Different worlds?

Finding complementarity between research and societal impact activities

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Table of Contents

Table of Contents

Abstract

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Keywords: 4-6 keywords go here.

1. Introduction

Many studies of the societal impact of research foreground universities' changing roles, often in the context of their funding conditions (Bornmann 2013; Hessels 2010; De Jong et al. 2016; Morris and Rip 2006; Blume & Spaapen 1988). A parallel claim emerges that this has challenged universities' accepted societal roles self-evident, introverted, self-accountable institutions, funded based on the general belief in science's usefulness, with more direct proof being demanded for their usefulness (Olssen and Peters 2005). That has necessitated universities justifying funding meeting societal needs, either directly in terms of economic growth or indirectly contributing more generally to societal well-being (Olssen and Peters 2005; Blume & Spaapen 1988; Gibbons 1998). This change is claimed to be problematic for universities and scientists, what Bozeman *et al.* have referred to as the 'dark side' of societal impact (Bozeman *et al.* 2013). Much research has focused on these demands' effects on universities as institutions or for strategic managers, whilst it is clear that these societal demands are creating uncertainties amongst academics and scientists too. In this paper, we therefore following the turn to practice in science studies (Soler et al, 2014) seek to create a framework for understanding the affects of impact on researchers and its consequences for research evaluation.

In the absence of a clear definition of what good societal impact is, researchers face uncertainty regarding the expectations they face regarding impact (De Jong et al. 2016). Researchers may both struggle with making their research relevant, as with finding compelling ways to explain their research's wider societal relevance to their stakeholders (Hessels 2010). In the social sciences and humanities (SSH), many researchers' fear this new societal mission's effects upon their own research's overall scientific quality (Cherney 2015; Cherney et al. 2011; Haynes et al. 2011; Chaharbaghi and Barry 2010; Collini 2009). We contend that impact in its current incarnation is fundamentally a policy concept driven by policy–makers' notions of impact (Donovan' 2017) as research driving to innovation, competitiveness and economic development in the context of the knowledge based economy (Alastalo *et al.* 2014). There is considerable dissatisfaction with the ways that policy frameworks steer some kinds of researchers (e.g. in social sciences and humanities) to articulate the value and impact of their research, sometimes culminating in an attempt to impose particular kinds of acceptable impacts (Benneworth *et al.*, 2017, Sivertsen 2018). Such steering frames the wider value of SSH research in ways that can lead to its subordination to other disciplines, or indeed its exclusion from funding eligibility (Maxwell & Benneworth, 2018). In this literature review we therefore seek to explore the issue of impact from two dimensions to understand how it functions in practice. We therefore ask three overarching questions

(a) why and how do academic researchers choose to engage with societal impact generation?

(b) what dilemmas and struggles do they experience within requirements of societal impact, and

(c) what methods do they use to deal with, accommodate or circumvent these struggles?

What this literature review reveals is that many researchers regard societal impact as "exogenous" to their valid ways of doing scientific research, even where impact is accepted as somehow being. Societal groups and institutions are considered as "outside audiences" whose values and needs differ from academic audiences (Haynes et al. 2011, 1050; Hakala and Ylijoki 2001; Ylijoki et al. 2011; Williams and Pierce 2016; Cherney et al. 2011, 10; Chaharbaghi and Barry 2010). Problems with societal engagement are framed as difficulties in "reaching out", "transferring to" or "translating" research results to the "outside world" (Ylijoki et al. 2011; Williams and Pierce 2016; Cherney et al. 2011; Capano and Verzichelli 2016, 214; Chapman et al. 2014; Haynes et al. 2011). This translation process requires additional time, efforts and skills from researchers and from their social surroundings to do this (Landry et al. 2010; Cherney 2015, 1014; Cherney et al. 2011; Chapman et al. 2014; Haynes et al. 2011). One determinant identified for why some researchers and fields engage more than others is explained by establishing 'complementarity' between excellent research and societal impact (Landry et al. 2010; Lam 2011; Cherney 2015; Boardman and Corley 2008; Haynes et al. 2011), and the embedding of impact creation within academic identities and definitions of research validity (Lam 2011; Hessels 2010).

2. Approach to the literature review

To address our three research questions we have used a literature review, separated into two phases, namely a (1) a review of literature on societal impact research in general as a means of background orientation, and (2) a focusing search and analysis of literature specifically on individual researcher's (dis)engagement with the notion of creating societal impact. The search for publications on societal impact was conducted using Web of Science with the keyword "societal impact". This first search revealed 576 items: following screening, removing publications unrelated to research's societal relevance, approximately 100 papers remained. Abstracts of these items were reviewed revealing several key facts regarding the importance of the individual level and orientation towards (engagement or disengagement in) societal impact activities. First, there is much literature and on measuring and evaluating the wider non-economic impact of research, SSH (Reale et al. 2017; Bornmann 2013). Second, some studies identify specific challenges and solutions that this wider approach requires, (De Jong et al. 2014; Benneworth & Jongbloed 2010; Olmos-Peñuela et al. 2014).

Thirdly, very few studies consider the researcher's orientation towards impact at the individual level and especially there is a lack of research in SSH and non-commercial settings. Much research on SSH impact is driven by the different kinds of impacts that are produced: popularisation (Peters 2013, Kreimer et al. 2011), business engagement (D'este et al. 2013), scientists' response to policy (De Jong et al. 2016), on popularisation, teaching and collaborations (Jensen et al. 2008), on collaborations (Cherney et al. 2011), on influence in politics (Capano and Verzichelli 2016). Conversely, there is relatively little research that considers how the production of impacts is related to different methods of knowledge production.

A second round of search introduced using additional keywords, reflecting the fact that societal impact is a relatively new term within literature[1] and focusing on this individual level: the selected keywords were "social relevance" (427 results), "societal relevance" (141 results), "research valorisation" (3 results), and "science-society interface" (19 results). Of c. 130 publications, 20 were selected as being most immediately relevant for the topic of researcher orientation towards impact generation. Studies about non-individual factors, measurement and evaluation and other aspects of societal impact were excluded, except where they offered possible interpretations of researcher context. These sources were then subjected to close reading to identify their main themes relating to researchers' potentially problematic experiences of engagement. This identified firstly the patterns of engagement by researchers, the hurdles they experienced in engagement, and the motivations and stimuli experienced for engagement. This idea of the "exogeneity of impact" emerged as a clear feature of the experience of impact generation, namely that impact is associated with non-academic values and practices (Chapter 3). The second step of this literature review was to identify the potential causes of that exogeneity, and to reflect more closely on the possibility of identifying characteristics that are associated with "endogeneity of impact", impact being associated with academic values and practices. We identified three such personal characteristics, namely personal circumstance, informal links and the wider institutional setting (Chapter 4). The third step involved further focusing on motivations associated with improving endogeneity of impact : we here identified drivers both outside but also within academic knowledge production communities (Chapter 5). That set of identified drivers forms the basis to answer the questions, which then structures the discussion in chapter is then provided in chapter 6 where we propose three stylised facts of finding complementarities between the academic and societal worlds across which researchers operate. We conclude by

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1   Choice of keywords was one of the big issues of the review. Term "impact" is relatively new, so additional keywords were included, but it still provides a lot of irrelevant results and possibly omits some relevant ones. It is especially an issue when cooperation with extra-academic institutions or publics is described in terms that are not in the discourse of societal impact within evaluation.

reflecting on our study's limitations, and propose some practical ways to use those drivers to build complementarity between academics and potential societal users.

3. The exogeneity of societal impact to research communities

The first theme emerging from the literature review was that individual researchers face substantive hurdles in delivering impact from their research. We here conceptually distinguish two kinds of barrier to impact. Firstly are barriers that arise out of some kind of idealistic opposition to the impositions that "impact" imposes upon academic choice and/ or freedom (3.1 below). Secondly are barriers that arise more opportunistically because of the time that engagement takes within a context of academic time scarcity, with impact creation being traded off by academics prioritising creating good research (3.1.2 below). More detail is provided below.

3.1 Idealistic tensions – problems of working with other worlds

What we here style as 'idealistic tensions' arise in encountering the attitudes that arise beyond the purely academic world, where other principles apply and these may be incompatible with academic beliefs (Haynes et al. 2011, 1050; Ylijoki et al. 2011; Williams and Pierce 2016; Cherney et al. 2011, 10). What academia prioritises, namely, publications of high-quality innovative research not always significant for business, policy-makers or general public (Haynes et al. 2011, 1050; Hessels 2010). Scientists prioritise excellence over relevance in research (Morris 2003, 363), although not in all fields (e.g, societal relevance in social sciences is important, Ylijoki et al. 2011, 728). Academic and societal fields may have different principles regarding how to create knowledge, and conflict between these different principles may impinge upon researchers' perception of research quality. These tensions manifest themselves as academics believing that engagement practices represents some kind of threat, challenge or barrier to doing what they regard as 'good' academic research, and even undermine their capacity to undertake 'good' research. We identify five domains where idealistic tensions exist between these different principles and values (see figure 1 below), with more detail provided below:

Figure 1 An overview of the main categories in idealistic tensions experienced by researchers in generating societal impact
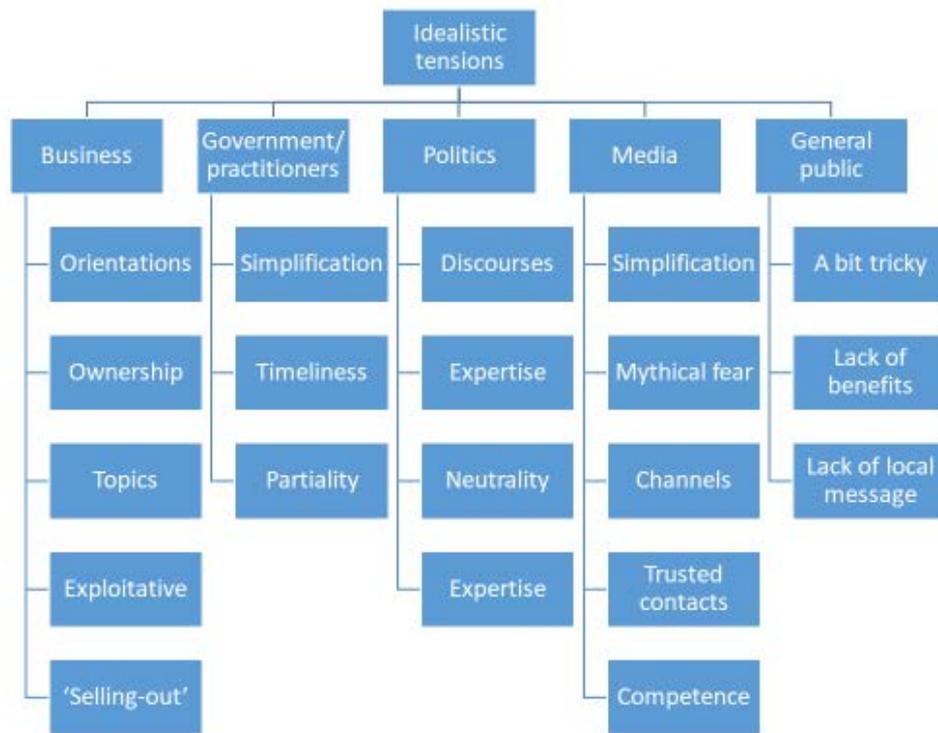
Source: authors' own design

3.1.1 Tensions of working with business

From the literature it was possible to identify five kinds of principled concern that researchers had when collaborating with business and industry. Firstly was a difference in orientation between researchers and users in knowledge creation processes, primarily related to the speed of activities, although to a lesser degree related to an overemphasis of application over discovery. This question of speed involved a contradiction between academics creating knowledge in a slow theoretical way as contrasted against firms that are focused on fast applicable research (Hakala and Ylijoki 2001, 377; Cherney et al. 2011, 10). Less important for researchers was a concern among researchers about a potential overemphasis on applied results, particularly in those research communities where there is already a close alignment of universities and industry researchers in national strategic research programmes (see for example the case of catalytic chemistry in Netherlands, Hessels 2010, 172).

Secondly were issues of the ownership of knowledge emerging, and a concern that working with businesses may limit the possibility for scientists to control results (D'este et al. 2013, 482), delay or inhibition of publishing results in scientific journals, because of commercial secrecy (Hakala and

Ylijoki 2001, 377; D'este et al. 2013, 482) or legal issues of contractual arrangements (Cherney et al. 2011, 10). Thirdly was a concern that working with business could potentially reduce freedom to focus on particular topics (Bozeman et al. 2013, 5) or defining the validity of research questions in purely economic terms (Chaharbaghi and Barry 2010, 92-93). The magnitude of these concerns varied according to field, status and experience: highly productive researchers were less sceptical about potentially negative influences on academic freedom compared with more junior researchers (Bozeman et al. 2013, 32).

Fourthly was a concern that the informal and collaborative relationships left research teams open to exploitative relationships with business partners, resulting from research being relatively labour intensive, often drawing on many author inputs, from academics, researchers, assistants and students (Bozeman et al. 2013, 34-36). Although students could benefit from business engagement, there were concerns that business engagement could be more exploitative than beneficial for students (Bozeman et al. 2013, 36). Finally was a concern that engaging with business and industry partners represented a 'selling out' and could reduce the overall recognition of their research's quality by their peers because of commercialisation's negative connotations (Bozeman et al. 2013, 31). One manifestation was a fear of being regarded as a 'researcher for hire', to demonstrate some desirable finding rather than create new knowledge, at odds with the notion that money should not be a primary motivation for scientists thereby raising suspicion more commercially oriented academics (Lam 2011, 1354).

3.1.2 Tensions of working within professional expert communities

The second area where there may be tensions in engagement is in the case of cooperation with governmental institutions and professional practitioners, which is much more usual in social sciences than cooperation with business. (Ylijoki et al. 2011) Some of the issues that arise in this sector are similar to those arising in collaboration with industry, but the main set of concerns originating in collaborating with actors in this domain are concerns with the issue of the use of knowledge. Chaharbaghi and Barry (2010, 81-82) highlight that whilst practitioners tend to use knowledge either instrumentally or symbolically, academics tend to use knowledge more conceptually. These differences in use behaviour thereby create a number of practical challenges for researchers, namely over simplification, timeliness and 'policy-based evidence making' (Torritti, 2010).

In terms of oversimplification, practitioners seek to simplify their activities in very specific and complex contexts, to find effective solutions for their problems, while academic researchers want to create deeper understanding around those problems, often resulting in further complications (Chaharbaghi and Barry 2010, 81-82). Regarding research timeliness, methodical and systematic

academic study requires lengthy time spells, while policy-makers demand fast applicable results and timeliness (Cherney et al. 2011, 10). There may be concerns that knowledge will be used for legitimation or manipulation, what Chaharbaghi and Barry describe as „Policy led evidence making as opposed to evidence led policy making" (2010, 82).

3.1.3 Tensions of contributing to politics and public debate

Although informing politics may be regarded as seen as a self-evidently important task for an academic (Haynes et al. 2011, 1050; Chapman et al. 2014, 264; Capano and Verzichelli 2016; Williams and Pierce 2016), three main concerns emerged regarding these kinds of engagement's effects. Firstly were the presence of different discourses, what Williams & Pierce (2016, 223) called the "intrinsic incommensurability of scholarly and everyday political discourses" (Haynes et al. 2011, 1051; Capano and Verzichelli 2016, 214). Everyday politics discourse make use of ambiguity of meanings, while scientific discourse relies on precision and clarification. (Williams and Pierce 2016, 225). Secondly, political debate is about opinions and value judgements, and scientific research does not generate certainty about these opinions and value-judgements, and indeed this can make can make academics in these fields reluctant to engage for fear of being criticised for going beyond their remit (Capano and Verzichelli 2016, 214).

Likewise, advocacy in policy threatening academic independence and this might be not so much of a question of value-neutrality, but of choosing sides independently (Chaharbaghi and Barry 2010, 83-85). Finally is the issue of neutrality, and the concern that political advocacy may threaten scientific integrity because of rhetorical issues and possible bias. (Haynes et al. 2011, 1050; although at least in public health approx. half of scientists disagree with that). Italian political sciences have a strong rhetoric of neutrality used to legitimise their position as science which simultaneously undermines their collective capacity to effectively influence politics (Capano and Verzichelli 2016, 229). Critical theories express concern about limiting research to political goals, thereby constrained topics whilst discouraging critical thinking and questioning of status quo. (Williams and Pierce 2016, 224).

3.1.4   Tensions of working with the media

For scientists who want to reach a substantial audience with their message then media engagement is a good way, but brings with it a number of trade-offs and conflicts that may generate distrust (Chapman et al. 2014, 262; Haynes et al. 2011, 1050). Firstly, media messages are often simplified, framed, biased, sometimes going so far as to misinterpret or misrepresent research findings, thereby undermining the neutrality principle (Chapman et al. 2014; Haynes et al. 2011, 1052; Capano and Verzichelli 2016, 229). In SSH, and particularly arts and humanities, researchers are

usually talking-head experts who opines on their field of knowledge, rather than relating more neutral 'discovery stories' of science and technology. Secondly, there may be a sense that media researchers are seeking attention via media engagement to compensate for inadequacies in their academic performance, even if research undermines that preconception (Chapman et al. 2014, 262; Haynes et al. 2011, 1052; Jensen et al. 2008). Two other objections relate to the practicalities of media communications. A lack of good relationships and contacts with journalists undermines the necessary trust that has to exist for media communications to avoid damaging those individual researchers (Chapman et al. 2014, 262). Likewise media engagement requires specific abilities, establishing connections with trustworthy journalists, selecting acceptable channels, formulating a message into a ready-to-use, simple and strongly opinionated form (Chapman et al. 2014; Haynes et al. 2011, 1050). These skills are not part of traditional academic training undermining scientists' lacking confidence in their media communications abilities (Chapman et al. 2014, 262).

3.1.5 Tensions of working with the General public

The general public as an audience attracts the least attention from most fields (Ylijoki et al. 2011), partly for reasons similar to other audiences (notably impartiality and simplification), but arguably the most important reason is that publics have few direct resources to spend on research (Ylijoki et al. 2011, 735). Whilst public engagement might be considered 'valuable', public engagement activities can rarely cover their costs (Hakala and Ylijoki 2001, 378), placing pressure on existing funding sources (Hakala and Ylijoki 2001, 378). Hakala and Ylijoki (2001, 367) identify problems of locality – it is often hard to frame public-oriented research as being excellent because of *locality* and *language*: in science there is a requirement to orient to international audience (publish results in English) whilst public audiences require results in local language for accessibility. Generally speaking, the norms of academic research norms (methodical, systematic, more theory oriented, international, detailed and complicated, neutral and critical) may conflict with the interests of outside audiences seeking knowledge that is applied, locally oriented, opinionated and easy to understand.

3.2 Opportunistic tensions and limited resources

A second set of tensions arise for primarily opportunistic reasons related to the fact that science is always done in a scarce environment with resources being limited, and so trade-offs are continually being made in in which less urgent priorities are not pursued. Societal engagement can be an important element of some kinds of research, but for other kinds of research where this is not necessarily the case, then it may involve a lot of additional work that does not necessarily serve individuals primary goals (Landry et al. 2010, 1390; Cherney 2015, 1014; Hakala and Ylijoki 2001, 377; De Jong et al. 2016, 9). Cherney et al. (2011, 8) mentions difficulties that arise in coordinating work between partners or delays because of contractual arrangements. A range of engagement activities

require additional time such as establishing relationships for collaborations, research translation, dissemination, communication with media or public (Cherney 2015, 1014; Cherney et al. 2011). Researchers doing research on internationally significant topics may not fit with the interests or priorities of local partners, and indeed something as prosaic as the difference between academic lingua franca and local language may create inadvertent and time consuming barriers to engagement (Hakala and Ylijoki 2001, 367). This decision of time allocation for societal impact activities depends a lot on career prospects. (Cherney et al. 2011, 8) Academic reward systems are primarily oriented towards scientific publications and do not recognize dissemination activities or practical outputs (Cherney et al. 2011, 8; Cherney 2015, 1013; Morris and Rip 2006; Haynes et al. 2011, 1054; Hessels 2010, 7; De Jong et al. 2016, 8). For researchers seeking scientific careers, they must dedicate time for scientific outputs, particularly junior researchers in the beginning of their careers (Ylijoki et al. 2011, 723).

Our point in making this distinction is not that these represent two significant categories for understanding SSH research social impact, but rather that there is a dynamic between these two categories. There are a range of issues that make it harder for academics to engage with different kinds of external communities, or at least to start to engage with these communities in terms of their knowledge practices. And the effect of all of these barriers and hurdles is that because engagement is not something that is intrinsically important to them, when they are forced with these hard choices, then there is a general tendency not to choose to pursue engagement, even if that initial effort would lead to engagement being later regarded as something that is worthwhile to do. We contend that this suggests that whilst scientists have an **ends-driven rationality for research**, they have **means-driven rationality for engagement**. The solution to the issue of increasing engagement therefore should consider this issue of *how does engagement become intrinsically important to academics' activities*, so that it is essential rather than elective.

4 Engagement as intrinsically important to academics activities

4.1 Patterns of engaging into societal impact activities

Although there may be a popular perception that academics prefer to remain in ivory towers rather than real-world engagement, the practices of studying of real-world phenomena demand that academics are naturally engaged in their environments. (Shapin 2012) Research shows that many scientists do care about their research's relevance and engage in dissemination activities, knowledge transfer, collaborating with various external organisations (Jensen et al. 2008; Ylijoki et al. 2011, 730; Capano and Verzichelli 2016, 225; Haynes et al. 2011). As Jensen et al. (2008) stress from research in France: "even in the institution hosting the most fundamental sciences, roughly half of the scientists

are in close contact with society, i.e. popularize or look for funding outside the academic sphere." (Jensen et al. 2008, 16). There are various axes that engagement may vary along, reflecting differences between fields, between SSH and non-SSH, but also within SSH, for example in arts research in which practice and research are often indistinguishable (Hazelkorn 2014). Institutional settings also matter, in particular the kinds of formal institutional support that is given as well as the informal engagement cultures within different kinds of institution (Olmos-Penuela et al., 2016; Bozeman et al. 2013). Finally, there are differences that reflect individual differences, whether more personal in nature (age, gender) but also seniority and position (Jensen et al. 2008; Bozeman et al. 2013). Societal relevance is usually more important in social sciences and humanities than natural and technological sciences. Ylijoki et al. (2011, 728) reports that societal relevance when choosing the topic is important for 37 % (in natural sciences) to 72 % (in social sciences) of research departments' heads in Finland. SSH scientists are involved more into popularisation activities, than non-SSH (Ylijoki et al. 2011, 731; Jensen et al. 2008, 4). Also in social sciences almost half or researchers consider practical professionals of the field as important audience (Ylijoki et al. 2011, 730). But SSH are less involved into industrial collaboration (Ylijoki et al. 2011; Jensen et al. 2008, 4).

Institutional settings, department's strategies and context also matter. Structure and organization of research unit affects the volume collaborations (Boardman and Corley 2008; Bozeman et al. 2013, 24) and there are evidence that size of the institution matters – smaller ones tend to collaborate more than larger ones (Bozeman et al. 2013, 22). In certain departments or research organisations collaboration or popularisation activities might be more stressed than in others (Haynes et al. 2011, 1051; Morris, 2003, 367; Hessels 2010, 186). There also seems to be a tendency to collaborate with industry more locally, that is, to have a preference for nearby institutions or researchers (Bozeman et al. 2013, 21).

Differences are also found according to a researcher's status with senior academics participate more in dissemination, entrepreneurship and collaboration activities than junior academics (Jensen et al. 2008, 13; Ylijoki et al. 2011, 723; Bozeman et al. 2013, 27). There are social and cognitive hierarchies in relation to impact (Jensen et al. 2008, 13), because it can be explained by

- work divisions – junior staff do mundane work while professors disseminate (Jensen et al. 2008, 13),
- career path – younger researchers are in need to be active in academic research and publishing (Ylijoki et al. 2011, 723),
- confidence in your own expertise and symbolic capital – senior academics are more known to mass media and have more contacts to be involved in various activities (Jensen et al. 2008, 13), and
- prior experience with collaborations and favourable attitudes towards it (Bozeman et al. 2013, 27).

4.2 Motives and stimuli for engagement

The presence of these structural barriers and pressures on academics to prioritise other activities raises the question of why academics choose to engage (or not) to engage with societal partners. Many of the kinds of the explanations offered tend to be totalising (talking about academic communities, institutions and policies at the aggregate scale) without reflecting the individual differences observed above. There are two kinds of explanations made for these academic choices (a) individual motivations for academic research and (b) individual position within wider academic structures. Individual motivations can be classified into four main areas (and individual academics may certainly have multiple motivations for academic work):

1)   personal satisfaction (intrinsic motivations), whether curiosity, duty or enjoyment. The first derives from an interest in problem-solving driven by curiosity (Hessels 2010, 12; the concept of „puzzle" in the terms of Lam 2011). Secondly might be a desire to make a contribution to society („informing the public", Jensen et al. 2008, 16; Hessels 2010, 12; Cherney et al. 2011, 25). Thirdly is the finding interacting with outside audiences enjoyable (Jensen et al. 2008, 16).

2)   financial incentives and rewards (extrinsic compensation) is where researchers are motivated to do things that bring various kinds of financial rewards, such as (a) research funding, particularly external funding given declining core budgets (Ylijoki et al 2011; Hakala and Ylijoki 2001) and/or when societal impact is one of the funding criteria (Hessels 2010, 12); (b) deriving personal profit via commercialisation (Lam 2011) or (c) securing funds underwriting research facilities graduate students (Bozeman et al. 2013, 26);

3)   providing access to resources and benefits (extrinsic instrumental) – creating impact may bring with it additional resources and benefits ranging from new insights for research, data access, contacts and networks, visibility, and ultimately enhanced career prospects (Jensen et al. 2008, 13; Bozeman et al. 2013, 23; Cherney et al. 2011, 25);

4)   scientific recognition (extrinsic outward) – undertaking research with societal impact might be evaluated scientifically as being important and thereby enhance the scientific reputation of the scientist concerned, what Lam calls 'ribbon', reflective of the idea of winning a medal (Hessels 2010, 185-186; Lam 2011).

Although this classification is neat, it is important to note that these different categories also have an internal interrelation, derived from a key characteristic of the academic community. Scientists are not driven in any great measure by financial rewards but rather primarily by a desire for recognition in parallel with interest in the topic (Lam 2011; Hessels 2010, 71). In practice the strongest motivation is to undertake research, whilst other elements involve securing the necessary resources necessary to implement that research and thereby address interesting questions (Hessels 2010, 167).

Financial considerations therefore also function as a signal of reputation, and can assist in providing necessary resources to do interesting and recognised research (Lam 2011; Hessels 2010, 12). Impact in that sense plays an important role in what Latour & Woolgar term the credibility cycle of researchers: to participate in science, one does research; to undertake research funding is required; winning funding requires recognition and reputation; acquiring reputation requires publishing results; producing results requires doing research (cited in Hessels 2010). But there is a risk here of instrumentalising engagement as something unimportant, a means to an end (excellent research) despite the fact that engagement may be an intrinsic and inseparable element of an individual's research practices. It is important to avoid conceptually separating engagement and research practices, because in reality many academics and researchers engage with various societal stakeholders as a routine part of their research (Hessels 2010; Sivertsen 2018). Talking of 'impact' as separate from research risks functioning as a discursive practice that positions impact as something exogenous to research activities (even if the partners are outside the academy) The idea of impact runs the risk of making that seem exogenous, underpinned by a whole set of discursive practices that contribute to this exogeneity.

But engagement also comes from endogenous considerations, that serve the 'end' of doing good research within a coherent scientific community (Ylijoki et al, 2011), even despite the increasing importance of relevance requirements. (Morris and Rip 2006; Morris 2003), and there are two conditions where engagement can be endogenous to the scientific process. Firstly, there may be scientific communities that regard engagement in societal impact activities as important for doing good research or indicative of good research. Secondly, it might be a necessary condition (*sine non qua*) for undertaking that scientific work, in order to access the contexts of application where knowledge can also be created. We therefore contend that the problems of engagement that arise when researchers are forced to deal with 'other worlds' may be resolved when that engagement tale place under conditions endogenous to the scientific effort (rather than exogenous), an issue to which we now turn.

4.3 Endogenous integral academic impact by building complementarity

If there was in a structural problem with societal engagement by academics then we would expect that researchers would not engage in societal impact activities at all or that engaged academic would be less successful in academic activities. But there are many societally engaged scientists, and indeed those who perform well in societal engagement activities are not necessary worse in academic performance: there is no connection between academic excellence and business engagement within a field (D'este et al. 2013). Furthermore, there is a positive connection between being active in

academic publishing and engaging into popularisation, industrial collaboration and teaching (Jensen et al. 2008; Bozeman et al. 2013, 31).

Therefore, rather than considering these as separate worlds into which crossing demands a trade-off and sacrifice of academic success, academic and society can following Landry *et al.* (2010) be considered as **complementary** worlds, and engagement with societal partners may potentially <u>under the right circumstances</u> enrich and increase the scope of the scientific endeavour (Landry et al. 2010, 1389). The mechanisms by which this might potentially take place are relatively clear. Societal collaboration provides topics and data which in turn creates research opportunities for results than can published in scientific journals (Hessels 2010, 172), in turn inspiring new engagement activities (and incidentally also teaching) (Landry et al. 2010). The key issue here is a constructive coupling between these complementary worlds that permits this complementarity to be exploited, and we here identified three factors that affect constructive coupling, (a) personal identity and efforts, (b) informal links and networks, and (c) institutional settings (Landry et al. 2010, 1397; Hessels 2010; Jensen et al. 2008, 13; Ylijoki et al. 2011).

Firstly, certain kinds of academic identity and role self-identification explains much of the engagement: engaged academics are typically active and passionate individuals who make efforts to transcend the barriers to engage with non-academic audiences as well as academic audiences . (Jensen et al. 2008, 13). Some studies identify an additional role expressed within the science self-perception, not just of traditional scientist, but of a 'translator' or 'entrepreneur' (Haynes et al. 2011, 1049; Lam 2011). Both these roles frame engagement as a good thing, and frame the role as being of an individual capable of solving the problems that engagement brings. Some possible individual strategies involve responding to policy opportunities, consulting with stakeholders, putting efforts in understanding the needs of users and adapting reporting strategies, finding ways of communicating with media, being ready for collaborations and keeping relationships with people in other institutions (Cherney et al. 2011; Haynes et al. 2011; Chapman et al. 2014). These strategies may also be used more opportunistically (to secure resources) by more traditional scientists who find themselves with what Lam terms a "mixed identity" (Lam 2011; Morris 2003). In some cases sustaining „pure" disciplinary identities may be one motivation underlying choices to not engage externally (Capano and Verzichelli 2016). One resolution involved those with multiple professional identities also taking multiple positions within and beyond academic, using those positions collectively to combine scientific research with practical outcomes. In some cases this kind of position – as an intermediary – may be even established institutionally (for example, knowledge transfer partners, Gertner *et al.* 2011; knowledge brokers, Pennell et al. 2013, knowledge and innovation transfer agents, Bullock et al. 2016).

Secondly, participation within informal networks – established relationships between academics and external audiences – may help crossing the 'gap' and develop these complementarities (De Jong et al. 2014; Spaapen and van Droge 2011; Olmos-Penuela et al. 2014; Cherney 2015, 1007). Complementary networks may exist with:

- policy-makers – conversations with them may far more influential than simple reporting (Haynes et al. 2011, 1052),
- journalists – to be asked to provide information and ensure information quality (Chapman et al. 2013, 268),
- industry partners – work in common projects is better with those, who you trust. (Cherney 2015, 1007)
- civil society organisations – they provide an audience to discuss ideas with you that they are interested in.

Trust is important for successful collaborations, for ensuring that contractual arrangements will be honoured, that results will be used in a consistent manner, that certain tasks can be delegated to partners; some of these networks may have the appearance of long-lasting, friendship-based relationships. There is also a self-reinforcing effect from participating in these societal impact activities in increasing researchers' reputation in this area in general (Cherney et al. 2011, 25).

Thirdly, certain institutional settings may help researchers to engage into societal impact activities. For example, research centres bringing together researchers from various institutions together, encourage researchers to collaborate within interdisciplinary environment (Boardman and Corley 2008). Interdisciplinary collaborations also benefit from more easily inviting external participation, and that can function to position individuals within engagement networks and also to provide engagement experiences (Boardman and Corley 2008; Klein 2010). Some departments or research organisations intentionally maintain collaborations with government, NGOs, industrial partners or other stakeholders and orient their strategies towards policy objectives or needs of other users, encouraging scientists to take on research that is relevant (Haynes et al. 2011, 1051; Morris 2003, 367; Hessels 2010, 186). These collaborations might be more informal, for example, collaborations of scientists within mixed research groups mixing more "traditional" researchers together with more "translational" researchers (Haynes et al. 2011, 1050). Some studies also highlight the importance of institutions not inadvertently inhibit networking possibilities, such as overloading staff with core activities leaving engagement as additional unpaid work (Cherney 2015, 1014; Castro-Martinez et al. 2010, 24; Kelly et al, 2018).

5. Scientific community and complementarity in practice

These differences lead to considerations about what might make engagement *endogenous-integral* rather than *exogenous-external* to scientific work. We here specifically consider the practices and activities that could be promoted to encourage academics to make engagement and impact complementary within their research. We note that scientists' primary motivations relate to a **mix** of scientific recognition and doing interesting work, and that these attributes are bestowed at least in part from within the scientific community. Thus for scientists to be intrinsically motivated to engage with societal impact activities, their scientific community will in some way signal approval that activity either by providing recognition and/ or possibilities to do engaged scientific work.

5.1 External motivations for academic impact

Studies on the societal impact of research often present engagement as being exogenous with the scientific community being forced into engaging into societal impact in order to access funding, with researchers in turn facing a "struggle" (Hessels 2010), and forced to adopt strategies of "coping", "managing" or "compromising" (Morris 2003; Morris and Rip 2006). These strategies might potentially threaten scientists in their credibility cycles, between demonstrating societal engagement to win funding and delivering scientific excellence to prove their scientific credentials, unless field-specific internal conditions facilitate that (Hessels 2010). Scientists have various strategies to deal with those contradictions, particularly those situated in positive institutional settings, with norms that engagement is not perceived as compliance, but as adaptive behaviour (Morris 2003) Under such circumstances, engagement is one of a range of criteria demonstrated for research legitimacy, in which science and the scientific community remain important, but also the diversity of funding sources and research activities, and building synergies between these research activities also legitimates this idea of good science, thereby balancing between their scientific interests and funders' interests (Morris 2003; Morris and Rip 2006). Engaged researchers do not lose their identity as independent scientists, nor leave their traditional communities, but rather incorporate some external elements in their scientific practices (Morris 2003).

If societal impact is required to get funding, and funding is the main antecedent for research, the necessity of delivering impact to acquire funding will lead to an association (via a survivor bias) engagement practices with good academic research practices. Morris (2003) notes additionally that funding decisions often evaluate engagement quality by scientific peers, so which allows scientists to avoid strictness of engagement requirements. Morris and Rip states: "for the majority of scientists the concern was, and is, less about the principle and more about the degree to which the link between research and benefit might need to be direct and demonstrable." (2006, 258) A similar conclusion is

expressed by De Jong et al. (2016) – usually scientists are more than willing to engage into societal impact activities, but either do not externalise it as a separate activity or do not know how to demonstrate it convincingly within research evaluation frameworks. Part of the issue here is that scientists do not resist generating impact, but rather resist the top-down imposition of particular kinds of impact. This suggests one issue may be 'policy alienation' – psychological disconnection with imposed policy, because of the importance of autonomy to scientists in their work (Morris 2003). Engagement may thus associated with powerlessness (not being in control of one's own work conditions and principles) and meaninglessness (not believing one's own work goals) (Tummers 2012).

5.2 Internal motivations for societal engagement

In some cases societal impact may integral to good research, allowing it evolve to be an internal criteria of the scientific community, not regarded as a barrier to academic autonomy. In some cases, scientific research is so integrated with practice that engagement generates rewards both in scientific and external communities (Ylijoki et al. 2011). As Bozeman et al. (2013, 26) states, sometimes fundamental research is indistinguishable from applied research: "Applied studies can contribute to fundamental knowledge and that fundamental studies can be somewhat applied in nature." So these different kinds of knowledge might contribute to each other and this would mean that for some scientists engaging into societal impact activities contribute to their scientific output and improve their academic careers. Hessels cites the example of catalytic chemistry researchers in the Netherlands deriving topics and data from industrial collaborations: their scientific publications are based on this 'applied' research, with industrial researchers also visiting scientific conferences (Hessels 2010, 172).

There may be cases were engagement in societal impact activities does not generate formal scientific recognition (such as being in conflict with publication requirements) but nevertheless the scientific community do appreciate and encourage engagement. As mentioned above, many scientists care about their research's societal impact (Jensen et al. 2008; Ylijoki et al. 2011, 730; Capano and Verzichelli 2016, 225; Haynes et al. 2011). The social sciences can be characterised as divergent disciplines (or fragmented adhocracies, De Jong et al. 2014, 10), with divergence in topics, few researchers engaged with each topic, less competition and low citation density. Under these conditions, societal engagement may emerge as a valid indicator of excellence alongside others in both formal (external) and informal (internal) evaluations (Hessels 2010, 185-186). Some scientific communities already value societal impact, with researchers' scientific careers already well-integrated with societal engagement (although the conditions under which this happens in practice are not widely understood).

6 Discussion: the key stylised facts of the Research Impact dilemma'

From our analysis, we would highlight two main key points emerging. The first relates to the nature of the problem regarding the intractability of creating impact from research at the level of the community as a whole. Our review suggests that it is produced by an intertwining of principled decisions regarding the opposition to working with external communities with opportunistic decisions related to the opportunity costs imposed by working with external communities under conditions of resource scarcity. Barriers to engagement come about because of a vicious dynamic between these issues that creates a barrier to activation. That barrier discourages new academics from learning the skills associated with engagement, from building the networks, and learning how to reap the potential benefits (as well as bear the costs) of that engagement. This is reinforced by emphasis placed on engagement framing it as a means to an end (the end being real research) allowing those who do not wish to engage to regard it as being mere desirable (elective) rather than potentially essential within research critical.

Stylised fact 1: the creation of impact from research emerges in a system in which engagement is (unfairly) regarded as a means to good research rather than a quality of good research.

But our review also suggests a condition under which this problem is addressed, by academics who are successful at creating impact associated with their own excellent research practices, thereby making it an end rather than simply a means within their scientific communities. The threat to research autonomy that engagement poses can only reasonably be understood as a threat if engagement is only a means to good research; if engagement becomes an end (a quality of good research) then academics retain the autonomy to make the evaluation between themselves about whether the engagement has been well balanced with the other facets of 'good' research. Under such circumstances, engagement must not come 'at all costs', rather that academic peers are empowered to take engagement visibly into account in exercising their academic judgements regarding research quality.   At a micro-level, this emerges from academics who perceive complementarity between scientific and societal partners as a (potential) condition for the creation of good research. At the meso-level scale of the science governance system this translates in a tendency over time to encourage and validate more kinds of research in which there has been demonstrable societal engagement.

Stylised fact 2: treating research engagement as a quality of good research requires developing a value framework allowing comparison with other 'qualities' of good research

This raises the question of how these scientific communities then adjudge whether a particular engagement is reasonable in that overall calculus of scientific values. Many researchers believe that societal impact is important and despite difficulties, pursue it. Whilst there are communities and institutions oriented exclusively towards pure science, regarding societal impact only as an external requirement for funding, there are also communities, where application of results to societal problems, research collaborations, communication with practical professionals and more general public are essential part of scientific work. This principled decision in trade-offs between scientific work and engagement in turn highlights that this distinction is a part of the academic identity and so improving engagement requires changing academic identities, and in particular, ensuring that identities are equipped to perceive complementarity between good research practices and engaged research practices. Changing these value systems means simultaneously addressing these various issues, configuring academic motivations to combine the two, resulting in an emergence over time of engagement as a normal part of academic practice.

Stylised fact 3: increasing research impact involves creating new academic identities that reflects the values of knowledge production communities where engagement is essential

On the basis of these stylised facts, we conceive of a number of policy recommendations on ways in which the science system could be modified in order to encourage the creation of increased research impact. This issue of academic identity suggests (following Knorr-Cetina's observation that academics are heavily path-impregnated, 1981) attention for the academic formation process, and particularly in the stage of the Ph.D. process, to ensure that academics-in-the-making are exposed to engagement processes in which they learn to judge engagement as good research. One element of this is in situating Ph.D. researchers in projects where they are involved in societal engagement as part of the overall research process, but because of the academic autonomy requirement, that is not necessarily applicable to all researchers.

Funding schemes that reward academic engagement as being academically valuable are one way to encourage this – we see for example in the UK the Arts & Humanities Research Council New Generation Thinkers scheme created a competition which rewarded excellent and innovative humanities scholars with their own radio programme. These schemes are resource-intensive and selective and therefore coordinate efforts, but other schemes to place academics into the networks by which they can undertake engagement are also possible, thereby building a kind of cognitive proximity to these external networks, and facilitating accessing them when it would be justified. Again in terms of media engagement, the Netherlands Organisation for Scientific Research (NWO) Bessensap scheme seeks to bring all of its funded Ph.D. students (including in SSH) into contact with journalists to reduce

the sense of distance that might be experienced. Additional measures could include establishing support systems within universities or research centers: possibilities for networking, skills' improvement within communication with media, intermediary positions for outside communication and management of collaborations, financial support for dissemination activities. Again we reiterate that there should be particular attention for junior researchers, not just because they have the greatest structural limitations, connected to managing their career within scientific community but also because without shifting the trajectory of these junior researchers then scientific governance networks will not evolve towards more engaged and impactful norms and identities.

A final element relating to the policy implications relates to stylised fact 3, namely that academics need themselves to retain judgemental autonomy over impact, and to regularly be called upon to judge whether the engagements and impacts have been good. It is relatively common to assert that it is therefore necessary to include activities, outputs and outcomes in terms of impact generation into academics' evaluation and career assessments. We would contend that to do this effectively what is necessary is to get beyond standardised quantifiable outcomes according to standardised definitions, but rather to return to a 'peer review' approach where academics propose how their research has created impact and themselves mobilise claims regarding this. This necessitates developing self-reporting systems and qualitative data frameworks, with standardisation being allowed so that it is not left to individual academics to make full justifications of all their impacts, to avoid a focus on "extraordinary impact" (Sivertsen 2018) requiring researchers to "be friends with Prime Ministers" (Benneworth *et al.,* 2016).

7 Concluding discussion

It is at the same time necessary to be slightly cautious in our contributions and recommendations, reflecting the limitations of a literature review which will inevitably be partial in their scope, omitting some alternative insights on researchers' position within societal impact requirements (or absence of them). For the purposes of this research, there were two main shortcomings in our research that were particularly germane for the study. Firstly, the restriction to English language led to the omission of certain national contexts, particularly those where there is not an extensive literature about scientific impact in English. Secondly, the use of Web of Science and Scopus for the searchers reduced the extent that books were covered only weakly in research, and because books provide an (admittedly falling but still) significant outlet for SSH research, this may also lead to lacuna in the overall coverage.

A second limitation in this whole debate is that the societal impact discourse is driven by natural and technological fields and is often based upon a relatively limited understanding of how societal

impact is reached in SSH communities. Because of the concentration on non-SSH fields, there is overemphasis on collaboration with business, innovation, commercialisation, which leads to economical and quantitative definitions of societal value. While in SSH fields engagement with stakeholders from governmental sector is much more common and popularisation activities for general public are more important. It is even more limited, when considering, that collaborations in SSH tend to be informal, that is, not registered in any formal document and harder to capture in research (Castro-Martinez et al. 2010, 23). Because of all those reasons, collaboration with "public", which might be important for SSH fields, tends to be viewed through the STEM lens and regarded as a kind of downstream public communications of science rather than genuine dialogue. This leads to biased image of societal impact generation and possibly reinforces this view of the separation of worlds, because in public understanding of science there is a clear separation of worlds between the scientific speaker and the vernacular audience.

This at the same time raises a number of avenues for future research, not least to understand the extent to which understandings of SSH impact remain excessively framed by these STEM-derived conceptions. There are a lack of studies, especially of a more qualitative nature, on individual level of SSH fields. They can be distinguished from non-SSH fields by their divergent nature, soft knowledge, communication with general publics and care for societal relevance in general. It would be interesting to understand if and how strongly societal impact aspects are internalised in research to SSH communities and if they are why that is then seen as being associated with exogenous practices. There is also a need for better understanding the differences within SSH disciplines in terms of the ways that engagement is judged as a characteristic or quality of good practice. Following our conclusions, it would be especially valuable to study the issues of academic identity and the ways that academics value engagement practices and perceive their scientific validity in terms of undertaking 'good' research.

As a final coda to the paper, we would note that much of the research about scientist societal engagement tends to concentrate on impressive success stories, what Sivertsen (2018) calls 'extraordinary engagement'. Whilst Sivertsen calls for more understanding of ordinary engagement, we argue that it is also necessary to understand unsuccessful engagement, examples of where there has been engagement but it has not worked effectively. We contended that the tensions of engagement can be resolved but we also need to understand the conditions under which it is scientifically problematic, as hinted at by Collini's evocation of the hypothetic medieval historian who abandons serious study to write a best-selling text book. There is a need to navigate between these heroic engagers and those who walk away to better understand the middle ground, to understand the role of failure and failed engagement in SSH impact.

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