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Is diversity in Delphi panelist groups useful? Evidence from a French forecasting exercise on the future of nuclear energy

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ABSTRACT

This paper further enhances the analytical power of Delphi methodology by identifying the advantages, disadvantages and challenges presented by increasing diversity among panel groups. Using Delphi survey data on the future of nuclear energy in France, we analyze the origins of the variety of judgments within and between two panels: one of experts and one of laypeople. We investigate the determinants of the stability of those opinions both in one given round and over several rounds of opinion-formation. We reach an apparently paradoxical conclusion: that non-expert judgment is less stable, but not necessarily less accurate, than that of experts, judgments on the part of experts sometimes being clouded by self-interest. Apart from highlighting some factors underlying the controversy over nuclear power, our paper calls for greater participatory democracy in Delphi panels, but also demonstrates the limits of such an extension.

1. Introduction

The Delphi method appears to be a tool of modern foresight and forecasting activities favored by many countries. The technique is seen to be an efficient procedure either to "obtain the most reliable consensus of opinion of a group of experts… by a series of intensive questionnaires interspersed with controlled opinion feedback" [1, p. 458] or to "identify dissent or non-convergence" [2, p.3]. In this procedure panelists are asked to give an initial opinion on a given topic, and are then given access to ideas expressed by others (the status of respondents not being provided), after which they are able to revise their original opinion in the light of the feedback they receive. This iteration process is repeated until a minimum of stability in panelists' responses is reached.

Such consensus – measured by a reduction in the variance of judgments over a number of rounds – is commonly observed in the literature on the Delphi method, either when panelists are experts, or when student panels (non-expert panels) are analyzed, these two types of panels accounting for most of the existing studies. It might be noted that the issue of the impact of panel composition on Delphi performance has seldom been investigated, even though [3, p. 372] conclude that "the validity of the technique will depend on the nature of the panelists and the task they have", calling for "more experiments to examine how

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expertise interacts with aspects of the Delphi technique and how it relates to accuracy improvement over rounds". Finally, while many empirical studies have made use of the Delphi methodology for foresight [4] or international comparison [5], this paper aims to add to the existing literature by addressing the methodological issues associated with this tool, dealing with the principal criticisms expressed in the literature regarding the selection process of experts, the composition of panelists [6], and their joint impact on the analytical power of the Delphi technique.

This approach resonates with problems observed in contemporary techno-economic and political spheres [7,8]. Recent examples of rising public skepticism towards scientific and technological discoveries abound: genetically-modified organisms (GMOs), mad cow disease in Western Europe, climatic change, the use of bisphenol A for producing baby bottles, and so forth [9,10]. The multiplication of such controversies challenges the idea of Sound Science, that is, the appropriateness of decisions exclusively founded upon the knowledge of scientific experts. The role of participatory democracy in activities involving prediction is increasing, and questions the relevance of panels exclusively composed of experts, leading to calls for the inclusion of non-experts in forecasting panels. But the resort to participatory democracy should not only be motivated by ethical motivations; this should also be a means of ensuring analytical precision. One might therefore wonder whether the inclusion of non-experts among Delphi panelists might contribute to a greater appropriateness of decisions based on Delphi results and a greater readiness on the part of the general public to accept those decisions [11,12].

The present study is directed to an empirical analysis of the advantages and disadvantages of diversity among Delphi panelists. Our ultimate goal is to test whether diversity of opinions might lead to a greater robustness, and might thereby facilitate political decision-making. Indeed, understanding whether or not different groups of people (experts vs laypersons) rely on divergent rationalities, and whether they are nonetheless able to reach a consensus, could be of assistance in composing reliable panels of inquiry when technological forecasting and political decisions are at stake. We will test our research hypotheses on the nuclear sector. Several factors account for our choice. First, during recent years and as in controversy over GMO or climate change, the use of nuclear power for civilian purposes has frequently been subject to important public controversies, sharpened in the wake of major nuclear accidents (Chernobyl in 1986; Fukushima in 2011) and extending beyond scientific concerns. The adoption of more radical opinion, both among experts and laypersons, can be anticipated. Second, knowledge in this domain is very complex and constantly evolving, creating a clear divide between laypersons and experts, or even among experts. Third, decisions in the domain of civil nuclear energy have a major public impact and this is likely to influence energy policy at the State level.[1]

Finally, the paper is organized as follows. We first present a survey of the impact of the composition of panels on the forecasting process and its performance so that we might construct some research hypotheses and also develop our analytical model. We point out that discrepancies in judgments made by experts and laypersons can generate diversity. Subsequent sections are devoted to the empirical testing of the working hypotheses elaborated in the first part. We conduct an empirical analysis using data collected during a technological foresight survey on the future of nuclear energy in France. This survey uses the Delphi method and involves a panel that includes both experts and non-experts. We investigate the diversity of judgments within the two populations and over repeated rounds in order 1) to test for differences and 2) to investigate their origins and stability. Finally, we consider the relative merits of including non-experts in Delphi panels, and also provide some practical recommendations to Delphi users.

2. The impact of panel composition (and of the inclusion of non-experts) on Delphi outcomes: a literature review

We begin with a literature review related to the possible consequences of including non-experts among Delphi panelists. We first show that creating mixed panels (composed of experts and non-experts) can be a way of introducing diversity and dispersion among initial opinions, experts and laypeople being presented in the literature as having differing perceptions of risk. We then show on the basis of existing literature that permitting laypeople to register opinions might create a greater degree of instability in the opinions expressed. However, this might be a strategy designed to deal with the judgmental biases of experts, explained with theoretical arguments in the third part of our theoretical analysis.

2.1. Access to differing (contradictory but fruitful) judgments of risk

There is an extensive literature devoted to the analysis of differences of judgment between experts and the general public. According to the American perception of Sound Science, when faced with controversy, public policy-makers must rely exclusively on expert advice. Given their status, experts are assumed to be able to provide objective and neutral solutions or responses. It is consequently assumed that any discrepancies arising between the views of experts and laypersons are due to a lack of rationality on the part of the latter. Expert judgment is supposed to be fact-based, laypersons' judgment being influenced by emotions and values, or limited by some cognitive bias [14] that reduces their capacity to reason.

More generally, discrepancies between the opinions of laypersons and experts respectively have been explained as arising from a lack of cognitive capacities on the part of the former, preventing them from rational analysis of a given situation. For instance, the nuclear power controversy would be explained by the existence of interindividual discrepancies in levels of knowledge and of cognitive capacities. Furman and Erdur [15] confirm this finding by showing the existence of a relationship between an agent's opinion on environmental policies and his/her level of knowledge of the matter.

[1] For instance, in 2006 78% of electricity produced in France was generated with nuclear power [13]).