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Strengthening the science–policy interface in Ireland

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Introduction

Much is expected from politicians and policymakers. The public have a low tolerance for poor allocation of scarce resources. They expect transparency and accountability from government, and they expect to participate in policy deliberations that impact their lives (Boaz et al., 2019; Gaventa & Barrett, 2012; Ó'Broin & Corrigan, 2021; Van Brussel & Huyse, 2019). Irish citizens report high levels of trust and confidence in science, believing that scientific knowledge and advice can address complex problems facing society (Eurobarometer, 2021). A low tolerance for policy failure and high trust in science are fertile conditions for evidence-informed policy.

Covid-19 presented an opportunity to learn how science advice systems have coped under pressure and to identify any cracks in the system. The pandemic revealed the complexity and uncertainty of policy problems, and their cross-sectoral and multidimensional nature, and demonstrated the need for a whole-of-government response. As

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politicians claimed to 'follow the science', scholarly interest turned to the lessons learned about the science–policy interface under emergency conditions (Fahy, 2022; Gluckman & Mendisu, 2021; Kennelly et al., 2020; Stevens, 2020; Whitty & Collet-Fenson, 2021; Williams et al., 2020). The pandemic has brought attention to the value of supporting national research capacity and the need for mechanisms to better align research evidence with policy problems. Investing in the supply of policy-relevant studies, building the capacity of policymakers to procure and make good use of available scientific evidence, and establishing mechanisms to bridge the policy and scientific communities are all necessary elements within a healthy science–policy ecosystem (Šucha & Sienkiewicz, 2020). This paper will describe current developments in Ireland aimed at promoting evidence-informed policymaking as part of ongoing reform of the national system for science advice. The paper will then critically assess the challenges and opportunities facing policymakers, the scientific community, knowledge brokers and decision-makers responsible for system-level management of science advice for policy.

Interpretations

Analysis of the use of evidence in policy is helped by explicit conceptual terminology (Blum & Pattyn, 2022). For the purpose of this paper, policy concerns the strategic decisions by government, designed to guide and direct future decisions and their implementation. The sites of policy work are government departments, where policy is determined. Notwithstanding the separation of the advisory function of civil servants and the decision-making responsibilities of ministers, in this paper policymakers comprise ministers and their officials. While acknowledging the central influence of administrative data and the role of 'grey literature', including research produced by lobbyists, evidence means research-based scientific evidence, primarily undertaken in universities and research institutes. Evidence-informed policy means the creation, mediation and use of evidence in making decisions, in choosing between policy options and in evaluating policy implementation. The term 'science–policy interface' describes the nexus between scientific evidence and policymaking while the 'science–policy ecosystem' captures the entirety of relations among all actors and stakeholders at national level involved in connecting science advice with policy.

Recent government initiatives

Ireland has an advanced research and innovation system but an underdeveloped evidence-support system to systematically create, mediate and use scientific evidence in public policy (Boyle, 2020; Lunn & Ruane, 2013; O'Connor, 2022; Ruane, 2021; Watt & Perkins, 2020). Two recent government initiatives are aimed at transforming how evidence is generated, mediated and used by policymakers to support government's response to complex challenges. The first of these is the *Civil Service Renewal 2030 Strategy* and the second is the National Research and Innovation Strategy, *Impact 2030*. These texts reveal government thinking about policymaking and about science, and how the science–policy interface is understood.

The *Civil Service Renewal 2030 Strategy* (Government of Ireland, 2021b) aims to improve the capacity of the civil service to advise government in responding to a variety of complex policy issues. Central to this ambition is a rigorous, professional and evidence-informed approach to policy development. The detail is contained in the companion *Civil Service Renewal 2024 Action Plan*, which claims that 'evidence-informed insights are central to good strategic policy-making'. The action plan identifies the supply, demand and mediation of evidence for policy as 'the key building blocks to enhance our insights-driven policy-making capabilities including access and use of data, supporting skills development and improving the policy making infrastructure and outreach' (Government of Ireland, 2021a, p. 19). The embedding of multidisciplinary 'strategic policy units' in government departments is anticipated to facilitate 'the development of high quality evidence based policy and a culture of evaluation throughout the policy cycle' (Government of Ireland, 2021a, p. 20). The Irish Government Economic and Evaluation Service (IGEES) features prominently in the action plan. Promoted as a model vehicle to develop the capacity of officials to extract insights from data, 'the IGEES will play a key role in equipping our staff with data and analytical capabilities to generate insights to inform policy development and the delivery of public services' (Government of Ireland, 2021a, p. 22).

The second government initiative is the National Research and Innovation Strategy, *Impact 2030*, developed by the Department of Further and Higher Education, Research, Innovation and Science (DFHERIS). The first pillar of the strategy calls for the maximisation of the impact of research and innovation on the economy, society and the environment. Such impacts are supported by 'long term

connections between policymakers across all Government Departments and the public research system' and by 'ensuring that collaboration between researchers and policymakers becomes a standard part of their respective roles' (Government of Ireland, 2022, pp. 9, 17). Policymakers cannot use research if they are not aware of it and so 'research and associated expertise must be much easier to identify and to access' (Government of Ireland, 2022, p. 17). At the same time, if scientists are to attend to the knowledge needs of policymakers, there is a need to 'improve the articulation of public policy needs to the research community so that they can engage proactively and creatively on this shared agenda'. The Research and Innovation Strategy announced the amalgamation of Science Foundation Ireland and the Irish Research Council into a new agency that will support the full range of scientific endeavours and is expected to advance 'interdisciplinary' research, seen as 'fundamental to addressing grand challenges'. New science advice structures are signalled in the strategy, needed to 'improve the flow of scientific advice to Government Departments … thereby strengthening evidence-based policy formation throughout Government' (Government of Ireland, 2022, p. 8). While the shape of any overarching science advice structures is still emerging, they are expected to include the decoupling of the Chief Science Advisor role from the role of the Director General of Science Foundation Ireland, signalling a more independent chief scientific advisor capable of bringing interdisciplinary advice to their cross-departmental role (DFHERIS, 2021; Royal Irish Academy, 2021).

Interest from the academy

It is not just government that is interested in making better use of scientific evidence in public policy. Since 2021 the Royal Irish Academy and the Irish Research Council have brought policymakers and researchers together as part of a series of 'Research for Public Policy and Society' symposiums. Tasked with 'developing and supporting the architecture of the research ecosystem with the establishment of dedicated structures and systems to deepen relationships between research and public policy' (Doyle, 2021a, p. 11), the report of these proceedings concluded that:

> ensuring access and dialogue between policymakers and the best possible scientific and scholarly knowledge and insight, from different disciplines and approaches, independent of institu-

> tional or political interests – is an important agenda for action in Ireland. (Doyle et al., 2021, p. 2)

At the same time, producing knowledge for central policymakers raises concerns about independence and clientelism, a loss of academic freedom and the ability to speak truth to power (Bynner & Terje, 2021; Mintrom, 2019; Norton et al., 2021). A willing rapprochement between policymakers and the scientific community cannot be taken for granted.

Having outlined interest among government and the academy in the science–policy interface, this paper will now assess the capacity and capability of the demand side (policymakers) and the supply side (researchers) to make better use of scientific evidence in policymaking.

The demand side (policymakers)

The capacity of policymakers to make use of evidence in the policymaking process is a fundamental pillar within the science–policy ecosystem (Doyle, 2021b). Initiatives by government and the scientific community to strengthen the science–policy interface are welcome; however, reform must be grounded in a sound conceptual understanding of the nature of policy problems and policy formation.

Many public policy problems are complex, seemingly intractable and resistant to simple technical solutions (Boaz & Gough, 2012). Policy decisions are 'the product of literally endless components and processes' to be managed under 'ceaselessly changing complexity' (Pawson, 2006, p. 18). So called VUCA conditions – volatility, uncertainty, complexity and ambiguity – are typical in open systems such as education, criminal justice, health, energy and housing, where policy functions probabilistically rather than deterministically. Policymakers are expected to introduce scientific evidence into 'wicked policy problems' (Rittel & Webber, 1973, p. 160), where there may be little agreement about the nature of the policy problem, about who is responsible for addressing the problem or what success looks like, and about who pays for policy responses (Andrews, 2017; Head, 2022).

Policy as value judgements

Government policy is rarely determined or led by science in some ideologically free context. Policymaking in many fields involves the political struggle over values and ideas (Stone, 2012), and the science–

policy interface comprises a series of interconnected human activities where values play a central, if underestimated, role (Head, 2015; Khosrowi & Reiss, 2019). For policy decisions to be technically and politically feasible, policymakers must attend to both the analytical and normative dimensions.

Policy scholars have been critical of hyper-rational, technocratic versions of evidence-based policy where values are ignored or downplayed (Beyer, 1997; Cain & Allen, 2017; Weiss, 1991). Prioritising the technical aspects of policy problems and neglecting their social and normative dimension risk the domination of a 'positivist, empiricist' perspective on knowledge, seen as damaging for the prospects of bringing evidence into policy, as Greenhalgh & Russell (2009, p. 304) explain in the context of medicine:

> The positivist, empiricist worldview that underpins the theory and practice of evidence-based medicine fails to address key elements of the policymaking process. In particular, a narrowly 'evidence-based' framing of policymaking is inherently unable to explore the complex, context-dependent, and value-laden way in which competing options are negotiated by individuals and interest groups.

The personal values of policymakers also influence the prospects of using research-based evidence in policymaking. Post-positivistic values and assumptions about knowledge can lead to blind faith in technical solutions to policy problems, an uncritical acceptance of 'what works', and a hierarchy of evidence where randomised control trials are seen as the 'gold standard' for generating reliable findings. Arguably, contemporary policymaking requires a turn against methodological orthodoxy in favour of embracing different epistemological world-views and different approaches to generating and using knowledge. The unwarranted reliance on the persuasive power of numbers presented as facts together with views about the status of scientific knowledge and claims about certainty and causality must be critically assessed in terms of their ontological, epistemological and methodological merit (Ball, 2015; Biesta, 2010; Oreskes, 2015; Parsons, 2002).

The failure of conventional models of policymaking

Commenting on policymaking in Ireland, Tom Ferris (2015, p. 89) captures the fantasy of routine and straightforward policy processes progressing along a predetermined and routinised schedule:

> In an ideal world, policy would be linear: starting with a range of options that are then filtered down to 'politically' acceptable options before being refined by way of research, analysis, consultation and impact assessment into a single option to be drafted into legislation, adopted by government, debated in parliament, enacted, and implemented and enforced.

This idealised version of policymaking has influenced expectations about the use of scientific evidence, as Lucas (2018, p. 1602) observes:

> Under the most ideal conditions, EBP [evidence-based policy] might be viewed as a process in which disinterested experts generate technical solutions to problems, and policymakers passively synthesize this research to select the optimal policies.

Idealised, linear versions of policymaking have been dismissed (Ansell & Geyer, 2017; Ball, 2015; Fullan, 1995; Lindblom, 1979; Whelan, 2022), with particular criticism reserved for the centralising tendency in traditional policy models:

> Despite a plethora of academic criticism over the past few decades, the realm of policy still remains dominated by the rational, positivist and quantitative approaches of New Public Management, 'evidence-based' approaches and target/accountancy oriented 'scientific' management. These approaches tend to have a top-down, centralising and hierarchical tendency in relation to policy actors and stakeholders and often imply a much greater degree of certainty and knowledge than is realistic within most policy situations. (Ansell & Geyer, 2017, p. 149)

In practice, the making and implementation of policy is typically non-linear, loaded with uncertainty, dynamic and incremental. Policy decisions are rarely the result of sterile and uncomplicated progression through analytically discrete stages within a policy cycle along the lines of problem identification, review of policy options, identification of policy options, policy implementation and policy evaluation. The daily working routines of policymakers permit attention to only a modest amount of available evidence at any given time (Cairney, 2022; Cribbin, 2021), a phenomenon known as 'bounded rationality' (Jones & Baumgartner, 2005). Consequently, policymakers face a dilemma

where they try to project central government control, seeking ever more precise control of complex and uncertain policy agendas (Boaz et al., 2016; Cairney, 2016; Cairney & Oliver, 2020; Sanderson, 2009).

Experienced policymakers recognise the inadequacy of linear policy cycles and top-down hierarchical schemas where policy agendas are conceived by government, developed by officials and implemented as planned (Newman, 2017; Oliver et al., 2014; Phillips, 2019). A critique of rationalist assumptions does not mean we should be pessimistic about the prospects for evidence-informed policy, as Sanderson (2002, p. 7) concludes, 'the conditions that have generated the postmodernist "bonfire of the certainties" do not signal the end of the need for an analytical or cognitive basis for decision making and action'. New policy models are emerging, reflecting more realistic, humble and practical conceptualisations about policy and the role of evidence.

Realism and pragmatism – Policymaking 2.0

A reaction to the hyper-optimism of positivism, with its idealistic pursuit of immutable truth, objective reality and law-like regularities, has been the growing interest in approaches to evidence use in policy that are more contextualised, experimental and inclusive. Ideas from realism and pragmatism are shaping alternative modes of policy-making.

Policymakers should not see evidence use as a 'technical exercise in instrumental rationality' for producing cookbook solutions; instead they should think about the 'practical' and 'appropriate' use of evidence within given circumstances (Sanderson, 2009, p. 711). This realist perspective encourages policymakers to 'steer a path between empiricist and constructivist accounts of scientific explanation … perceive social change to be neither linear nor haphazard … and favour neither qualitative nor qualitative information' (Pawson, 2006, p. 18).

Like realism, pragmatism offers an alternative to positivism in terms of a worldview on the use of science for policy (Creswell, 2014; Sanderson, 2009). Pragmatic policymakers are 'pluralist with respect to knowledge', valuing knowledge 'as warranted by different uses, purposes and contexts' (Ansell & Geyer, 2017, pp. 151–2). Knowledge for policy is considered to be useful when it makes sense in the context of a particular policy problem, as Ansell & Geyer (2017, p. 153) note:

> pragmatism contextualizes, but does not abandon the goal of collecting and using knowledge. It is sensitive to the need to

bring different types of knowledge together and reflexive about the values inherent in knowledge production.

The doctrine of 'what works' has become associated with the evidence-based movement, but policymakers as 'intelligent pragmatists' (Dewey, 1993, pp. 6–7) are curious not just about what works but also about *why* a policy intervention works, for *whom* and under *what conditions*. Engaging with these broader and deeper questions means embracing the enlightening influence of research on policy rather than the purely instrumental, and consequently uniting policymakers and the scientific community in the pursuit of better policy and better outcomes for citizens (Pawson & Tilley, 1997).

The supply side (researchers)

Many academic researchers in Ireland express an interest in influencing policy but report that they are disappointed that their research does not seem to be noticed or used by policymakers (O'Connor, 2022). At the same time, policymakers complain that academic research is inaccessible, written for an academic audience and irrelevant to the kind of policy questions they must confront (Head, 2015). Policymakers are frustrated when relevant research findings are not available when needed or when researchers conclude that further research is necessary to address policy questions (Amara et al., 2004; Granger & Maynard, 2015; Van der Arend, 2014). At the root of these tensions is the fallacy of the evidence-to-policy pipeline and the failure of the 'generate–transmit–adopt' approach to science advice (Martin, 2015, p. 18). Deficit models mistakenly assume that simply increasing the supply of policy-relevant studies will automatically lead to more or better use of research in policy (Gluckman, 2014; Knott & Wildavsky, 1980; Martin, 2015; Newman et al., 2016). The complexity of many policy problems and challenges facing society has prompted calls for a new kind of science and shifted expectations about what science can do for policy.

Funtowicz & Ravetz (1993, p. 739) coined the term 'post normal science', arguing that 'the science appropriate to this new condition will be based on the assumptions of unpredictability, incomplete control, and a plurality of legitimate perspectives'. While 'post normal science' is still far from universally understood, the idea has been picked up in the EU policy–science community, with Šucha & Sienkiewicz (2020, p. 15) arguing that 'there exists a class of policy-

related scientific issues for which straightforward research studies … are incomplete, inadequate or inappropriate'. A topical instance of post normal science for policy is evident in how the Intergovernmental Panel on Climate Change (IPCC) generates scientific information on climate policies for governments. The IPCC has pioneered new ways of assessing, synthesising and integrating scientific knowledge from across a broad range of disciplines (Pearce et al., 2018). This inclusive and integrated methodology is credited with achieving global consensus on heretofore highly contested issues, notably the impacts of global warming of 1.5°C above pre-industrial levels. New modes of creating scientific knowledge may be necessary for post normal policy problems, but developments on this front are slow and uncertain. That said, there are actions on the research supply side that could improve the impact of science on policy. These include an increase in the prevalence of cross-disciplinary research, embracing the role of critical policy analysis and incentivising researchers to pay attention to the knowledge needs of policymakers.

Cross-disciplinary research

Excellent scientific knowledge and advice depend on the availability of excellent disciplinary research. But if science becomes entrenched in disciplinary silos with little engagement across different research perspectives, philosophical stances and terminology, it risks becoming alienated from society and from policy. Multicausal and multidimensional policy problems require multidisciplinary and transdisciplinary analysis and advice. In Ireland integrated research approaches (multidisciplinarity, interdisciplinarity and trans-disciplinarity) are in relatively short supply. The reasons for this are complex (see Stock & Burton, 2011), but they are resolvable and worthwhile so that pluridisciplinary scientific policy advice is more available, valued and used.

Critical policy analysis

Researchers have a 'duty to expose and unravel the complexity of an issue', particularly where problems are located in a 'contested ideological terrain' (Morrison & van der Werf, 2020, p. 1). While sometimes inconvenient for policymakers, a strong tradition of critical policy analysis is an important feature of a vibrant science–policy ecosystem. The relatively weak tradition of critical policy analysis in Ireland is problematic since better science *for* policy depends on a better science *of* policy (Fitzgerald, 2012; MacCarthaigh, 2013;

O'Connor, 2022). It follows that self-evident claims about the beneficial contribution of scientific evidence to better policy outcomes and to more democratic and accountable decision-making should themselves be open to scientific inquiry. The supply of critical policy analysis and cross-disciplinary policy-oriented research should be incentivised and recognised at institutional level and valued in public funding schemes (Cairney & Oliver, 2020).

Incentivising the policy impact of research

Growing interest in research assessment in Ireland presents an opportunity to strengthen the science–policy interface. Research reward and assessment practices can contribute to hyper-publishing, gaming of the system and low-quality research, in turn raising concerns about the relevance and rigour of scientific research available for policymakers (Gough, 2021; Shaxson & Boaz, 2021; Slavin, 2017; Weaver & Snaza, 2017). Poorly designed research assessment systems and perverse funding incentives have contributed to a distortion of research impact claims (Gorad et al., 2020; Morrison & van der Werf, 2020). Incentivising the policy impact of research within a broader research assessment framework is not straightforward.

Quality and impact are important elements of any research assessment system, but the focus must move beyond quantitative journal and publication-based indicators and the evaluation of a narrow range of research outputs. The recent EU Council conclusions on research assessment and implementation of open science recognise the significance of research assessment systems in ensuring that scientific research is 'more reliable, more efficient and more accurate, better understandable by society and responsive to societal challenges' (European Union, 2022, p. 1). Attempts to design a national research assessment system should take account of the political consensus at EU level and consider how such systems can explicitly recognise the policy impact of research in support of evidence-informed policy.

To reward and incentivise a plurality of policy impacts of research, we should make more use of context-sensitive indicators that take account of value creation in assessing the impacts of research activity on policy, and less use of standardised comparable indicators such as bibliometric indices.

Having considered the capacity of policymakers and the scientific community to play their individual roles in strengthening policy by using scientific evidence, we must also consider how both communities might be brought closer together.

Two-communities thinking

Caplan's (1979) 'two-communities theory' described how policymakers and researchers exist in different institutional settings with their own priorities and professional values and different assumptions about policy and scientific knowledge. A two-communities perspective is seen as contributing to adversarial relations, inhibiting the prospects for mobilising and using research evidence:

> A traditional view of the science–policy interface portrays two separate communities, each with their own principles, cultures and ways of working. Science and policy differ on multiple grounds: in the way they define and approach problems and solutions, the nature of their questions, timeframes and time horizons, attention spans, breadth of perspectives and attitudes to uncertainty. (Šucha & Sienkiewicz, 2020, p. 4)

Two-communities perspectives on the accessibility, timeliness and policy relevance of scientific research have been well documented (Cherney et al., 2012; Hammersley, 2003; Hargreaves, 1996; Hillage et al., 1998; Levin, 2011, 2013; Oancea, 2005; Orland, 2009). Table 1 presents the traditional differences between officials and academic scientists in terms of their perspectives on the purpose and utility of science, the timing and accessibility of research outputs, the target audience for research findings, the incentives to produce knowledge and the limitations of scientific knowledge. Originally developed by Ruggles (2004), it is adapted here for the Irish context.

A misalignment of cultures between policymakers and researchers based on different and competing worldviews on the nature and purpose of scientific knowledge does not bode well for harmonious relations, as Lunn & Ruane (2013, p. 4) observe:

> Researchers sometimes perceive or find policymakers to be unreceptive to relevant research, ignorant of key findings and concepts, anti-intellectual, and more concerned with managing immediate political agendas than with developing policy that will best serve society. For their part, policymakers can perceive or find researchers to be excessively theoretical, ignorant of political realities and institutional details, aloof, driven by their own agendas and really more concerned with publishing papers than with helping to develop policy.

Table 1: Differences between views of government officials and academics on scientific knowledge

Actors	*Government officials*	*Scientists*
Purpose	Knowledge needed to meet regulatory requirements and to provide reliable information for decision-makers. Research 'questions' are framed by legislators and regulators and have immediate social and economic implications. Ultimate goal to broker between competing interests and values.	Original research framed by scientists and driven by empirical analysis and expert judgement. To expand the understanding and knowledge of the natural world through an ongoing process of questioning, hypothesising, validation and refutation.
Role of uncertainty	Predictive certainty is required by the political process and the legal system. Knowledge is frequently and necessarily generalised to situations very different from those in which the original data were collected. Uncertainty is unwelcomed by the public, legislators and the courts.	Uncertainty is expected and 'embraced'.
Completeness of information	Must frequently act before all the necessary information is available.	Publish when a body of knowledge has been developed, tested and validated.
Statistical significance/ acceptable error/burden of proof	Often work with a legal mandate to minimize Type II error (false negative) with the result that Type I error (false positive) is increased.	Strive to minimise Type I error. To reject what is true is seen as more harmful than keeping the data that are not true.
Role of values	Officials are required to consider and work with the values of many, including the public, politicians, the scientific community and the regulatory community.	Academic scientists work primarily with their own and their disciplinary values; seldom have to incorporate public or political values.

Table 1: Differences between views of government officials and academics on scientific knowledge (Contd.)

Actors	*Government officials*	*Scientists*
Knowledge products	'Gray literature' strategies and action plans, administrative data, regulatory documents.	Published, peer-reviewed papers and books, presentations at conferences.
Time frame	Determined and driven by statute, regulation and the political process. Finite and often quite short, aligned with political cycles. Resolution of problems being reacted to is often crisis-driven or driven by court-mandated timelines.	Open-ended; usually carried out relatively free of an urgent need for the information generated.
Political influence	Directly influenced by politics. Programme for government sets policy agenda.	Indirectly influenced by the researcher's own political philosophy and by their perception of the preferences of competitive funding bodies.
Accountability	Parliamentary oversight, the courts and stakeholders, including the public.	Professional peers.
Incentives	Compliance with legal requirements, working for the public good. Mobility within the civil service.	Professional recognition and promotion within the academic system.

There is a risk that two-communities thinking can be used as a ready-made excuse for policymakers and researchers not to engage, perpetuating siloed research and policymaking activities, not conducive to addressing complex policy problems. In response we see growing government and academic interest in bridging mechanisms aimed at bringing policymakers and researchers closer together.

Knowledge mobilisation

Many countries have established bridging or mediating mechanisms known variously as knowledge brokers, research translators,

knowledge mobilisers or boundary spanners. These structures establish the connective tissue of the science–policy ecosystem. They can be formal or informal, established by governments or by the scientific community, or as joint partnerships.

At its most basic level, the brokering of research for policymakers involves communicating or disseminating research findings in the direction of policymakers. But because scientific evidence rarely speaks for itself, knowledge brokering is needed to make sense of and translate scientific knowledge in the context of policy problems. Seen as part of a 'process of transforming knowledge from research into practice by crossing or spanning boundaries' (Rycroft-Smith, 2022, p. 20), the dynamic and interactive role of knowledge brokers is emphasised by Ward et al. (2009, p. 268):

> positioned at the interface between the worlds of researchers and decision makers, they are seen as the human force behind knowledge transfer, finding, assessing and interpreting evidence, facilitating interaction and identifying emerging research questions.

At its best, knowledge brokering can foster mutual understanding and collaboration, breaking down professional barriers between researchers and policymakers, as Lomas (2007, p. 131) observed in the case of research use in public health policy in Canada:

> knowledge brokering encompasses all activity that links decision makers with researchers, facilitating their interaction so that they are able to better understand each other's goals and professional cultures, influence each other's work, forge new partnerships, and promote the use of research-based evidence in decision-making.

In Ireland we have examples of public knowledge brokering services in health, agriculture, environment, health and safety, and economics. In addition, think-tanks, clearing houses, lobbyists and private research institutes play a role in bringing research to the attention of policymakers. Little is known about the design and effectiveness of knowledge brokering initiatives in Ireland. They seem to operate without system-level coordination. International evidence suggests that countries interested in evidence-informed policy need to build and coordinate their knowledge brokering capacity (European

Commission, 2017; Gough et al., 2018; McGowan & Murphy, 2021; MacKillop et al., 2020; Neal et al., 2022; Oliver et al., 2022; Rose et al., 2020; Rycroft-Smith, 2022).

Ireland, Denmark, Finland, Estonia, the Netherlands and New Zealand have comparable national capacity for science and innovation but have diverse science advice systems and structures. Internationally, we can observe bottom-up, top-down and networked solutions to designing formal arrangements for bringing scientific evidence into policy. In Finland the Science Advice Initiative, a joint venture by the Finnish science academies, demonstrates the value of taking a science-led, experimental and iterative approach to determining the most appropriate science advice structures. In contrast, the Biden Administration in the US established the President's Council of Advisors on Science and Technology and also mandated the use of science advice in policy by legislating for officials across government to seek from scientists, engineers and other experts the best available scientific and technological information and advice (United States Office of the Press Secretary, 2021). Executive orders and coordinated efforts to 'strengthen and develop new strategies and structures to promote consistent evidence-based decision-making inside the Federal Government' (United States Office of the Press Secretary, 2022) continue the US approach to legislating for science advice, following on from the Evidence-Based Policymaking Commission Act 2016 and the Foundations for Evidence Based Policymaking Act 2018. The science advice ecosystem in the UK includes a network of government-established 'What Works' centres across policy fields and a network of chief scientific advisors assigned to each UK government department. This cadre of advisors work under the leadership of the government chief scientific advisor and are expected to act as a bridge between officials and the wider world of scientific knowledge, and also to function as 'licensed dissidents', challenging civil servants.

Conclusion

Ireland, like most countries, is working to formalise and strengthen its national evidence-support systems alongside its research and innovation system (Global Commission on Evidence, 2022; Oliver, 2022). This paper makes the case that national ambition for a well-functioning science–policy ecosystem requires a departure from conventional modes of policymaking and siloed research activities; a

reappraisal of the two-communities perspective; and the design of appropriate structures to coordinate, guide and govern our national system for science advice. A systematic mapping of the science–policy ecosystem in Ireland would reveal our national capacity and capability to generate and supply policy-relevant scientific knowledge; to filter, synthesise and mobilise scientific findings; to procure and use scientific evidence in policymaking. A systematic mapping would also help to assess potential structures for governing Ireland's science advice system.

Government and the academy have signalled the need for an overarching institutional framework and coordinating structure to collect, organise and maintain science advice for public policy. The intersection and boundaries across science policy, science funding and science advice will need to be handled with care. New structures are likely to be established to oversee governance arrangements for science–policy relations and to guide and advise on the science–policy interface in Ireland. The establishment of DFHERIS in 2020 was a significant development given its research funding remit and its responsibility for national policy on research and science. If an individual government department or body is to be assigned responsibility for science advice for government, it will require the authority to mandate cross-departmental activity and to coordinate whole-of-government responses. The scientific evidence suggests that any new science advice structures should be co-designed, inclusive, interactive and participatory, without partisan allegiance to the interests of one community, particular research disciplines or forms of evidence. They should facilitate ongoing dialogue and democratic engagement, build trust, and foster meaningful collaboration and partnership.

Scientific knowledge has a role to play in all areas of public policy. It will take time and measured consideration to further strengthen our national capacity to create, mobilise and use scientific evidence for policymaking, and to establish effective institutional arrangements to coordinate science advice. In return we can expect transformative effects of scientific evidence on public policy and ultimately on the lives and well-being of society and its citizens.

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