

Reaping the Informational Surplus in Bayesian Persuasion¹

Extended Abstract²

Ronen Gradwohl Niklas Hahn Martin Hoefer Rann Smorodinsky

Policymakers often turn to experts for advice regarding the potential impacts of policies under consideration. And while experts may themselves be concerned with the same impacts as the policymaker, different experts may also have a variety of additional concerns and interests. For example, the policymaker may be concerned about the impact of the policy on society as a whole, whereas each expert, in addition to caring about society, may also be interested in the policy's impacts on a particular sector of society. When the experts differ in their additional concerns about specific sectors, should the policymaker solicit information from all of them or restrict his attention to only one?

We study this question within the framework of information design known as Bayesian persuasion. This model considers a setting where experts receive private information, and the policymaker must choose an action that affects his own payoff as well as the experts'. The model captures settings where the informed experts can commit to a *signal*—a distribution over messages that depends on the experts' information—prior to obtaining that information. The experts' challenge, and the focus of the literature, is to decide how much of the information they should share with the policymaker.

Although experts take no action, the combination of access to private information with the ability to commit to a signal proves to be quite advantageous to them. However, when multiple experts are involved, this advantage may decline. Indeed, recent work discusses the deterioration in experts' payoffs as more experts compete, at the same time benefiting the policymaker.

In this paper we consider a new model of competition among experts. There are multiple experts and a state space for each of the experts and policymaker, and, although states are a priori unknown, there may be almost arbitrary correlation between different players' states. As always, experts commit to a signal prior to receiving any private information. In contrast with other models, however, our policymaker is restricted to receiving one message, from an expert of his choice.

From a descriptive perspective, there are many settings in which the policymaker lacks the resources or the attention to receive input from all experts. In particular, when the policymaker is tasked with deciding whether or not to implement some policy, consultation with all the experts may be too costly; instead, the policymaker may have to choose one

¹Gradwohl: Department of Economics and Business Administration, Ariel University. Email: roneng@ariel.ac.il. Gradwohl gratefully acknowledges the support of National Science Foundation award number 1718670. Hahn: Institute of Computer Science, Goethe University Frankfurt. Email: nhahn@em.uni-frankfurt.de. Hahn gratefully acknowledges the support of the German-Israeli Foundation grant I-1419-118.4/2017. Hoefer: Institute of Computer Science, Goethe University Frankfurt. Email: mhoefer@em.uni-frankfurt.de. Hoefer gratefully acknowledges the support of the German-Israeli Foundation grant I-1419-118.4/2017 and Deutsche Forschungsgemeinschaft grants DFG Ho 3831/5-1, 6-1, and 7-1. Smorodinsky: Faculty of Industrial Engineering and Management, The Technion – Israel Institute of Technology. Email: rann@ie.technion.ac.il. Smorodinsky gratefully acknowledges United States-Israel Binational Science Foundation and National Science Foundation grant 2016734, the German-Israeli Foundation grant I-1419-118.4/2017, the Ministry of Science and Technology grant 19400214, Technion VPR grants, the Bernard M. Gordon Center for Systems Engineering at the Technion, and the PMRI – Peter Munk Research Institute – Technion.

²The full version of this paper can be found at <https://arxiv.org/abs/2006.02048>.

from whom to solicit information. From a normative perspective, when the policymaker has flexibility in choosing how much advice to receive, he may actually prefer to limit the amount of advice.

Indeed, our main result is that in *all* equilibria of the game, the policymaker learns *all* of his payoff-relevant information. That is, with as few as two competing experts, the policymaker reaps all of the informational surplus. We obtain this strong dichotomy between the single- and multiple-expert cases in a very general model. We allow for an arbitrary information structure and arbitrary utility functions of the experts, as long as experts are not perfectly aligned with one another in their objectives. Without this assumption—that is, if experts are perfectly aligned—the multiple-expert case is nearly identical to the single-expert case, and so the informational surplus is primarily enjoyed by the experts.

Our main result leads to two counterintuitive observations. First, from the policymaker's point of view, the restriction to interacting with just a single expert is actually a benefit, and in fact should be self-imposed: Without the restriction, the policymaker may obtain only limited information from the experts, but with the restriction he reaps all the informational surplus. Second, from the experts' point of view, commitment power could be a double-edged sword. A single expert interacting with a policymaker is always better off with commitment power, but with more than one expert that same commitment power could be strictly harmful. Here, experts may be better off forgoing this power.