

EDITORIAL

SCIENCE, POLICY, AND ADVICE. LASTING TENSIONS IN A SYMBIOTIC RELATIONSHIP

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In recent years, discussions around scientific expertise and its relevance for policy making have heightened. In Austria, too, significant steps have been taken to address the role of scientific advice and its relation to science and innovation policy as well as sectoral policies. Austrian legislators have been restructuring science and innovation policy advice by merging two existing councils into FORWIT. At the same time, European efforts to better understand, and improve, science-for-policy ecosystems have begun to resonate across various policy fields. And last year, when we started to think about this special issue more concretely, the then-new government in Austria announced its plan to conduct a system evaluation of the Austrian research and innovation policy landscape.

These developments affect what we call (as a general umbrella term) the science-policy-interface, that is all instances and spaces where science and policy come together with the ambition to utilize (scientific) knowledge for political decision-making. To us, these developments also provide an opportunity to examine how some of the most relevant and frequent emanations of this interface – namely, advisory councils and evaluation institutions – have been affected by these developments, how actors involved in maintaining and innovating them have reacted to them, and whether these pushes to be more effective in informing policymaking are showing results. The fteval platform and FORWIT therefore decided to explore how prospective policy advice and retrospective evaluation can

complement each other in the Austrian context and beyond and also aim at understanding underlying historical and institutional trajectories.

When we set out this special issue, we foresaw to combine contributions from three intersected strands of science-policy-interface.

- Concerning the transformation of science advice, traditional advisory bodies (including councils and expert panels) remain central to evidence-informed policymaking, yet their roles, independence, and impact are continuously evolving. These shifts are driven by new governance frameworks, changing political priorities, and increasing demands for responsiveness and transparency.
- The evolving interplay between knowledge production, advisory functions, and policy implementation highlights the need for robust, adaptive, and reflexive advisory mechanisms. Therefore, also evaluation practices and methodologies are adapting to meet the growing complexity of policy challenges.
- Beyond traditional advisory structures, the broader science-for-policy ecosystem is being redefined by novel advisory formats, interdisciplinary knowledge production, and new institutional arrangements. This includes the rise of mission-oriented policy advice, foresight-driven strategies, and co-creative approaches that engage a wider range of stakeholders. However, these developments raise critical questions about the legitimacy, accountability, and effectiveness of advisory processes.

Our open call for papers was successful regarding two of those three broad topics: we solicited contributions that deal with deep analyses of scientific advisory bodies, as well as more systemic perspectives on (mostly national) science-policy-interfaces. However, one strand of our interest is not represented explicitly, that is the role of evaluation. This might appear strange for a journal specifically dedicated to that topic; we still decided to move forward with this special issue, because we believe that policy advice structures at least implicitly entail evaluative elements as giving advice logically includes an assessment of the subject of advice. Hence, we also realized that evaluation of policy instruments is, of course,

an important tool in the toolbox of advisory bodies and one that is often deployed to also assess science-for-policy ecosystems.

Even though this strand of our initial call is not as explored in depth as we had wished for, it is still implicitly present. The relative absence of evaluation as an explicit theme in the contributions to this volume is itself telling. Advisory and evaluative functions tend to be institutionally separated, operating on different time horizons and answering to different logics of accountability. Yet that separation conceals a logical dependency: every advisory recommendation implies a theory of change – a claim, however implicit, about what intervention will produce what effect under what conditions. Testing those claims is precisely what evaluation does. The feedback loop between recommendation and evidence of effect is, in most science-for-policy systems, the missing infrastructure.

There may also be an epistemological reason why evaluation sits uneasily in this debate. Most contributions in this volume embrace models of advice that are iterative, co-productive, and deeply context-specific – and such models are, in a certain sense, evaluation-resistant. The counterfactual logic at the heart of rigorous evaluation – what would have happened otherwise? – becomes difficult to apply when advice and policy are co-constituted rather than sequentially ordered. This is yet another reminder that the methods of evaluation need to match the complexity of what is being assessed. Carol Weiss's early insight that social research often works through an "enlightenment function" – gradually shifting how problems are framed rather than directly informing discrete decisions (Weiss, 1977) – remains underexplored in its implications for evaluating advisory work specifically.

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The system evaluation of the research and innovation policy landscape stipulated in the coalition agreement of Austria's present federal government offers a rare opportunity to close this loop in practice. A system evaluation must – and will – engage advisory bodies as FORWIT not only as objects of evaluation but also as co-definers of the normative framework against which achievements are measured. That double role – simultaneously evaluated and evaluator – is productive precisely because it is uncomfortable. It also surfaces what may be the most difficult question in this context: not how advice is given, but whether it matters – and whether and how it is taken up. While some of the contributions to this volume address this question, none comes up with a definite answer.

With these more general remarks in the background, this special issue covers the following topics addressed in the call for papers:

- The development of advisory councils in historical perspective: why and how did advice bodies and councils come into being? How did these structures develop over time, and which organizational models developed?
- The evolving role of advice bodies and councils: How have councils adapted their advisory functions to meet new policy demands? Did changing governance frameworks lead to the reorganization, abolishment or introduction of advice bodies?
- Institutional settings and governance models: What structures facilitate best an effective interplay between advisory bodies, evaluation institutions, and policymakers?
- Science-for-policy ecosystem: How do different national systems integrate both advisory and evaluative functions to support evidence-informed policymaking?

1. STATE OF RESEARCH

Assessing and conceptualizing modes of scientific policy advice has become a focal point of academic interest from different disciplinary perspectives. If we track the literature on the subject, we can identify a few distinct results that also inform the different contributions to this special issue, and that also helps us to (broadly) organize them below. It should be stated that this literature overview is far from exhaustive, or even systematic. It builds on a separate working paper one of us has been putting together and focuses on areas that we deem of particular interest in the context of this special issue (Buntfuß, 2026). First, we briefly state important shifts in the academic assessment of utilization of scientific knowledge for policymaking, and how those have impacted the way we think about expertise and evidence. Then we briefly touch on different frameworks that have been developed to conceptualize scientific policy advice more analytically. We conclude this section with insights informing the way we have organized this volume.

Shifts in the science-policy-interface

We start this section with stating notable shifts in the science-policy-interface over the past two decades. Up until the early 2000s, a linear model of knowledge utilization predominated, conceptualizing science as a neutral provider of facts and policy as their applicant (e.g., Weiss, 1977). Over the past two decades, however, this model of “speaking truth to power” was increasingly replaced by relational and process-oriented approaches that emphasize the interplay between the two spheres. Instead of advocating strict separation, more recent literature emphasizes the necessity to understand the science-policy-interface as a communicative interplay between politicians and experts. Hoppe (2005) distinguishes patterns of interaction at the science-policy-interface, describing different dialogue models. Introducing an iterative discourse on available knowledge, political decisions, and value judgments (Weingart, 1999; Falk et al., 2019), this approach explicitly distances itself from the ideal of value-free science—a principle that has been strongly

criticized from both a philosophy of science perspective (Brown, 2020; Douglas, 2009, 2021) and an empirical one (e.g., Jasanoff, 2004). Instead, it emphasizes the intertwinement of knowledge and values within the communication process, as reflected, for example, in the value-based commissioning of scientific advice (Fleischer et al., 2010).

Another conceptual shift emerged with the turn toward transdisciplinarity and the co-production of knowledge (Jasanoff, 2004; Nowotny et al., 2003). These approaches view science as an integral part of political processes in which actors from science, policy, and civil society jointly generate and apply knowledge. Particularly influential in this context was the concept of “Mode 2” science (Gibbons et al., 1994), which supplements traditional, discipline-based research (“Mode 1”) with context-sensitive, problem-oriented, and participatory knowledge production. More recent work also critically reflects on power asymmetries in knowledge generation (e.g., Turnhout et al., 2013), such as when certain actors or forms of knowledge are systematically excluded or strategically ignored (McGoey, 2012).

Expertise and evidence

As a result of this more realistic (and empirically founded) understanding of the science-policy-interface and the utilization of knowledge for policymaking, we can highlight two important concepts that are at central stage when we talk about utilization of knowledge for policymaking. One relates to the term expertise and deals with the role of experts in a time of its crisis, with the “honest broker” being the idealized version. The other one relates to the term evidence and deals with what counts as relevant facts for policymaking, with the movement for an “Evidence-based Policymaking” at its core. Both concern the expectations towards knowledge utilization for more informed policymaking.

It’s long been stated that expertise is in a sort of crisis, while at the same time being in more demand than ever (Eyal, 2019). The most prominent attempt to tackle the inherent tensions of expertise is probably Roger Pielke’s “honest broker” model. It describes a role for scientists that extends beyond mere knowledge production while avoiding the risk of

scientists becoming advocates. The “honest broker” integrates scientific knowledge with the concerns of political stakeholders and presents alternative policy options without committing to a specific position. This role is particularly relevant because it addresses the tension between (alleged) scientific neutrality and normative positioning, bridging the gap between purely analytical knowledge production and political decision-making. Honest brokers acknowledge that there is no single scientific answer and present different policy alternatives, conditional to decision-makers’ values. The significance of this model lies in its assignment of a role to scientists that goes beyond mere knowledge production while avoiding the danger of scientists becoming one-sided advocates for a particular political position. Thus, the model becomes an important tool for understanding and shaping the complex relationship between science and policy.

Despite its appeal, the “honest broker” model has not been without criticism. As noted above, complete value neutrality on the part of scientists is deemed impossible in much of the social scientific literature on the matter, as scientific work is always shaped by certain values, assumptions, and normative positionings that cannot be fully balanced (e.g., Jasanoff 2004, Douglas, 2009). Discussing the role of the “honest broker” in the context of climate science and the IPCC, Havstad & Brown argue that complex issues cannot be reduced to a set of neutral conditionals that work as equal alternatives, subject to the value-laden choice of decision-makers (Havstad and Brown, 2017). As they stress, this image re-introduces the ideal of value-free science. In a more pragmatic argument, Havstad & Brown emphasize that the attempt of ‘putting all alternatives on the table’ is unfeasible in practice. Nevertheless, the model of the honest broker can serve as – imperfect but practical – reminder that scientific knowledge is inevitably shaped by normative assumptions. The challenge lies in making those (often implicit) assumptions transparent and reflecting on them in discourse without this being misinterpreted as lobbying or advocacy.

Just like expertise, the notion of evidence has become almost omnipresent in today’s discourse about the science-policy interface.

Through examples such as industry-led suppression of research on the effects of fossil fuels, Justin Parkhurst vividly demonstrates the relevance of evidence for policymaking—and the unintended consequences of its neglect. His conclusion: “Evidence matters” (Parkhurst, 2016, p. 3f). Yet the conceptual idea of Evidence-Based Policymaking (EBP) to simply supply politics with knowledge and apply the methodological rigor of scientific evidence to policy-relevant knowledge seems faulted. As Simons and Schniedermann (2021) emphasize, EBP must not be confused with a neutral description: it is, rather, a theory about how politics works on the one hand, and a normative goal for how it should work on the other.

EBP is first and foremost the political idea that political decisions lead to more effective problem-solving and generally function better when they are as far as possible based on evidence. At its core, EBP therefore differentiates different forms of knowledge, introducing a hierarchy of knowledge, with randomized control trials or other highly standardized methods placed at top. The EBP approach thus targets the entire political process, which is to become more professional through the integration of scientific evidence, which is considered the most valuable knowledge (Straßheim, 2023). Inspired by the success of evidence-based medicine and the appeal of seemingly ideology-free evidence, this idea was first articulated by Tony Blair’s government in 1990s’ Britain under the slogan “what counts is what works.” In 2001, it was adopted by the OECD and shortly thereafter by the EU, linked to the hope of achieving “better regulation” through more rational policy (Simons and Schniedermann, 2021). Due to its popularity and widespread adoption, EBP can be described as a movement—a characterization its proponents also embrace (Parkhurst, 2016).

However, like all scientific knowledge, evidence is contingent on its conditions of production—and thus inextricably linked to political and normative questions. The discourse on evidence-based policy creates the impression that debates over normative questions become superfluous due to the clarity of the evidence. As Holger Straßheim succinctly puts it: “The irony of evidence is that, in a performative contradiction, it must conceal its own conditions of validity in order to

claim obviousness and clarity.” (Straßheim, 2023, p. 84, own translation). Katharina Paul expresses a similar critique: “Evidence-based policy must therefore be understood as a process in which knowledge and strategic non-knowledge play important roles. For this reason, evidence-based policy must not become the sole maxim.” (Paul, 2019, own translation) The movement seems to assume that political and normative disputes could be replaced by purely methodological, or scientific questions—and resolved through the corresponding methods. This assumption itself is to be understood as “neglected politics behind EBP” (Simons and Schniedermann, 2021, p. 523).

Frameworks for scientific policy advice

With these cautionary reflections on two important and prominent conceptual ideas directly related to the science-policy-interface, we turn to two conceptual frameworks that pursue different approaches to structuring the science-policy interface. One key element here concerns the role of organizations. Specifically, advisory organizations, while providing scientific expertise, do not belong solely to the scientific subsystem but also fulfill a specific function for the political system. From this perspective, advisory organizations are “boundary organizations” that ensure the coupling of the two distinct systems and their logics (Lentsch, 2016). This involves them repeatedly finding themselves caught between contradictory demands.

A practical implication for advisory work is that advisors must actively engage in this process (whether defined as being caught between different functional logics or not). Some literature refers to this as “brokerage” (Přstross et al., 2025), building on the previously discussed role ideal of the “honest broker” (Pielke, Jr, 2007). This term has gained significant popularity, particularly among some practitioners of scientific advice (see, e.g., Gluckman 2014; Gluckman et al., 2021). While it represents a role model for individuals—rather than an analytical perspective on the organization and practice of scientific advice, a strand of literature, however, extends this concept by introducing the term “knowledge brokering organizations” (KBOs) (MacKillop et al.,

2020). KBOs are understood as organizations for which the articulation of evidence for political application is a central part of their work; they maintain specialized structures, practices, and personnel and have proximity to the respective government without being part of it. Since the late 2000s, there has been a noticeable increase in KBOs, which is attributed to a perceived lack of advisory capacity (MacKillop and Downe, 2023).

The approach of viewing advisory organizations as KBOs emphasizes how these organizations ensure the legitimacy of their work and advisory products. MacKillop & Downe (2023) observe different strategies in this regard. Some rely on academic practices and quality standards, such as peer-reviewed research, rigorous methodology in their own procedures, or an emphasis on the academic background of their content-focused staff. At the same time, however, the work of KBOs must also be relevant and adapted to the temporality of political processes, leading KBOs to present their work as both evidence-based and useful.

This perspective emphasizes that evidence is actively processed within KBOs (often described as evidence synthesis, translation, or evidence review) rather than being homogeneous facts that are simply “pushed” unchanged into a political process. MacKillop et al. (2020) criticize such a “push approach” as naive and idealistic, advocating instead an understanding of knowledge brokering that focuses on narratives and power practices that frame and permeate the interplay between scientific knowledge and politics. This includes, for example, a closer examination of the legitimacy narratives that KBOs constantly construct and reconstruct in their work (MacKillop and Downe, 2023).

The Policy Advisory Systems (PAS) approach (Halligan, 1995; Capano, Craft, et al., 2025b) offers another perspective on the political contexts of scientific advice. According to the prevailing definition, a Policy Advisory System is an “interlocking set of actors, with a unique configuration in each sector and jurisdiction, who provide information, knowledge, and recommendations for action to policymakers” (Craft and Howlett, 2017, p. 217). These systems are characterized by the fact that advice comes from multiple, often parallel-acting sources, which may also compete with

one another. PAS are thus situated at a meso-level, typically examining advisory systems within specific policy fields and their capacity to provide actionable recommendations (Brans et al., 2022).

The motivation behind the PAS approach is to understand the variations in the forms and structures of scientific policy advice across different policy fields and states, with comparative analyses often at its core (Capano, Craft, et al., 2025a). Traditionally, the variability of PAS is analyzed through the influence of different actors within an advisory system, conceptualized in terms of their (institutional or personal) proximity to government and a distinction between internal and external actors. According to (Capano, Casula, et al., 2025), this distinction has significantly influenced the design of advisory committees in many OECD countries, with a general trend toward greater involvement of external actors, which also brings more interest groups into the respective PAS (Brans et al., 2022).

Another key question concerns the government's ability to exercise control over advisory actors – specifically, whether and how governments can ensure that the advice they receive aligns with their own priorities and goals. However, this is typically framed only in terms of short-term (crisis management) versus long-term (proactive, forward-looking) considerations, without exploring how such substantive congruence might be conceptualized (Craft and Howlett, 2017). More recent approaches place greater emphasis on this substantive aspect. For example, Capano, Casula, et al. (2025) analyze expert committees not only in terms of the origin of experts (internal or external to government) but also their disciplinary homogeneity. This shifts the focus from the government's control function to the question of what the composition of expert committees reveals about the political backgrounds and preferences of decision-makers.

Despite the high degree of formal variability, a common function of PAS can be identified: providing assessments, evidence, and arguments for solving political problems (Brans et al., 2022). In this way, the approach emphasizes that the stage of the policy cycle in which an issue or proposal is situated is crucial for advisory practice (Brans et al., 2022). This accounts for the temporality of expertise better than other approaches do. A

strength of the PAS approach is that it conceptualizes scientific policy advice from the outset as part of the existing political and institutional environment.

An even broader, and more politically driven variation is the “Science-for-Policy Ecosystem” concept, which describes the science-policy interface as a complex, dynamic, and multi-layered system encompassing diverse actors, institutions, processes, and forms of knowledge (Pedersen, 2023; Scharfbillig et al. 2024; Almeida et al., 2025). This framework is particularly employed by the European Commission’s Joint Research Centre (JRC) and in the work of Gluckman (2014) to capture the diversity of actors, the plurality of knowledge sources, and the institutionalization of interfaces between science and policy.

Despite their differences, the KBO and the PAS models aim to help understand the role of scientific expertise in political processes, thereby always providing an image of the interplay between science, policy, and politics. Yet while academic literature has refined and critically appraised the realm of scientific policy advice with increasing lucidity and conceptual innovation, the tension of utilizing scientific knowledge for political decision-making will not go away. One way to understand that tension of utilizing scientific knowledge for policymaking is that two distinct forms of justification must be addressed at the same time:

“On the one hand, epistemic robustness, which pertains to the justification of knowledge claims, and, on the other hand, political robustness, which refers to aspects of responsiveness and political justification.” (Pedersen 2014, p. 549)

This immanent tension of political and epistemic robustness affects the science-policy interface as a whole. And it is enforced, in practical as well as organizational matters, for example by neglecting, or ignoring, the specificities of advisory work, which leads to de-contextualization of knowledge for policymaking, or the tendency to turn a blind eye on norms, values and interests that are determining what serves as relevant knowledge and the way it is put forward. In addition, there is a trend to depoliticize political questions by reframing them as questions of

knowledge as the “epistemization of the political” (Bogner, 2021). We usually assume that, with the push for professionalizing policy advice structures in both organizational and institutional settings, these tensions will be alleviated. Certainly, this has contributed to the various developments in policy advice described in the following articles. And yet we have to be cautious, as we do not (yet) see strong empirical evidence that supports this assumption.

2. ORGANIZATION OF PAPERS IN THIS VOLUME AND GENERAL OBSERVATIONS

When it comes to this special issue, we see the two frameworks outlined above as a first opportunity to cluster the contributions: The first section addresses the development of advisory councils from an institutional perspective, and here specifically councils that are primarily directed towards science and research policy. Broadly, then, this follows the framework of individual knowledge brokerage organisations. The second section deals with broader (eco-)systems of scientific advice comprising multiple institutional arrangements and sector policies as addressees of advice, thereby roughly following the idea of looking at entire policy advisory systems.

However, whether organizational or systemic, two elements can be found in all contributions. The first concerns the weighing of independence particularly in relation to accountability and relevance, and the second the various and changing functions scientific advice can adopt and the different – if not contradicting – effects this can have on the role of advice. These two, then, can be seen as the central themes across all contributions: the meaning of independence spans liberty of topic selection, procedural autonomy, to organizational self-governance. At the same time, the expectations in advice continue to shift, encapsulating diverse, sometimes contradictory, functions ascribed to scientific advice from justification posturing to real impact. While science and research policy advisory councils ultimately also shape the policy framework for science, advisory structures within specific sector policies provide knowledge for policy implementation. Yet in which ways this feeds back on the science system is hardly ever at the centre of considerations.

Author(s), short title	Key characteristics describing advisory systems	
	Significance of independence of advice structures	Functions of advice within policy frameworks
Councils: Trajectories of Science and Research Policy Advice		
Pichler: History of advisory councils in Austria	Development from legally dependent councils with predominantly institutional memberships and without resources to councils with their own legal personality, staff and budget as well as a personal membership led to greater impact	Development from a mere sounding board to a coordination platform for science and research policy, eventually to a “real” advisory body devising opinions and strategies as well as recommendations on the allocation of extra-budgetary funds
Banda/Sanz-Menéndez: Science, technology and innovation advisory council in Spain	Increasing independence and shift towards predominantly meritocratic composition of membership weakened impact on science and research policies and responsiveness to political requirements	Accompanying transition to democracy; coordination and design of science and research policy, originally entrenched in the national governance system; change to a more detached external perspective of advice
Heinze/Jappe: German Wissenschaftsrat	The Wissenschaftsrat is not really independent; it is deeply embedded in a multi-layered federal governance system; there is an increasing tension between its formal structure and actual actions	Coordination between the federal and state governments in higher education and science policy matters; advice on reform proposals and the promotion and evaluation of scientific excellence
Buntfuß/König: Quality management	Relatively high independence does not replace the need to establish practices for quality assurance.	Different and diffuse expectations in role of FORWIT requires the council to calibrate its practices for quality assurance on case-by-case basis
Ecosystems: Institutional Structures and System Dynamics		
Faßmann: Scientific policy advice in Austria	Independence (autonomy) of advice bodies and agencies is most effective when relating to clearly defined areas, otherwise advice may lose link to policymaking; dedicated resources are key	Science for policy: enabling the apt implementation of a broad range of sector policies (e.g. fiscal, social, health, climate); policy for science: advice on the design of science and research policies
Zollinger: Scientific advisory network in Switzerland	Existing policy advice institutions proved inept during the Corona crisis due to their self-referential setup and the resulting unstructured use of scientific advice; a new network is intended to overcome institutional boundaries and lead to more yet formalised openness	Utilizing scientific advice systematically in the federal government’s crisis management; establishing coordination processes between the bodies involved and clear communication with policy; joint planning of evidence-based policy

Wise/Wilson/ Schwaag Serger: Place-based science- for-policy	Co-creation of advice structures in specific (e.g. thematic or local) settings; science-policy interaction works both ways and is highly context-specific; organization must be flexible and challenge-driven; stable funding is beneficial	Integration of advisory and evaluative functions, governance of transformation; policy learning, more interactive relationship between knowledge and policy, strategic coordination, trans- disciplinary approach, turning knowledge into practice
Kahn/Ralphs/ Mustapha/Borel- Saladin: Policymaking and advice in South Africa	Long-lasting impact of autonomy paradigm; tensions and lacking communication between academic and state-directed approaches leads to failure in the face of challenges; convergence can provide opportunities	Providing evidence, particularly scientometrics, for informed policymaking; sounding board for dealing with HIV/AIDS crisis; joint planning of big science and developing complex technosystems
Allegra: Scientific Advice in EU institutions	Advisory bodies in EU-specific sectoral policy domains: separation of advice and regulation to keep scientific independence as legitimation; development of more general advice structures towards a quasi- council embedded in the EU institutional framework	Informing and legitimizing sectoral policymaking while balancing tensions between scientific expertise and democracy, thereby providing spaces of co- production; strategic cross-cutting scientific advice to coordinate more generally across the science- policy boundary

Table 1: Organization of papers and key characteristics

Source: authors’ own compilation

Along these categories, we can summarize the following observations:

(1) In the context of scientific policy advice, the paradigm of the autonomy of science is often translated into (and confounded with) organizational independence¹, which, however, is no guarantee for impact. Always depending on the political, historical and cultural context, overly independent councils may not be sufficiently embedded in the policy cycle so that they lose the capability to link up with those addressed. While in one system, a high degree of independence heightens credibility, in another it symbolizes the ivory tower. Relating to that, the terms of membership of an advice body reflect this dichotomy: personal expertise or institutional representation as the members’ legitimation influence

1 Here, autonomy means epistemological and methodological freedom from undue interference, while independence means organizational (and also financial) freedom from institutional restraints that would apply otherwise.

their capacities to act as interlocutors with the policy system – one way or another. Personal membership reflects that scientific knowledge is not a disembodied structure, but institutional identities still shape a person's expertise even if they are not an institutional representative. Another aspect present throughout various settings is the availability of resources (e.g. budget and staff), which arguably broadens the room for manoeuvre, and thus factual independence, an advisory body enjoys. Even though the contributions yield no general evidence, it is safe to assume that there may be a certain trade-off between the independence of a council and its relevance where extreme high or low degrees of independence may both hamper relevance.

(2) The functions of scientific advice analyzed in this issue span a broad spectrum, ranging from science for policy to policy for science. On one end, advice involves providing governments or ministries with the scientific knowledge they need to fulfill specific tasks. This is most common in science-driven sectoral policies, such as health or environmental policy. In science and research policy, too, such advice is typically sought for concrete issues – like legislative proposals or funding allocation. More often, however, advisory bodies serve as coordination platforms or sounding boards. This is true particularly in cross-cutting policies where domain boundaries are blurred, and advice feeds less directly into the policy cycle. Science and research policy tends to align with this pattern, focusing on how policies should be designed to promote science and research. Actual policy planning as a form of advice is rare and usually limited to distinct challenges, such as managing a pandemic, developing big science initiatives, or addressing transformation processes.

(3) The question of independence of advisory bodies relates differently to the functions of advice according to their respective characteristic. Where advice is given as an element required in course of a defined policy process, independence may come in handy as justification for decisions taken, or put differently, to delegate responsibility. In case of coordination or serving as a sounding board as main roles, independence may compromise a council's ability to profoundly involve itself into political decision-making procedures. Even more so, advice taking the form of joint planning for

science-related projects requires an iterative approach where the needs of both policy and science are mutually taken into account. Usually, when the potential of science-for-policy is fully exploited, it is the result of co-creation rather than being developed in a black box.

3. CONCLUSION

Unsurprisingly, the historical development and institutional as well as organizational settings of scientific policy advice structures and bodies are context-dependent and, therefore, vastly different among the cases covered in this special issue. The tensions between science and policy as societal subsystems are lasting and must continuously be rebalanced. There is not one best-suited approach neither in analytical nor in normative terms. And yet, all cases share certain historical trajectories, such as the progress from a more linear understanding of the science-policy relationship to arrangements where mutual involvement gains greater importance, and a push for increasing professionalization. This may be interpreted as a consequence of the increasing complexities of both scientific developments and the challenges that the realm of policymaking faces.

Within that broader setting, the articles collected in this special issue follow distinct analytical approaches, thereby reflecting different functions of advice that vary along policy domains. When it comes to analyses of the institutional development of science and research policy advisory councils, it appears that scientific advice is focused on providing institutional capacities to shape science and research policies, if only in a rather generic way. Here, we can detect varieties of the KBO approach in the respective analyses. On the other hand, where scientific advice is expected to supply evidence in the sense of applicable knowledge in problem-solving contexts of (often multi-layered) sector policies, systemic frameworks and ecosystems seem to be a relevant point of departure for the analysis, contributing to varieties of PAS.

However: whatever the institutional models and analytical approaches, science and policy must understand each other's standards of credibility

and accountability to transgress the science-policy boundary so that they can become (and remain) “resources for one another” (Ash, 2002). For the time being, this balancing requires our attention and, occasionally, careful recalibration.

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