Economic Science and Public Policy

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In this article, research on the application of science to policy issues is reviewed and applied to economic science. Economists who want their professionally credentialed economic research to have an impact on public policy are advised to consult with policy decision-makers in framing their research questions and throughout the research process, thus assuring that the resulting findings will be relevant. A minimal degree of bias in framing, conducting, and presenting research complements a high degree of relevance for the results, allowing economic research to make a difference.

Key Words: decision-making, policy relevant, research

Soon after he took office (on March 9, 2009), President Obama issued a memorandum on scientific integrity that opened with a statement reflecting the importance he places on science in the policy process:

> *Science and the scientific process must inform and guide decisions of my administration on a wide range of issues, including improvement of public health, protection of the environment, increased efficiency in the use of energy and other resources, mitigation of the threat of climate change, and protection of national security*.

This and similar statements by the president and his cabinet members have given hope to anyone who wants her research to be policy-relevant. These statements invite science—biological, physical, social, and statistical science, genomics, informatics, economics, climatology, hydrology, phytopathology, and more—to truly inform policy decisions. In this article, I explore how food, agricultural, and resource economists might best take advantage of these opportunities.

I approach this subject with an upfront admission that production of policy-relevant economic science is extremely difficult. The institution of science prides itself on "arms length" objectivity, peer review, skepticism, and acknowledgement of uncertainty whereas policies arise from interested parties' messy negotiations, often on a timescale that precludes what economists would independently define as adequate to conduct deliberative research. Still, the reasoned merger of scientific and policy processes while retaining

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the principles that underlie each can yield powerful solutions to "wicked" problems.[1]

Policy-related versus Policy-relevant Science

I think that most economists, if asked, could relate their research to a policy issue, great or small. Adaptation to climate change, for example, *could* be informed by basic research on the economic factors that are necessary and sufficient for society to gain from adaptive behavior. But is research that can be *associated* with a policy issue necessarily policy-relevant? Research that has great potential for usefulness in policy decision-making is not likely to be policy-relevant if its production adheres to the conceptually described "linear model" of science.

The linear model, popular since Vannevar Bush's (1945) landmark report, *Science: The Endless Frontier*, suggests that basic research is the font of knowledge from which innovation arises *after* sequential transformations of basic findings into practical applications. In this representation, research findings are disseminated on a silver platter as "truth" to people who can put that truth into a technological or policy context. There is a major problem with this approach—sometimes there is no one there to accept the platter.

For example, a common policy analysis from economists will select multiple approaches (e.g., regulation, taxation, and subsidies) to deal with a real policy problem (e.g., a need to reduce nitrogen runoff in a water system). Using data from actual cost schedules and simulations of nitrogen runoff from various intensities of each policy approach, the economist can determine the most economically efficient approach and the optimal amount of nitrogen runoff from an efficiency standpoint. This typical research frame yields results that are insightful, highly credible professionally, and well meaning in the policy context but that avoid the reality of the messy processes involved in agri-environmental policy decision-making. The framework is realistic in that it points out tradeoffs and makes clear all that we do not know and the nature of uncertainties, but it does not suggest how uncertainties should be resolved for better policymaking or who should resolve them (except for the occasional "more research is needed" clause). Frankly, it is uncommon for policymakers to request the most efficient policy scheme or the economically optimal outcome. These are arcane concepts that do not equate to "cost-effectiveness" or "value for money," concepts that multi-objective, budget-constrained decision-makers are more likely to understand.

This sort of disconnect between the wonderful insights a discipline can provide and the knowledge needed for actual decisions was addressed by Sheila Jasanoff (1987), who considered over several decades the boundary between science and policy. Her work continues to be relevant since the culture of neither science nor politics has changed over the last several decades. Jasanoff pointed out that, while we all generally agree that scientists should not be making policy, good science should not be influenced by politics, and scientific soundness should be judged by scientists rather than policymakers, there is a big gray area around the boundary line between science and policy that is contested. In this

[1] Rittel and Webber (1973) first formalized the moniker "wicked" to describe complex problems in which a purely scientific-rational approach cannot be applied because of the lack of a clear problem definition and differing perspectives of stakeholders. Public policy poses classically wicked problems.

gray zone, economists may be asked questions that economics cannot answer. Or they may feel forced, in the face of probing by regulators or other decision-makers, to reveal just how large the uncertainties surrounding their findings can be when applied in the real world. Then again, policy decision-makers may be frustrated by the absence of "bright lines" in scientifically credible economic findings. Risk assessments, benefit/cost guidelines, standardization, advisory committees, and independent scientific review boards are all ways of trying to cope with a "contested boundary." Jasanoff (2004) coined the concept of co-production of science for policy and policy for science, which relies on give and take discussions between policymakers and scientists within the boundary's gray zone.

Economics' Contribution to Policy vis-à-vis Politics

There is a big difference between making economics policy-relevant and politicizing economics. Pielke's (2007) stylized characterization of interactions between scientists, policy, and politics applies well to economists. He described four general types of interactions where the scientist is (i) a pure scientist (ii) an issue advocate, (iii) a science arbiter, or (iv) an honest broker of policy alternatives. He contended that each scientist (and/or her institution) could choose the category into which she falls. An adaptation for economic analysts follows (see Figure 1 for a graphic depiction of an adaptation of this model).

The *pure economist* is one who is disengaged from the ultimate uses of economic findings and selects research subjects based on curiosity, personal interest, and/or to approach scientific "truth" through advances in economic theory or methods. The group of economists that advances theory and develops conceptual models is essential to the progress of economic science. Our profession needs such pioneers. But in the context of policy decision-making, they are apolitical and, thus, their findings score low points for relevance and for utility for policy decision-makers.

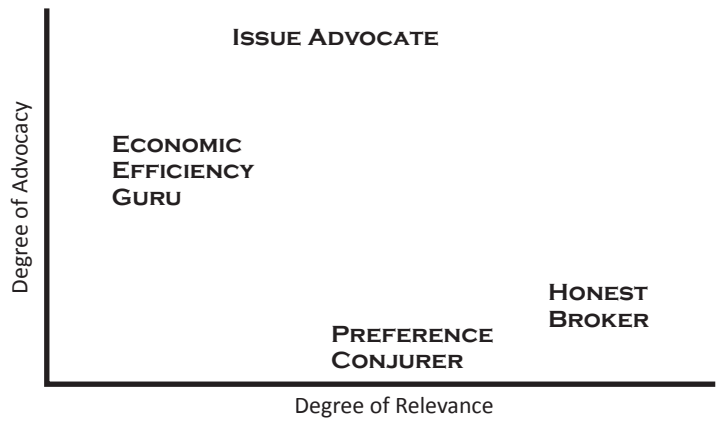

Figure 1. Stylized Categories of Economic Advisors

Adapted from Pielke (2007).

The *issue advocate* occupies the opposite extreme and advocates specific political agendas based on her interpretation of economic findings. She represents the "politicization of economics." Acting as an advocate for an issue in the name of economics can lead to battles between economists when an economic rationale for a policy action is challenged (as it most often is). The selective use of economics to support an advocacy position harkens back at least to Hayek and Keynes. But the "battling economists" scenario is ultimately damaging to economics because it paints a stark picture of the lack of reliability of any one economic finding (and feeds all those economist jokes). A government institution that takes up issue advocacy, even to support the political position of its leader's political bosses, faces a serious risk. When the political boss leaves (as always happens), the new boss could hold a diametrically opposed position, identify the institution with the previous administration, and distrust its analytical findings from day one, eliminating the institution's usefulness (and possibly the institution's longevity).

The *economic efficiency guru* contributes to the "economictration of politics"—the economist insists that policy should be dictated by what economic theory suggests is optimal. It is an interpretation of science-based policy; that is, one disciplinary body's research findings should be the very basis for policy decisions and be weighed more heavily than other decision-making criteria. In reality, this is rarely true. Whether the economics guru is advising on the basis of economic efficiency, equity, or some other economic principle, she may completely miss the decision-maker's target. That kind of approach does not bode well for the sustainability of a policy-relevant economic institution either.

What I will call the *preference conjurer* recognizes that economics has utility for policy decision-making, designs arms-length research related to particular policy decisions *as interpreted by her disciplinary perspective*, and presents findings that can be picked up by and used by decision-makers whose decision criteria happen to map into the research frame. I think many in our profession do this and with good intentions. Sometimes it works, but Dilling (2007) characterized this process as relying "heavily on serendipity—serendipity that the information provided is what is needed and serendipity that someone will come along and use the science in the appropriate manner to improve the human condition."

The *honest broker of policy alternatives* goes beyond producing what she *believes* will fit the decision-maker's needs and takes the extra step to co-produce economic research *with* the policy decision-maker that is directed toward specific policy decision-making needs.

Both the preference conjurer and the honest broker create a policy direction that is science-informed rather than science-based. Public analytical institutions are best served by a model under which one estimates the economic implications of a number of policy alternatives and presents the results without, to the degree possible, imposing anyone's values. This truly positivistic approach serves the public good. Rather than restricting the utility of the analytical findings to a single client, it expands their usefulness, allowing them to inform the entire debate on an issue. All sides of a controversial issue concerning a wicked problem can use the same results, potentially precluding alienation of particular interest groups or policy leaders. The honest broker's upfront consultation and ongoing contact with decision-makers provide these benefits, and the results are far more likely to make a real difference since the

analytical framing is well informed and the policy options analyzed will include some approaches that are already under consideration by decision-makers.

Getting to Policy-relevant Economics

So, exactly how can we systematically identify policy relevance? Sarewitz and Pielke (2007) proposed a "missed opportunities" matrix (Figure 2) as a framework for this question. Their approach attempts to identify gaps between the supply of information and the demand for information by policy decision-makers and other users. Obviously, the worst-case situation, shown in the upper righthand quadrant of Figure 2, is when policy-relevant information neither results from scientific investigation nor is viewed by users as useful. In a self-assessment of the relevancy of the U.S. Geological Survey's (USGS's) National Water Quality Assessment (NAWQA) Program, Elizabeth Graffy (2008) found, through informal interviews of USGS and congressional policy staff members, that researchers and policymakers associated with USGS studies felt disenfranchised by each other. The scientists felt that the policy staff members misunderstood science and expected too much too fast, generating frustrating "fire drills" that did nothing to advance them institutionally. Policy staff members, on the other hand, regarded science as "too vague or too general for the policy decisions that urgently needed to be made" and were annoyed by what they saw as a too frequent response that more funding was needed to answer the question at hand. These are conditions that lead to the most undesirable outcome. For economists who want policy-relevant science, the situation depicted in the lower lefthand quadrant of the matrix is the most desirable—empowered users of research taking advantage of effectively deployed research capabilities.

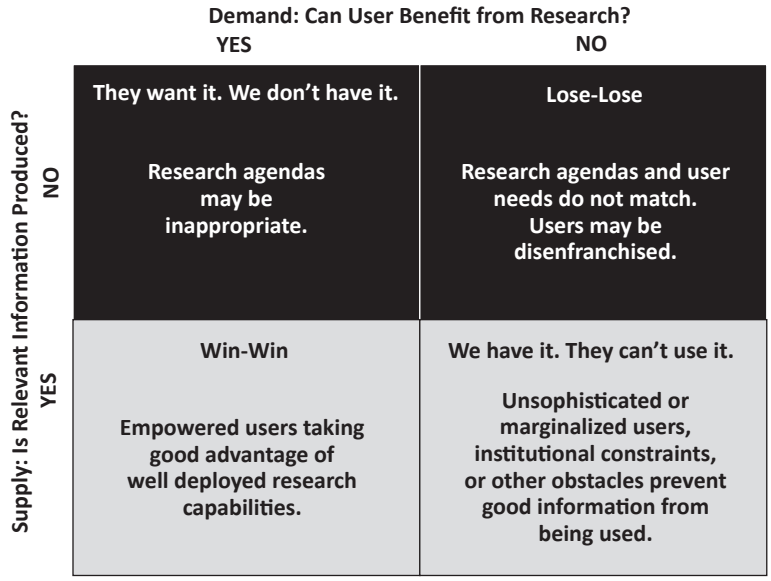

Figure 2. Missed Opportunity Matrix

Adapted from Sarewitz and Pielke (2007).

Shaw (2005) connected the strength of co-production of economic and policy outcomes to the degree of interaction between scientists and policymakers. Weak co-production is possible with a managed interface, a bidirectional exchange of information across the boundary, and/or formal negotiation between users and producers of research about what the information will look like when produced. The strongest co-production comes from including the policymaking community in framing the problem and assuring periodic reappraisals of the information by that community as research progresses. For example, development of an environmental benefit index by the U.S. Department of Agriculture (USDA) Economic Research Service emerged after close consultation and exchanges with decision-makers at USDA's Natural Resources Conservation Service.

How can we conduct research in food, agricultural, and natural resource economics in a participatory manner with policy decision-makers without being seduced into politicizing economics? Do our institutional structures allow that to happen? Do they facilitate it or reward it? Do our graduate programs and work experiences train us to do it?

Participatory co-production of policy-relevant economics will likely require institutional changes. A first step is for institutions to decide whether they truly want to promote policy-relevant science. I imagine that some do not, that they prefer to remain producers of "pure" science. One would think that the land grant colleges of agriculture would not be among those preferring pure science, but I do not presume that to be true across the board. If an institution *does* want to promote policy-relevant economics, it will have to invest in motivating cultural change, facilitate opportunities, incorporate training, and develop new reward systems.

Elizabeth Graffy (2008) realized the breadth of changes needed firsthand. She determined that the USGS NAWQA Program would increase the relevancy of its scientific information to national policymaking if it made policy-relevant research a priority, and she undertook a series of steps over a six-year period to do so. The first was to identify, through interviews and observation, the needs, barriers, and opportunities that confronted the program, wherein she discovered the nature of the disconnect between research staff and policymakers. Building on the knowledge gained in that exercise, she and the staff put together a draft plan for enhancing relevance. Briefings of congressional staff and stakeholders were scheduled more frequently and were better planned than the previous, generally ad hoc meetings. The policy relevance of NAWQA science projects and programs was incorporated into official work plans and reflected in decisions about promotion, performance, and bonuses. Research summaries were produced for all major research products, and the summaries were carefully crafted to be informative but also accessible to readers outside the profession. Policy and public decision-makers were also included in the peer review process. Over time, the NAWQA Program's successes led to development of a heuristic model linking policy and science (see Table 1).

I would guess that many readers of *Agricultural and Resource Economics Review* have played the role of economic scientist at the first stage of the model (issues emerge) shown in Table 1. An economist may announce, for example, that farm program payments are capitalized into farm land or that the Supplemental Nutrition Assistance Program provides a measured stimulus to the general economy. Stage 4 (legislate priorities and goals) is easy too. Applied scientists know how to put their knowledge to work on the ground.

Table 1. The "Functions of Scientific Information" Model Linking Science and Policy

Stages of the Policy Process	Corollary Functions of Economic Information	Diagnostic Questions
1. Issues emerge	Announce discoveries	What did you find?
2. Frame issues	Put issues into perspective	What does it mean?
3. Set priorities	Test decision options/scenarios	What matters? What can I do?
4. Legislate priorities/goals	Validate choices or tradeoffs	What supports this decision?
5. Implement goals	Enable implementation	Where? How?

Source: Graffy (2008).

But what about the corollaries to framing the issue, setting priorities, and passing legislation? It may be more difficult for economists to view an issue from the perspective of a decision-maker, know what to include in tests of decision options, validate choices, and clarify the actual tradeoffs that decision-makers will face. Economics can provide important *input* at all stages of policy conceptualization, consideration, maturation, and implementation. And can do so without the economist "making" or advocating policy.

If we want publicly funded research to be policy-relevant, we must educate ourselves and those who seek an economic basis on which to make policy decisions. We must recognize that economic analyses must be available at times and places when needed for policy decision-making and that "state of the art" is not perfect knowledge (almost never). We need to invest in the following core actions to achieve policy relevance.

1. Consult with policy decision-makers at the stages of framing a research issue and planning the research project. This does not mean, for example, blindly following the political consultants' wishes. But improved understanding of the policy context may change economists' perspectives on the goals, objectives, and appropriate methods for the research.

2. Orient scientific research so that it discovers new policy alternatives rather than narrowing a set of existing alternatives to a few scientific favorites. Good policy decisions are more likely when a broad set of options is available.

3. Recognize that results of a perfect study released *after* related policy decisions had to be made will fail to be policy-relevant. A less than ideal study can yield findings that, even though preliminary, can be extremely useful in informing policy decisions.

4. Communicate findings in a manner that makes them accessible to policymakers. Publishing for peers in recognized journals remains important for scientists and gives them credibility. But if only scientific peers can understand the significance of the research, it will fail to be policy-relevant.

5. Keep in mind that science is only one of multiple factors that go into most policy decisions.

Policymakers also will have to invest in new approaches.

1. Actively participate in research scoping and framing exercises. This kind of activity often is viewed as a low priority. However, contributions by policymakers at these early stages can ensure that the subsequent research actually meets their needs, thus eliminating wasted time.

2. Refrain from seeking scientific support as a basis for promoting a political position. Tempting though it may be to claim that a scientific fact from one study or synthesis of scientific findings should be the sole basis for "science based" positions, taking such an approach is likely to lead to scientists battling with each other rather than to persuasive arguments. Science is a process in which ultimate perfect knowledge is rarely if ever achieved. Uncertainties surround almost all that we "know." A naive strategy has, in many instances, resulted in more rather than less contention around an issue.

3. Respect scientific integrity. President Obama (2009) says it best: "The public must be able to trust the science and scientific process informing public policy decisions. Political officials should not suppress or alter scientific or technological findings and conclusions. If scientific and technological information is developed and used by the federal government, it should ordinarily be made available to the public."

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