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An International Study of Contemporary Definitions and Conceptualisations of Impact by Funders of Social Science Research

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Nathan Coombs, Hilary MacDonogh and Eugénia Rodrigues
Centre for Science, Knowledge and Policy - SKAPE

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Authors' Bios

Dr Nathan Coombs is co-director of the Centre for Science, Knowledge and Policy (SKAPE) and Senior Lecturer in Economic Sociology in the School of Social and Political Science, University of Edinburgh. His research focuses on central banking and financial governance and addresses the interplay of expertise, science and the legitimacy of public authorities in contemporary societies.

Hilary MacDonogh is a PhD candidate in the School of Social and Political Science at the University of Edinburgh. Her research focuses on the interaction of knowledge, expertise and policy particularly as related to issues of coloniality.

Dr Eugénia Rodrigues is co-director of the Centre for Science, Knowledge and Policy (SKAPE) and lecturer in Science, Technology and Innovation Studies in the School of Social and Political Science, University of Edinburgh. Her research deals with questions of public participation in science and technology, expertise and the democratisation of knowledge, particularly around topics linked to the environment and climate change.

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Executive summary

Purpose

This report was commissioned by the ESRC to map, evaluate and learn from contemporary trends in defining the impact of social science research. UKRI's predecessor, RCUK, was a pioneer in introducing 'pathways to impact' statements to funding applications in 2009. Answering the call by government to demonstrate the return on investment of publicly funded social science research, the ESRC defined research impact as a demonstrable contribution to (1) scientific knowledge and (2) the provision of social and economic benefits to society. Following the UK's lead, impact frameworks have over the past 10 years been introduced by funders internationally. This project examines how definitions and conceptualisations of impact have evolved through their diffusion in new organizational contexts. The report further asks whether these trends yield insights for the ESRC's own future definitions of, and approaches to, impact. The report's findings derive from a systematic review of public documents about definitions and conceptualisations of research impact in the social sciences across a sample of international funding bodies.

Key findings

- **Funders have taken diverse approaches to how knowledge exchange, engagement, outcomes and impact are defined, conceptualised and interrelated.**
- **Metrics for measuring social impact is increasingly recognised by funders but supplement rather than replace case-based, narrative methods.**
- **Definitions and measurements of the economic impact of social scientific research remain under-developed.**

Conceptualising impact

Impact is hard-to-define and relates ambiguously with terms such as knowledge exchange, engagement, and outcomes. A key finding of this report is diversity in how knowledge exchange (as a process) and impact (as an outcome) are conceptualised and interrelated. In their policy documents, funders are blurring the distinction; maintaining the distinction but assessing both; or using the terms interchangeably. Other funders place no explicit focus on impact or are seeking to challenge the politicization of knowledge production in co-production models. This definitional diversity is connected to the variety of underlying process models adopted by different funders.

Case study

The Dutch Research Council's (NWO) approach is informed by the concept of 'productive interactions' developed by the EU-funded SIAMPI project (2009-13). The idea of productive interactions considers the direct, indirect, and financial interactions between researchers and stakeholders as measurable acts of knowledge exchange which are not clearly distinct from impact given the gradual shift from interaction to impact. Recent policy documents by the NWO suggest an expanded definition of research impact. This definition is concerned not just with instrumental knowledge utilisation but also with "demand articulation, connecting parties and innovation" across the timeline of a research project.

Measuring impact

The report's second key finding is that there is increasing recognition by funders that metrics can play an important role in measuring and communicating the impact of research. However, openness to the potential of metrics is not matched by confidence in the availability of a robust and standardised suite of metrics for measuring the specifically social (as opposed to scientific) impact of research. Even for funders open to the use of metrics, they continue to play a supplementary role to narrative, case-based methods. There is room for funders to take a more experimental approach to measuring impact, utilising different methods for different programmes, and track their effectiveness at capturing impact.

Case study

The Australian Research Council (ARC) looks to data to reduce reporting burdens within its remit of assessing the quality, engagement and impact of Australia's university research. While ARC's quality assessment is being revamped into a highly data-driven approach, engagement and impact assessments still mainly rely on narrative case studies with some supplementary compulsory and optional indicators. Yet even this ancillary use of indicators was questioned by a 2020-21 review recommending that indicators remain optional. Current indicators were considered too income-focused, excluding engagement activities that led to efficiencies or cost savings.

Economic impact

Measuring the economic impact of social science research remains a puzzle. UK Treasury methodologies, which apply cost-benefit analysis, are unsuitable. For example, economic techniques such as stated preference surveys used to estimate the monetary value of public goods cannot easily be applied to social science research. Many existing approaches for evaluating the economic value of social science are qualitative or based on the direct financial contributions of private sector partners to research projects. Therefore, this report finds that measuring the total economic value generated by the ESRC's portfolio of social scientific research funding may not be possible, even if some types of instrumental research might permit cost saving measurements.

Case study

A report attempting to solve the puzzle of how the economic benefits of social science research can be measured was authored for the London School of Economics Public Policy Group by Cambridge Econometrics in 2012. The report assumes social science research benefits government and business through the mediation of staff with academic social science training. The report values social science research as equal to the combination of consultancy fees and the salaries of de facto knowledge brokers in organizations. The report concedes, however, that there is no easy way to identify workers involved in 'research mediation' and the methodology addresses social science nationally rather than measuring the impact of funding by specific organisations like the ESRC.

Policy and practice implications:

- Policy makers should note definitions of impact proposed by funders such as the Dutch NWO and Australia's ARC, which bring knowledge exchange and engagement to the forefront along with impact. They should also reformat application and assessment processes to be less focused on predicting pathways to impact. Whilst the ESRC already recognises the importance of engagement and knowledge exchange activities, it could build on existing structures, such as Impact Acceleration Accounts, to support and encourage them further as part of an overarching impact 'ecosystem' which is sufficiently flexible and devolved to react to opportunities for impact (recognising impact's non-linear emergence across the duration of a research project).
- Metrics could play a useful role in supplementing impact case study narratives. However, some discretion should be afforded to researchers in defining their own metrics measuring knowledge exchange and impact. A suite of standard categories and benchmarks from which researchers selected relevant metrics could maintain comparability and permit limited aggregation across ESRC's portfolio.
- Measuring the economic impact of ESRC's portfolio of social science research may not be possible across the full extent of funded research projects. However, there are opportunities to experiment with different approaches to measuring the economic impact of social science research. Examples include co-production projects where private industry contributes to doctoral research funding, or public health research which leads to measurable cost savings in healthcare. Cost-Benefit Analysis (CBA) appears to be the most promising approach for ESRC to trial for these purposes.

1. Introduction

This report presents the findings of a systematic, document-based research project about contemporary definitions and conceptualisations of research impact in the social sciences across a sample of international funding bodies, primarily within Europe but also including the Americas, Australia and East Asia.

The idea that research should 'make a difference' plays an increasingly important role in legitimising public expenditure. The evaluation and metrication of research impact is also used instrumentally by government agencies to allocate funding to projects and research units. Understanding contemporary trends in the definition and conceptualisation of impact is thus important for governments, funding bodies, and academic communities.

Broadly speaking, 'impact' describes how research affects scientific discourse and imparts social and economic benefits to society. Following innovations by the Australian Research Council in 2005 and Research Councils UK in 2009, funders increasingly expect research proposals to demonstrate the potential for impact, and research assessment exercises seek to measure impact after the fact.

Until 2020, UKRI and its predecessor RCUK required "pathways to impact" statements in research funding proposals (these statements have been dropped now that expectations of impact are well-embedded in the application process). Research assessment exercises like the UK's periodic Research Excellence Framework (2014, 2021) incentivise impact by tying it to formulas that determine the future funding of research units.

Few countries have gone so far as the UK in institutionalising impact within their funding regimes, but the goal of making impact an integral part of the evaluation of research projects has diffused beyond the Anglosphere and been adopted internationally.

It is in this context that this research project was commissioned by the UK's Economic and Social Research Council. Fifteen years after the RCUK Impact Toolkit was created to guide researchers' impact activities, this report provides an overview of how impact is defined and conceptualised by funders in the social sciences internationally and puts contemporary trends amongst funders into dialogue with scholarly reflections on the 'impact agenda' (Smith et al., 2020).

Section 2 supplies the historical context for the emergence of research impact evaluation as well as providing an overview of the academic state of the art on the subject. Section 3 offers details on the project's research methodology, including how the sample of funding bodies was selected and how information was collected and analysed. Section 4 presents the first major finding: international, cross-funder diversity in how impact is conceptualised and related to adjacent concepts such as knowledge exchange, engagement and outcomes. Section 5 examines the relationship between impact definition and its measurement, exploring how funders are combining metrics with narrative, case-based techniques. Section 6 surveys approaches aiming to capture the economic impact of social science research. Section 7 concludes with implications for policy and practice.

2. Defining research impact: conceptual and practical considerations

2.1 Historical and political context

Driving the 'impact agenda' are multiple, interlocking institutional developments in the postwar era. A key change is the expansion of higher education. In 1950 in the UK just 3.4% of school-leavers attended University; by 2022 the figure was 37.5%. The World Bank estimates that in 2020 spending on higher education in the UK was equivalent to 5.5% of GDP, almost half that spent on health. University education and research in the UK is no longer an elite 'ivory tower' but an industry that employs hundreds of thousands of full-time University staff.

The expansion of the University sector and its growing expense has contributed to the perceived need to justify the relevance and utility of research.

Aligning with the goals of the UK's New Labour government (1997-2010), this was framed in terms of the need for the social sciences to demonstrate 'return on investment' and contribute to 'evidence-based policymaking'. Then Secretary of State for Education and Employment, David Blunkett, delivered a speech in 2000 arguing that the social sciences need to avoid becoming "detached from and irrelevant to the real debates which affect people's life chances". For Blunkett, social sciences can prove their worth by conducting large scale quantitative studies which will help government "evaluate specific policy initiatives" (quoted in Hodkinson, 2000: 1361).

Blunkett's instrumental conception of social science only captures a narrow slice of what scholars themselves recognise as their contributions to knowledge and society. No authoritative empirical data exists on how social scientists understand the value of their research, but it is reasonable to assume that many would subscribe to a broad humanist conception (Collini, 2012).

A survey conducted with 711 academics at 9 UK Universities in 2008 asked what they consider 'impact'. The results overlap with instrumental concerns such as informing public policy and improving health and wellbeing. However, academics also consider the societal impact of their work as relating to educational development, helping the socially excluded, and cultural enrichment (Upton et al., 2014).

When political pressure for impactful research was translated into an operational target within the higher education sector, research impact was defined inclusively. A RAND Europe report (Grant et al., 2010), commissioned by Higher Education Funding Council for England (HEFCE), evaluated different approaches to impact for the planned Research Evaluation Framework and stated that a key criterion is that definitions of impact be acceptable and credible for academics.

RCUK, when developing their definitions of impact, were guided by similar considerations. They were responsive to political pressure for generating impactful research but carved out space for scholarly autonomy by including a wide spectrum of beneficial effects in their definition of impact. RCUK defined impact as a "demonstrable contribution" and included the examples:

> creating and sharing new knowledge and innovation; inventing ground-breaking new products, companies and jobs; developing new and improving existing public services and policy; enhancing quality of life and health (UKRI, 2019: n.p.).

In the UK's Research Excellence Framework, which introduced impact as an assessment criterion in 2014, impact is also broadly defined as an

> effect on, change or benefit to the economy, society, culture, public policy or services, health, the environment or quality of life, beyond academia (REF, 2021).

These definitions are some of the most cited in the international literature on research impact and are returned to in this report. They provide a benchmark against which alternative framings by other funders can be compared.

2.2 The challenge of defining 'impact'

As research impact has become embedded into the funding requirements and research assessment frameworks of organisations across the world, definitions of impact have proliferated. Scholars observe that impact is often defined vaguely, with many different definitions circulating in scholarship and policy literature (Alla et al., 2017; Gow and Redwood, 2020). Alla et al. (2017), for example, found 108 distinct definitions in published work within the public health field.

Belcher and Halliwell (2021) argue that existing definitions and their conceptual underpinnings are "fundamentally flawed", as they conflate analytically distinct types of changes with temporal stages in the research process. By this Belcher and Halliwell mean that some definitions of impact are fixed on qualitatively different types of change (i.e., regarding ***who*** is affected by research and ***how***), whereas other definitions situate impact relative to the temporal stage of the research process – from research conception to dissemination to utilization of research findings (with impact usually positioned as the final stage in the process).

2.2.1 The linear process model

Most definitions of impact are underpinned, implicitly or explicitly, by a ***process model*** about how research is conducted, how knowledge is exchanged, and how research leads to outcomes and benefits for stakeholders and society.

Many existing definitions of impact, especially those adopted by UK organizations, adhere to a ***linear*** process model of how "knowledge shapes policy" (Boswell and Smith, 2017). In this model, a gap is posited between the creators of knowledge and prospective beneficiaries who stand to gain from being exposed to research findings. The challenge is thus construed as improving communication to better broker between knowledge creators and knowledge beneficiaries.

Hammersley (2014) draws out the implications of the causal metaphor: impact is understood as an event following a successful bridging of knowledge generators and knowledge beneficiaries. When exposed to research findings, stakeholders adjust their assumptions and plans, embarking on a new organizational or behavioural trajectory. Hammersley likens the linear process model to a cue ball (research findings) striking the billiard ball (stakeholders) and sending the latter in a new direction after impact.

This linear model of research impact has been subject to criticism from multiple angles. At the conceptual level, some authors see the process of how knowledge shapes policy less like as a direct causal chain linking knowledge creators with beneficiaries and instead as a diffuse, multi-actor process unfolding over long time periods (Weiss, 1977). What Weiss calls the 'Enlightenment' model relies on ideas spreading through networks and communities which provoke incremental changes to beliefs and practices.

Agreeing with Weiss, Boswell and Smith (2017) note that the linear process model of how research leads to policy change runs against decades of research which debunks positivist assumptions (Silvertsen and Meijier, 2020: 68). Boswell and Smith further observe that research is often taken up by policymakers for strategic reasons, to defer making a decision, or because findings validate their existing course of action.

Even when research does seemingly impact policies and practices in a direct, linear fashion, that may be due to serendipitous or 'extraordinary' (Silvertsen and Meijier, 2020) circumstances rather than through formalised bureaucratic channels where the persuasive force of the evidence is the decisive factor.

2.2.2 Time lags and attribution

Practical objections to the linear model often refer to the difficulties it presents for impact measurement. The EU-funded 'Social Impact Assessment Methods for research and funding instruments through the study of Productive Interactions' project (SIAMPI, 2011) assessed how social impact occurs and the methods best suited to measuring it.

The project's final report advocates for moving the focus to 'productive interactions' between researchers and stakeholders because these incremental acts of knowledge exchange are much easier to measure than impacts themselves, which may occur a considerable time after the completion of a research project.

Elaborating the rationale, Spaapen and van Drooge (2011) suggest that attempts to measure impact directly are beset by problems of ***attribution***. Because changes occur over long-time spans and involve multiple actors, attributing effects to specific pieces of research is very difficult (McCowan, 2018).

Further problems of attribution include the difficulty of separating the impact of research from other inputs as well as the international nature of innovation, which overflows the national boundaries in which research assessments are conducted (Silvertsen and Meijier, 2020). For similar reasons, Spaapen and van Drooge (2011) endorse the SIAMPI project's network-oriented conception of productive interactions rather than the linear model, as they believe it is much easier to measure and attribute productive interactions than measuring impact directly.

The adoption of linear models is partly responsible for eliciting cautious responses from scholars to the impact requirements introduced over the past decade or more. Concerns about the instrumentalisation of knowledge and the crowding out of critical perspectives are heightened when attached to the expectation that research should deliver direct, short-term and demonstrable benefits (Upton et al., 2014). The fear is that rewarding these kinds of impacts may disincentivise 'blue skies' research and public intellectualism. Although the latter is impactful in moving thinking forward, it can only rarely be directly related to demonstrable, short-term contributions to the economy and society (McCowan, 2017).

2.2.3 Benefits or 'Grimpacts'?

A final point of contention is that many impact definitions state that research is considered impactful so long as it delivers extra-academic 'benefits'. Scholars have pointed out that this relies on the assumption that the impacts of knowledge are in the public interest.

History, however, is replete with counterexamples where research impacts have had apparently negative effects, or what is dubbed 'Grimpacts'. Examples include a public scare promoted by the publication of a research paper linking the MMR vaccine with autism, infringement of data privacy in the Cambridge Analytics scandal, and the financial engineering which contributed to the 2008 financial crisis (Derrick et al., 2018). In these cases, close interactions between researchers with private sector organisations and advocacy groups eroded normal ethical and procedural standards.

Ultimately, the literature highlighting the negative effects of research points to the subjective and normative nature of equating impacts with societal 'benefits'. It suggests that the term 'benefits' should be handled with care or possibly substituted by a more neutral term.

2.3 International evolution of impact definitions and measurements

Scholars have noted that as the impact agenda has spread beyond core originating countries such as Australia, the UK and the Netherlands, it is expected that definitions and conceptualisations of impact will evolve and branch off in new directions (Smith et al., 2020). Reasons that definitions of impact may evolve include:

- second mover advantages in responding to the experiences of other countries and academic commentary and analysis;
- different institutional arrangements and research cultures which require adapting impact definitions;
- transnational organisations exerting influence over national and supra-national funding and research assessment bodies;
- spontaneous ideational innovation by actors involved in drafting policies.

For these reasons, this project takes the international diffusion of impact requirements as an opportunity to examine whether such an evolution has taken place and, if so, if new definitions and conceptualisations of impact by social science research funders offer insights for the ESRC's own future definitions.

This project's mapping and scoping exercise puts developments into dialogue with the scholarly literature to arrive at evidence-based reflections on change and continuity in the impact agenda on the global stage.

3. Research methodology

To examine the potential evolution of impact definitions and to put them into dialogue with scholarship on the impact agenda, the project took a qualitative approach. This included two key elements: (1) a literature review addressing recent academic debates on impact, impact assessment methodologies and related tools, and (2) a survey of current impact frameworks based on a web-based document analysis from major research funders, significant international bodies and general grey literature.

The aim was to build a wide-ranging representation of key developments in impact definitions and conceptualisations originating from different countries and funding organisations over the past 10 years while keeping the sample size manageable.

To survey the contemporary impact frameworks of funding bodies internationally, we selected a sample of significant cases (table 1). These were primarily drawn from Europe given the prevalence of centralised public funding bodies accountable to governments in this region and the relatively advanced state of the impact agenda in Europe. We also sampled relevant funding bodies in the Americas, Asia and Australasia which were notably engaged with evaluating research impact. The selection was guided by the need for:

- diversity in geographic coverage and of research cultures;
- evidence of recent appraisal by the funder or by an external organisation of the approach to research impact;
- representativeness of the full range of impact types and processes (e.g. narrative/metrics, process/outcome);
- identifiable innovative elements in any of the approach components (e.g. addition, removal or modification of impact dimensions).

Once an initial batch of cases was selected, the research process unfolded in an iterative way, refining themes and analytical categories and expanding the pool of funders in the sample. The iterative approach led us beyond the focus on national funding bodies to include supra-national funders and research policy agreements that are increasingly shaping the ways impact is conceived and implemented by national funders and other organisations.

Similarly, as impact frameworks were surveyed and funders were mapped, we expanded the scope of the literature to include critical reviews of assessment frameworks, measurement tools and alternative propositions for impact assessment.

Table 1: Sampled entities

Entity	Geographical range	Remit
Agence Nationale de la Recherche (ANR)	France	Funder. Funds project-based research across seven fields (including humanities and social sciences, life sciences, engineering, mathematics, environmental sciences) and operates national Work Programme of Ministry of Research.
Australian Research Council (ARC)	Australia	Funder. Focuses on all disciplines except clinical and medical research, administers National Competitive Grants Programme and advises Government on research issues.
Deutsche Forschungsgemeinschaft (DFG)	Germany	Funder. Funds research in the social sciences and humanities.
Dutch Research Council (NWO)	Netherlands	Funder. Manages competitive research funding in the domains of social sciences and humanities, science, applied and engineering sciences and the Netherlands Organisation for Health Research and Development.
European Research Council (ERC)	European Union	Funder. Administers competitive funding across all fields.
Fonds National de la Recherche (FNR)	Luxembourg	Funder. Funds research in various branches of the sciences and humanities whilst emphasising strategic areas.
Horizon Europe	European Union	Funding programme designed to pursue clearly defined work programmes.
National Research Foundation	South Africa	Funder. Funds research across all disciplinary fields.
National Science Foundation (NSF)	USA	Funder, federal scope. Supports research across all disciplinary fields.
Research Grants Council (RGC)	Hong Kong	Funder. Administers competitive funding for a broad set of disciplines from humanities and social sciences, biology and medicine, business studies, engineering and physical sciences.
Social Sciences and Humanities Research Council	Canada	Funder. Focuses on supporting research and training in the social sciences and humanities as the federal research funding body.
Swiss National Science Foundation (SNSF)	Switzerland	Funder. Evaluates research proposals and awards public funding in all academic disciplines as a private foundation.
Wellcome Trust	United Kingdom	Funder. Charitable foundation focusing on health research.
The Network for Advancing and Evaluating the Societal Impact of Science (AESIS)	International	Network encompassing a diverse range of stakeholders (e.g. evaluators, funding agencies, policymakers) aiming at encouraging and demonstrating the social (and economic, cultural…) impact of science.
The San Francisco Declaration on Research Assessment (DORA)	International	Declaration of principles and organisation campaigning for responsible research assessment. Signatories include, amongst others, funders, HEIs and individual researchers.
Leiden Manifesto	International	Manifesto. Formulated at the 19th International Conference on Science and Technology Indicators (2014, Leiden) and crystallised in vol 520 of Nature (2015), the Manifesto defines 10 principles for best practice in research assessment.
Hong Kong Principles	International	Set of principles for assessing research formulated in 2019 at the 6th World Conference on Research Integrity to help research institutions reduce perverse incentives of metricised approaches.
OECD	International	Set global standards in 2015 Frascati Manual for national science and technology indicators. 2016 project to assess impacts of public research to compare practices.

Source: Authors' own

4. New directions in impact definition and conceptualisation

The first finding of this project is that some funders have developed novel approaches to defining impact and relating it to processes such as engagement, knowledge exchange and collaboration.

As discussed in section 2.2.1, the way in which the concept of impact relates to ideas such as knowledge exchange is often underpinned by a linear process model. As such, the term 'impact' in research assessment has traditionally been reserved for describing the social, political and/or economic ***outcomes*** that occur sometime after research completes. Terms such as knowledge exchange, engagement and collaboration are generally considered as ***processes***, means and/or pathways that create the potential for later impact.

The ESRC currently follows this approach. Its impact toolkit defines knowledge exchange (KE) as "the two way exchange between researchers and users" in sharing "ideas; research evidence; experiences; and skills" and states that KE is "fundamental to our understanding of what makes excellent research". ESRC further encourages researchers to include "activities" that are "associated" with KE such as "seminars; workshops; placements; and collaborative research" in their impact plans.

Yet, this study found some funders diverging from the linear process model, which has led to variation in how impact is linked with knowledge exchange and engagement.

For example, the SIAMPI project (2009-13) proposed the concept of 'productive interactions' as a proxy for impact, rather than as a means for achieving it, explaining that there "is not always a clear distinction between social impact and 'productive interactions' because the transition from interaction to impact is often gradual" (Spaapen and van Drooge, 2011: 212). (The ESRC also recognises "the non-linear, emergent and diffuse nature of the research we fund and the effects it has", but it maintains that KE and public engagement are primarily just tools that researchers can use to achieve impact.)

To understand the emerging conceptual variation in funders' definitions of impact, it is helpful to analytically distinguish between what we term 'outcome impact' and 'process impact'.

- ***Outcome impact*** is the conventional definition of impact focused on the changes/benefits brought about by knowledge utilisation of research findings by stakeholders. It generally occurs ***after*** the completion of a research project.
- ***Process impact*** refers to when funders include the knowledge exchange, engagement and interactions occurring throughout the duration of a research project within their definition of impact. Unlike outcome impact, process impact generally occurs *prior* to the completion of a research project.

All funders' definitions of impact include outcome impact but only a small number of funders have expanded their definitions to include process impact. That is not all: there are further variations in the way that funders relate knowledge exchange and engagement to impact (see table 2, below).

First, as described above, some funders expand the definition of impact to include terms such as knowledge exchange and engagement, blurring the boundaries between these concepts and arriving at definitions close to what we term process impact.

Second, one funder (the ARC) maintains the distinction between outcome impact and engagement activities, but they assess and reward both evenly rather than prioritising impact like in the UK REF and ESRC.

Third, one funder (Switzerland's SNSF) maintains the focus on ex-post analysis of impact to preserve the scientific autonomy of the research process from political pressures and commercial interests in co-production models.

Fourth, several funders loosely relate concepts such as impact and knowledge utilisation, illustrating a tendency for semantic slippage.

Fifth, various funders eschew an explicit impact framework, less to abandon the importance of research impact rather than take a stance that the best way to achieve it is to avoid pinning it down.

Table 2: Conceptual linkages between KE, engagement and impact

Type	What it does	Examples
1. Expanding the concept of impact	Challenges linear models of impact to create opportunities for impact from the outset of research.	Dutch NWO, French ANR, Luxembourg's FNR
2. Engagement and impact as distinct but equally important	Defines 'engagement' and 'impact' discretely but rewards both equally in evaluation.	Australian Research Council
3. Protecting the autonomy of the research process	Challenges the less-desirable effects of bringing politics closer to knowledge production in co-production models.	Switzerland's SNSF
4. Semantic slippage	Unclear how concepts relate – sometimes and seemingly unintentionally used interchangeably.	Evident with several funders. E.g. Canada's SSHRC
5. No explicit impact focus	Does not abandon importance of impact but does assume best way to achieve it is to avoid trying to pin it down.	Germany's DFG, Wellcome Trust

Source: Authors' own

These different approaches are discussed in-depth in the following sections.

4.1 Expanding the concept of impact

Several funders expand the definition of impact to include activities such as knowledge exchange, engagement and collaboration. Defining knowledge exchange and engagement as impactful in themselves raises the status of these activities so that they are considered on par with the outcome of impact rather than subordinate to it. This is what we term ***process impact***.

The funders in question include the Dutch Research Council (NWO), France's ARN and Luxembourg's FNR; each of which approach this in different ways.

4.1.1 The Dutch Research Council

The Dutch Research Council (NWO) invests around 1 billion euros each year in research to address social challenges, curiosity driven research and research infrastructure.

In 2023, NWO explicitly stated that its definition of impact was "expanding" to include not only the "use of knowledge" but also "aspects such as demand articulation, connecting parties and innovation in research" (NWO, 2022: 54). In turn, NWO's 'knowledge utilisation policy' was turned into an 'impact policy' to create a more continual approach to impact from the outset of research. NWO's strategic plan states this as such:

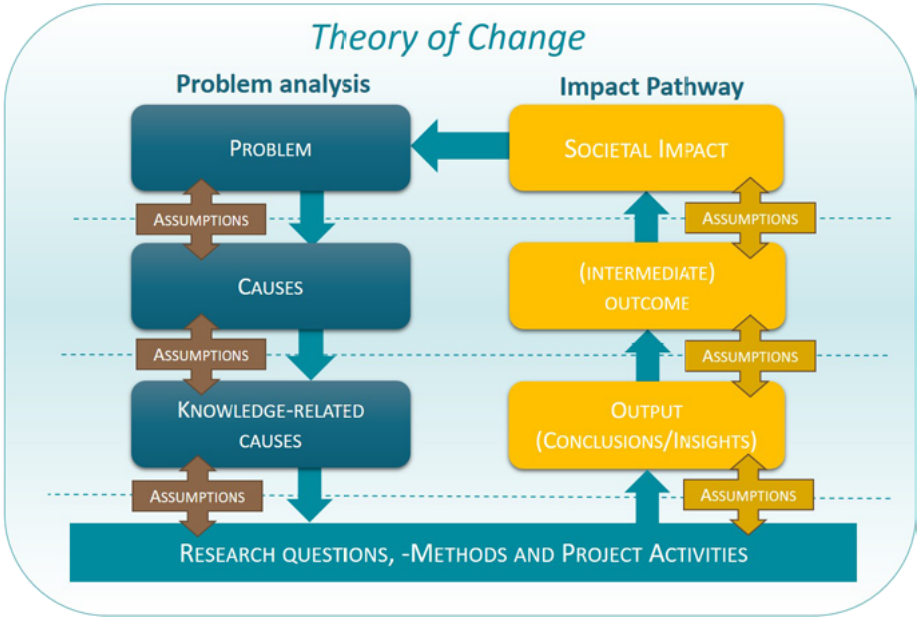
> NWO intends to transform the 'knowledge utilisation policy' into an 'impact oriented policy'... In other words, under the new policy applicants will no longer be required to indicate ***in advance*** how knowledge could be used ***later***, but will instead be expected to create opportunities for impact, both scientific and societal. (emphasis theirs).

To open its 2023 strategy, NWO begins with the premise that "science and society are inextricably linked" and that "developments in society therefore have a direct impact on science" (NWO, 2022: 7). NWO defines social impact to result from this interaction, which is "created by [science's] interaction with society, the business community, governmental bodies, citizens, knowledge users etc." (NWO, 2022: 54).

This conceptualisation diverges from linear models which assume research to unidirectionally impact society. Instead, NWO assumes that the two are co-constitutive, and its impact approach is aimed at promoting this mutual exchange. As such, NWO identifies research themes and creates funding instruments in consultation with government, stakeholders in society and the knowledge sector (NWO, 2022: 43).

NWO also acts as a "connector" in promoting "unimpeded collaboration to increase impact" between "researchers, governments, politicians, knowledge institutions, industry and other knowledge users" (NWO, 2022: 21, 15). Indeed, unimpeded collaboration forms the fourth building block for its vision for 2030 in its objective to "help create a research landscape that has significant scientific and societal impact worldwide" (NWO, 2022: 21).

Figure 1: NWO circular model of impact



Source: (NWO, n.d.).

4.1.2 France's ANR

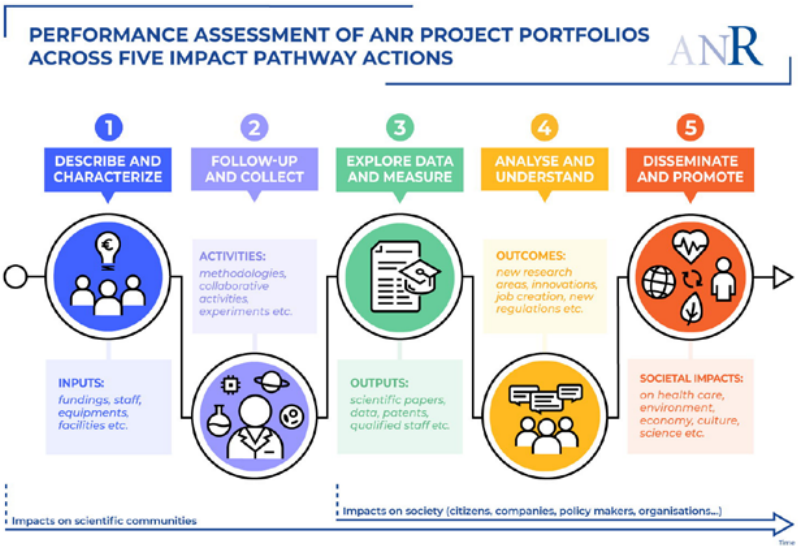
As per a 2006 government decree and its 2014 amendments, France's ANR is responsible for analysing the impact of its allocated funding. To do this, ANR developed an "impact pathway of research" model as a "useful tool for grasping the concept of impact and sharing a common vocabulary" of impact-related terms.

This pathway demonstrates how impact is conceived by the ANR as occurring throughout five defined stages of research (process impact) rather than being reserved to define an ex-post change in society, policy or the economy (outcome impact). In ANR's model, "impacts on scientific communities" are conceptualised as occurring from step one, "describe and characterise", through to step five, "disseminate and promote", while "impacts on society" are conceptualised as occurring from step three, "explore data and measure", onwards (Agence Nationale de la Recherche, 2022).

Hence there is a qualified blurring of the way that impact is distinguished in the linear model from non-instrumental activities taking place during the research process. For example, ANR broadly considers the training of "qualified staff" and the generation and open publication of data to be included as social impact, both of which are activities that occur ***before*** a change in society would be evident.

Accordingly, impact is assessed by ANR at each step of the impact pathway, from what it considers "the beginning of the project (1), to the follow-up (2), the end (3) and the ex-post steps of the project (4, 5)". ANR assesses impact for project portfolios, which might be a group of projects funded through a particular instrument or under a specific given research theme.

Figure 2: ANR process model of impact pathways



Source: Agence Nationale de la Recherche, 2020.

4.1.3 Luxembourg's FNR

Luxembourg's Fonds National de la Recherche (FNR) expanded its definition of impact for some activities without extending it as far as NWO. For example, FNR includes doctoral training and the augmentation of research culture as both an outcome and a "first instance of impact" (Fonds National de la Recherche, 2023: 2). Developing individual researchers and research teams and improving research culture are also listed in CORE's 2023 funding description as some of the "expected output, outcomes and impact of results" (Fonds National de la Recherche, 2022: 6).

The focus on training and improved research culture as impactful is an aim of the DORA declaration (DORA, 2012); as such, it has become a priority of several funders that are signatories such as FNR. ESRC already considers "capacity building through technical and personal skill development" as one potential "impact" of research (UKRI, 2022).

4.2 Engagement and impact as distinct but equally important

4.2.1 Australian Research Council (ARC)

The Australian Research Council conducts an engagement and impact (EI) assessment to make visible the "tangible benefits" of research and to identify the institutional infrastructures that enable engagement and translate research into impact. In its EI assessment, ARC evaluates "engagement" and "approaches to impact" alongside "impact", while maintaining them as separate phenomena. Unlike the NWO, the ARC does not blur distinctions between impact and engagement activities. Indeed, the method of assessing them individually requires them to have distinct definitions.

The ARC's Engagement and Impact (EI) Assessment scores each – one rating is allocated each for engagement, impact and approaches to impact – thus treating them with similar importance rather than subordinating ***processes*** leading to impact solely to the final outcome of impact. To facilitate evaluations, ARC has developed, reviewed and refined the following definitions:

- ***Research engagement***: "the interaction between researchers and research end-users outside of academia for the mutually beneficial transfer of knowledge, technologies, methods or resources";
- ***Research impact***: the "contribution that research makes to the economy, society, environment or culture, beyond the contribution to academic research" (Australian Research Council, 2018: 6);
- ***Approaches to impact***: lacks a formal definition, and this has been criticised by universities for making the assessment criteria and expectations unclear (Australian Research Council, 2021: 9).

ARC's methods of formally assessing "engagement" and "approach to impact" are in line with the recommendations of Boswell, Smith and Davies (2023) who argue for assigning more weight to the pathways, means and processes through which research is translated into impact.

For these scholars, impact is achieved in incremental, unforeseen and indirect ways. Activities such as engagement can enrich debate and play a significant role in the subtle processes of learning which underlie impact. As such, they argue these activities are worth recognising as ends in themselves rather than – as with REF21 - as supplementary activities that merely bolster the case made for impact (Boswell et al., 2023: 21).

4.3 Protecting the autonomy of the research process

4.3.1 Switzerland's SNSF

Switzerland's SNSF uses its National Research Programmes (NRP) as an impact instrument for tackling social challenges. Asserting at once that impact should be documented, but also that it is difficult to identify straightaway, SNSF commissioned consulting firm Technopolis to take a follow-up, ex-post, impact evaluation of three of its NRPs (Kolarz et al., 2018).

Technopolis used a linear model of impact which assessed impact as the final stage in a sequence starting with "problem/need" and moving to "inputs/activities", "outputs" (findings), "outcomes" (research and training of PhDs/Postdocs) and, finally, "impact" (Kolarz et al., 2018: 17, see figure 3 below). Part of Technopolis' advice to SNSF was to engage in co-production, consultation and collaboration activities as means of achieving impact.

SNSF's response to Technopolis's recommendations demonstrates the concerns some funders have with models based on co-production. For example, when Technopolis recommended involving non-academic stakeholders to increase impact, SNSF responded with the need for caution over involving stakeholders with conflicting interests and the potential political or commercial instrumentalisation of research.

SNSF's responses also demonstrate the benefits of a linear impact process model. For example, when Technopolis recommends stating "intended outcomes and impact prior to the program start" (Kolarz et al., 2018: 50), SNSF points to the iterative nature of defining the success criteria and indicators of impact (Swiss National Science Foundation, 2018). Protecting the autonomy of the research process from impact considerations would allow these criteria to be defined autonomously throughout research.

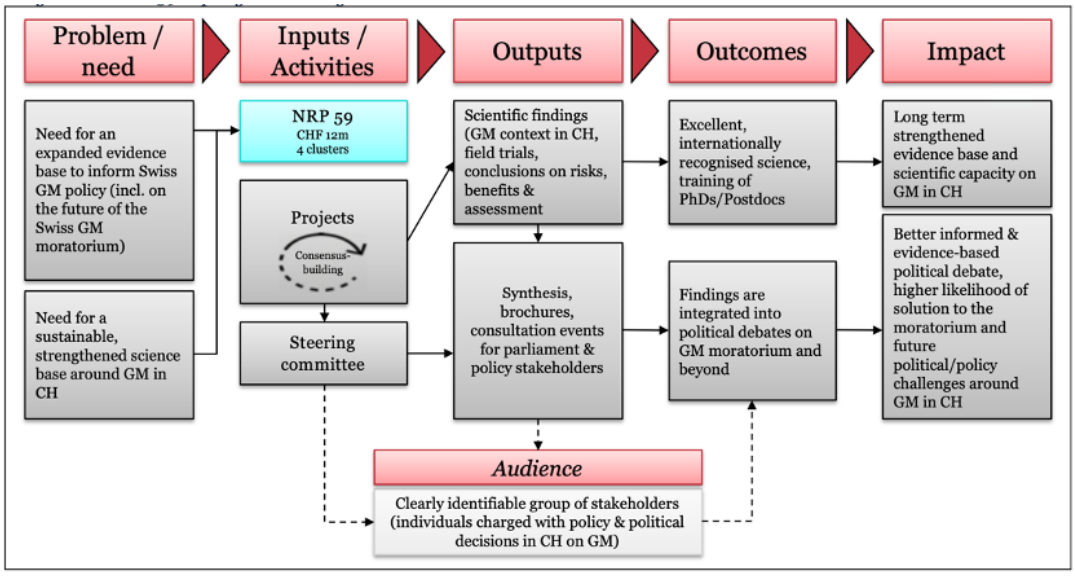
The points made by SNSF align with the academic literature arguing that politics shapes knowledge, rather than vice versa. In its worst form, the influence of power on knowledge leads to research questions that are tailored to political agendas, conceptual analysis that is weak in rigour, and methodological innovation that is restrained (Boswell et al., 2023: 28)

In this respect, concerns may be raised over co-producing research with governments, policy makers and commercial interests i.e., those with power. This would not apply to co-producing research with vulnerable communities i.e., those needing empowerment.

The tendency to conflate the two types of co-production should be addressed as it risks allowing cautions over the former to eclipse the benefits of the latter. In reverse, conflating the two can place focus on the benefits of co-producing research with vulnerable communities while overlooking concerns of co-producing with political and commercial interests.

One innovation made by Technopolis was its identification of nuanced types of impact made by the SNSF's NRP funding instrument. Technopolis praised the flexibility of the NRP instrument and added value by identifying five "distinct" NRP "archetypes" to reflect the different purposes, different resulting impacts and, therefore, distinct approaches to impact required by individual research projects. Different types of NRPs were identified as dealing with 1) "reinforcement"; 2) "decision support"; 3) "acceleration"; 4) "steering" and 5) "orientation" to reflect different orientations to impact (Kolarz et al., 2018: 2).

Figure 3: Switzerland's NRP impact model



Source: Kolarz et al., 2018: 17.

4.4 Semantic slippage

Funders sometimes overlook explicitly defining some or all impact-related terms and only loosely relate process impact and outcome impact. Nor do these funders adhere to a clear process model to indicate how these concepts relate to each other.

For example, Canada's Social Sciences and Humanities Research Council's (SSHRC) Connection Grant applications are evaluated on criteria including the potential to have "impact within and/or beyond the social sciences and humanities research community" and these grants can be used to cover "knowledge mobilization" activities (Social Sciences and Humanities Research Council, 2023).

However, while SSHRC directs applicants to a "definition of terms" website where they can find a definition of "knowledge mobilisation", no such definition for impact is given (Social Sciences and Humanities Research Council, 2021). Neither is there an explanation of how SSHRC relates and distinguishes impact from its understanding of knowledge mobilization.

For example, criteria for the SSHRC's Insight Award includes the creation of research leading to "demonstrable impact" within academia or beyond without including a definition of impact or explaining how it should be demonstrated.

The SSHRC's Connection Award rewards an individual or team "whose initiative has engaged the campus and/or wider community and has generated intellectual, cultural, social and/or economic impacts". Here, there is no differentiation between different forms of impact – cultural, social, economic, intellectual – or between "engagement" and these types of impact.

4.5 No impact

Several funders explicitly eschew using impact as a criterion in research evaluation. These funders do not deny that research does and should benefit political, social, economic and environmental life. However, they make clear that the best way of achieving impact is by supporting excellent "basic" or "discovery" research that is evaluated only according to scientific criteria (Wellcome, n.d.).

That said, it is important to situate these funders within larger national innovation strategies. In many countries, funders that forgo an impact focus exist alongside funders and funding instruments that do take an impact focus and use impact criteria to fund research. Germany's Deutsche Forschungsgemeinschaft and the UK's Wellcome Trust are two such funders that will be discussed.

4.5.1 Germany's Deutsche Forschungsgemeinschaft (DFG)

DFG is Germany's central agency for funding research from universities and uses mainly "scientific criteria" for funding decisions such as the project's quality and the qualifications of its applicants (DFG, 2022: 2 and DFG, 2019). DFG excludes impact as a criterion for funding decisions, which includes excluding quantitative metrics such as h-indices and impact factors from consideration (DFG, 2022: 3). In a 2013 talk in Japan called "Societal impact and freedom of research", Dr Peter Strohschneider illustrated this by arguing that Germany, "an economically rather successful country", fostered a "culture of innovation by having a huge segment of our research system which does not bother about innovation at all" (Strohschneider, 2013).

DFG representative Dr Kathrin Winkler elucidated this in 2019 at the 5th colloquium for Applied Research of the Getúlio Vargas Foundation, Brazil. Arguing for the importance of basic research in a pluralistic research system, Dr Winkler claimed that social impact is not immediately noticeable and social challenges are not always anticipated or known. As such, research should be funded that is broad in thematic and disciplinary focus to create a "knowledge repository" that can be used to address challenges as they arise rather than demanding direct social impact for contemporary social challenges (DFG, 2019).

Outside DFG, two-thirds of research funding is from industry which either produces research itself or through collaboration with research partners. "Industry-funded research" does have an impact focus and is claimed to produce "rapidly realisable results and applications" (Federal Ministry of Education and Research, 2018).

4.5.2 Wellcome Trust

As an independent charitable foundation founded in 1936 with a focus on the health fields, the Wellcome Trust acknowledges that research "transform[s]" our understanding of health and wellbeing. However, Wellcome has positioned itself to focus on "discovery research" rather than impact explicitly, which it justifies in the following statement:

> At a time when many funders are moving away from supporting curiosity-based discovery, and towards projects with a nearer-term impact, we have made a bold commitment to support discovery research as one of the best ways to achieve significant shifts in our understanding of health, life and wellbeing (Wellcome, n.d.).

Wellcome Trust's position is that impact-focused research can stifle the creativity necessary to encourage breakthroughs and make the most substantial social progress. "The greatest advances in knowledge", claims its website, "come from unexpected places, discovered by researchers who have the time and support they need to pursue new lines of investigation". Yet, Wellcome does focus on engagement and collaboration through hosting events and creating partnerships with decision makers in business, government and other organisations "to ensure that scientific evidence remains at the heart of health policy" (Wellcome, n.d.b).

4.6 Concluding remarks

Clarifying how funders define ***outcome impact*** as well as how they relate it to ***process impact*** - the encounters, events and processes that lead to outcome impact – is useful in better understanding the preconditions and manifestations of impact and ultimately in finding ways of making research more impactful. This section presented evidence that shows funders are adopting a variety of approaches to refining how outcome and process impact are understood and related. The next section dives into the growing debate about using quantified indicators to represent and communicate the impact of research and the interlinkages between measurement and conceptual approaches to impact.

5. Metrics and narratives

The previous section analysed funders' approaches to defining impact and adjacent concepts such as knowledge exchange. This section reports our second major finding: that several funders are showing interest in using quantitative indicators to communicate impact, which has influenced their approach to defining impact and activities such as engagement and knowledge exchange. In some cases, concepts like ***engagement*** and ***collaboration*** are used as proxies for impact because they are more amenable to identification and quantification (see section 5.4.3).

That said, this study finds that most funders use metrics to support rather than replace narrative case studies, the latter which remains the preferred assessment method.

This section discusses the rising demand for metrics which is matched by challenges in developing useful ones (5.1 and 5.2). Next, it discusses the way in which funders use metrics for scientific impact (5.3). This is followed by a discussion of attempts at developing quantified indicators for social impact (5.4) including using bibliometrics (5.4.1), creating frameworks and indices to represent the multidimensionality of impact (5.4.2), measuring process impact as a proxy for outcome impact (5.4.3) and altmetrics (5.4.4). Last, the section provides a case study to illuminate the challenges in developing metrics for impact assessment, and it points to the nascent development of a global field for evaluating research impact.

5.1 The rising demand for metrics

Narrative case studies, while not faultless, are considered the best available method for assessing research quality and impact (Wilsdon et al., 2015: viii). Yet, over the last 20 years, metrics have assumed a larger role in research evaluation due to their potential to make research systems transparent and accountable in the context of growing auditory pressures and constrained budgets.

Numerical data, in the form of indicators as matrices and indices, offer tools to help legitimate funding decisions to governments, reduce administrative burden and cost and facilitate comparison of impact across scientific disciplines and countries by turning "difference into quantity" (Espeland and Stevens, 2008). Comparative data helps benchmark against international practices while driving competition for status between and within research and funding institutions.

A large body of literature discusses the wide and pervasive role of metrics in decision-making for the governance of public and private organisations (Davis et al., 2015). According to this literature, metrics present themselves as an objective measurement of performance that claims legitimacy, simplifies complex issues, closes debate to facilitate decision making and allows comparison between diverse phenomena (Espeland and Stevens 2008: 408; Davis et al., 2015).

Narratives can perform some of the same legitimating and evaluative functions (Bandola-Gill and Smith, 2022; Coombs, 2022), but they cannot aggregate the impact of a research funder's portfolio into a number which can be communicated to governments and publics.

5.2 Challenges in using metrics

For each benefit indicators promise for research assessment, substantial obstacles exist in developing effective ones. One substantial obstacle is designing indicators for broad application across disciplines which can capture impact in its multi-dimensional and diffuse forms. Attempts to overcome these challenges, discussed throughout this section, have not held up entirely to review.

A 2015 independent review of metrics in UK research assessment concluded that indicators could not replace the nuanced judgment provided through narrative case studies. The review provided survey evidence of the growing scepticism over relying solely on quantified indicators to evaluate research (Wilsdon et al., 2015).

A separate survey of organisations across 13 countries named metrics and indicators as a main problem. Respondents stated that "most of the impact cannot be easily quantified or aggregated, so it is challenging to define appropriate, sensitive and robust metrics and indicators" (Virlon and Schultz, 2015: 28). Similar conclusions were reached by independent reviews of other impact assessments in the UK (Stern, 2016: 21) and Australia (see section 5.5).

Table 3: Indicators and metrics of research impact

Concept/framework	Description	Pros/cons
Indicators for scientific impact		
Journal impact factor (JIF)	Frequency average journal article is cited in a year. Divides number of article citations by number of citable articles.	Originally used to rank journals. Also used to assess quality and individual academic success which is controversial.
h-index	Measures productivity and academic impact. h is number of publications cited at least h number of times.	Not affected by a single influencial publication. No accounting for multiple authors and potential for gaming.
Eigenfactor	Rates journal's total importance or impact. Number of a journal's citations with highly ranked journals weighted.	Accounts for the significance of journals. Results are difficult to interpret. Not significantly better than JIF.
Indicators for impact beyond academia		
Bibliometrics	Used by funders alongside their own data to analyse various relationships.	Bibliometrics are available. However, they offer narrow definitions/measurement of impact.
Payback framework	Breaks down the research process into segments. Analyses five categories of 'paybacks' per segment.	Intended to represent the multidimensionality of impact. Used primarily in health services research.
Productive interactions: a process impact concept used as proxy for outcome impact	Exchanges between researchers and end users. Indicators developed for direct, indirect and financial interactions.	Crucial preconditions of impact. Sidesteps the challenges of measuring impact.
Altmetrics	Social media shares, downloads. Academia.edu, ResearchGate, Twitter and Mendeley. Cybermetrics and webometrics.	Measures the influence of research in real time. Questions persist over whether it is a true reflection of impact or just hype.

Source: Authors' own

5.3 Metrics in scientific impact evaluation

The potential (and pitfalls) of metrics have been widely discussed in the context of scientific/academic impact. Numerous measures of scholarly impact have been developed since the 1950s, including journal impact factors (JIF), h-indexes and other bibliometrics. The development of these indicators continued into the 1980s as public management stressed having quantified evidence of the output and value of scientific research. From the 2000s, rapid technological innovations expanded the availability of citation data through the Web of Science (WoS) and Google Scholar, among other platforms.

JIF was created to rank journals and help inform librarians' purchasing decisions (DORA, 2012), and it was eventually used to measure the quality of individual articles and an individual's academic success for promotions and reviews. JIF is generally considered a poor instrument for measuring individual performance, even by its creator, Eugene Garfield. Journal-based metrics have been criticised as "narrow, poorly designed indicators" which have unwanted effects on research and provide perverse incentives that encourage gaming and strategic behaviour (Wilsdon et al., 2015: viii; De Rijcke et al., 2016, 4).

Yet, the availability of JIF and other citation indicators, along with a lack of alternatives, perpetuates their wide usage for assessing individual researchers and wider scientific and social impacts of research (see the next section 5.4) (Hoeffel, 1998).

The 2013 San Francisco Declaration on Research Assessment (DORA) originated to disrupt the continued predominance of JIF and set standards to improve methods for research evaluation. With 23,963 individual and organisational signatories to date in 164 countries, DORA reflects the widespread dissatisfaction with using journal-based metrics for assessing research. UKRI is a signatory to DORA and has been a pioneer in explicitly barring journal metrics from being used to assess funding applications.

5.4 Indicators for assessing social impact

To measure impact outside of academia on the "economy, society, culture, public policy or services, health, the environment or quality of life" (REF 2021), indicators promise to communicate research's social value to government and the public.

However, as compared with academic impact, attempts to systematically identify and represent socio-economic impact on a large scale have been less successful and have generated fewer instruments (Scoble et al., 2010: 3).

Impact is multifaceted and diffuse while social scientific research is context dependent and diverse, making both resistant to being captured and represented by a universal indicator (Ràfols, 2017). Indeed, broadly applicable impact indicators have been found to exclude highly significant forms of impact that fall outside the indicator's parameters such as efficiencies and costs saved (see review of ARC's use of indicators in section 5.6).

Nonetheless, several approaches to quantifying socio-economic impact have developed during the last few decades which are discussed in this section. First, bibliometrics are often used alongside other data sets to measure social impact by funders who employ them within their own methodologies (5.4.1.). Second, frameworks such as the Payback Framework and BRIDE bring bibliometrics into a composite index alongside other indicators to capture the multidimensionality of impact (5.4.2). Third, projects and funders have developed process impact concepts such as ***productive interactions*** and ***engagement*** to represent the encounters that precede impact and are more easily measured than outcome impact (5.4.3). Finally, alt-metrics offer fast moving but still hypothetical indicators that may help measure impact (5.4.4).

5.4.1. Bibliometrics for social impact assessment

Bibliometrics were named by the greatest number of organisations as the main method used for impact studies in a 2015 survey by Tools and Actions for Impact Assessment and Policy makers Information (TAIPI), with respondents from 18 organisations in 13 countries (Virlon, 2015: 14).

Some funders such as France's ANR explicitly state the importance of "describing and measuring the benefits of research for society in the broad sense: the economy, the health, the environment, the culture etc.".

To this end, ANR uses bibliometrics alongside its own data to analyse the impact of the projects it funds as well as groups of projects that fall into its portfolios of work. Data is used by ANR to analyse various relationships such as the link between a project's publications and its initial stated aims, the time lags between project funding and publication and the link between cross-institutional partnerships and multi-institutional publications (Agence Nationale de la Recherche, 2020; Virlon et al., n.d.).

5.4.2. Frameworks for assessing the multi-dimensionality of social impact

Several frameworks have been developed to coordinate diverse indicators for evaluating and comparing socio-economic impacts along multiple dimensions.

For example, the 'Payback Framework' and BRIDE (Brunel Research Impact Device for Evaluation) were developed by scholars at Brunel University in 1996 and 2009, respectively. The 'Payback Framework' uses an index of indicators to capture and quantify the 'payback' of scientific research. Here, the research process is divided into segments within which five categories of 'paybacks' are analysed including "journal articles", capacity building through research training, "cost reduction" in service delivery and "commercial exploitation of innovation", among others (Donovan and Hanney, 2011). The 'Payback Framework' was developed specifically for the health services field and has been taken up across countries within this field. The Payback Framework was adapted to a Futures of Work programme; however, this initiative found that some impacts remained "inaccessible" to measurement (Klautzer et al., 2011: 201).

BRIDE also attempts to compare and assess socio-economic impact across disciplines by ranking impact along four levels according to two dimensions: depth and spread. The objective of BRIDE is not to evaluate impact's substantive value, but, rather, its pervasiveness across a community of research users (spread) and the significance of the change brought by it (depth). Accordingly, impact is improved through a strategy of either increasing depth – through more research – or widening spread – through enhanced engagement with users (Scoble et al., 2010).

BRIDE could be used more broadly given that it identifies the spread and depth of various forms of impact. However, in practice, BRIDE has been used to identify areas for which narrative case studies are used to provide in-depth assessment (Scoble et al., 2010).

5.4.3. Indicators for process concepts as proxy for impact: productive interaction (SIAMPI) and engagement (ARC)

Process impact concepts focus on the encounters and preconditions that potentially develop into impact in its various forms (social, economic, environmental etc.) and manifestations (diffuse, direct, indirect, incremental, unforeseen). Thus, process impact concepts can be applied more broadly to various fields of research. These concepts also represent activities that are more easily identified and quantified than outcome impact. As such, they circumnavigate many of the challenges in measuring impact itself such as time lags and attribution difficulties.

The 2009-2011 SIAMPI project is an early attempt to utilise a process impact concept as a proxy for socio-economic impact. Determining that "[f]or social impact assessment, reliable and accepted indicators are not available", SIAMPI developed indicators for '***productive interactions***' between society and science instead (Spaapen and van Drooge, 2011: 211). Productive interactions, which are determined crucial preconditions of impact, are defined as "exchanges between researchers and stakeholders in which knowledge is produced and valued that is both scientifically robust and socially relevant" (Spaapen and van Drooge 2011: 212). SIAMPI developed indicators to measure ***direct***, ***indirect*** and ***financial interactions.***

As noted in section 4.2.1, the Australian Research Council more recently started evaluating process impact through its research 'engagement' evaluation, which ARC conducts alongside its assessment of 'impact'. ARC's research engagement assessment is its only assessment that requires quantitative indicators. Specifically, ARC established four compulsory indicators that all applications must submit as part of evaluation. Indicators remain optional for ARC's impact assessment, suggesting impact's greater resistance to being captured by universal indicators. This is discussed more in section 5.6.

5.4.4. Altmetrics and emerging computational metrics

Altmetrics are "fast-moving" but still somewhat hypothetical impact measurements that promise information on the flows and usages of research (Penfield et al., 2014: 30). Altmetrics include social media shares, webometrics and cybermetrics all of which come from websites such as Mendeley, Twitter, Academia.edu and ResearchGate.

The relationships between research items on these sites are measured through altmetrics (Wilsdon et al., 2015: 5), and the impact of research within and outside academia is ascertained – including new audiences gained - according to citation and sharing on various sites. Indicators are still being developed for academic blog posts, code and data sets (Wilsdon et al., 2017: 11 and Priem et al., 2010). Overall, altmetrics promise to improve upon citation metrics in communicating the reach and influence of a wider range of research items in real time.

However, problems remain. For example, the data underlying altmetrics is not freely available and often belongs to the commercial sector, which is problematic. Further, the behaviour and motivation underlying sharing research on social media is not clearly understood; nor is the potential for gaming (Wilsdon et al., 2017: 12). In short, there is still a question over whether this is a true reflection of impact or just "buzz" (Wilsdon et al., 2017: 12; Priem et al., 2010).

5.5 Specificity in indicator development and ways forward

Some funders use indicators to assess impact mainly within specific fields, disciplines, portfolios or at the project level rather than across all social science research.

For its ex-post evaluations, France's ANR forgoes using indicators as part of a standard methodology. Instead, it uses them in consultation with stakeholders and through varied methodologies as suited to different projects and portfolios. For ANR's impact focused funding instruments that use ex-ante evaluation, such as the ASTRID (Specific Support for Defence Research Projects and Innovation) programme, the "possible impacts" of a project are outlined and evidenced at the specific project level at the time of application submission (Agence Nationale de la Recherche, 2022: 24). As noted, the "Payback Framework" and BRIDE are predominantly used for specific purposes and fields rather than broadly.

Funders and a significant minority of academics continue to be hopeful that accurate and robust metrics can be developed to measure socio-economic impacts of research. This potential is argued to depend on refining ways in which data is collected and processed and on keeping data open for interrogation and negotiation (Wilsdon et al., 2015). Advice for developing "responsible metrics" was issued in a 2015 report claiming that metrics must be "robust, humble, transparent, diverse and reflexive" for them to be understandable and vigorous enough to be meaningful (Wilsdon et al., 2015: x).

SMART criteria have also been applied to indicator development in a wide range of monitoring and evaluation contexts. SMART refers to the need for an indicator to be

Specific - or narrow enough to focus an intervention on one objective and not any other

Measurable – in that they can be counted, analysed, observed and tested

Achievable - in the case that a target is set

Relevant - in that it measures what it is meant to represent

Timely - in terms of the time spent collecting data (Doran, 1981).

The following case study illustrates the dilemmas of developing indicators for assessing outcome impact as well as process impact.

5.6 Case study: Australian Research Council (ARC)

Australia's ARC recently integrated quantified indicators into its ERA (quality) and EI (engagement and impact) research assessments. ERA is currently being revamped into a "modern, data-driven approach" for implementation in 2024-25 (Australian Research Council, 2022). However, attempts to employ quantitative indicators in the EI assessment have not entirely held up to review.

EI evaluates 'engagement', 'impact' and 'approaches to impact' separately. Yet, indicators are only required as part of the 'engagement' assessment, which is comprised of four compulsory indicators (cash support from research end-users, research income, amount and number of end-user sponsored grants and commercialisation income) alongside narrative case studies and optional indicators. In turn, indicator use remains optional for the impact assessment.

The four compulsory engagement indicators were reviewed by a 2020-21 Advisory Committee, which found them to be "too income focused", to fail to "recognise engagements that lead to cost savings or greater efficiencies" and to otherwise be deficient in providing value (Australian Research Council, 2021: 23).The review concluded that "there is no adequate metric that can quantify research engagement relationships in a 'one size fits all' approach, and that the nature of research engagement can be very discipline specific" (Australian Research Council, 2021: 24).

The one engagement indicator that held up to review was for the "co-supervision of research students with research end-users", which the Committee found to be a "useful and broadly applicable indicator of good research engagement practice" (Australian Research Council, 2021: 24).

A similar conclusion was reached for the optional impact assessment indicators, with the Committee noting:

> Even more so than for engagement, expert analysis and international best practice suggests that there is currently no set of quantitative indicators that adequately captures the broad range of research impacts (Australian Research Council, 2021: 24).

The Committee did not suggest abandoning the search for relevant metrics. Instead, it recommended that indicators for both engagement and impact should be optional and determined by universities on a "discipline-by-discipline basis" while "monitoring international progress" in developing suitable ones to apply more broadly (Australian Research Council, 2021: 24). As such, the next section discusses the various global organisations and initiatives that have arisen to share practices transnationally and to address concerns over impact evaluation.

5.7 International actors and an emerging global ecosystem

Like ARC, many funders in our sample were interested in how other funders globally were responding to pressures for and unwanted effects from requiring impact evidence. At the same time, since the 2010's, several global initiatives have emerged to voice dissatisfaction with existing research evaluation and set international standards to support 'responsible' research assessment.

Together, these developments demonstrate a growing global field and have opened spaces to share and shape international thinking on this topic. The most notable of these initiatives include the San Francisco Declaration on Research Assessment (DORA), the Leiden Manifesto for research metrics and the Hong Kong Principles.

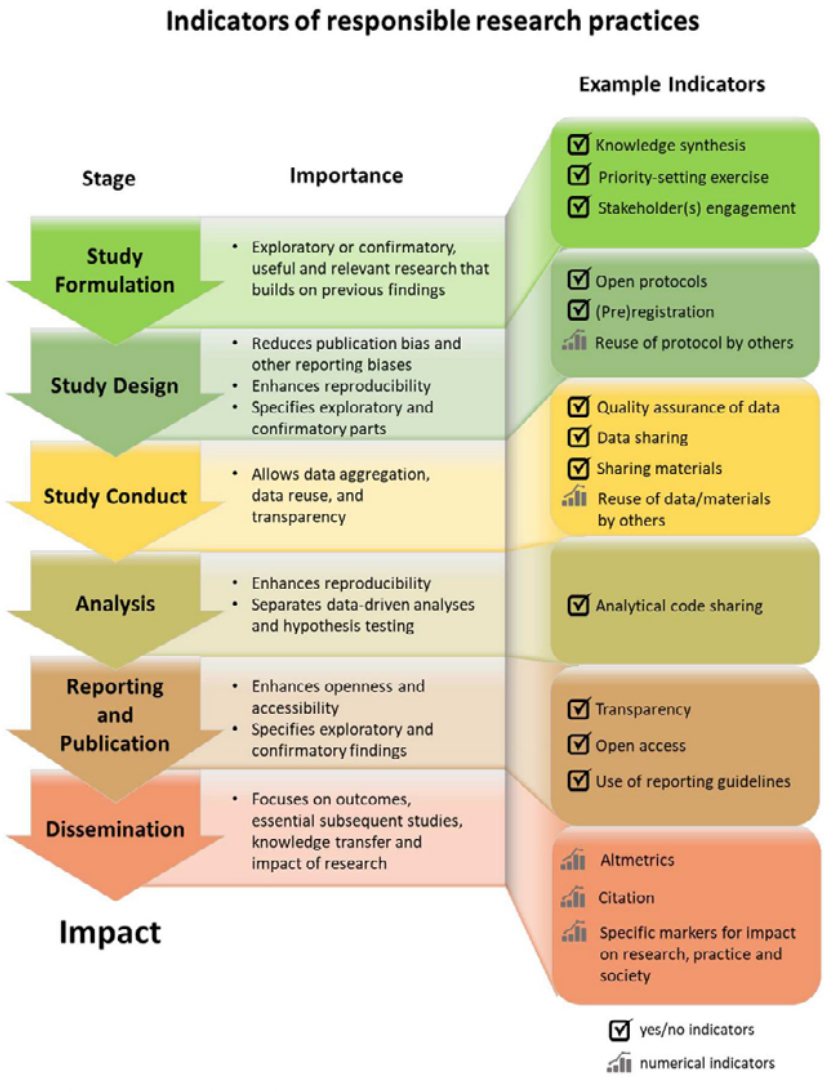
DORA, which emerged in 2012 and currently has 23,817 signers from 163 countries, initially issued recommendations centred on assessing research on its own merits and rejecting the use of journal-based metrics. Since then, DORA hosted various meetings to consider ways of improving research assessment, and it developed Project TARA (Tools to Advance Research Assessment) (DORA n.d.). DORA's principles have been integrated by many of the funders in our sample. Several, such as Luxembourg's FNR and France's ANR, explicitly state their uptake of DORA recommendations such as the exclusion of JIF from evaluations, promotion of open research and support of diverse research teams (see Agence Nationale de la Recherche, 2019).

The Leiden Manifesto emerged in 2015 as an initiative by the scientometrics and science policy community to improve guidance for bibliomentrics users (Hicks et al., 2015). Alongside the ten principles proposed for measuring research performance, the Leiden Manifesto has an ongoing blog detailing the courses it offers and the directorates – such as the European Commission's Directorate General for Research and Innovation - which align policies to its approach (see Leiden Manifesto, n.d.). Several universities position their research evaluation practices in line with the Leiden Manifesto.

Other sets of international standards include the five Hong Kong principles for assessing research, which were formulated in 2019 at the 6th World Conference on Research Integrity. Examples of these include assessing researchers on responsible research practices (see Figure 4 for examples of indicators for responsible practices) and rewarding the practice of open science, among others. Institutions and individuals are invited to endorse the Hong Kong Principles (Moher et al., 2020). AESIS - the Network for Advancing and Evaluating the Societal Impact of Science - organises events worldwide to bring together the people involved in research evaluation to share best practices (see AESIS, n.d.).

Together, these organisations and initiatives indicate a nascent and growing global field in research impact evaluation. This transnational ecosystem has potential to shape and be shaped by the approaches to impact taken by national funders worldwide. This growing global field is of interest to funders such as ARC as forerunners in establishing impact evaluations as well as funders such as South Africa's NRF (National Research Foundation, 2020), which more recently started integrating an impact agenda.

Figure 4: Indicators of responsible research practices from Hong Kong principles



Source: Moher et al., 2020.

5.8 Concluding remarks

In short, metrics promise to serve a valuable role in justifying the funding decisions of social science research. Funders globally have attempted to develop metrics to represent the multidimensional impacts of research by using bibliometrics, frameworks and proxies such as process impact concepts that measure the preconditions of impact. Yet, no suite of quantified indicators has been found to satisfactorily capture the impacts of scientific research across disciplines. As such, innovations in indicator development will be eagerly monitored by many funders internationally.

6. Economic impact

For governments, the economic value generated by research activities is important for justifying expenditure on them. Higher education in the UK and elsewhere has undergone marketisation and the utility of publicly funded research is increasingly tied to the idea that Universities can be engines of economic growth and efficiency (Berman, 2011). Most definitions of impact therefore include the changes brought about in the society ***and*** economy.

However, evaluating the economic impact of the social sciences has proven challenging (Cheah and Yu, 2016). Unlike STEM subjects, which often value the economic impact of research using input-output macroeconomic models, social sciences are far less likely than other disciplines to produce impacts which have a clear monetisable value. The influence of the social sciences tends to be indirect and diffuse in line with Weiss's (1977) Enlightenment model of how knowledge shapes policy – the social sciences encourage new ways of thinking and promote innovations which fly under the radar (NESTA, 2007).

Attempts to measure the economic impact of social science research beyond the income received from private sector partners thus requires creative, non-market-based valuation of its 'benefits'. Various techniques are available, but only a small number have been applied to attempt to quantify the economic impact of social science research.

This section of the report begins (section 6.1) by showing how some international funders attempt to capture the direct economic impact of research. It then outlines (6.2) techniques for measuring the indirect and non-market-based economic impact of social science research using cost-benefit analysis (6.2.1), qualitative approaches (6.2.2) and an experimental econometric approach (6.2.3). The final part (6.3) presents estimates of the value generated by social science research, noting the difficulties of applying these methodologies to the ESRC's portfolio.

6.1 Economic impact definition and measurement

Considering the extent to which economic impact is a priority for governments, attempts to quantify or model the economic impact of social science research are surprisingly rare. Some funders such as France's ANR have developed funding instruments aimed specifically at economic impact. ANR's "economic impact of research and competitiveness (IERC)" funding component brings research organisations and companies together into "Collaborative Research Projects involving Enterprises" (Agence Nationale de la Recherche, 2022: 21).

Other funders that address the economic impact of research have generally focused on income received and commercialisation processes. Australia's Impact and Engagement Assessment (EI) (discussed in section 5.6) is a good example. In the EI's 2018 assessment of engagement, the four compulsory indicators that supplement the impact case study narrative are:

1. Cash support from research end-users;
2. Total Higher Education Research Data Collection (HERDC) research income;
3. Amount and number of research end-user sponsored grants;
4. Research commercialisation income from subsidiaries, spin-offs, licenses, options and assignments.

These are construed by the EI as general metrics for measuring engagement rather than being conceptualised specifically as measuring the 'economic impact' of research.

The French ANR, by contrast, through the review it ordered of the EU Flagship programme, defines economic impact as "involvement and cooperation with business, knowledge transfer and intellectual property rights" as measured by "partnerships and contacts with industry, spin-off creation and survival rates, and patent analysis" (TAIPI, 2018: 8).

The EU's Horizon Europe (2021) defines economic impact similarly as the generation of innovation-based growth, creating more and better jobs, and leveraging investments in research and innovation (European Commission, 2021). However, no method is stated for how these economic impacts can be measured.

In general, 'economic impact' within social science funding regimes and impact assessments is construed as either the direct income which research projects attract from end-users and private sector partners, or various macroeconomic benefits such as lowering unemployment (many of which may be hard to attribute to research).

An exception is the idea of cost-savings, which Australia's EI was criticised for overlooking in a 2020-21 review of how its measures engagement. Cost savings can be quantified but doing so requires the application of non-market-based cost-benefit analysis techniques.

6.2 Non-market-based measurements of economic impact

Where economic impact is not realised in marketable products and services (including patents and commercial spin offs), measurement techniques must take their inspiration from welfare economics (Pigou, 1932). Such calculations are inspired by the idea of market failures and negative externalities where the full costs and benefits of products, services or goods are not fully expressed in market prices.

Techniques derived from welfare economics are appropriate for selecting and planning government expenditures where costs will not be directly recouped, if at all, except over very long time horizons. They are also used to assess the benefits of proposed projects against alternative options (examples include large infrastructure projects, public health investments, etc). Typically, this is achieved by cost-benefit analysis.

6.2.1 Cost-benefit analysis

To calculate the costs and benefits of planned expenditure, the HM Treasury Green Book (2022) guidance on the appraisal and evaluation of policies, programmes and projects stipulates that social Cost-Benefit Analysis (CBA) and social Cost-Effectiveness Analysis (CEA) should be used in the short-listing appraisal process.

CBA involves comparing costs to discounted benefits to estimate the Net Present Social Value of planned expenditure, defined as the "present value of benefits less the present value of costs" which provides a "measure of the overall impact of an option" (HM Treasury, 2022: 50).

Green Book guidance recognises that some economic 'benefits' are not monetisable or quantifiable. Nevertheless, quantification is encouraged, and the Green Book recommends non-market valuation through the construction of 'shadow prices'.

Techniques for constructing shadow prices include Green Book approved transferrable (generic) prices, revealed and stated preferences derived from survey responses, and subjective wellbeing approaches.

1. **Transferrable prices** are a standard set of prices prescribed by the Green Book which can be used 'off the shelf' for valuing the economic 'benefits' of expenditure.
2. **Revealed preference** techniques infer an implicit price attached to a public good by examining behaviour in a similar market.
3. **Stated preference** techniques look at individuals' willingness to pay to receive or avoid an outcome using professionally designed surveys.
4. **Wellbeing** estimations based on questionnaire responses can be used to estimate the relative prices of non-market goods.

Where none of these techniques is adequate for estimating shadow prices, the Green Book suggests enlisting professional economists to devise new techniques to assist in CBA (see section 6.3). This is necessary to measure the indirect economic impact of social science research which generally has no analogue in a 'similar market'.

Revealed and stated preference techniques are unlikely to be easily applicable as they assume individuals and/or communities are aware of research and its benefits. It is possible to imagine policy makers or other stakeholders being asked to estimate how much they would have paid, for example, to commission a particular piece of research they find useful. Yet given the very small number of respondents, it is uncertain how reliable the monetary figures provided would be – normally these techniques are applied over large sample sizes of respondents.

Areas where it is easier to calculate social science research inspired cost savings (using CBA), are instrumental forms of research in certain fields where there are well-established non-market-based measurements. This includes environmental policy, where transferrable prices and stated preference surveys have been used to construct common value metrics in water quality management, waste forest management, and oil spill litigation (Brouwer, 2000; Fourcade, 2011). In health policy, there are similar common metrics available such as Quality Adjusted Life Years which are ascribed monetary values and can be used in CBA and CEA (Whitehead and Ali, 2010).

There may be potential to make use of some of these metrics to calculate the economic impact of instrumental streams of funded social science research (see section 7.3).

6.2.2 Qualitative approaches

An alternative is to approach economic impact qualitatively. While not encouraged, HM Treasury's Green Book admits the possibility of certain forms of CBA where monetary figures cannot be placed on benefits. Vice versa, in REF impact case studies, economic figures are sometimes used to support the impact narrative, despite the overall framing being qualitative (Bandola-Gill and Smith, 2002).

Other qualitative approaches to economic impact are conceptual in nature. The Arts and Humanities Research Council (2009), in a report on 'The economic impact of UK arts and humanities research', offers a stylised, two-axis model of the relationship between economic capital and civic capital, and maintenance and growth. It is intended to demonstrate that while governments often associate economic impact with growth, equally important is preventing the deterioration of societal wealth and social capital. Based on this insight, the report proposes a counterfactual scenario where the UK did not have arts and humanities graduates educated by researchers in the field. It argues this would lead to economic pain.

Although having valuable insights to offer, qualitative approaches to economic impact are limited by their inability to attach monetary figures to the impact of research in a systematic manner.

6.3 Experimental approach

The boldest experimental attempt to quantify the economic 'impact' of social science in the UK is a study commissioned from Cambridge Econometrics for the London School of Economics Public Policy Group in 2012 (Cambridge Econometrics, 2012).

The report distinguishes the value added and jobs sustained by spending on social science research from the value of the benefits to users of research. The former is a well-established area of measurement and the report cites studies undertaken by Universities UK in 2002, 2006 and 2009 which use input-output accounting to calculate the total value added by spending on Universities (supplemented by a Keynesian 'multiplier effect') (see Kelly et al., 2009).

However, as the report notes, value calculations do not reveal 'return on investment' because they are neutral from the perspective of the whole economy (the same value would be created if government money was spent on other activities).

Instead, the focus of the report rests with calculating the monetary 'benefits' of social science research for its users. As the report notes, this is a difficult measurement as social science research does not usually result in goods that receive a market price. The report proposes that the value of social science research lies in the advice it provides to decision makers and practitioners in public policy and business. Most of the cost of this advice rests with the paying the salaries of research 'mediators' trained in social science needed to translate research findings into actionable insights.

Research mediators may provide advice as in-house staff, consultants, or think tank employees (among other specialists). Based on selection criteria that includes workers with a social science degree in occupations relevant to research mediation operating in industries in which research mediation is a significant activity, Cambridge Econometrics estimate there are 384,000 relevant workers. Using the Labour Force Survey data, they then estimate the 2011 wage bill for these workers as £14 billion (not including national insurance contribution, workplace pensions and other support costs).

In addition, Cambridge Econometrics measure the supply of research mediating services by consultancy firms. These are broken down into economic consultancy, management consultancy, and consultancy for central government. On the assumption that 30% of consultancy spending is on research mediation, they arrive at the estimate of £450 million. In total, including overheads, they estimate that £19.4 billion was spent on research mediation in 2010-11.

This is an ingenious, experimental approach to capturing the 'economic impact' of social science research. It nonetheless has serious limitations as a method for capturing the economic impact of specific research projects or a funder's portfolio of projects.

First, the measurement is economy-wide and does not differentiate between new social science research and the existing 'common stock' of social science research which is mediated by staff and consultancies. It is a rolling annual measurement of the economic value of social science research in the national economy.

Second, because of the limitations of the data, the estimation relies on some rough generalisations. For example, Cambridge Econometrics concedes there is no certain way to know which workers are involved in research mediation. Similarly, their estimate for the percentage of consultancy work involving research mediation is somewhat arbitrary.

6.4 Concluding remarks

The measurement of the economic impact of social science research remains a puzzle. Based on our survey of the state of the art in the measurement of economic impact, it may not at this time be possible for the ESRC to calculate in monetary terms the economic impact of its portfolio of funded research. Most existing methods are inappropriate, even for calculating costs savings, since they require shadow prices which are not available or plausibly constructible for capturing the effects of many types of social science research. Capturing the economic impact of the ESRC's portfolio may require targeted interventions focusing on types of research which are amenable to CBA (see section 7.3).

7. Policy and practice implications

This report finds continuity and change in the definition and conceptualisation of impact by funders of social science research. As impact frameworks have diffused throughout the international funding landscape, the definitions of UKRI, the UK REF, and the ARC put out into the world over 10 years ago are still the most common reference points in policy literature.

Similarly, there have been no definitive advances in the measurement of impact. Metrics are an appealing prospect for their promise to reduce the expense and resources needed to evaluate impact. But metrics that satisfactorily capture social (as opposed to scientific) impact across disciplines remain absent. Narrative accounts of the social impact of research are still the primary way that impact is communicated and evaluated.

Finally, the measurement of the economic impact of social science research remains a puzzle. While funders generally put much weight on the economic impact of research, we found no major innovations in techniques for measuring the economic impact of social science research. The most creative method remains a Cambridge Econometrics report for the London School of Economics Public Policy group written in 2012 (section 6.3). However, it provides a national estimate of the value of the common stock of research and is not appropriate for measuring the impact of specific projects or the economic impact of a research funder's portfolio.

Despite these continuities, there have been potentially significant incremental changes. The first lies with how impact is conceptualised in relation to knowledge exchange and engagement. A challenge to the linear model was already evident in the findings of the EU-funded SIAMPI project (2009-2013), which advocated the concept of 'productive interactions' and blurred the line between knowledge exchange and impact.

In the years since, the Dutch NWO, French ANR and Luxembourg's FNR have embraced an expanded definition of impact. This is not limited to the utilisation of research findings by stakeholders after the completion of project (outcome impact) but also includes the knowledge exchange, engagement and interactions occurring throughout the duration of a research project (process impact). We judge this as a potentially significant shift in the meaning of impact.

A second change lies with how impact is measured. Funders have started looking to measure 'process impact' rather than solely 'outcome impact' by designing indicators to measure engagement activities, such as ARC did with co-production. Some of these measurements have held up to review, sidestepping challenges associated with measuring outcome impact such as difficulties with broad application, attribution and timeframes. Experimentation with designing impact indicators continues alongside technological innovation and enhanced computing power that allows new ways of analysing larger amounts of data.

Drawing on these findings, this report's policy and practice implications are based on our judgement of the most promising developments in the international field as well as our own ideas about how to respond to persistent challenges of impact evaluation. These implications are grounded in the state-of-the-art of the international policy field, supported by arguments from the scholarly literature.

7.1 Foregrounding knowledge exchange and engagement

Knowledge exchange and engagement are universally recognised as important activities for disseminating research findings beyond the academic sphere. In impact frameworks such as those of UKRI focused on output impact, knowledge exchange and the various interactions and exchanges that happen during the research process are valued instrumentally insofar as they facilitate the generation of societal and economic benefits.

This approach is being challenged by funders such as the Dutch NWO, Luxembourg's FNR and the French ANR, who have adopted expanded definitions of impact which include not only the use of knowledge by stakeholders but also interactions between researchers and beneficiaries across the timeline of a research project (section 4.1). For these funders, impact includes "demand articulation" and "co-creation" in research design (NWO), "raising of scientific awareness" in the research process (FNR), "cooperation and collaboration" in the development of research and publication networks (ANR), and ensuring diversity when assembling research teams (FNR and ANR).

While it is necessary to recognise the dangers of politicisation in co-production models (as noted by the Swiss SNSF, section 4.3.1), ***policy makers might consider following the example of the NWO, ANR and FNR by defining impact more broadly in line with our definition of process impact (which includes the knowledge exchange, engagement and interactions occurring throughout the duration of a research project).***

This approach would allow knowledge exchange and engagement to be valued not simply as facilitators of impact but as impacts in themselves. Thus conceived, social science research would be relieved of some of the pressures associated with the linear process model of impact to demonstrate the direct societal change caused by research over the short term (section 2.2.1). An expanded definition of impact would align with a more realistic 'Enlightenment' (Weiss, 1977) view of social change as resulting from a slow diffusion of ideas across networks, involving multiple actors.

Furthermore, an expanded conception of impact could frame impact as a 'contribution' to the economy and society rather than as delivering instrumental 'benefits'. As discussed in section 2.2.3, the term 'benefits' is problematised by academic literature on 'Grimpacts'. Derrick et al. (2018) argue it is naïve to assume that all research impacts are necessarily positive and serve the public interest.

Another approach to consider, but which shares some of the same advantages of an expanded definition of impact, would be to follow the ARC by keeping definitions of knowledge exchange and impact distinct but weighting them as being of equal importance. This would have the benefit of not requiring a new definition of impact, thus avoiding a significant change in the term's meaning and side-stepping the need to communicate any such change efficaciously to the research community. Furthermore, ARC's methods of formally assessing "engagement" and "approach to impact" is in line with the recommendations by Boswell, Smith and Davies (2023) who argue for assigning more weight to the pathways, means and processes through which research is translated into impact. However, it should be noted that one possible disadvantage of this ARC-like approach is that the definition of impact would remain tied to the linear process model and evaluations would continue to require evidence of the 'exceptional' (Silvertsen and Meijier, 2020) changes brought about by research.

Alongside reassessing the definition of impact, ESRC should consider ways of reformatting application and assessment processes to reflect this new and broader understanding of impact. The ESRC already formally recognises the importance of engagement and knowledge exchange as tools or means for achieving impact. But the ESRC could go further by giving these activities more weight when considering and evaluating potential for impact (see toolkit). Further, in recognition of impact as a non-linear and emergent phenomenon, ESRC could build on existing structures to develop an overarching impact 'ecosystem' as a flexible and devolved system capable of identifying and supporting nascent impacts. For example, programmes such as Impact Acceleration Accounts (IAAs), which provide flexible and devolved funding to research organisations, can be seen as one foundation on which to focus and build in this support.

7.2 Making room for metrics

Metrics and indicators have proven controversial tools for evaluating research impact. This is partly due to their association with measuring the economic income generated by research projects or with measuring academic impact through journal impact factors or bibliometrics. While narrative case studies of impact, such as those produced for the UK's REF exercises, have been criticised for being extremely time-consuming and involving selective plotting of the evidence to satisfy bureaucratic expectations (Bandola-Gill and Smith, 2022), scholars nonetheless prefer narratives to metrics as they believe narratives can capture the heterogeneous and idiosyncratic ways in which social science research can make a difference (whether by influencing policymakers, organizations, communities or individual behaviour).

At the same time, narratives have clear limits for communicating the impact of a funding body's portfolio to government. Narratives require close reading and attention, and they cannot be easily aggregated or simplified. Metrics on the other hand hold the promise of reducing the heterogeneity of a funder's portfolio to a single number or set of numbers that can be tracked across time. Metrics are potentially better for communicating the impact and contributions of social science research to central government and legitimating their cost in the public eye.

We find a problem not with the use of metrics per se, but with the fact that funders have not yet discovered a robust suite of indicators for measuring social impact. Funding bodies such as ARC and ANR have attempted to sidestep this problem by allowing research projects to suggest their own indicators. This, however, invites heterogeneity which is in tension with the communicative appeal of metrics which lies in their potential for aggregation and simplification (see section 5.5). We therefore suggest not that policymakers consider following the approach adopted by specific funders but rather suggest that they could selectively draw on ideas and adjust them to suit the ESRC's purposes.

Policymakers might consider providing some scope for researchers to define their own impact metrics but also provide a toolkit of standard indicators and benchmarks to help maintain comparability and permit aggregation across the ESRC's portfolio of funded research.

Defining these metrics would be simpler if an expanded definition of impact was adopted or if knowledge exchange was equally weighted to impact (section 7.1). As the SIAMPI project argued persuasively, societal impacts are hard to measure due to time-lags and difficulties of attribution. 'Productive interactions' occurring throughout the timeline of a research project are more amenable to measurement and metrication as they lie within the strategic control of the research project.

If adopting the latter approach, some metrics which could be considered for inclusion in the toolkit include the number of doctoral students co-supervised with research users, the number of engagements and interactions with stakeholders in research dissemination events, and income contributed to projects from external organisations (other than the primary research funder). Such metrics would need to be used responsibly, in line with emerging international best practice.

7.3 Simplifying the puzzle of economic impact

'Economic impact' means different things to different funders and organizations. It is often construed as research which contributes to economic growth, reducing unemployment or other positive macroeconomic effects. Research funding and evaluation organizations frequently share these goals but understand 'economic impact' in a more 'micro' sense. This means they focus on the monetizable impacts that can be attributed to specific research projects and findings.

However, attaching monetary figures to the economic impact of social science research has proven challenging. Because social science research only rarely results in products that can be traded on markets, or other commercialisation processes, monetising the 'benefits' of social science research requires non-market-based valuation (section 6.2).

One promising approach lies with calculating the cost savings enabled by research, which involves cost-benefit analysis (CBA). Various techniques are available for putting a monetary figure on cost savings, including transfer pricing and stated and revealed preference surveys. Yet only a small number of the benefits of social science research can be assigned the shadow prices necessary for quantitative CBA.

One possibility to consider is that much social science research does not generate monetisable economic impacts. While social and economic impacts are entangled, most research projects in the social science, even when they contribute to public policy discussions, do so through reframing language, value choices and governmental priorities rather than seeking to promote cost savings.

For this reason, if the ESRC's goal is to capture the economic impact of its portfolio of funded research, **we suggest that policy makers consider identifying programmes and funding streams where common monetary metrics are available for calculating economic benefits and cost savings.**

There are no directly analogous models by other funders which can be emulated here. But the general idea would be to follow the approach of funders such as the European Research Council (ERC) who differentiate between 'blue skies' research in the pursuit of knowledge and instrumental funding schemes targeted towards specific social problems (including the supplementary 'Proof of Concept' funding stream for exploring the commercial and social potential of the findings of ERC-funded research).

Within an instrumental stream of research funding, there is a greater possibility to align impact evaluation with common monetary metrics for environmental and public health benefits, which would enable CBA. At the same time, it would relieve the broader portfolio of the expectation that it has a monetisable economic impact which can be calculated (which as noted is not possible with the tools available in the current state of the art).

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