainty in the simulation model

[2] Historically, U.S. CBO relied on an elasticity-based model to simulate health reform policy, but recently (as of 2018) switched to a utility maximization framework.