Knowledge Brokering Repertoires: Academic Practices at Science-Policy Interfaces as an Epistemological Bricolage

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Abstract   With the rise of research impact as a 'third' space (next to research and teaching) within the universities in the United Kingdom and beyond, academics are increasingly expected to not only produce research but also engage in brokering knowledge beyond academia. And yet little is known about the ways in which academics shape their practices in order to respond to these new forms of institutionalised expectations and make sense of knowledge brokering as a form of academic practice. Drawing on 51 qualitative interviews with researchers and research users involved in two large knowledge brokering initiatives in the UK, this study identifies four repertoires of co-production practices: (i) *Challenge* to the existing policy framework, (ii) *Deliberation* between diverse stakeholders, (iii) *Evidence intervention* producing of actionable knowledge, and (iv) *Advocacy* for specific evidence-based options. By exploring knowledge brokering as navigation of different knowledge production regimes – traditionally academic and policy-oriented – the paper contributes to the existing debates by providing insights into the nature of navigating science-policy interactions as a process of epistemological bricolage, requiring an assemblage of different meanings, values and practices into new repertoires of practice. Importantly, the choice of a repertoire is not limited to the individual choice of a researcher but rather, it is shaped by the broader institutional context of higher education, risking *instrumental bias* in which practices oriented towards practical solutions are incentivised over critical or participatory forms of engagement.

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Introduction

Science is increasingly called to the rescue in grand policy challenges. At the same time, as the problems become complex, traditional science structures are perceived as not sufficient to solve them. The calls for transformations of science (e.g., Nowotny et al. 2001; Funtowicz and Ravetz 1993) to be more interdisciplinary, collaborative and user-driven (Macq et al. 2020) have been translated into specific research funding and evaluation programmes. In the UK (and several other countries – Bandola-Gill et al. 2021), these changes resulted in an emergence of a new institutionalised practice, called in this context Knowledge Exchange and Impact (KEI) within the higher education and funding systems (Kearnes and Wienroth 2011). This trend is reflected in the evolving organisational settings of the universities – from dedicated Knowledge Exchange and Impact Offices, university missions and strategies and increasingly – criteria for assessment of academic merit in career progression.

The emergence of a new institutionalised practice is not just a matter of new strategies or incentives. Rather, from the inception of such developments as the impact agenda, the goal was explicitly a deeper cultural change, aimed at promoting not only the excellence of research but also its applicability (Watermeyer 2012; Smith et al. 2020). This has led to new forms of accountabilities for both the researchers and the universities where 'just doing research' is increasingly not an option. Thus, researchers are expected to engage more closely with their socio-economic environments and practices such as knowledge brokering[1] are becoming an increasingly standard element of an academic portfolio.

These changes are not only political and institutional but also epistemic (Miettinen et al. 2015). Addressing the demand for 'usable science' – through such practices as knowledge brokering (Turnhout et al. 2013) requires adaptation to research practices to produce different types of knowledge – scholars over the last 30 years have argued widely that applicability of research requires 'new' science as evidenced in the predominant calls for Mode-2 (Nowotny et al. 2001), Post-Normal (Funtowicz and Ravetz 1993) or transdisciplinary (Mobjörk 2010) knowledge production. Thus, new practices such as knowledge brokering emerged as a mode of academic practice (Turnhout et al. 2013). Consequently, academic knowledge production has transformed into an arena in which different 'knowledge regimes' (Felt et al. 2016) are co-existing.

Conceptualising knowledge brokering as a practice at the intersection of traditional and new modes of research opens up new avenues for scholarly attention. The research thus far has focused on different ways of conceptualising these transitions toward the applicability (e.g., Oliver et al. 2014) and the challenges associated with producing knowledge for policy (Sundqvist et al. 2015) as well as the consequences

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[1] A note on terminology: this paper uses a term knowledge brokering to capture the practices of cross-boundary interactions between science and policy (cf. Meyer 2010; Grundmann 2017). The choice of this term over other commonly used in the field – such as co-production or boundary spanning – was guided by its conceptual closeness to terminology used in the UK higher education (knowledge exchange) as well as its breadth as it encapsulates different approaches to both producing and mobilising knowledge (Turnhout et al. 2013; Bandola-Gill and Lyall 2017).

of these new policies for higher education institutions (Watermeyer and Chubb 2018; Derrick 2018). Less is known about how academics responded to this new expectation and – more importantly – how the new priorities have been translated into practices. This question is of key importance, as it allows not only to identify the meanings of knowledge brokering but also to explore the process of hybridisation of academic practice and the ways in which academic practice transforms to account for – often contradictory – expectations (Langfeldt et al. 2020). As such, the process of 'bricolage' of different epistemic orders – including meanings, values and practices - is largely unexplored in this context.

This paper addresses this gap by exploring socio-political 'repertoires' of knowledge brokering, described by Ezrahi (1990) as a 'range of norms, institutions, or behaviours upon which [any political world] can draw'. By employing this perspective, this paper problematises the notion of knowledge brokering by arguing that – just like knowledge itself (Knorr-Cetina 1981) – knowledge brokering does not sustain a meaning outside the social context in which it takes place. This perspective on knowledge brokering enables a focus that is not just on individualised strategies but rather encompasses culturally and institutionally constructed ways of practising knowledge production and dissemination. Therefore, knowledge brokering requires a focus on sense-making (Weick 1995) and practices (Swidler 2001), as well as value assessment of different forms of knowledge and knowing (Felt and Fochler 2010).

Against these conceptual debates, this paper aims to answer the following questions: (i) What types of knowledge brokering repertoires could be identified in the research practice of academics? (ii) What kinds of factors shape the emergence of different repertoires? These questions are answered through a micro-sociological exploration of the meanings and practices of knowledge brokering by 51 researchers and research users in two UK-based research and impact initiatives. The initiatives differed in their main focus (public health and genomics) but both were publicly funded by the UK research councils, entailed collaboration between researchers and policymakers, and were located at universities.

By exploring the empirical context of knowledge brokering initiatives, the paper makes two key contributions. Firstly, it positions knowledge brokering as an epistemically and pragmatically diverse practice. Researchers navigate the competition between traditional academic values and standards and production of policy-relevant knowledge not by choosing one or the other but rather by engaging in 'epistemological bricolage' (Freeman 2007) – creating new meanings and practices that are a hybrid of the two. Secondly, the paper points to knowledge brokering and impact practices as transitional areas in which different knowledge regimes meet. By exploring different repertoires of knowledge brokering, this paper focuses on the previously under-explored problem of how new knowledge orders meet and become hybridised 'on the shopfloor'.

In what follows, the paper positions itself in the broader literature on science-policy interactions. These two areas of literature are particularly useful for problematising the notion of 'knowledge brokering repertoires' through the lens of two specific types of socio-political tensions: epistemic tensions between activities aimed at either production of knowledge or achievement of specific policy change, and

pragmatic tensions regarding changing modes of knowledge production. Following a section on methods, this paper continues to explore these conceptual debates within the empirical setting of the two case studies of knowledge brokering initiatives working in public health and genomics by identifying various knowledge brokering repertoires and the characteristics and factors shaping these various models of the research-policy interface. The paper ends with a concluding discussion outlining the central contribution of the research.

Literature Review

The "New" Science?

The time period between the mid-1990s and early 2000s was fruitful in debates over the changing role and condition of science faced with increasingly complex challenges. What emerged was a number of influential new models of thinking about science, including Post-Normal Science (Funtowicz and Ravetz 1993), and Mode-2 Science (Gibbons et al. 1994; Nowotny et al. 2001). Even though these models are often discussed together, they differ in terms of their key focus but also in terms of the underpinning assumptions regarding the old and new forms of science.

Post-normal science focuses most explicitly on the qualities of knowledge that are usable in policy in situations where ''facts are uncertain, values in dispute, stakes high and decisions urgent'' (Funtowicz and Ravetz 1993: 744). Post-normal policy problems cannot be divided into smaller components solved using purely technocratic forms of knowledge but rather they require the participation of different societal actors. This need for closer collaboration with stakeholders was similarly a key concern for Mode-2 Science (even though these two approaches differ significantly in their analysis of causes and effects of the changes toward the 'new' science). In this new approach to science, knowledge production is deeply embedded in society (rather than limited to universities), and knowledge is being produced in the context of the application. What the scholars call "contextualised science" assumes deep embeddedness of science within society, whereby society in turn "speaks back" to science (Gibbons et al. 1994: 50). They argued that in contemporary society we are witnessing what they call a "de-differentiation" of institutions, with boundaries becoming increasingly blurred and categories overlapping. However, some common threads are running across these different models, which suggests that, regardless of the precise terminology used or framing of the change (for example in terms of policy, of innovation or more broadly, of all the different spheres), all these models link the relevance of science with its embeddedness in and implications for society as well as the interactions with non-scientific actors.

Despite the intuitive appeal of these new imaginaries of science, they were met with a debate. The key argument criticising them was that some (in particular Mode-2 science) are more prescriptive than descriptive, making it difficult to ascertain how these models would be enacted in practice (Hessels and Van Lente 2008). In practice, the transition between Mode-1 and Mode-2 is not as straightforward but the notion of blending different epistemic and value systems in these

two models was largely underdeveloped. This is surprising, considering the often contradictory tensions these two modes introduced in academic life (Håkansta and Jacob 2016). Nevertheless, even if the empirical value of these models is questioned, they undoubtedly had performative effects on shaping the approaches to funding and assessing science.

Science-Policy Interfaces

This leads to the point of the meaning of 'usability' of scientific knowledge – one that is at the centre of the concept of knowledge brokering. The underpinning assumption behind the new knowledge regimes discussed in the preceding section is one of the inability of traditional academic research to impact on policy and practice on its own. Even though the predominant constructivist paradigm of STS literature assumes that science and policy are 'co-produced' social orders (Bandola-Gill et al. 2022), on the practice level these two realms are often disjointed, both institutionally and culturally. Consequently, the process of knowledge production in academia and policy differs significantly, in terms of the epistemic standards of knowledge, their assessment criteria and the institutional context in which they are produced (Bandola-Gill 2019). This leads to a problem of translation – or as some put it a reconciliation – between the supply of knowledge by academics and the demand for specific knowledge tools by policymakers (Sarewitz and Pielke 2007; McNie 2007). Seen from this perspective knowledge brokering might be seen as a science policy tool aimed at 'reconciling' the gap between academic knowledge production and policy needs by expanding the participation of and engagement with stakeholders.

Knowledge that is valued in policy is one that credible, legitimate and salient (Cash et al. 2003). Credibility, as argued by Cash et al. (2003), is assessed by a "proxy" of the scientific process and as such knowledge is considered credible when it is seen as adhering to the norms of scientific knowledge production. Legitimacy, however, refers to the broader acceptability of evidence by the end-users, for example through its alignment with the values, perspectives and concerns of the broader social environment in which the expert advice is being given. Finally, saliency refers to the relevance of evidence. Knowledge for policy purposes is assessed in accordance with its political (not purely scientific) value, consequently prioritising the applicability in context over universalistic values of science (Bandola-Gill 2021; Grundmann 2017; Håkansta and Jacob 2016). Therefore, in order to effectively support science-policy interaction, knowledge brokers perform three types of tasks (Bandola-Gill and Lyall 2017): tasks related to managing the format of research (e.g., providing summaries, recommendations, etc.); tasks related to building links between different actors within policymaking (e.g., linking experts and research users); and tasks related to co-producing knowledge for policymaking (e.g. helping to develop shared questions).

The other side of the usability puzzle is the use of knowledge by the policy actors. The relationship between research and action has been a central subject of inquiry in social science (Contrandriopoulos et al. 2010), as 'knowing' and 'doing' differ in some important qualities (Grundmann 2017). The knowledge

utilisation literature conceptualises this difference through the lens of the form of evidence uptake in policymaking, highlighting the multiplicity of ways in which knowledge could influence policy (Weiss 1979, 1980), including conceptual, instrumental and symbolic-political ways. This categorisation – by outlining changes in understanding and changes in actions – implicitly differentiates between knowledge and practice as two separate realms on which research could impact. Instrumental uses of research are targeted towards influence on decisions, actions, etc., while conceptual uses influence awareness and understanding (Nutley et al. 2007)

Nevertheless, there is an inherent tension between action- and understanding-oriented modes of interaction between science and policy and the types of strategies, meanings and values that are mobilised. Chambers et al. (2022), whilst looking at the concept of 'co-production' of science and policy, observe that the literature predominantly focuses on frameworks oriented toward realising specific, pre-determined goals whereas the key quality of the co-production is that the goals emerge in the process. This highlights a key challenge with producing knowledge through 'new modes' (such as co-production or transdisciplinary research): a risk that they often reproduce the existing models of knowledge production and power relations rather than offer a transformative setting (e.g., Turnhout et al. 2020).

Meeting the requirements of relevance necessitates the engagement of stakeholders in different elements of the research process. This process of knowledge brokering involves "generating, sharing, and/or using knowledge through various methods appropriate to the context, purpose, and participants involved" (Fazey et al. 2013: 19). As such, knowledge brokering is inherently a boundary practice (Gieryn 1983) as it involves mediating between different stakeholders as well as translating knowledge between them. Such practices involve linking and reconciling different standards of knowledge and translating academic knowledge into actionable evidence (Grundmann 2017).

Finally, knowledge brokering is emblematic of evolving roles of academics which might range from traditional value-free 'ivory tower' to politically engaged advocacy (Lam 2010; Pielke 2007; Smith and Stewart 2017; Turnhout et al. 2008). Pielke Jr (2007) outlined four such models: pure scientist, science arbiter, honest broker and issue advocate. These four models of science-policy engagement differ in terms of the willingness of different types of researchers to engage with the politics of the policymaking process (therefore in their willingness to depart from the traditional value-free ideal of science). Similarly, Turnhout et al. (2019) focus on three types of practices of experts: servicing (responding to policy requests for expert knowledge), advocating (offering solutions or policy options) and diversifying (opening the debates to new voices). Whilst useful, this literature does not engage with the question of blending and hybridising these different forms of expertise, rather than choosing one or another. Furthermore, the exploration of the conditions under which academics choose specific forms of practices is underdeveloped, which risks overemphasising the role of academic agency in science-policy interactions and underemphasising the broader institutional, cultural and epistemic contexts in which science-based advice is used.

Table 1 A summary of interviewees.

Category of interviewees	Case 1 (Genomics)	Case 2 (Public Health)
RESEARCHERS		
Senior academics (Professor-level)	8	9
Early and Mid-career academics (Post-doc to Reader/Senior Lecturer Level)	7	12
RESEARCH USERS		
Policymakers	4	9
Others (e.g. NGOs)	1	1
TOTAL	20	31

Methodology

This article is based on 51 qualitative interviews conducted with individuals associated with two knowledge brokering initiatives (Table 1). All of the interviews were semi-structured and conducted by the author. The vast majority of interviews took place in a private room, while six were conducted over the phone at the interviewees' request. The interviews followed a thematic interview schedule, exploring experiences with knowledge brokering, the meaning of the concept, the strategies employed, and barriers to and facilitators of knowledge brokering. The interviews took on average 60 minutes (with the longest one taking around 90 and the shortest one 45 minutes).

The two organisations were chosen based on 1.) their focus on various aspects of policy (genomics and public health); 2.) the longevity of the organisations (over 8 years), to account for the time lag of research-based policy change; and 3.) the structural qualities of the initiatives – financed by public funds and located at universities. The initiatives were funded to support knowledge brokering between academics and policymakers and employed a variety of knowledge brokering strategies, ranging from policy briefs, seminars and events, evidence submissions, collaborative and contracted research, evaluations, and rapid reviews, to broader communication via press and social media. Both initiatives were funded by UK research council funders, engaged with a range of local, national and international policymakers, and were primarily tasked with achieving research impact.

As the focus of this study was on the academic side of knowledge brokering and the ways in which researchers responded to the external expectations of 'impact', the majority of the interviewees were academics. The interviewees' backgrounds (in both organisations) spanned multiple disciplines, including public health, environmental science, sociology, psychology and economics. The initial list of potential interviewees was developed based on the organisations' websites and publicly available documents, including blogs, press releases and reports. This list was then extended via 'snowballing' (i.e., asking included interviewees to suggest further interviewees). The research obtained University of Edinburgh Ethical Approval. The interviews were digitally recorded and participants signed an informed consent form

Table 2 Different repertoires of knowledge brokering.

Mode of knowledge production The outcome of knowledge brokering	Collaborative	Autonomous
Knowledge (Conceptual)	Deliberation	Challenge
Action (Instrumental)	Evidence intervention	Advocacy

beforehand. All data were anonymised, including interviewees' institutional affiliations and positions.

The interviews were transcribed by a transcription company and coded in NVivo by the author. The data analysis was iterative and the coding framework was developed by the author through a number of coding stages, each with an increasing level of abstraction. The key themes identified in the data were: academic culture, institutional determinants, meanings of knowledge brokering meanings of impact, knowledge brokering strategies, evidence authority, characteristics of policy problems, and characteristics of the policy process. The nodes were then explored using the NVivo query function, in particular the matrix query used to identify cross-cutting themes. The exploration of the descriptive themes identified in the data was then conceptualised by iteratively introducing theoretical concepts and moving from the descriptive to conceptual insights. In particular, the knowledge brokering repertoires were first identified thematically and then explored in-depth by cross-exploring them with cognate codes, such as 'autonomy', 'deliberation', 'critical social science', 'relevance', and 'excellence', as well as envisioned outcomes of knowledge brokering practices, categorised into 'instrumental' and 'conceptual' impacts. The results allowed for mapping of the repertoires across other themes and consequently identifying their core epistemic and pragmatic dimensions as shown in Table 2. The identification of the four repertoires captured the vast majority of the codes and no other significant approaches were identified.

Findings

Even within a research community working in one area, the interpretations of knowledge brokering and the ways in which it should be practised varied significantly. In particular, the interviewees presented divergent views regarding two issues: the dominant mode of knowledge production (whether it was produced individually or collectively), and the perceived outcomes (i.e., forms of impact – instrumental or conceptual) of these initiatives. The diversity of forms of knowledge brokering discussed by the interviewees was organised across these two dimensions into four socio-cultural repertoires: Deliberation, Challenge, Evidence Intervention and Advocacy (Table 2). The vast majority of interviewees practised more than one of these repertoires as they flexibly mixed and matched them, depending on the problem, institutional setting or their own values and priorities.

The first dimension in which knowledge brokering repertoires differed was their focus on collaboration or evidence as the underpinning ethos of knowledge production. Perhaps unsurprisingly, considering the literature on new modes of knowledge production (discussed above), the majority of interviewees prioritised working closely with stakeholders (rather than remaining autonomous from them) and saw it as central to knowledge brokering. As such, they saw the knowledge underpinning their activities as produced collectively between academics and other stakeholders. On the other hand, the interviewees saw the value of knowledge produced in more 'canonical' ways (Sundqvist et al. 2015) where the production of research and its use are separated (and consequently, the knowledge brokering process was seen as more linear). Here, the notion of academic autonomy – the freedom to pursue one's own research agendas – was still seen as an important academic value and a number of interviewees discussed it as at times necessary for effective knowledge brokering (cf. Broström and McKelvey 2018).

The second way in which the knowledge repertoires differed was in their envisioned impacts. The central tension here was between activities aimed at broad learning about problems (knowledge) and one aimed at developing policy solutions (action). The tension between the two models is illustrated in the following quote:

> It's a question of translation. What does one mean by translation? So, translation and impact might be taking the outcomes of the research and disseminating them in a way that everyone around can understand. […] So, there was a real dialogue, there was a real understanding. Really, really interesting stuff. But, what it did less of, was to say, "Well, what does that mean directly for policy?" […] So, if you close the circle and come back into a set of potential users of these insights, because that set of potential users of these insights are still going, "Well, that's quite interesting but what does it mean for me?" (Case 1 Policymaker 4)

The notion of 'closing the circle' suggests that activities focused on expanding knowledge or proposing specific directions of policy action require different approaches, even if they are not mutually exclusive. Table 2 summarises these different dimensions of knowledge brokering and maps the different repertoires. These

qualities of the four knowledge brokering repertoires are explored in the following sections.

The Repertoires of Knowledge Brokering

Deliberation

The first repertoire of knowledge brokering – Deliberation – was characterised by the interviewees as "bringing people together" (e.g., Case 1 Researchers 1, 2, 3) in order to support learning about the problems from multiple perspectives, akin to deliberative approaches (Chilvers and Kearnes 2020). The main strategy here was to facilitate the dialogue between a variety of stakeholders – policymakers, practitioners, researchers and service users – to promote mutual learning, for example within seminars and workshops.

This approach to knowledge brokering was seen as the most 'acceptable' approach to knowledge brokering practice – even researchers who strongly aligned themselves with traditional academic values (such as autonomy, curiosity-driven exploration, impartiality, etc) engaged with this type of knowledge brokering practice. One of the reasons for such broad acceptability of this form of knowledge brokering is the fact that it was an approach that does not require too extensive epistemic or institutional changes in knowledge production – different actors came together with knowledge produced within their institutions (and knowledge systems more broadly) and freely exchange the ideas:

> I think it did successfully become a space for dialogue. I don't know that I can say that like "Oh it changed this policy in this way", but I think it did. It was a safe space for people to come and talk about things and I think over the whole number of different areas. (Case 1 Researcher 4)

Within this repertoire, the boundaries between science and policy and practice could be upheld, even though the space was collaborative. The idea of impartiality of science in this setting was enacted by viewing science as a neutral *space* in which the learning debate could be carried out. An important aspect of this 'space neutrality' was the focus on reflexivity rather than the utility of knowledge:

> What I think we did do for the policymakers who did participate and who over time we developed relationships with was offer them the opportunity to think bigger and to meet a variety of people who were thinking about things in different ways. (Case 1 Researcher 2)

As indicated by the above quote, this repertoire was predominantly oriented towards 'opening up' the debate to different forms and ways of knowing – from different disciplinary perspectives on science to policy, practice and lay perspectives. Therefore, the goal was not necessary to produce new 'hybrid' knowledge (Miller 2005) but rather to mix discernible forms of knowledge.

This necessarily meant that some tensions and power struggles came to the fore – and these tensions were not necessarily 'resolvable' (cf. Chambers et al. 2022). Consequently, this repertoire rarely leads to the production of policy knowledge and solutions that are applicable in the short term. In its most successful form, this repertoire expanded the types of actors and forms of knowledge involved in the policymaking processes, offering the transformative potential for creating new frameworks and ideas. In its least successful form, this repertoire was discussed as 'unproductive' (Case 2 Researcher 8) and not leading to any tangible results. In some cases, the interviewees discussed the risk of this format, without skilful facilitation, turning into a quasi-academic seminar or workshop, albeit with a more diverse audience.

Challenge

The second repertoire of knowledge brokering entailed an understanding of this process as aimed at challenging the existing policy frameworks – the way policy problems are structured and understood (Schön and Rein 1994). This repertoire was seen as targeted at conceptual uses of evidence, with impact understood as achieving changes in policymakers' knowledge and awareness (Nutley et al. 2007). The interviewees discussing this repertoire saw the overall goal of knowledge brokering as changing how policymakers think about problems, or framing the policies in broader terms:

> I think [knowledge brokering] is often helping people who are engaged in a policy issue to think: "Well, actually how might we think about this?" and was often more useful than trying to say: "Here is a problem and this is the solution". Thinking around framing questions, rethinking questions. (Case 1 Researcher 3)

As evidenced by this quotation, the interviewees engaging in this type of repertoire viewed their role as critically analysing existing policies rather than developing any specific policy advice. This repertoire was perceived as involving a degree of engagement with a variety of actors; however, the interviewees prioritised the quality of research and academic autonomy. Hence, navigating the closeness of the relationship was seen as the most important challenge for this type of strategy. In particular, maintaining critical distance (rather than trying to achieve consensus) was perceived as a key tension. For example:

> I do stuff that's much more policy-facing at a national level, perhaps more critical. And, the way I see how [Case 2] operates, particularly the colleagues that are in [Case 2], is that it is very, much more locally oriented. And, sometimes, not necessarily very critical. And, sometimes, rather too close to practitioners. And not able to necessarily take a step back. (Case 2 Researcher 10)

This repertoire entailed such strategies as workshops and seminars, policy briefs and evidence submissions, although with a degree of boundary work setting required (Gieryn 1983), rather than a blurring of boundaries between the

communities of academics and policymakers. The reason for a stricter separa-
tion of science and policy lies in the strategic but also epistemic underpinnings
of this approach – which most closely resembles traditional approaches to see-
ing scientific advice as "speaking truth to power" (Price 1968; Wildavsky 1979).
The understanding of the science-policy relationship within this model assumes
a clear separation between science producing "truth" and policymaking exert-
ing "power". As the strength of science lies in its ability to construct "truth" in
the form of scientific facts, it, therefore, sees the academic rigour and authority
of science as closely intertwined and as such it was drawing on the norms and
values aligned with traditional academic models (Sundqvist et al. 2015, 2017).
The goal of this repertoire was predominantly a science-based critique. Therefore
– and perhaps surprisingly - the interviewees discussing knowledge brokering as
'challenging' existing policy frameworks perceived the production of the highest
quality of academic research as a way of assuring the impartiality of both the evi-
dence and them as experts. However, this conceptualisation of the role of science
did very little to transform the existing power and epistemic hierarchies – the
underpinning assumption was one of upholding the boundaries and the division
of labour between science and policy. This does not mean that the interests of the
marginalised groups were completely ignored – Challenging policy was in fact
seen (especially by the social scientists in both organisations) as a way of rep-
resenting and championing the interests of the marginalized groups affected by
the current policies. Nevertheless, in its least successful form, this repertoire was
exclusionary and reinforced existing power relations where access to 'the table' is
limited to elite academics.

Evidence Intervention

The third knowledge brokering repertoire entailed creating specific research-based
outcomes (recommendations or alternatives), which were co-produced by a variety
of stakeholders, including researchers, policymakers and laypeople/service users. As
such, it frames the engagement between academics and policymakers in terms of
'interventions' (cf. Bandola-Gill et al. 2022) aimed at increasing the use of evidence
in policy. The interviewees employing this framing saw the aim of knowledge bro-
kering instrumentally – as the production of evidence that policy and practice part-
ners might use directly in their practices, as illustrated by the following quote:

> What sometimes practitioners need and want are actionable messages that
> have clear relevance and a clear set of implications for policy or practice, but
> that doesn't make them simplistic necessarily. […] I see lots of interesting stuff
> academics are involved in doing that policy and practice partners might see
> and say "Yeah? So what? What does that mean for me?" And there is some-
> thing about the translation of an idea or a vision or a clear set of commitment
> to evidence-informed practice being translated into workable practice. But
> coming together as academics and researchers and policy and practice partners
> and service users is probably the best way to get as close as you can get to effi-

cient and effective services or ways of delivering whatever it is you're delivering. (Case 2 Researcher 5)

In a way, this repertoire was the most similar to Deliberation, as it was delivered in collaboration with policymakers and practitioners as the main source of credibility and utility of research. Nevertheless, unlike Deliberation, Evidence Intervention was aimed at blurring the boundaries between science and policy and producing knowledge that was unique to the specific settings rather than offering a mix of different knowledge produced within selected knowledge systems.

Furthermore – distinguishing it from both Deliberation and Challenge, this repertoire was targeted at producing instrumental impacts: changes not only in knowledge but also in policy action, including specific decisions and programmes. Hence, many of the interviewees referred to the outcomes of such projects as "actionable research" (Case 2 Researchers 3, 5). Therefore, this type of evidence went most significantly against the traditional academic knowledge production as it removed entirely the academic criteria for (e)valuation of knowledge and instead promoted qualities most closely aligned with the new modes of knowledge production (e.g., Nowotny et al. 2001). This repertoire required going beyond the production of knowledge within the pre-existing institutional knowledge systems – one with new processes of assessing its value (cf. Funtowicz and Ravetz 1993). Here, the interviewees discussed prioritising the applicability of research in specific contexts and its relevance to policymakers over its academic qualities (such as being theory-driven or using complex methodologies). Therefore, in this context, the academic value was seen as secondary to the policy value of research. Production of such evidence was perceived as requiring more than just disseminating and deliberating on research findings and instead required production of research with the specific policy goal in mind. The interviewees gave examples of collaborative research, including various forms of contracted research, such as evaluations or rapid evidence reviews.

This repertoire adopted a focus on involving the policymakers in the process of knowledge production and working in partnership to produce a result that could then be implemented in policymaking. As such, this type of knowledge production was discussed as significantly different from academic research:

> You do have to bend a lot more, in terms of your research design and what you want to do to the needs they have, some of which might just be practical. So it's that kind of difference. You have less control as a researcher and it's more intimate and more potentially political. (Case 2 Researcher 12)

The tension and negotiation between robustness and utility were therefore at the core of this repertoire. Some of the interviewees struggled with this form of knowledge production as not being 'scientific enough' – meaning that the simplified methodologies and shortened timelines of this type of research were seen as a stark contradiction of the scientific standards. This of course is not surprising in the context of the literature on regulatory science, pointing to the important cultural, epistemic and institutional differences between scientific and policy knowledge (Grundmann 2017). The production of this 'hybrid' knowledge (Miller 2001) amalgamating elements of scientific and political considerations became even more problematic when

university spaces (Bandola-Gill 2019). The key struggle here – even for the academics who were proponents of co-produced research was in the processes of academic evaluation, which inherently consists of the idea of what 'good research' is. For example, the interviewees pointed to difficulties with publishing the results of these projects.

Therefore, this repertoire – similarly to Deliberation – opened up the knowledge production to actors who were not traditionally involved in research (such as policymakers and practitioners). On the other hand, the explicit focus on usability of the produced knowledge and the outcomes of collaboration in the policy/practice context meant that, in contrast to Deliberation, this repertoire was inherently excluding more critical or marginalised voices and focusing on actors who could be agents of change, for example, senior policymakers or practitioners. As such, it reinforced whose voice counts and who the powerful actors are.

Advocacy

The final repertoire of knowledge brokering viewed it as advocacy for concrete policy options. This repertoire was perceived by interviewees as necessary (at least occasionally) in specific cases of policy issues such as alcohol or tobacco regulation or alleviating health inequalities. As this approach was aimed at promoting specific policy options, it was inherently oriented towards instrumental impacts and as such, it was seen as the most 'political' repertoire and one that is the furthest from the traditional academic values of impartiality and autonomy. Nevertheless, this repertoire was not completely a non-academic act - the interviewees predominantly referred to "advocating for evidence" (e.g., Case 2 Academic 5) and saw it as an appropriate form of knowledge brokering approach in cases where the evidence base was robust and unanimous and produced in an autonomous way (i.e., without political steering). As such, the academics perceived it as inherently different from political advocacy, as they only saw themselves as advocating for the academic consensus. At the same time, the focus on "evidence-based advocacy" might be seen as a self-legitimising strategy (or even risk what Pielke Jr (2007) called stealth advocacy), as the notion of scientific consensus is not straightforward and might at times involve specific, value-laden choices.

One consequence of working with concrete policy options was politicisation, as the crystallised policy options might support the formulation of polarised coalitions (Turnhout et al. 2008). The vast majority of academics working on knowledge brokering projects referred to impartiality as the core value guiding their practices. And academics practising the advocacy repertoire were not different in this regard as they discussed advocating for evidence as still being an 'impartial' activity. Yet, the boundary between 'evidence-based' and 'political' advocacy seemed at times ambiguous. For example, one of the interviewees explained their idea of Case 1 acting as a 'pressure group':

> Organisations lobby all the time – drinks industry, tobacco industry – they lobby, why shouldn't we lobby? Now some of my academic colleagues feel very uncomfortable about that; they say that's a political activity and we

should stay out of politics and keep our independence and we only have credibility because we are independent and we're not political. So I think there's a big divide there about how political we should be. (Case 1 Researcher 9)

This quote illustrates the fact that the scale of political involvement (for example in terms of acting as a lobby group to the government) when advocating for specific policy solutions was seen as problematic, even for academics who believed that at least some scale of political involvement was acceptable in academic work. Even when the political involvement entailed advocating for evidence (rather than politics), the lines of acceptable (or non-political) intervention appeared to remain contested and there was no agreement among the interviewees regarding the specific boundaries of impartiality in this context.

In some ways, the Advocacy repertoire was similar to Challenge – as they both involved critique of the existing policies and were imbued with normative assessments (despite highlighting neutrality and impartiality as key values). The key difference was in the focus on problem versus solution. The Challenge repertoire offers an evidence-based critique of the existing systems, engaging policy from a bird-eye view. Advocacy on the other hand offers not only a critique but also a solution – concrete programmes that might be implemented. Therefore, Advocacy might be seen as a mirror image of Challenge – but each of them is grounded in different underpinning paradigms of legitimacy of science in policy. For Challenge, legitimacy was seen as ultimately grounded in the privileged position of science as a knowledge system which produces unique forms of knowledge, for Advocacy the legitimacy is much more directly aligned with the usability principles of 'new' science whereas the legitimacy was seen as explicitly grounded in the involvement of science in politics (Bijker et al. 2009) rather than differentiation between knowledge and power (Haas 2004).

Choosing Between Different Knowledge Brokering Repertoires

The discussion of the knowledge brokering repertoires has pointed thus far to knowledge brokering as a phenomenon that is diverse both in its epistemic (production of autonomous academic evidence or collaborative research) and political enactments (with diverse boundaries between science and policy). Thus, the paper discussed the four repertoires of knowledge brokering as shaped by the tensions stemming from the hybridity of this practice, involving a bricolage of academic and policy modes of knowledge production, even if the precise balance between different modes is different between the repertoires.

The choice of the repertoire was shaped by localised meanings and values of researchers (for example their own understanding of their role as academics) but it was also significantly impacted by the factors external to researchers themselves – the characteristics of the policy, of the process and of the research settings. The interviewees did not sign-up for only one of the repertoires but rather chose and adapted according to specific circumstances.

Policy characteristics. One of the central factors influencing the model of knowledge brokering (as well as the possible outcomes) was the nature of policy problems.

The interviews suggested that the structure of policy problems had influenced the types of interactions between research and policy. Interestingly, the politicisation of an issue was not necessarily the sole determinant of the type of knowledge brokering repertoire. At times a politicisation of an issue leads to retrenchment to 'Mertonian' values of science and opting for repertoires where science and policy could be separated. Especially, when dealing with contested or emerging issues such as new, yet unregulated technologies, the focus was on broadening the debate and on a need to retain critical perspectives. As such, these types of problems were better fitted to an approach using the Challenge or Deliberation repertoires. For example:

> It is something where we faced challenges in the relationship between the policies that kind of [research] – assisted reproduction in embryology that is an emerging policy area that requires, I suppose, quite technical regulation and then you've got the social research that is quite diffuse. I do think there was something about the kind of research we were doing and the kind of policy areas that we were engaged with that did not necessarily promote specific solutions. (Case 1 Researcher 10)

In the case of more established academic and policy debates (even if still politically sensitive) such as the key public health issues such as smoking regulation or obesity prevention, interviewees discussed their preference for methods that were geared towards Advocacy approaches and promoting specific, evidence-based solutions.

Furthermore, the choice of the strategy was often dictated by the personal characteristics of the policymakers. Some policy actors were open to critique, for example within the Challenge function. Interestingly, the interviewees were not uniform in their perception of how close the relationship with policymakers should be. A close collaboration and consensus-driven approaches of Co-Production or Deliberation were seen as challenging as the academics might feel a need to censor themselves in order to meet what they might perceive as policymakers' expectations of them. On the contrary, a few interviewees pointed out that, actually, a close relationship with policymakers might enable critical work, because the trust built over time would allow bolder statements to be made (e.g., when it came to Challenge or Advocacy). Therefore, navigating between factors that increase the chance of research being used and factors that ensure the possibility of critical intellectual work required a delicate balance to be maintained

Academic incentive system. Finally, the models of knowledge brokering were shaped by academia's institutional incentive system. The performance-based assessment of research quality in the UK – the Research Excellence Framework – has been expanded to include an assessment of the non-academic value of research (Smith et al. 2020). The new system of evaluating the performance of academics has had important consequences on knowledge production. Despite its important role in legitimising knowledge brokering, the system of incentives shaped the preference for different models of knowledge brokering. As the academics were required to show concrete, measurable changes in policy and practice, per the definition of impact, they steered towards the strategies having a higher propensity to lead to instrumental impacts (Smith and Stewart 2017) – hence focusing on either producing actionable

knowledge or advocating for specific solutions. Therefore, the academic incentive system disadvantaged more critical and reflexive forms of knowledge brokering (such as Challenging and Deliberating) and instead incentivised repertoires leading to instrumental changes, such as Co-production and Advocacy. Furthermore, the REF framework was then translated into specific structures at the universities – the interviewees pointed to REF managers encouraging knowledge brokering practices that would potentially lead to impact case studies. Interestingly, a high number of senior academics reported that they were discouraged from engaging in knowledge brokering activities in the past, but due to REF, their managers started to actively encourage this practice, particularly if it leads to concrete impacts.

Researcher and research characteristics. Finally, practices of knowledge brokering have (at least at times) reinforced the existing academic hierarchies. The early-career researchers (particularly those on fixed-term contracts) discussed some forms of engagement as difficult at their stage of career – Advocacy and Challenging were seen as difficult to employ without a senior status. Female researchers discussed taking on a large burden of engaging with time- and resource-intensive strategies, such as Co-production or Deliberation whereas senior male academics were more often invited to offer Challenge or Advocacy, for example within more prestigious advisory committees. The choice of a strategy was also dictated by the disciplinary histories – interviewees working in Public Health were most comfortable with Advocacy as a legitimate strategy within this discipline. Sociologists were most comfortable with the Challenge repertoire and more critical forms of interaction with policymakers.

Concluding Discussion

The relationship between research and policy is a subject of a long-standing debate that has seemingly accelerated in recent years with the emergence of new forms of incentives for knowledge brokering on both the academic and policy sides. This research explored how academics make sense of their practice in the light of the expectation to produce policy 'impacts' (Smith et al. 2020) to shed light on the process of 'bricolage' of traditional and new forms of knowledge production in the process of navigation of science-policy interfaces. The paper reinforced the existing arguments on the variety of roles academics can employ in the policymaking process, ranging from a greater focus on the autonomy of researchers to closer engagement with the policy process (Pielke 2007; Broström and McKelvey 2018). However, by focusing on specific ways in which researchers translated the concept of 'knowledge brokering' into sets of ideas and practices, this paper identified implicit entanglements of values, meanings and practices that emerge at the intersection of policy and research. In particular, the paper identified four situated repertoires of knowledge brokering: Challenge, Deliberation, Evidence Intervention and Advocacy. The repertoires differed in terms of 1.) the focus of knowledge production seen as either a collaborative production of hybrid knowledge or as mixing of evidence produced within separate knowledge systems (e.g., science and policy); and 2.) the

perceived outcome of the process as either achieving specific policy goals or the emergence of the new epistemic and political frameworks.

Analysing knowledge brokering in terms of socio-political repertoires points to two key insights into the process of navigating science and policy. The first implication is the centrality of skill in epistemological bricolage (Freeman 2007) – of combining elements from different knowledge systems and creating a unique learning experience. The key insight here is one that in practice, the distinction between different knowledge paradigms either traditionally academic or aligned with 'new science' such as Mode-2 (Nowotny et al. 2001), transdisciplinarity (Klein 2004) is in fact significantly blurred. Indeed, the interviewees discussed the repertoires as either more closely aligned with traditional scientific practices or – on the contrary – as proposing a need for a disjunction from traditional values and knowledge assessment criteria. At the same time, the participants did not see their practices as entirely placed within the realm of 'old' or 'new' science but rather as a nuanced combination of the two. The interviewees combined different elements of different knowledge regimes to develop situated and epistemically unique repertoires of practice.

The focus on bricolage between different knowledge regimes confirmed the paradox of boundary blurring – where the co-produced projects often reinforce the traditional division of labour and modes of action rather than challenging or expanding them (e.g., Turnhout et al. 2008). For example, Evidence Intervention is a repertoire which, despite blurring boundaries and hybridising knowledge production, has also hardened the traditional structures of power. This chimes in with the point made by Chambers et al. (2022): the transformative potential of science-policy projects "depends on iteratively balancing critically reflexive and solutions-oriented spaces". As shown in this project, the quality of the navigation of this tension had a more substantive impact on the transformative potential of the project than the scale of boundary blurring. For example, the repertoires that were seen as less 'applicable' (e.g., Deliberation), were the ones that were potentially more transformative, as they enabled the creation of spaces where more diversity of voices, including marginalised ones, could transcend the existing policy frameworks. Hence, this paper has shown that the transformative effects of various science-policy projects were not necessarily an outcome of merely challenging the traditional knowledge production system but rather by skilful facilitation and creating political conditions under which more radical and non-traditional voices could become part of the debate.

Furthermore, each of the repertoires was associated with a specific set of challenges. Not surprisingly, the two repertoires that were the least common in practice were Advocacy and Challenge as they were the least flexible ones – their success depended predominantly on meeting specific conditions (or 'windows of opportunity) rather than efforts by the academics. In contrast, Evidence Intervention and Deliberation were more flexible and could be shaped to achieve the more 'agile' (cf. Chambers et al. 2022) targets, meeting both the requirements of usability and transformation. For example, they could be shaped in terms of whom to exclude/include, what forms of knowledge hybridity to introduce, and how to shape the goals and targets of the exercises.

This leads to the second implication of seeing science-policy interfaces through the lens of the four repertoires of knowledge brokering: one relating to competition and ordering of the repertoires. The key contribution here lies in the insight into the act of choice of the strategy of interaction between science and policy. As emphasised in the paper, the interviewees rarely signed-up to only one of these repertoires but rather adapted their strategies when faced with pressures and challenges of policy (such as the structure of policy problems), process (such as the locus of engagement in the policy cycle) or academic institutions (such as pressures to document the specific socio-economic benefit of research funding). With the rise of the impact agenda and institutionalisation of knowledge brokering in academic structure, the choice of a strategy to navigate the science-policy interface is no longer external academic institutions. The experiences of the interviewees suggested that the broader systemic factors often prioritised repertoires targeted at instrumental, rather than conceptual forms of knowledge brokering.

Even though the boundary between knowledge and action (and their conceptual closeness to instrumental or conceptual impact) is to a large degree fluid, the interviewees discussed the strategies aimed at achieving the related aims to be more rigid. These two general approaches require different types of knowledge brokering strategies and involve different processes. Consequently, the constrained resources, combined with a variety of institutional pressures (e.g., for research impact or specific policy direction), confirm the overall 'instrumental bias' in the higher education system, whereby different social and institutional incentives support action aimed at closing down mechanisms. In this way, the existing tensions disadvantage broader, often critical forms of engagement between researchers and policymakers. Therefore, repertoires such as Deliberation or Challenge might be disadvantaged, or even at times impossible to put into practice.

This paper proposed an exploration of knowledge brokering as a practice requiring a bricolage of different knowledge production paradigms by exploring differently situated repertoires of knowledge brokering. Such an outlook changes the focus from exploring knowledge brokering in terms of a process or set of relationships, and positions it in terms of a socio-cultural change in the way knowledge is produced, translated and employed (cf. Nowotny et al. 2001). Attending to these tensions has illustrated both the risks of instrumental bias, as the variety of policy, process and academic factors narrow the incentivised repertoires, but also the opportunities, as such attention presents a variety of practices with which academics can engage. Notably, the biggest limitation of this research is the fact that it was conducted in a specific disciplinary and institutional context (particularly, considering the REF system in the UK), therefore these findings might not be fully generalisable to other contexts. This limitation, however, opens up opportunities for more research – and particularly comparative research on broader determinants of the strategies employed to academic engagement with policy.

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