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From Deliberation to Production: Public Participation in Science and Technology Policies of the European Commission (1998–2019)

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Abstract This article investigates how a discourse about the role and value of public participation in science, technology, and innovation emerged and evolved in the research policies of the European Commission. At the beginning of the twenty-first century, two main discourses have been successively institutionalized: the first focused on participation *in policy-making*, while the second aimed at participation *in the production of knowledge and innovation*. This paper distinguishes three main institutional phases: (i) a phase dedicated to public participation in the governance of science and technology (2000–2010); (ii) a reframing period of science and technology policies by the Commission to integrate the growing emphasis on innovation (2010–2014); (iii) a period focusing on co-creation and citizen science as new ways to involve the public in science and technology (2014-today). Factors such as individual commitments of key policy actors, specific epistemic communities and institutional dynamics within the Commission played a crucial role in shaping the policies of participation. But broader factors are also essential to account for these changes. In this respect, the economic crisis of the late 2000s appears fundamental to understanding how the conception and promotion of public participation in the European science and technology policies have evolved over time. This paper thus offers new insights to the analysis of the political economy of public participation.

Keywords Public participation · European Commission · Research and innovation · Open innovation · Citizen science

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Introduction

The participation of different publics in science and technology-related issues is a key theme in Science and Technology Studies (STS). Multiple scholars in STS have shown that lay people can meaningfully engage in discussions and deliberations about science and technology (Irwin and Wynne 1996) and contribute to making democracies stronger by contributing to civic debates about controversial issues resulting from scientific and technological developments (Callon et al. 2009).

In policy circles, public participation (often under the heading of "public dialogue" or "public engagement") has been conceived as a powerful remedy to the perceived decreasing legitimacy of governing institutions since the 1990s resulting from techno-scientific controversies such as the "mad cow disease," the dioxin affair, and genetically modified organisms. Public participation was often understood by public authorities, at the national and European levels, as a way to reduce opposition to technological change by achieving a broad social consensus (Irwin 2006). Political authorities progressively acknowledged the need for reform in governing science and technology by including various participatory mechanisms, resulting in what STS scholars have described as a "participatory turn" (Jasanoff 2003). In Europe in particular, these reforms have led to the creation of new *deliberative* forums on science and technology-related issues, involving and engaging stakeholders as well as members of the wider public (Grove-White et al. 2000), in line with the more general turn towards participatory mechanisms in European institutions (Saurugger 2010).

Research on participation in science and technology has mainly focused on these deliberative kinds of public participation, stressing connections between the forms of these participatory arrangements, the issues that are discussed, and the publics that are constructed through participatory procedures (Irwin 2001; Wynne 2006; Lezaun and Soneryd 2007; Marres 2007; Chilvers and Longhurst 2016). Part of the literature also reflect critically on the role played by scholars in the humanities and the social sciences as experts in constructing and promoting participation in science and technology policies (Felt 2010; Fisher 2011; Joly 2015; Aguiton 2018).

However, other forms of public participation are also emerging, around concepts such as "creative economy," "open collaborative innovation," "open science," "living labs" or "citizen science" (Chilvers and Kearnes 2016; Lezaun et al. 2016). Although attached to different disciplines and produced in different contexts, all these concepts invoke participation not as a deliberative process, but also as a productive one, geared towards the production of innovation, technology, and scientific knowledge.

As some authors have argued, the literature lacks empirical analysis of the actual processes through which policies of public participation are crafted as well as of the broader political contexts which give these practices their meanings (Felt and Fochler 2010; Joly 2015; Delvenne and Macq 2019). Burgess and Chilvers (2006) point to the "fundamental influence of the wider context of science and technology governance, whether it be institutional, political, cultural, scientific, environmental, and so on, in (…) shaping engagement processes." Tyfield (2012)

also criticized the STS literature for its lack of attention to the political and economic context of science, innovation and public participation – echoing a similar point by Thorpe (2010) about the missing analysis of the "political dimension of science policy." In line with this research agenda, the second main aim of this paper is to provide insights about the political economy of public participation in science and technology by unpacking the institutional arrangements that produce different policy discourses.

Our study is based on the science and technology policies of the European Commission (EC). The emergence of a policy discourse about the value of public participation in general has been particularly striking at the European Union level since the beginning of the 1990s. At that time, the participation of "civil society" in decision-making processes came to be viewed as increasingly necessary (Saurugger 2010) for the good "governance" of European institutions. This new discourse also emerged in the domain of science and technology policy, leading to the production and promotion of various participatory mechanisms (Felt and Wynne 2007; Felt 2010; Anichini and de Cheveigné 2012). By the early 2000s, a number of participatory experiments, which took place in different member states, were systematized at the level of the European Union (Abels 2007). Specifically, the EC was the first and main institution at the EU level engaged in the promotion of participatory democracy, especially in the field of science and technology (Aldrin and Hubé 2016). It has been particularly creative in coining new labels to designate its participatory ideals, such as "Responsible Research and Innovation" (Tancoigne et al. *forthcoming*) or adopting others, such as "Science 2.0" or "Open Science" (EC 2015).

The existing literature offers many insights on the effects of EU policies towards public participation in science and technology,[1] but little on the emergence and evolution of the discourse itself. When it takes into account the historicity of participation (Ryan 2015), it remains narrowly focused on the science policy discourse itself, without broadening the perspective to other fields of policy that could explain its emergence and historical transformations (see, however, Felt 2010). In other words, this literature does not really "open the black box of the European Commission" (Edler et al. 2003), nor does it provide an in-depth analysis of the ways in which public participation in science has been put on the agenda of the EC and how it has evolved through time. Informed by an analysis both of the discourses and of the actors and institutions that produced them, we trace the emergence and evolution of the discourse on public participation in science and technology at the EC[2], and offer an interpretation of the processes that drove these changes.

[1] Initiatives aiming at including different publics in science and technology-related issues have been labeled in a number of different ways (e.g. public participation, public involvement, public dialogue, or public engagement). As our goal in this paper is to account for different forms of initiatives, including different publics in the pursuing of different goals, we deliberately choose to use '*public participation*' as a generic term which, conceived in a broad sense, allows to report for different types of *participations*. This decision is consistent with the proposition made by Chilvers and Kearnes (2016) to broaden our understanding of 'public participation' to account for other types of procedures than the 'traditional' deliberative ones.

[2] We chose to focus on the European Commission and its Directorate General for research as our objective is to analyze European policies. Other institutions, such as the European Research Council and the European Institute of Innovation and Technology have been left out of the analysis as they do not engage formally, as institutions, in the fabric of the European research and innovation policies.

Science and Technology Policies at the European Union Level

With the exception of the strategic EURATOM treaty of 1958, research and technology policy has been a relatively minor component of EU policies until the early 1980s (Guzzetti 1995). In a context of exacerbated competition with the United States after the end of the Cold War, the European Union's Research and Technological Development (RTD) policy became implemented by specific research programmes: the multiannual Framework Programmes for Research and Technological Development (FP). The first Framework Programme (FP1, 1984–1987) aimed at targeting and coordinating the efforts of the European scientific community through a dedicated budget and various funding tools. This budget kept increasing over time, from FP1 to FP7 (2007–2013) and H2020 (2014-today): starting at 1.3B€/year (FP1), it reached 10B€/year for H2020, which, corrected for inflation, amounts to a 700% increase in budget. The Framework Programme then became the main research policy tool of the EC.

Within the Commission, the Directorate-General for Research (and Innovation, after 2010) has been in charge of the drafting of the Framework Programmes. The Directorate-General for Research and Innovation (DG RI), like the other DGs, is headed by a director-general and divided into units directed by heads of units. These heads of units constitute the organizational backbone of the Commission and represent the main locus where the policies are crafted. The person acting as a head of unit usually possesses most policy expertise and articulates the policies of the units with the larger policy objectives of the EU (Bauer 2008). The fact that the Framework Programmes have to be renegotiated between the EC, Member States (through the Council), and the Parliament every five years generates rich discourses where the objectives and implementation of research policies are debated and often redefined. Furthermore, every year, within the Framework Programmes, new Work Programmes (WPs) are being defined, which operationalize the general policies of the Framework Programmes. These discourses offer a rich material to analyze the emergence of the issue of public participation in science and technology and its transformations over time.

The research presented in this paper is based on a wide range of sources: documents of the Framework Programmes from FP5 (1998–2002) to H2020 (2014–2020) and their Specific Programmes and Work Programmes dedicated to science and society issues, expert reports from the dedicated FP6 Science and Society (SaS) and FP7 Science in Society (SiS) Programmes, descriptions of the 65,908 research projects funded by the EC from 1999 to June 2017 through the Framework Programmes, organizational charts of the administrative apparatus of the EC since 2003, and a set of semi-structured interviews with nine former Heads of Units and key policy officers of the Directorate-General for Research and Innovation (April 2015 and May 2016). The coding and lexical analysis methods of the documents are presented in Box 1.

Policies about participation in science and technology underwent three main phases. The initial phase is characterized by the development of a discourse on participation framed as *deliberation* for science and technology policymaking

(2000–2010). The second phase is a transitional phase, integrating the growing emphasis on *innovation* (2010–2014). The third sees the emergence of a discourse on participation in *production* of knowledge and innovation (2014-today).

This article combines an analysis of internal and contextual factors to explain these discursive shifts. Institutional entrepreneurs, epistemic communities and a crisis of legitimacy are key factors explaining the emergence of the first discourse. Hierarchical dynamics within the institutions, as well as the economic crisis, are essential factors explaining the emergence of the second discourse.

Box 1 Making sense of the strategic documents and projects through hypothesis coding and lexical analysis

The literature identifies four distinct dimensions of public participation in science and technology: the *what* (what issues are the objects of participation), the *who* (identity of the involved publics), the *how* (procedural formats), and the *why* (reasons motivating participation) of participation (Fiorino 1989; Marres 2007; Stirling 2008; Felt and Fochler 2010; Chilvers and Longhurst 2016). These four dimensions were used to carry out hypothesis coding (Saldaña 2012) on the EC strategic R&D policy documents and the experts' reports, in order to analyze the emergence of the issue of public participation in science and technology and its transformations over time. Hypothesis coding is the application of a researcher-generated, predetermined list onto qualitative data to assess a researcher-generated hypothesis. Here we looked how the *what*, the *who*, the *how* and the *why* of public participation were framed in those documents. Two distinct discourses on public participation emerge from this analysis: public participation as *deliberation* and public participation as *production*.

A lexical extraction[a] performed on the "objectives" field of the research projects funded within the Science and Society (SaS), Science in Society (SiS) and Science with and for Society (SwafS) programmes (n = 420) also revealed two groups of terms related to public participation: 1/ a group of terms referring to deliberative public engagement in policy making ('democratic debate,' 'dialogue,' 'consultation,' 'deliberative process'); 2/ a group of terms referring to participation in research and innovation making ('user innovation,' 'user-innovation,' 'participatory research,' 'participatory innovation,' 'citizen science,' 'co-creation'). We expanded this coding to all the "objectives" field of the research projects funded by the EC from 1999 to 2017 through FP5, FP6, FP7 and H2020.

[a]We used the software Cortext Manager (https://managerv2.cortext.net/)

Public Participation as Deliberation

Until the late 1990s, none of the FPs mentioned "public participation" in science and technology. The general public was not the intended audience of these programmes, which focused mainly on the benefits of science for the economy through knowledge transfer towards the private sector (European Economic Community 1987). It was in the FP4 (1994–1998) that "the public" entered the discourse on research policy, but not yet as an active "participant," only as "passive" citizens in need of education. As the EU put it in 1994, "The latest developments in the Community […] indicate an increasing need for public understanding of science and for strengthening the interface between science, research and society" (European Community 1994). This vision was implemented in the 5th FP (1998–2002) which included a programme devoted to helping the public better understand science and technology. This educational goal mainly aimed at building support for science and research. As the authors of the FP5 put it: "it will be important to improve the image of science and research in society with the objective of creating a favorable environment for research and technological development" (EC 1999). The EC mainly conceived the public as scientifically uneducated, lacking information and knowledge on science and technology, a vision that has been described as the "deficit model" (Irwin 2014).

The emergence of a discourse promoting public participation coincides with the arrival, in 1999, of the Belgian physicist Philippe Busquin as the new Commissioner for Research. In an interview with a journalist of *Nature*, he emphasized that "his political vision is community-based" by pointing to his personal biography (Dickson 1999). As a follow up to his postgraduate research in the 1970s – on the impact of industry on local communities – he created "a group made up of representatives from petrochemical companies, local authorities and local people" to discuss "the environmental impact of the companies' activities." It was under Busquin's impetus that the internal working paper *Science, Society and the Citizen in Europe* (EC 2000) was produced within the Directorate-General for Research and opened the way to the institutionalization of public participation in science and technology policies at the EC. This document contained the first appearance of a discourse on "public participation" in science and technology policy. It called for the "involvement of representatives of civil society … particularly in defining the priorities of public-funded research" (p. 8) and for setting-up new forms of dialogue (such as citizens' juries, fora, and conferences) between the different actors involved in science and research, namely "researchers, experts, political decision-makers, industrialists and members of the public" (p. 16). Public participation was seen as necessary to address the public's "growing skepticism, even to the point of hostility," towards "advances in knowledge and technology" as well as the disappearance of an "unquestioning enthusiasm" for science and technology (p. 5). Unlike in the 1990s, it was no longer solely education that was envisioned as a remedy against "skepticism" or "hostility," but participation in decision-making. In the 1990s, several public controversies involving science, technology, and medicine (GMOs, "mad cow"

disease, contaminated blood, chicken dioxin, etc.) had received wide media attention. What was previously framed as the public's "ignorance" about science was now increasingly viewed as public "hostility" towards science and expertise, with participation emerging as a solution to deal with a "crisis of expertise" and trust in scientific institutions (Abels 2002; Ferretti 2007).

This "crisis of trust" (real or imagined) did not solely concern scientific expertise but also political institutions more generally. Philippe Busquin took office in a time of turmoil within the Commission: the Santer Commission had recently resigned following a deep conflict with the Parliament, and Busquin's predecessor Edith Cresson had been accused of nepotism. As a result of this institutional turmoil, the EC published in 2001 its *White Paper on European Governance*, which aimed at putting forward a roadmap for the future reforms of the European institutions. The White Paper affirmed that "participation" should be a key principle of "good governance," promoted in order to restore trust in institutions and to help solve the perceived legitimacy deficit of the EC (Sternberg 2013). In the previous decade, public participation had emerged as a political tool to deal with public opposition to policies, for example, in the field of development, where the World Bank became a champion of public participation (Bhatnagar and Williams 1992).

In the EU, these changes, both in discourse and in institutional structures, resulted from actions taken by a small number of individual policymakers, such as Busquin, in a general context of legitimacy deficit, where policymakers perceived public participation as a tool to restore trust in institutions. But they also owed to broader changes in research policies at the EU level. The Lisbon Agenda, published in 2000 in the aftermath of the unemployment crisis of the mid-90s (James 2012), placed research as a key means to sustain economic growth, through the making of a "Knowledge Society." Philippe Busquin remembers:

> I also found that in the European Commission, in the other directorates-general, research was absolutely not perceived as important for the economy […] The Lisbon summit in the spring of 2000 was a turning point. For the first time, heads of state have agreed to put research at the top of the European political agenda (Busquin and Louis 2005: 91–92).

In the Lisbon Agenda, the (economic) future of the EU was presented as lying in its ability to produce knowledge and innovation. This economic justification also served for the establishment of the European Research Area by Busquin in 2000. This new research and innovation policy was seen as a way to improving Europe's competitive position towards the United States and Japan (Ulnicane 2015), a concern that had been a major driving force of research policies at the national levels since the 1950s.

This agenda was directly taken up by the Science and Society Programme of the DG, and provided the rationale for the promotion of participation. As the authors of the *Science, Society and the Citizen in Europe* put it:

> The Lisbon objectives will be achieved only by an economy geared to innovation and a society fully committed to it. There is a need to develop an open

> mind to innovation, in full knowledge of the associated benefits and risks, and to create an open dialogue between researchers, industrialists, policy-makers, interest groups and the public as a whole (EC 2000).

The key point was the focus on the necessity of "a society fully committed" to innovation and of citizens possessing an "an open mind" (i.e. supportive) towards innovation. An "open dialogue," later reframed as "participation," became a means to achieve this goal.

This new focus on *public* participation and *deliberation* is reflected in the last FP5 Work Programme (EC 2001) in which a section dedicated to "dialogue with the public" presented a new objective: "To explore mechanisms for involving the public in science policy related debates in order to identify ways experience could be shared and generalized across Europe" (p. 32). The Work Programme listed such "experiences," such as deliberative polling, standing consultative panels, focus groups, or citizens' juries, carried out in other fields of public policy at the local and national levels. The same year, 2001, saw the birth of the Science and Society Directorate within the DG, composed of several units devoted to issues related to governance, ethics, gender equality, and raising awareness of young people about science. The creation of this directorate, rather than a subaltern "unit" or "programme," constituted a major step in the institutionalization of public participation at the EC.

The focus on deliberative participation was formalized in the first year of the 6th FP (2002–2006) with the launch of a Science and Society Programme and the publication of the *Science and Society Action Plan* (EC 2002). The Action Plan listed existing initiatives and proposed a number of actions to be developed, including organizing "local and regional dialogues on 'Science and Society'" and exchanging "best information […] on the use of participatory procedures."

This trend continued with the 7th FP (2007–2014), where the Science *and* Society Programme was renamed Science *in* Society. A stronger emphasis was put on how to implement the exchange between researchers, stakeholders, citizens, and, significantly, civil society organizations. This discourse was therefore accompanied by the creation of a number of new instruments (such as the Mobilisation and Mutual Learning Action plans) that were designed to meet the overall objective of civil society participation. The program grew into a key place for experimenting with new types of interactions between science and society. Learning was no longer envisioned solely as a transmission of knowledge from experts to citizens, but as a mutual learning experience.

The Science and Society Directorate, which elaborated these different programmes, comprised then up to 140 staff members and funded around 350 projects in this field between 2003 and 2013, of which almost one quarter were related to deliberative public participation in policymaking (Fig. 1).

To summarize, the first discourse on public participation in science and technology, which emerged with FP5 and became institutionalized with FP6 and FP7, focused on the inclusion of different publics in dialogues, debates, and deliberations as means for contributing to decision-making. Public participation was understood as a part of the policymaking processes, with the hope that by contributing to the definition of research policies, citizens would embrace the promises of science and

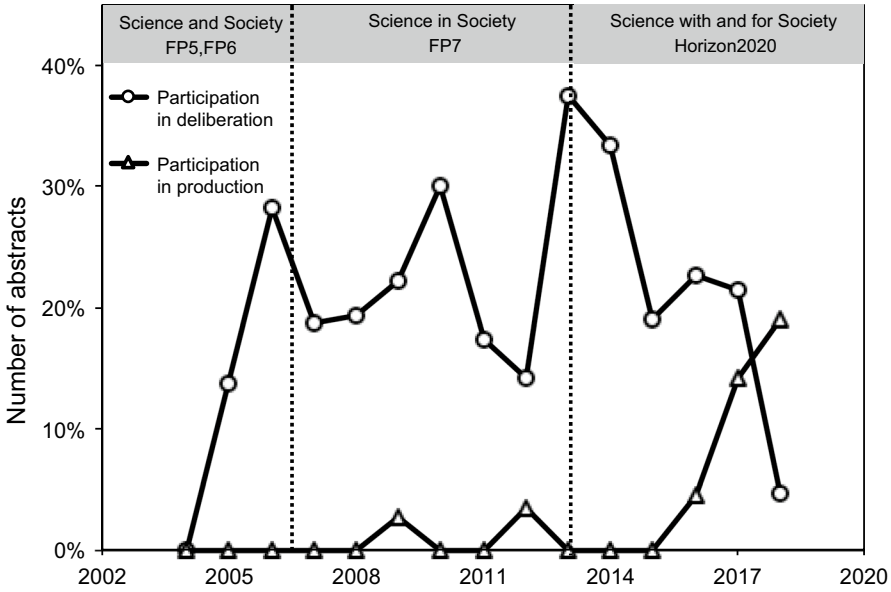

Fig. 1 Discursive changes on public participation as seen in the "objectives" field of the projects funded by the Framework Programmes Science in Society, Science and Society and Science with and for Society (n = 440)

technology. However, the "deficit model" persisted: participation was just another means to "educate" citizens (Irwin 2006). As a former head of one of the Unit of the Science and Society Directorate put it in an interview:

> Well, I observed that all the guys who are involved in science policy have a very positivist vision of science. They have what I call the 'old physicist' syndrome. (…) They say 'hey, how can we make young people like science?!' (…) I did not share that view and I elaborated a lot on the report of Brian Wynne (Policy Officer #1, interview, 27 April 2015).

The "report of Brian Wynne" refers to the 2007 report *Taking European Knowledge Society Seriously* (Felt and Wynne 2007), which was mandated by the Directorate General for Research on the topic of European science and governance. This report, published at the beginning of FP7 was produced by an expert group composed of influential STS scholars: Ulrike Felt, Brian Wynne, Michel Callon, Sheila Jasanoff, Pierre-Benoit Joly, Arie Rip and Andy Stirling. As the report explicitly mentioned, its authors took into consideration three main concerns, namely, the "widely-recognized problem of European public unease with science," the "European Union's commitment" to improve civil society's involvement in science and governance, and the need to "address urgent European policy challenges that are often taken as strongly scientific in nature – including climate change, sustainability, environment and development." The report presented a strongly critical perspective, considering that the sources of public concerns with certain technological advances lied in what it called "inadequacies in the governance of innovation itself" (Felt and

Wynne 2007: 11). It then criticized the institutional focus on deliberation only after innovation took place, as if the public was only interested in downstream questions. This approach, the authors concluded, marginalized "legitimate democratic concerns about the inputs that drive innovation research in the first place" (Felt and Wynne 2007: 11). The authors pleaded for the development of "upstream" public deliberation and for resolving profound normative questions concerning the shaping of science and innovation, including the direction, scale and speed of research. It also criticized the instrumentalist vision of science, limited to its contribution to economic growth, and the unreasonable expectation that scientific innovations alone could solve societal challenges.

According to a policy officer, that report "did not do a good job in terms of influencing [policy officers]" (Policy Officer #2, interview, 22 April 2016). However, its publication highlights the role played by STS scholars in the promotion of public participation within the DG Research (Felt 2010; Aguiton 2018). This report is just one example of several reports commissioned by policy officers of the DG Research in the second half of the 2000s (Stirling 2006; Felt and Wynne 2007; Pestre 2007; Mitcham and Stilgoe 2009; Siune and Markus 2009)[3]. Academic STS scholars embraced this mission to "democratize science" and were hoping that their scholarship would translate into public policies. Overwhelmingly, they recommended public participation as a means to "democratize science." As the STS scholar Andrew Stirling put it:

> [There is a] need for the public engagement community as a whole to concentrate considerably greater resources than has hitherto been the case on the raising of awareness – especially among senior policy makers. This means getting beyond haphazard interactions with individual decision makers – no matter how influential – and aiming for continuous long term structural engagement with policy making processes as a whole (Stirling 2006).

At the end of the 2000s, the discourse on public participation in policymaking, under various headings such as "public engagement," was institutionalized with the benediction of academics eager to impact policy. However, the subsequent funding of these initiatives did not always match the ambitions of academic scholars. Indeed, after the first phase, which saw the emergence of public participation in science policymaking, a second phase started around the end of the 2000s during which this discourse gradually evolved and some of its ambitions were scaled back.

Transition: Responsible Research and Innovation (RRI)

The emergence of the "Grand Challenges" rhetoric in EU research policies to designate specific problems like an ageing society, climate change, or the limits to natural resources, provided another rationale for the involvement of civil society in research policies. The idea of "Grand Challenges" integrated previous

[3] The two scholars mentioned in the introduction (Felt 2010; Ryan 2015) were either part of these expert groups (Ulrike Felt) or adopted their framing (Lorna Ryan).

commitments about the social function of science, the need for collaboration among multiple actors, and interdisciplinary perspectives, but changed the spatial outlook of these policies, which were now trans-national or global (Ulnicane 2016). The first use of the Grand Challenges term in EU research policy was in the 2007 *Green Paper on the European Research Area* (EC 2007a, b). The paper called for a broad public consultation in order to "discuss and specify the R&D orientations […] to address the major challenges that Europe faces in an open world." It specified that European research policy had to "experiment with new ways of involving [European] society at large in the definition, implementation and evaluation of research agendas" (EC 2007a, b). In line with ideas promoted within the Science in Society Programme, the idea was to share some of the traditional prerogatives of science policymakers with structured organizations (universities, businesses, CSOs, etc.), but also with "citizens." Not only was participation presented as a way to smoothen the relationship between science and society (something previously advocated), but it was also meant to create "a culture and spirit of innovation" (p. 17), inaugurating a growing emphasis on "innovation" in science and technology policy discourse.

"Innovation" became a particularly strong focus in European science and technology policy after the publication of the 2006 expert report *Creating an Innovative Europe* (Aho and Georghiou 2006). The authors of the report argued that "an R&D-driven strategy was insufficient" and that policies should foster "a culture celebrating innovation" (Edler and Georghiou 2007). The 2010 Europe 2020 Strategy (for "smart, sustainable and inclusive growth"), emphasized the role of innovation in reaching economic objectives (EC 2010).

The global financial crisis of 2008 goes a long way in explaining these changes. As José Manuel Barroso, then President of the EC, stated emphatically in the 2010 Commission's communication of *Europe 2020*:

> The crisis is a wake-up call, the moment where we recognize that "business as usual" would consign us to a gradual decline, to the second rank of the new global order. This is Europe's moment of truth. It is the time to be bold and ambitious (EC 2010).

The economic crisis reinforced previous approaches that considered research and innovation as the engines of growth and employment. As a policy officer reckons, it reoriented priorities away from the promotion of public participation as a way to democratize policymaking:

> I think [the economic crisis] gave another argument to those who were thinking 'we need research for the industry,' to solve jobs problems and to say that research and innovation are needed for tomorrow's jobs. And, it this perspective, the romanticized ideal of public participation have been set aside a little bit (Policy Officer #1, interview, 10 May 2016).

This instrumental vision of research did not emerge in 2008. In the deep economic crisis following World War II, scientific research had been frequently heralded as a driver of economic growth at the national level. Half a century later,

the EC resorted to the same argument, but this time with a growing focus on "innovation." The message was heard by the research community, as the proportion of successfully funded research projects containing the word "innovation" in their objectives increased threefold between 2008 and 2017 (from 6 to 18%) and twenty-fold in the different science-society programmes (from 3% to 64%) (Fig. 1). Although a rather banal justification for national science policies, this argument had a considerable effect on shaping the Framework Programmes. The idea of a European Research Area, which had become a political reality under Busquin in 2000, was now linked, at the highest policy level, to the promise of "innovation." In 2010, the Commission launched its flagship initiative *Innovation Union 2020* (EC 2011), which aimed to "unleash Europe's innovative capabilities" as well as to re-focus research and innovation policy on the "Grand Challenges" faced by European society.

In *Innovation Union 2020*, partnerships between "all key stakeholders" of the research process were valued in order to "provide platforms for open innovation and citizen engagement" (EC 2011). Firms were encouraged to "co-innovate with users and consumers in order to better satisfy their needs or create new routes to market" (p. 20). Citizens were considered as 'users' and 'consumers' who were invited to "co-innovate" with firms. Like in the first discourse on public participation, the rationale was to better align research to the need of society (or at least, the need of users and consumers). Yet, interestingly, another justification was also highlighted: the participation of users and consumers in the research process would facilitate the creation of products by easing the transition from research to market. According to Edler and Georghiou (2007), since the mid-2000s at the European Union level, "a new interest [had] emerged in the meaning of demand-side approaches to innovation and, more concretely, in the use of public demand as an engine for innovation." Participation was seen in this framework as a way to produce marketable innovations, to bring new topics for European research, and to align research on the needs of European society.

In 2010, significant personal and institutional changes took place in the Commission. The Irish politician Máire Geoghegan-Quinn became Commissioner with a portfolio including research and science policy. She chose the Dutch civil servant Robert-Jan Smits to become Director-General of the DG for Research, after working under Busquin. Robert-Jan Smits had obtained a master's in international relations at the *Institut Universitaire de Hautes Etudes Internationales* in Geneva, at a time when the school distinguished itself from the nearby, but more liberal and participatory *Institut Universitaire d'Etudes du Développement*. He then pursued his training in international law at the Fletcher School of Law & Diplomacy at Tufts University. Although the position of DG is subordinate to the Commissioner, it held more influence on the content of research policy, the DG being, as a reporter for *Science* put it, the "most powerful civil servant in Brussels's science policy circles" (Rabesandratana 2018). Smits views about science and society were very different from those of Busquin. As a policy officer made clear:

> It has to be said that the Director-General does not like [science and society issues], this is why in 2010 he reduced all the services that were working on them. (…) His mindset is, above all, to get back to the good old face to face where research is the business of the academia and the industry. So to get back to this face to face without the complications brought by this third actor [civil society] (Policy Officer #1, interview, 10 May 2016).

Indeed, under the Director General Robert-Jan Smits, a profound restructuring of the DG took place in order to better integrate "innovation" in the programmes. Three months after his nomination, the DG was renamed DG for Research *Innovation* and Science. At the same time, the activities related to science and society were marginalized: the dedicated Science and Society Directorate was cut, the number of policy officers working on science-society issues was downsized to 40 staff members (down from 140) and regrouped in a unit named "Ethics and Gender" within the European Research Area Directorate: there was no longer a directorate or even a unit specifically dedicated to science-society issues. Finally, the Science in Society Programme was not renewed in the Commission's proposal for Horizon 2020 (Policy officer #4, interview, 11 May 2015).

It is in this context that the label of Responsible Research and Innovation (RRI) emerged in the EU.[4] The first public mention of RRI appeared in a 2012 document, *Responsible Research and Innovation. Europe's ability to respond to societal challenges* (Directorate-General for Research and Innovation 2012). In that document, Máire Geoghegan-Quinn, then European Commissioner for Research, Innovation and Science, placed the emergence of RRI in line with the Europe 2020 strategy:

> The grand societal challenges that lie before us will have a far better chance of being tackled if *all societal actors are fully engaged in the co-construction of innovative solutions, products and services*. Responsible Research and Innovation means that societal actors work together *during the whole research and innovation process* in order to better align both the process and its outcomes, with the values, needs and expectations of European society (Directorate-General for Research and Innovation 2012; our emphasis).

The term "co-construction" that sociologists of science and technology had elaborated and used so often by that time – although with different meanings – had been directly imported into policy discourses and associated with Responsible Research and Innovation. However, in its implementation, the concept of co-construction, was not deployed as scholars who understood "co-construction" as a redistribution of power between experts and non-experts (Callon) or as the "co-production" of epistemic norms and institutions (Jasanoff). Indeed, in the 8th Framework Programme (2014–2020), named Horizon 2020, the science-society relationship was still conceived in very traditional terms – predating "co-construction" ideals – since society was seen as having to support science and technology because the latter powerfully contributed to economic progress and to solving societal challenges.

[4] Although a first reference to "Responsible Research and Application of Science and Technology" can be found in the FP6 (European Community 2002).

The concept of Responsible Research and Innovation nevertheless played a significant role in the evolution of the Commission's science policy. The concept was elaborated by René von Schomberg, who held a PhD in Philosophy and STS, and had been working as policy officer in DG Research since 1998 (von Schomberg 2012). Conceived as part of a sort of survival strategy by the remaining members of the previous Directorate, the label "Responsible Research and Innovation" was coined to salvage the previous science-society activities in anticipation of the next Horizon 2020 Framework Programme. According to one of the officers involved:

> You have to remember that it all happened in a period of downsizing. (…) So, we had to refocus on our core objectives. (…) How was it possible to transform what we had learned in the Science-Society programmes in a more politically relevant action? (…) In a day-long brainstorming meeting gathering all the staff members, we happened to coin the expression RRI (Policy Officer #4, interview, 11 May 2015).

The six dimensions (or "keys") of RRI (public engagement, gender equality, science education, ethics, open access, governance) therefore mirror almost perfectly the previous work topics of the Units in charge of the FP6 Science and Society and FP7 Science in Society programmes. According to a policy officer, the label RRI was intended to be a strategic resource to raise the interest and enroll some members of the European Parliament during a workshop organized by the staff members in charge of the Science in Society programme between Autumn 2010 and Spring 2011 (Policy Officer #4, interview, 11 May 2015). After this workshop, the planned Horizon 2020 Framework Programme received numerous amendments that reintroduced a science-society programme, under the name Science with and for Society (SwafS). It became a dedicated "unit" – administratively more powerful than a "programme" – within the European Research Area Directorate and saw an increase in budget (though a decrease in relative terms): from 330M€ in FP7 (0.65% of the total R&D budget) to 462M€ (0.6% of the total R&D budget). The Science with and for Society's first Work Programme claimed that it would "be instrumental in addressing the European societal challenges tackled by Horizon 2020, building capacities and developing innovative ways of connecting science to society." It also highlighted how much it was part of the RRI ambitions: "This approach to research and innovation is termed Responsible Research and Innovation" (EC 2013). In other terms, RRI was not a radically new initiative, as it was often presented, but a powerful tool in recoding science-society topics as a key dimension of research and innovation processes. RRI allowed these topics to fit in the new orientations of research and innovation policies, salvaging what had been established in the previous period.

By developing the concept of RRI, policymakers brought the idea of innovation to bear on "Grand Challenges," bringing along notions of user-led innovation. Indeed, by the years 2010 a number of technological innovations, especially in the field of NTIC, made clear the benefits of involving users. These notions opened the door to the promotion, within the Science with and for Society Programme, of a new form of public participation focusing on the involvement of a public conceived as consumer and user of innovations, not as citizens concerned about the political implications of research policy. Both the financial crisis of 2008 and the involvement

of another epistemic community—economists and management experts focused on innovation, rather than STS scholars—contributed to these transformations in the reframing of public participation.

Public Participation as Production

The EU science and technology policies evolved once again when the civil engineer Carlos Moedas took office at the end of 2014 as the new Commissioner for Research, Innovation and Science. As STS scholar Arie Rip, chair of the Expert Advisory Group for the Science with and for Society Programme in 2014 and 2015, commented:

> When in 2015 the new Commissioner Carlos Moedas (for Research and Innovation) came in, he introduced his own approach, the three Os: Open innovation, Open science, Open to the world. One effect that is visible is that the Advisory Group SwafS/RRI has to take it into account, and is now asked to advise on a new fashionable concept, 'citizen science', which has diverging and somewhat contested interpretations (Rip 2016).

The expression "citizen science" had been coined independently in 1995 by sociologist Alan Irwin to refer to the involvement of citizens in deliberations about science and in 1996 by the ornithologist Rick Bonney to refer to data collection by citizens for scientific projects (Strasser et al. 2019). As an ambiguous expression, covering both ideas of participation adopted by the EC, it was perfectly suited to display the continuity and novelty in EU research and technology policies.

Carlos Moedas, seizing on the second meaning of citizen science, expressed this vision in a speech he gave in June 2015:

> On 25 April this year, an earthquake of magnitude 7.3 hit Nepal. To get real-time geographical information, the response teams used an online mapping tool called Open Street Map. (…) We are moving into a world of open innovation and user innovation. (…) A world where new knowledge is created through collaborations involving thousands of people from across the world and from all walks of life (Moedas 2015).

This speech, addressed to members of research and innovation organizations, was entitled "Open Innovation, Open Science, Open to the World" and focused on the "need to get research results to market" and include citizens in research and innovation. This new strategy moved the conception of public participation toward the direct involvement of the publics in the production of knowledge and innovation.

The fact that Moedas came up with a new strategy for his Research, Innovation and Science portfolio is not too surprising given the mandate he received from the President of the Commission Jean-Claude Juncker. In the very first paragraph of his mission letter to Moedas, Juncker emphasized the renewal he wanted his commission to incarnate:

> With the start of the new Commission, we have an exceptional opportunity, but also an obligation, to make a fresh start, to address the difficult geo-political situation, to strengthen economic recovery and to build a Europe that delivers jobs and growth for its citizens (Juncker 2014).

This quote also reveals something of the particular mindset of Juncker and his commissioners at the time: the economy was perceived to have not yet recovered from the 2008 financial crisis and policymakers had an obligation to find a way to continue the process of economic recovery.

In 2016, the EC published a new overall strategy for research and innovation: "Open Innovation, Open Science, Open to the World" (Directorate-General for Research and Innovation 2016). This strategy expressed the desire to "open up the innovation process *to all active players* so that the knowledge can circulate more freely and be transformed into products and services that create new markets, fostering a strong culture of entrepreneurship." The goals of the new research and innovation policy ("create new markets") and the idea of including "all active players" in innovation remained similar to previous policy documents. But the "active players" were increasingly cast, not just as users of products, but also as "citizens" (and "civil society organizations"). This strategy presented a mix of the two discourses we have outlined: citizens as participating in deliberative procedures (having "a say in what research is meaningful to them" and redirecting "research agendas towards issues of concern to citizens"), but also as a potential "source of innovative ideas" along the idea of co-creation endorsed by the EC. The idea that citizens could do more than voice their opinions in deliberative procedures took shape around the notion of "citizen science," understood as the participation of non-professional scientists in the production of scientific knowledge. For the EC, citizens were considered "valid producers of knowledge," because, "just as people offer spare rooms via AirBnB, why shouldn't they be allowed to offer spare brain power via citizen science?" (p. 34).

The traditional way of envisioning participation in decision-making and the new conception of public participation based on knowledge co-creation were expanded in the following two Work Programmes (WP 2017 and WP 2018). This new discourse had taken shape in the 2009 FP7 Work Programme (EC 2008), when civil society and civil society organizations were invited to participate in "research activities" (p. 6). By 2016, policymakers acknowledged that "citizen science is increasingly on the agenda" (Directorate-General for Research and Innovation 2016).

This evolution towards a new conception of public participation was recognized by the actors themselves. In the Horizon 2020 Science with and for Society Work Programme, a call for projects (2016–2017) stated:

> There is increasing interest, and occasional experiments in processes of co-construction (e.g. agenda-building and policy inputs, co-evaluation, co-funding) and co-production (e.g. citizen science). (…) While traditional approaches to public engagement will remain, this topic constitutes an opening towards the 'new wave' of public engagement where 'co-creation' is a key notion. It

> will provide innovative solutions to the more heavily technology and/or systems oriented approaches in other parts of Horizon2020 (EC 2016: 16).

The shift in discourse from the discursive to the productive did not remain at the level of the EC strategic documents; it also appeared, as one would expect, in the projects funded by the various science—society programmes (Fig. 1). Mentions of "deliberative public participation" rose rapidly after 2004, peaking at almost 40% of all funded projects under the Science in Society Programme (FP7), only to drop to less than 12% under Science with and for Society (Horizons 2020). After 2016, terms related to "public participation in research and innovation" surpassed those related to "deliberative public participation."[5] This observation does not imply that a profound change occurred in the concrete participatory practices developed through these projects, but it is a good indication that the changing policies of the EC impacted the way participation was conceived and promoted.

The introductory paragraph of the 2018–2020 Science with and for Society Work Programme foregrounded citizen science: "[Science with and for Society] will explore and support citizen science in a broad sense, encouraging citizens and other stakeholders to participate in all stages of R&I" (EC 2017). The Work Programme mostly defined the expected outcomes of citizen science in terms of the "Development of new knowledge and innovations by citizen scientists" (p. 37), while downgrading "Agenda setting" and "foresight," two essential parts of the "deliberative" model of public participation, as optional criteria for the contribution to implementing RRI (in this case through its 'public engagement' dimension) (p. 8).

The reactions of policy officers who worked for the previous science-society programmes to this new vision of participation was not always positive. Some believed that deliberative participation was more important than direct contribution to scientific research:

> Citizen Science, to me and to a lot of other people, it is essentially birds counting, which means that it is often importing data into science. (…) But it is rarely (…) asking citizens their thoughts on research agendas or on an approach of innovation. (…) So I was, and I am still afraid that I could be asked to work on birds' counting and to drop the rest, because to me it would be denaturing the work of Science and Society (Policy Officer #3, interview, 17 May 2016).

This last quote shows the potential gap that the policy officers saw between the deliberative form of public participation (promoted during the 2000s) and the productive one (since the years 2010s). Instead of a progression in the amount of power given to citizens in the research process, they saw it as a depoliticization of citizen engagement, now reduced to "bird counting."

Even though one can map interesting dynamics of these two kinds of discourses, it is important not to miss the bigger picture. A broader look at the entire set of projects funded by the Commission reveals that the discourse on public participation, in one form or the other, remained marginal among all the funded projects. No

[5] One has to keep in mind that at least 2 years occur between the drafting of a call and project launch.

more than 3.5% of the 65,488 projects funded *outside* the different science-society programmes (SaS, SiS or SwafS) mention terms related to public participation. Furthermore, this proportion has remained nearly constant over time, even showing a decrease since 2007. In other terms, the effort of policymakers (and STS scholars) to embed public participation in scientific research more broadly remained confined to the science-society programmes and did not spread beyond. And even though RRI was envisioned as a cross-cutting issue in Horizon 2020, it did not succeed in mainstreaming public participation activities in the funded projects. Yet, considering the progressive institutionalization of public participation in the wider context of the European research policies brings an additional nuance. Even if it remained marginal overall in research policy as well as among the funded projects, the notion of public participation did bring along significant institutional changes, including the creation of administrative units and programmes, the hiring of administrative staff, and the production of multiple internal and commissioned reports. Shifting from descriptive discourse analysis to a public policy analysis, we have begun to understand why the notions of public participation have changed over time.

The future of public participation in European science policy, in one form or the other, is far from certain. It even seems that the importance of public participation and other science-society issues is currently receding. Indeed, the expression "Responsible Research and Innovation" is mentioned in only one occasion in the Commission's proposal for the next Framework Programme, and no specific program is dedicated to pursue the aims of the Science with and for Society Programme (EC 2018). The potential disappearance of science-society issues in the next framework programme spurred reactions in different communities. An online petition launched in 2018 by the national correspondents of the Science with and for Society Programme denounced the lack of "a specific programme line or a sufficient budget dedicated to Science, Society and Citizens' activities" in the Commission's proposal for the new FP (SIS.net 2018). The petition called on the European Institutions to "set a separate programme in line with a sufficient separate budget for the successor of the 'Science with and for Society' programme." This call was echoed by a letter to *Science* signed by a list of researchers involved in the promotion of RRI through European funding in the past years (Mejlgaard et al. 2018). These petitions show that science-society issues were sufficiently institutionalized as to federate actors beyond DG Research around shared interests in maintaining specific dedicated programmes promoting them. Ultimately, this mobilization of interested actors makes visible the economy of public participation and science-society issues that has developed over time.

Conclusion: The Political Economy of Public Participation

To sum up, the "traditional approaches" and the "new wave" of public participation (in the actor's terms), or the "deliberative" and the "productive" (in our terms), differ analytically along the four dimensions we selected for our discourse analysis (Table 1).

Table 1 Characteristics of the two discourses of the European Commission on public participation in science and technology

	Participation in decision-making	Participation in knowledge and innovation-making
What	Decision (policymaking)	Knowledge and/or innovation
Who	Society, public (collective)	Citizens, users, consumers (individuals)
How	Dialogue (discussing)	Co-creation (producing)
Why	Generate legitimacy (trust)	Produce economic and societal value (commodities)

In this paper, we have presented, for analytical purpose, the evolution of one discourse to another as a linear process. Of course, reality is more complex. There have been overlaps between these two ideal-typical discourses and the frontiers between them were sometimes blurred. However, our analysis suggests that these ideal-typical discourses reflect a broader evolution in the way public participation has been conceived and promoted by the EC. In other words, even if particular projects, concepts and strategies have sometimes mixed the two outlined discourses, the rationales for public participation have globally evolved through time.

Simply noting that the rationales for public participation in science and technology have changed over time does not provide a satisfying explanation for why they evolved. Discourses are embedded in actors and institutions and understanding their own dynamics is essential. We explained the discursive changes in the ideas about participation at two levels: at the level of actors' dynamics within the institution and at the broader level of political, economic, and cultural factors impacting research and innovation policy.

First, the dynamics between different actors played a crucial role. Our analysis points to conflicts between different individual and collective actors that, over time, promoted different conception of public participation in science and technology. These conflicts and coalitions strongly influenced the way participation has been both originally conceived and promoted and, more recently, redefined to fit the position of newly appointed dominant actors. In this respect, Commissioner Philippe Busquin played a significant role as an "institutional entrepreneur," i.e. someone who acts to create, maintain, or weaken an institution (Lawrence et al. 2009). He succeeded in introducing public participation as one of the crucial dimensions of the relationship between science and society, thereby contributing to institutionalizing public participation in the EC's policies. But our study also shows the limits of high-ranking policymakers. When Robert-Jan Smits was Director-General of the DG for Research and Innovation, he planned to disband the Science in Society Programme, but lower level policy officers were able to salvage most of it by rebranding it as Responsible Research and Innovation.

Policy officers also accomplished significant institutional work when they promoted the deliberative vision of public participation within the DG. In their institutional work, they mobilized a number of STS scholars that contributed, by providing expertise, to support the claims of policy entrepreneurs. The influence of this epistemic community (Haas 1992; Meyer and Molyneux-Hodgson 2010), composed of scholars working on science governance, is characteristic of the 2000s, when there

were frequent interactions – and a progressive hybridization – between academic knowledge on science governance and normative political discourses. In this period, expert reports, research projects, conferences, and advisory groups contributed to the translation of STS concepts into the political sphere.

Second, the institutionalization of public participation, in its originally deliberative form, was partially due to events outside of the administration of the EC (Greenwood et al. 2002). Indeed, the different crises of the 1990s (sociotechnical crisis induced by the GMO and 'mad cow' scandals, as well as a broader crisis of legitimacy in the European institutions) favored the emergence of public participation in the agenda of the EC. More recently, the economic crisis of the 2000s, redirecting research policies toward innovation production, contributed to changing the conception of which kind of participation should be promoted and for what reason. As previous crises before it, the late 2000s economic crisis appears through our analysis as a key element to justify the evolution of public participation, as conceived and promoted by the EC over time. Our conclusion therefore focuses on the political economy of research and innovation and its impacts on public participation.

As shown through this paper, public participation is a polymorphic concept, which forces analysts to consider the multiple justifications that were invoked to promote it. Two discourses now coexist within the EU "Research and Innovation" policies. While public participation had initially been conceived and promoted as a way to build legitimacy of research policy decisions by involving publics into decision-making processes, it is now also promoted as a way to produce better/more knowledge and innovation by involving publics into knowledge and innovation-making processes, and thus building legitimacy for science and technology as a whole.

This changing conception of public participation is partially due to the actors' and institutional dynamics within the EC and its administration. However, if one is to understand the broader picture of what happened at the EC, one has to take into account the changing political-economic context of research and innovation policies as well.

Our results offer precious insights on the effects economic dynamics can have on public participation. Thorpe and Gregory, through the analysis of public engagement with science in the UK, previously showed the close interconnection of participatory discourse with the post-industrial economic strategy of the British state. Following their analysis, public engagement in science policy derived political legitimacy from being embedded in discourses of post-Fordism and the knowledge economy (Thorpe and Gregory 2010).

Our own analysis shows that the effect of the political-economic context is not restricted to the emergence of the first discourse on public participation; it was also instrumental in shaping its evolution. In other words, the economic dynamics after the 2008 financial crisis justified the shift from the original discourse of public participation centered on decision-making toward the inclusion of publics in innovation-making. The economic crisis made it almost impossible *not* to emphasize the imperative to innovate in European research and innovation policies. And it was this focus on innovation (conceived as the production of marketable products), combined to institutional changes (reduction of the number of staff members, potential disappearance of a dedicated science-society programme in Horizon 2020) that brought

the DG's staff members working on public participation to adapt their discourse and their conception of public participation to fit with this new imperative, giving rise to the emergence of RRI and, later, to a new wave of participatory processes aiming at involving publics directly to the production of science and innovation.

Taking into account the political economy of public participation in research and innovation policies allowed us to offer possible explanations as to why and how the latter was institutionalized at a given policy level. In the case of the EC, public participation always remained a marginal part of the EU research and innovation policies. Through its career in the institutions, it has been reframed so as to fit with the new powerful imperative of fostering innovation for the sake of economic growth, the resolution of the so-called "Grand Challenges," or the ideal of "Responsible Research and Innovation." The institutionalization of public participation at the EC and its evolution over time did not necessarily mark a significant commitment to upsetting the balance of power between citizens, on one side, and policymakers and scientific institutions, on the other. Discourses on participation reflected shifting views about citizens and their role in the governance of science and technology. Citizens now seem to be conceived as consumers and potential co-creators of science, technology, and innovation, rather than potential contributors to debates about how to govern them. Public participation in science has therefore proven to be a particularly flexible concept which could be adapted to various contexts in order to serve different goals. This observation warrants critical appraisal from STS scholars of the way the conception of participation is evolving, as well as of the way it might further evolve in the future.

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