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Implementing the transformative innovation policy in the European Union: how does transformative change occur in Member States?

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3 1 Title: Implementing the transformative innovation policy in the European Union: how does
4 2 transformative change occur in Member States?
5 3

6 4 Abstract. Despite the emerging theoretical **importance of the ‘transformative change’ approach,**
7 5 **relatively little is known** about how transition towards this approach is happening in different
8 6 European contexts, as well as the **institutional factors that** help explain possible different reform
9 7 trajectories. To fill this research gap, this article interprets the adoption **of the ‘transformative**
10 8 **change’** approach in Europe as a paradigmatic case of multi-level policy implementation in the
11 9 European Union. **Taking** advantage of an institutional approach drawing on path dependency,
12 10 **it considers how** transformative change is happening in two Member States (France and
13 11 Germany). **It does so by focusing on** the policy mix adopted **to address** grand challenges and
14 12 the type of governance mechanisms mainly **used to secure** legitimization and coordination.
15 13 Albeit within the same EU framework, this article shows a diverse development of the
16 14 innovation policies in the two Member States with the use of a different mix of policy
17 15 instruments in line with their traditional domestic institutional contexts. Institutional contexts
18 16 also filtered the early stages **of the responses to the COVID-19 crisis**. These results have
19 17 specific implications useful for policy makers and practitioners **in the** design and
20 18 implementation of regional innovation policies across different European contexts.
21 19

22 20 Keywords: Regional innovation policies; transformative change approach; EU multi-level
23 21 policy implementation; institutional approach; governance arrangements
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1. Introduction

The innovation policy literature has traditionally identified two frames as co-existing and dominant (Soete 2007). These frames arise from different historical contexts. Developed after the Second World War, the first frame focuses on innovation for growth because of the institutionalization of governments' support for research and development (henceforth 'R&D'). This emphasis on the role of state promotion was dropped during the 1980s in favor of the establishment of national systems of innovation for knowledge commercialization and creation. This second frame has recently been joined by the 'transformative change' one (Schot and Steinmuller 2018), which pushes for an alignment between innovation objectives and social and environmental challenges (Boon and Edler 2018; Kattel and Mazzucato 2018), such as climate change, pollution, poverty, reduction of inequality, etc. In this context, the use of public experiments and consultations is particularly important to ensure high degrees of reflexivity and learning in decision-making processes. Both the choice of policy mix to address new societal and environmental challenges (Borrás and Edquist 2013; Edler et al., 2016), and the governance solutions to ensure policy coordination (Braun 2008; Edquist 2019), are therefore particularly pertinent to this frame.

Despite its theoretical significance, few empirical studies have analyzed how the transition towards the 'transformative change approach' (henceforth 'TCA') is happening in different European contexts, as well as the domestic features that help explain possible different reform trajectories in implementing the transformative innovation policy in Europe. In the past decade the European Union (henceforth 'EU') has stressed the notion of a national innovation policy in a context of transformative change (see for example, European Commission 2018a; 2018b; 2018c; 2019). It represents in fact a paradigmatic case of multi-level policy implementation in the EU due to the tendency of the MSs (henceforth 'MSs' refers to Member States, and 'MS' to Member State) to use their discretion to adapt EU policies to specific domestic preferences/circumstances when transposing them into national legislation (Thomann and Sager 2018; Zhelyazkova and Thomann 2021) – a process which the political science literature has called 'customization' (Thomann 2019).

To fill this research gap, the article examines the adoption of the TCA in different MSs by focusing on two specific TCA dimensions, which are "the choice of policy mix to address grand challenges" and "the governance mechanisms used to ensure legitimization and coordination".

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3 59 Adopting an institutional approach, this article tests the general hypothesis that the
4 60 transition towards the TCA is context dependent because it is conditional on the existing
5 61 institutional landscape. Albeit within the same European framework, therefore, it is likely that
6 62 there exist different reform trajectories based on the institutional framework for innovation
7 63 traditionally prevalent in each MS. This path dependence hypothesis concerning transformative
8 64 transition in the EU is empirically tested by conducting comparative analysis of the evolution,
9 65 from the 2000s until the present, of the multi-level and multi-actor implementation
10 66 arrangements of the innovation policy in two MSs – namely Germany and France. Their
11 67 analysis is in fact a means to empirically investigate which aspects related to the domestic
12 68 institutional context may induce the choice of different implementation arrangements in a
13 69 context of transformative change: the presence in France and Germany of a traditional, different
14 70 institutional context for innovation makes it possible to explore how a path dependency
15 71 mechanism may have generated different reform outcomes.

16 72 The article is structured as follows: Section 2 presents the EU legal framework for
17 73 research and innovation policy (henceforth ‘R&I’); Section 3 introduces the theoretical and
18 74 analytical background; Section 4 describes the research design and methodology; Section 5 and
19 75 Section 6 respectively present the German and the France case; Section 7 discusses the
20 76 findings; Section 8 concludes.

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22 78

29 79 **2. Research and Innovation Policy in the European Union: From Policy to Multi-Level** 30 80 **Policy Implementation**

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32 82 R&I is an umbrella concept: it links the traditional industrial policies and the research and
33 83 technological development policies of the EU. The Treaty on the Functioning of the EU of
34 84 1981 enacted both policies. R&I then gradually emerged during the 1980s due to the
35 85 consolidation of multi-year funding programs relating to projects developed by universities and
36 86 research institutions. The Lisbon Strategy then increased its political salience (CEU 2000),
37 87 since it identified R&I as one of the main instruments with which to achieve the EU’s strategic
38 88 objective of becoming the most competitive and knowledge-based economy in the world.

39 89 As mentioned in the introduction, the EU debate has often highlighted the notion of
40 90 national innovation policy in a context of transformative change. That is also apparent in
41 91 various EU initiatives, especially as regards the two dimensions of the TCA on which this
42 92 article focuses.

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3 93 In particular, the “Innovation Union” flagship initiative of the EU’s 10-year Europe
4 94 2020 strategy increased spending on R&I while facilitating access to finance in the framework
5 95 of enhanced partnerships between public and private entities in different MSs. To overcome
6 96 the above-mentioned problem of the excessive proliferation of instruments, the Horizon 2020
7 97 program unified the various funding instruments for R&I in order to provide better support for
8 98 innovations developed to respond to the main challenges of the third millennium. For the EU
9 99 institutions, innovation was then expected to address a set of well-chosen grand challenges,
10 100 such as the transition to a low-carbon and inclusive economy (European Commission 2012).
11 101 Moreover, through the 2015 Lund Declaration, the EU «prioritizes training a new generation
12 102 of researchers who will have the skills to address grand societal challenges underpinned by an
13 103 excellent research base» (Schot and Steinmueller 2018, p. 1561). The more recent EU policies
14 104 in response to the COVID-19 crisis have also placed emphasis on the link between innovation
15 105 objectives and grand challenges. The Recovery and Resilience Facility (henceforth ‘RRF’), in
16 106 fact, associated R&I with digital and green transformation, with the MSs’ Recovery Plans
17 107 comprising at least 20% of measures in the field of digital innovation and 27% in that of
18 108 environmental improvements.

19 109 As regards the governance solutions to ensure policy coordination, all the recent EU
20 110 initiatives have pushed for the establishment of partnerships in order to increase collaboration
21 111 between public and private entities at both national and sub-national level. In calling for wider
22 112 stakeholder engagement, the Commission’s Lamy Report argued that «as part of a coherent
23 113 innovation policy, EU policymakers should be required to regularly identify, in dialogue with
24 114 stakeholders and citizens, how and what innovation can help them more easily achieve their
25 115 objectives (European Commission, 2017a: 12, *emphasis added*)». This stakeholder
26 116 engagement can therefore facilitate an alignment between innovation objectives and grand
27 117 challenges:

28 118
29 119 Fully mobilizing and involving stakeholders, end-users and citizens in the post-2020 EU R&I program, for
30 120 instance in defining its missions, will not only increase the degree of co-creation, it will also *maximize its impact*
31 121 *and stimulate a stronger demand for innovative products and services as well as a better grasp of social changes*.
32 122 This will bring *open science and open innovation* to the next level and turn Europe into a continental living
33 123 innovation lab (ivi: 19, *emphasis added*).
34 124

35 125 In recognizing these notions of ‘open science’ and ‘open innovation’, the Research,
36 126 Innovation and Science Experts Group (henceforth ‘RISE’) of the European Commission

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3 127 (henceforth ‘EC’) argues that it is «*crucial to break open the current supply-side research*
4 128 *dominance in addressing societal challenges*, which has sometimes cornered the discussion
5 129 and debates to technical debates about measurement, evidence and methodologies» (EC,
6 130 2017b: 160, *emphasis added*).

7 131 The idea that **innovation requires the construction of** transformative coalitions involving
8 132 a wider set of actors is therefore at the core of the current EU policy debate. These coalitions
9 133 should be based on **new relationships among the different levels of government and among the**
10 134 **state**, the market and civil society, with the EU supranational structures ensuring coordination.
11 135 The perspective of multi-level governance (Committee of the Regions 2014) **therefore appears**
12 136 **important for the** study of transformative innovation policy in the EU, **given the** different public
13 137 and private actors that are involved **at different levels**. The adoption and implementation of the
14 138 transformative innovation policy in the MSs requires in fact a degree of compliance (Thomann
15 139 and Sager 2018) with the EU framework, with different implementers **cooperating to ensure**
16 140 **transposition** of the EU recommendations. In line with the EU general framework, the so-called
17 141 Open Method of Coordination (henceforth ‘OMC’) is believed to be the most appropriate
18 142 governance mechanism to guarantee this transposition in the field of R&I **as well**.

19 143 As «a means of governance [aimed] to integrate public policy instruments into a more
20 144 co-operative decision-making framework» (Budd 2013, p. 288), **the OMC seeks to provide a**
21 145 **framework of cooperation among the MSs so that national policies converge on** some common
22 146 objectives through the circulation of practices and peer review (Casula 2019). More in detail,
23 147 the OMC provides the use of the ‘benchmarking’ methodology **by which the** EC comparatively
24 148 monitors the results achieved and facilitates the circulation and exchange of best practices. **In**
25 149 **other words**, the OMC implicitly suggests that the process of European integration should
26 150 prefer the adoption of a multi-level coordination **system** and the alignment of national
27 151 economic policies (Borras 2018). In the specific field of R&I, for example, the OMC operates
28 152 in three complementary ways: i) by proposing to MSs **the goal of spending** 3% of the Gross
29 153 Domestic Product (henceforth ‘GDP’) **on R&D**; ii) by developing a set of declarative
30 154 documents that establish guidelines and principles for voluntary action by national
31 155 governments; iii) by adopting a set of coordination cycles led by national policy makers for
32 156 discussion and coordination on single issues.

33 157 **During the past decade**, some scholars have analyzed the functioning and the
34 158 application of the OMC in the field of R&I. Borras (2015), for example, finds that the exchange
35 159 **of experiences among national officials is conditional on the** administrative capacity of the
36 160 national systems in combination with the contingent commitment of a specific political

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3 161 leadership. De Ruiter (2010) argues that the EC **often lacks adequate** administrative structures
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5 162 and technical skills to accompany the consolidation of the entire institutional structure which
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7 163 is based on a complex set of indicators and related reporting. Kaiser and Prage (2004) **focus**
8
9 164 **their analysis on the** multi-level nature of the policy that is implemented in domestic systems
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11 165 characterized by a different division of competences among the levels of government involved,
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13 166 and with an historical diversity of national innovation systems articulated around a plurality of
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15 167 institutions and policy instruments. On this issue, some scholars (Darvas and Leandro, 2015;
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17 168 Efstathiou and Wolff, 2018) argue that the traditional cycle of direction and monitoring of the
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19 169 European Semester did not significantly affect the reform initiatives launched by national
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21 170 governments. The historic difference **among** national innovation systems continues in fact to
22
23 171 be pronounced (EC 2013; 2014), **and national policy mixes have remained largely stable over**
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25 172 **time.**

26
27 173 This academic debate suggests looking at the traditional institutional context for
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29 174 innovation when transition towards transformative change is analyzed in the EU. **To this end,**
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31 175 **the next section presents** the theoretical background used to build a common framework **to test**
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33 176 **that transition's adoption** in different MSs, based on the EU legal framework for R&I described
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35 177 in this section.

36 178 37 179 38 180 **3. Theoretical Background: Towards a common approach to testing the implementation** 39 181 **of the transformative innovation policy in the Member States**

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41 183 Several scholars (Schot and Steinmuller 2018; Smits et al., 2010; Fagerberg, 2016) argue that
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43 184 TCA analysis **requires a new knowledge base that should not be dominated by** economics and
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45 185 innovation studies **but instead needs a** more interdisciplinary perspective with different fields
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47 186 interacting to interpret the changing dynamics of innovation policies – in particular,
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49 187 development studies, history of technology, sustainability transition studies, and governance
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51 188 studies.

52 189 **This article takes part in this debate by proposing a novel interpretation of policy**
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54 190 **analysis. The interdisciplinarity characteristic of this field allows** not only the joint use of
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56 191 domestic variables with a different nature but also **the employment of a** plurality of theoretical
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58 192 and analytical approaches that **every researcher can decide to adopt according to** his/her
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60 193 specific research question(s) and the collective problems analyzed. **Furthermore, the**

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3 194 **fundamental units of policy analysis** concern the empirical study **of how the main actors** that
4 participate in the policy process behave, producing different policy outcomes. As previously
5 195 discussed, this is particularly valid for a complex policy issue such as the analysis **of how**
6 196 transformative change happens in the MSs **as a result of** the transposition of the EU
7 197 recommendations. **In the domestic domain, several actors are involved at various levels, and**
8 198 **they produce different implementation dynamics. In fact, transformative change requires**
9 199 **system transitions to horizontally coordinate policies** from various domains and specific
10 200 sectoral policies for health care, environment, transport, labor market, etc. (EC 2018d; 2020a,
11 201 p. 4). A strong multi-level dialogue is necessary to avoid horizontal coordination failures (Schot
12 202 and Steinmuller 2018, 1563), together with the use of an open-ended approach engaging in
13 203 technology and science politics and not just policy. Innovation values are in fact co-produced
14 204 in the policy process (Kirs *et al.* 2021), with new spaces for public debate, deliberation, and
15 205 negotiation, as well as new coordination mechanisms that include experimentation, learning,
16 206 reflexivity, and reversibility. **A change in the entire government approach is therefore needed**
17 207 (Kuhlmann and Rip 2014).
18 208

19 209 A public policy approach is then particularly suitable **for investigating the**
20 210 transformative change transition in the EU. On this issue, **as regards the** two dimensions of the
21 211 TCA considered in this article, **the policy literature has to date shown that** the growing salience
22 212 of these policies **on a government's agenda** has resulted in the introduction of new coordination
23 213 mechanisms (Braun 2008), and new support bodies such as agencies and committees (Edquist
24 214 2019; Serger *et al.* 2015; Breznitz *et al.* 2018). **Moreover,** the traditional classifications of
25 215 policy instruments (Acciai and Capano 2020) **have also applied to innovation studies in regard**
26 216 **to the choice of tools to ensure horizontal coordination. For example, while Edler *et al.* (2016)**
27 217 **differentiate the policy tools according to the objectives** pursued and their orientation, which
28 218 can be directed to the demand or supply of innovation; Borrás and Edquist (2013; 2019)
29 219 distinguish between 'soft' tools based on persuasion, and 'hard' tools such as regulation and
30 220 transfer of resources. Even if these classifications continue to be heterogeneous, **academic**
31 221 **debate pushes towards the adoption of** 'policy mixes' to ensure horizontal coordination and then
32 222 better address the challenges of the new millennium by paying attention to the configuration of
33 223 the domestic context within which multiple actors exchange resources based on previous
34 224 consolidated relationships (Flanagan *et al.* 2011; Flanagan and Uyarra 2016). Differentiated
35 225 impacts can in fact arise from the interaction among innovation tools in different contexts, **as**
36 226 **well as in the wake of historical processes of** consolidation of the national systems (Edler *et al.*
37 227 2016).

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3 228 The results provided by these first studies on R&I in Europe are therefore in line with
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5 229 the expectations of the theoretical approaches that emphasize the path dependence of national
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7 230 systems (Streeck and Thelen 2005). As a consolidated theoretical and analytical approach
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9 231 within policy studies (Bevir, 2009), the use of an institutional perspective therefore appears
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11 232 pertinent to the purpose of this article, especially if its historical variant (Peters 1999; Pierson
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13 233 2011) is used. Institutionalists argue in fact that alternative institutional paths are only made
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15 234 possible by small events that reinforce the initial random choices (Lowndes 2005). Following
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17 235 a path dependence argument, their basic assumption is that when a particular path has been
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19 236 started, actors are reluctant to change direction because of the high costs that this would entail.
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21 237 Characteristics of the pre-existing institutional context therefore influence the spread or
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23 238 otherwise of new ideas that legitimize forms of institutional innovation (John 1999).

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25 239 Drawing on this institutional approach, the debate on EU multi-level policy
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27 240 implementation – from the first studies on Europeanization to the most recent ones – has
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29 241 analyzed the role of domestic context in stimulating or hindering institutional innovation. This
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31 242 institutionalist perspective suggests that research on different implementation dynamics in the
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33 243 EU «could only be understood within an institutionalist framework that takes into account the
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35 244 mediating effect of domestic institutions» (Bürzel 2009, 591). In particular, the EU multi-level
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37 245 implementation debate has used the concept of customization to explain the different way in
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39 246 which MSs, going beyond legal compliance (Thomann and Sager 2018), interpret and adapt
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41 247 EU rules and recommendations when putting them into practice, based on domestic preferences
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43 248 (Thomann 2019; Zhelyazkova and Thomann. 2021). This debate illuminates how MSs use
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45 249 transposition as an opportunity to regain control on EU targets: MSs are considered as problem-
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47 250 solvers since they strive to achieve compliance, and to adapt – that is, customize – EU policies
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49 251 to their domestic institutional contexts. In essence, the concept of customization depicts how
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51 252 transposition – as bottom-up implementation – results in tailor-made solutions in a multilevel
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53 253 system (Thomann 2015, 1368).

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55 254 Drawing on a similar institutional approach to EU studies, this article argues that the
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57 255 way in which transformative change happens in MSs is closely influenced by specific features
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59 256 related to the domestic institutional context. *Our working hypothesis is therefore that the*
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61 257 *transition to the TCA in the EU is a consequence of the existing domestic institutional*
258 *landscape. Following a path dependence argument, the article maintains that the characteristics*
259 *of the pre-existing institutional context for innovation can determine different policy outputs*
260 *when transformative innovation policy is implemented in different MSs. If the tools used in*
261 *previous reform trajectories can condition the choice of policy mix to address grand challenges,*

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3 262 the consolidated relationships between the constellation of public and private actors that at
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5 263 different levels of government are involved in innovation policy can affect the governance
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7 264 arrangements mainly used. The empirical and analytical strategy used to explore this working
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9 265 hypothesis is presented **in the next Section**.

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14 268 **4. Research Design and Methodology**

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19 270 This article is driven by the logic of comparison in qualitative studies (Mahoney & Goertz,
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21 271 2004; Casula *et al.* 2021), and it focuses on a small-N, case-oriented comparison **by adopting**
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23 272 **a most-different systems design intended to compare dissimilar cases**.

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25 273 The use of a comparative method **is closely pertinent to the purpose of this article**
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27 274 **because of its** «capacity to go beyond descriptive statistical measures, towards an in depth
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29 275 understanding of historical processes and individual motivations» (della Porta 2008, 202).
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31 276 Moreover, the use of a case-oriented strategy dealing with a small number of cases facilitates
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33 277 the application of an institutional approach **given its potential to favor** «the development of an
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35 278 extensive dialogue between the researcher's ideas and the data in an examination of each case
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37 279 as a complex set of relationships, which allows causal complexity to be addressed» (della Porta
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39 280 2008, 207). Even if it provides the basis for generalizations that are provisional **only on the**
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41 281 empirical observations, the use of this research strategy **enables in-depth investigation of the**
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43 282 impact of a set of relevant factors **and comparison of** analytical propositions with many data
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45 283 points (della Porta and Keating 2008). For these reasons, case studies and small-N comparisons
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47 284 – that are predominantly narrative in scope – are useful for both theory-building and theory-
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49 285 testing (Blatter and Haverland, 2012), and they have been praised for their detailed analyses of
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51 286 processes (Rueschemeyer, 2003).

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53 287 **As regards the choice of the units of analysis, determining the use of a most-different**
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55 288 **design is the need to contrast contexts** and to compare the development of innovation policy
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57 289 where a different institutional framework for innovation has traditionally been present; **and**
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59 290 **then** bring out the **unique features of** each particular case analyzed (Skocpol and Somers 1980)
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291 and, based on the path dependence hypothesis **previously advanced**, «discover whether similar
mechanisms and processes drive changes in divergent [...] places» (McAdam et al. 2001, 82).

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3 293 The *ratio decidendi* of the research design adopted in this article having been thus
4 discussed, the case selection procedure used is now presented, followed by description of the
5 294 empirical and analytical strategy adopted to investigate the different implementation dynamics
6 295 of the transformative innovation policy in the two MSs analyzed.
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12 13 298 *Case Selection*

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18 300 The case selection procedure started from recognition that there are different innovation
19 301 performances in the EU countries and their regions, as highlighted by the European Innovation
20 302 Scoreboard (EC, 2020b). For this reason, it is for example difficult to generalize the experience
21 303 of the Scandinavian countries, which are at the forefront of innovation in Europe thanks to
22 304 particularly proactive policies (Fagerberg 2016). These are in fact small countries, with a
23 305 manufacturing base restricted to a few sectors and open to internationalization, within a system
24 306 characterized by trust in institutions (Bonaccorsi 2016). These contextual conditions make a
25 307 possible comparison between the large Western European countries and the Scandinavian ones
26 308 ineffective for the purpose of this article. Furthermore, among the large European countries,
27 309 the considerable difference among the coordination models of companies undermines the
28 310 effectiveness of the comparison between liberal systems (Hall and Soskice 2001).

29 311 In light of these considerations, the comparison proposed in this article is restricted to two large
30 312 Western EU countries (France and Germany) that usually have a strong influence on the EU
31 313 agenda and play the role of major innovators in the EC's surveys (EC 2020b; 2020c). While
32 314 sharing similar contextual factors, including those related to their background economic
33 315 indicators, France and Germany present several differences concerning their institutional
34 316 context and their economic structure that make it interesting to test the path dependence
35 317 hypothesis, especially if their recent innovation policies are discussed and compared through
36 318 contextualization on the historical development path.

37 319 As a federal system, a model of consensual democracy with a dispersion of power
38 320 among a plurality of actors able to establish relationships of stable collaborations has
39 321 historically prevailed in Germany. Cooperative relations between the federal level and the
40 322 sixteen *Länder* to contribute to the formulation and financing of R&I policies also consolidated.
41 323 For example, these cooperative relations facilitated the launch of important constitutional
42 324 reforms that also included an amendment that took effect in 2015 to widen the federal

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3 325 government's leeway in funding universities (Sofka 2015). **The German public research system**
4 **has traditionally** also included the involvement of non-university research companies co-
5 326 funded by the federal government and the *Länder*, and a large network of state-owned
6 327 laboratories. **As regards the entrepreneurial fabric, the large companies in the medium-high-**
7 **tech manufacturing sector, in fields such as the automobile and chemical sectors, flanked by a**
8 328 **network of highly specialized and rated small and medium-sized enterprises, played a crucial**
9 329 **role.** These enterprises **have also been** very inclined to export. **This composite** entrepreneurial
10 330 fabric was for example able to drive the economic recovery after the sharp decline of 5.6% of
11 331 **in GDP** in 2009.

12 332
13 333
14 334 **The institutional architecture of the country – a unitary system with a strong tradition**
15 335 **of administrative centralization and where decentralization to the regions has only been more**
16 336 **recent – instead conditioned the development of the innovation system in France.** In this
17 337 context, **the French innovation system was marked by state interventionism**, so much so that it
18 338 was defined a case of "technological Colbertism" (Laredo and Mustar 2001). **For decades, in**
19 339 **fact, this country has placed emphasis on large national programs in the military and civilian**
20 340 **fields** in support of national champions operating in a limited number of sectors, with a very
21 341 marginal role played by universities and small and medium-sized enterprises (Cohen 2007).
22 342 This legacy **required** a review of the organizational system and tools to increase the
23 343 specialization of the French industry in sectors related to new and high technologies (Beffa
24 344 2005), and to halt the ongoing de-industrialization process. This review took place within an
25 345 institutional context characterized by the capacity for coordination of the executive in a semi-
26 346 **presidential system of government in which the central government maintains some**
27 347 **responsibilities.** The aim of this review was to overcome the traditional French top-down
28 348 approach **and** then strengthen the connections between companies of various sizes and the
29 349 research system. **The Law for Innovation and Research, in 1999, enacted a first wide-ranging**
30 350 **response to the erosion of the industrial base. Its aim was to accelerate** technology transfer
31 351 through public-private collaboration and stimulating the birth of new companies through tax
32 352 incentives.

33 353

34 354

[Insert Table 1 here]

35 355

36 356 To sum up, **this study selected Germany and France because** their traditional
37 357 **institutional contexts** for innovation present several differences that may have contributed to
38 358 the choice of different implementation arrangements in a context of transformative change.

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3 359 Whilst the large companies in the medium-high-tech manufacturing sector played a basic role
4 within the German entrepreneurial fabric, with an increasing connection with the national
5 360 research and innovation system, several attempts had been made to overcome the ongoing
6 361 French de-industrialization process resulting from the traditional state interventionism. As a
7 362 result of this "technological Colbertism" legacy, the government financings related to the
8 363 percentage of gross domestic expenditure on R&D (GERD) and to the percentage of business
9 364 enterprise expenditure on R&D (BERD) have traditionally been greater in France, as compared
10 365 to the average not only of Germany but also of the EU27 and the OECD (see Table 1). For the
11 366 same reason, France has always recorded lower values than Germany as regards the BERD as
12 367 a percentage of both GDP and value added in industry, and the percentage of BERD financed
13 368 by the business enterprise sector. French administrative centralization has also inhibited the
14 369 development of processes of vertical and horizontal coordination between different public and
15 370 private bodies. This coordination has instead been greater in Germany, due to its consolidated
16 371 model of consensual democracy.
17 372

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374 *Empirical and Analytical Strategy*

375

376 The empirical strategy focused on a qualitative analysis of the multi-level and multi-actor
377 implementation arrangements used in the two selected cases. The aim was to discuss and
378 compare the transformative evolution of the innovation policies in France and Germany in
379 recent years through a contextualization on their historical development paths.

380 The findings were based on documentary analysis, secondary literature, and 15 in-depth
381 interviews conducted in the period 2018-2020 with key actors in Brussels, Paris, and Berlin.
382 The empirical investigation started with analysis of the official documents produced over the
383 years by European and domestic institutions, and the secondary literature. The researcher
384 triangulated this desk analysis with the data collected during the interviews with key actors. To
385 this end, the researcher used an "expert interview" methodology (Littig 2011) to select
386 informants by considering as 'experts' those with a thorough knowledge of the transformative
387 evolution of the innovation policy in the two MSs. Interviews lasted approximately 60 minutes
388 each, and they were tailored to the interviewee's position/role in order to collect additional
389 information about the evolution of the transformative innovation policy in Germany and France
390 and the institutional reasons that pushed towards different implementation dynamics.

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3 391 After this field research, a triangulation of all the primary and secondary qualitative
4 data collected guided the data analysis procedure. This procedure checked the validity of the
5 392 study (Ruffa and Evangelisti, 2021). From an analytical point of view, the final output was the
6 393 construction of a policy narrative (Fisher and Forest, 1993; Mahoney, 1999) on how the
7 394 transformative change was happening in Germany and France according to their different
8 395 institutional contexts and their historical development paths. These policy narratives concerned
9 396 the two dimensions analyzed in this article.
10 397

11 398 The policy narrative related to “the choice of policy mix to address grand challenges”
12 399 adopted a diachronic perspective to describe if an effective horizontal coordination had been
13 400 present within the general national strategy, and therefore how the link between innovation
14 401 strategy and grand challenges had been articulated in each MS, as expected by the EC
15 402 recommendations. This narrative started with the main actions taken during the 2000s, and it
16 403 ended with the ones put in place until the beginning of 2021, therefore including an analysis of
17 404 the German and French Recovery Plans.
18 405

19 406 The analysis of the “governance mechanisms used to ensure legitimization and
20 407 coordination” involved description of the vertical and horizontal coordination mechanisms
21 408 mainly used in each MS. This second policy narrative started from description of the general
22 409 governance for innovation related to the inter-departmental and State-regions coordination. It
23 410 then provided an overview of both the composition and tasks of the main innovation support
24 411 bodies used, and the way in which regions, regional stakeholders and civil society were
25 412 involved in implementation. The aim of this second policy narrative was then to reconstruct
26 413 the type of governance model (e.g., top-down, bottom-up, or mixed) prevalent in each MS, and
27 414 the effective implementation at the domestic level of the EC recommendations.
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29 416 The next two Sections present these narratives of policy events, while Section 6
30 417 provides a general discussion and comparison on how transformative change is happening in
31 418 the two MSs.
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34 421 **4. The German Case**

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36 423 *The choice of policy mix to address grand challenges*

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38 425 Particularly important for testing how transformative change is happening in Germany as
39 426 regards the presence of an effective horizontal coordination, and how the link between the
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3 424 national innovation strategy and grand challenges is articulating in this MS, is empirical
4 analysis of the High Technology Strategy (henceforth 'HTS'). Launched in August 2006 by
5 425 the first Merkel cabinet, the HTS is a sort of "umbrella program", since it comprises different
6 426 interventions for industrial competitiveness and the strengthening of applied research. Whilst
7 427 some of its initiatives were continuations of existing incentive tools that had been reshaped
8 428 with a view to reducing bureaucratic burdens,¹ others circulated new resources focused on new
9 429 areas and objectives (IPI 2008). The national government extended the HTS until 2013. Then
10 430 it confirmed a new program in 2014 for the next three years, and in 2017 it launched the 2020
11 431 HTS, subsequently followed by the current 2025 strategy.

12 432
13 433 The 2020 HTS strengthened the link between innovation and response to grand
14 434 challenges. An high-level official of the EC interviewed, in fact, underlined that «within the
15 435 periodic analysis and monitoring of national research policies done by this Directorate, it
16 436 always seemed clear that the last version of the German Strategy now shows high horizontal
17 437 coordination, having targeting strategic intervention priority areas and sectors in this
18 438 country...more than has happened in other countries». ² The 2020 HTS established in fact these
19 439 priorities in various fields — in particular, intelligent mobility, civil security, and the digital
20 440 society and economy. That link also included a connection with the sustainable economy and
21 441 energy systems through different coordinated initiatives to facilitate energy transition in
22 442 Germany. More in detail, the “Energy Transition Priority” (*Energiewende*) sets goals for
23 443 transport, heat and electricity, and adopts new solutions for a climate-friendly, secure energy
24 444 supply system.

25 445 As the next sub-section will explain, and as another high-level official of the EC
26 446 interviewed remarked several times, «it would have been impossible to achieve such results in
27 447 this country without the strengthening and cohesion that has existed over the years and amid
28 448 the various transformations of the national strategy between the main German ministries, which
29 449 have been able to create an exceptional modus operandi [...] and administrative practices aimed
30 450 at common goals, albeit with many “brains” involved in the various central departments»³. This
31 451 cross-departmental policy strategy also facilitated the launch of other structural reforms, which
32 452 were integrated with the HTS objectives of achieving the horizontal coordination
33 453 recommended by the EU.

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¹ Cf. Interview with a representative from *Kreditanstalt für Wiederaufbau* – KfW Research, KfW Group, Team SME and Competitiveness.

² Cf. Interview with European official, Directorate-General for Research and Innovation Directorate A — Policy Development and Coordination Unit A.4 — Analysis and monitoring of national research policies.

³ Cf. Interview with European official, DG Growth, Directorate General for Research and Innovation.

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3 454 In this general context, within a general endeavor to increase the financial endowment
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5 455 and to focus on a small number of priorities, the attention to small and medium-sized
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7 456 enterprises grew, with a 30% increase in their funding by the program “Priority for small and
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9 457 medium-sized enterprises” (*Vorfahrt für den Mittelstand*), launched in 2016. Moreover, over
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11 458 the years, Germany has strengthened the integration between the strategy and public-sector
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13 459 digitalization, with these reforms playing an increasingly important role in the reduction of
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15 460 bureaucratic burdens.⁴ That led to the launch, in 2017, of the “Point of Single Contact 2.0
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17 461 Project” (*Einheitlicher Ansprechpartner 2.0*) to realign public services around a single contact
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19 462 point. Finally, Germany had been able to achieve a leading position in the establishment of a
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21 463 bio-based and sustainable economy thanks to a set of programs and initiatives set up by
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23 464 Ministries at federal and state levels as part of a well-coordinated interdepartmental strategy
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25 465 launched in 2010, i.e. the “National Research Strategy BioEconomy 2030” (*Nationale
26
27 466 Forschungsstrategie BioÖkonomie 2030*).

26 467 This historical development path also conditioned the choice of instruments in response
27
28 468 to the COVID-19 crisis in Germany. As part of the *Wumms Recovery Plan*, Germany launched
29
30 469 a €50 billion package to finance emergency measures focused on well-chosen environmental
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32 470 challenges – in particular sustainable mobility and the energy transition. These actions were
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34 471 undertaken under the umbrella of the 2025 HTS, and they were fully integrated with it. More
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36 472 in detail, this package seeks to increase R&D investments in cutting-edge technology for green
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38 473 transformation. For this purpose, it comprises different measures: in particular, grants for
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40 474 consumers to increase the affordability of electrical vehicles for the average German citizen; a
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42 475 package of €10 billion devoted to municipalities and public institutions to accelerate the
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44 476 modernization of public transport infrastructure; and a €5 billion package for the transition of
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46 477 the German rail network toward more sustainable models. Based on the traditional institutional
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48 478 context for innovation previous described, Germany also introduced a €2 billion fund for the
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50 479 short-term support of the expansion of venture capital that finances start-ups; and, a €10 billion
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52 480 one for the long-term financing of these companies. In this general context, the German
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54 481 government is creating a framework to support enterprises’ new orientation, above all through
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56 482 the insurance provided by the new “Federal Agency to Promote Breakthrough Innovation”
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58 483 (*Bundesagentur Für Sprunginnovationen*), and specific grants. As regards the latter, the most
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60 484 important grant covers half of the R&D costs of companies with fewer than 100 employees.
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⁴ Cf. Interview with a representative from Germany Trade & Invest (GTAI).

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3 486 *Governance mechanisms used to ensure legitimization and coordination*
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6 488 Innovation policy in Germany is formulated by two departments, namely the Ministry of
7 Education and Research and the Ministry of Economy and Energy. The latter has gradually
8 489 strengthened its role by acquiring skills relating to business support programs (in particular
9 start-ups and small-medium enterprises), and the promotion of applied research. **Whilst this
10 490 initially created tensions and overlaps between the two departments, the intervention of the
11 Chancellor of the Federal Republic of Germany as the arbiter of internal conflicts within the
12 491 executive, has facilitated the institutionalization of inter-departmental collaboration in recent
13 492 years,**⁵ also through dedicated resources and shared objectives (EFI 2016; 2017; 2018).
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20 496 The “Unified Conference for Science” (*Gemeinsame Wissenschaftskonferenz*) ensures
21 coordination between the federal and state levels of government. Established in 2007, this is
22 497 made up of ministers responsible for finance and research at the federal and state levels, and it
23 498 has the task of coordinating initiatives shared by the various levels of government. Cooperation
24 499 between levels of government in the financing of some initiatives is also ensured by the
25 signature of three pacts: the first aims to strengthen research internationalization; the second
26 500 aims to strengthen the large research companies present in the German system; and, the third aims
27 501 to finance clusters and universities of excellence.
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34 504 As result of the increase in these vertical coordination mechanisms, and in line with the
35 legacy to establish cooperative relationships between public and private actors at different
36 505 levels of government, from a comparative perspective the German system stands out for the
37 506 manner in which R&I programs are implemented, which is the responsibility of different
38 507 specialized institutions with a public, semi-public or private nature called *Projekträger*. **The
39 508 central government or the *Länder* authorized these bodies to deal with several administrative
40 509 issues related to the policy’s implementation.**
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46 511 Over the years, **also** various *ad hoc* council bodies have followed one another.
47 512 **Consisting of experts from the economics and science sectors**, these bodies were established
48 513 by the Federal Government to define and accompany the implementation of its innovation
49 514 strategy. In 2006, for example, **it created the** “Council for Innovation and Growth” (*Rat für
50 515 Innovation und Wachstum*) and the “Union for Research between Science and Economics”
51 (*Forschungsunion Wirtschaft-Wissenschaft*). These bodies have taken part **in the** initiative
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⁵ Cf. Interview with European official, DG Growth - Directorate-General for Internal Market, Industry, Entrepreneurship and SMEs.

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3 517 “Partners for Innovation” (*Partners für Innovation*). This initiative started in 2004 with the
4 purpose of consolidating the innovation culture in the German system (IPI 2008) by bringing
5 518 together governmental representatives, large companies, industrial groups, trade unions, trade
6 519 associations, scientific and applied research centers in thematic working groups. In 2015, the
7 520 Federal Government set up two further expert groups: the “High-Tech Forum” (*Hightech-
8 521 Forum*), consisting of twenty representatives from the world of science and business with
9 522 policy advice tasks; and the Platform for Industry 4.0 (*Plattform Industrie 4.0*), which is
10 523 divided into inter-disciplinary thematic working groups tasked with creating and disseminating
11 524 knowledge about the digitalization of industrial processes.
12 525

13 526 The involvement of regions and regional stakeholders in the development and
14 527 implementation of the various HTS initiatives has also increased in recent years, following the
15 528 model of consensual democracy that traditionally characterized this MS. As regards
16 529 management of the energy transition projects previous described, for example, according to a
17 530 senior ministerial official interviewed, «Germany immediately understood that in order to
18 531 achieve an effective energy transition ... especially in rapid time ... it was not possible to
19 532 proceed with top-down actions ... we therefore opted for a massive involvement of regional
20 533 stakeholders, in particular as concerns the selection of specific areas of intervention [...] We
21 534 are talking about the involvement of representatives of over 90 institutions and organizations
22 535 of different kinds [...] something that had never been seen before at these levels in Germany».⁶
23 536 In accordance with this participatory approach, the basic idea underlying these projects is that
24 537 their implementation necessarily requires the establishment, for at least a decade, of large
25 538 consortia in which scientific institutions, universities, private companies, and organized civil
26 539 society work together to develop new transformative solutions.
27 540

28 541 Finally, in line with the RISE group’s recommendations to include the notions of “open
29 542 science” and “open society” in the national innovation strategy, in recent years Germany has
30 543 experimented with various actions to activate civil society participation, principally social
31 544 innovation, public participation and openness to technology. For example, the “Future Forums”
32 545 (*Zukunftsforen*) project facilitates dialogue among politicians, scientists and citizens, while the
33 546 new web platform “Citizens Create Knowledge” (*Bürger Schaffen Wissen*) supports,
34 547 economically and operationally, the development of citizen science projects that focus on new
35 548 emerging societal and environmental challenges.
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⁶ Cf. Interview with a representative from the *AiF Projekt GmbH*, Agency of the Federal Ministry of Economics and Technology.

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5 550 **5. The French Case**6
7 5518 552 *The choice of policy mix to address grand challenges*9
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12 554 In the space of two decades, the French innovation system has gone from a management-style
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14 555 policy focused on national champions to an innovation policy articulated around such a wide
15
16 556 array of policy solutions and tools that it has been called an administrative “mille-feuille”. This
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18 557 has led to incremental changes within the French transformative transition, with different and
19
20 558 conflicting objectives to pursue and in the absence of a single coordinated national innovation
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22 559 strategy. In this context, the link between innovation and grand challenges remained very weak
23
24 560 at least until 2015, when France launched the National Research Strategy (*Stratégie nationale*
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26 561 *de recherche* - henceforth ‘SNR’). Although currently in place, this link still lacks effective
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28 562 horizontal coordination as foreseen by the EU recommendations (Levratto *et al.* 2017;
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30 563 interviews with European officials⁷), especially if compared with the German one. According
31
32 564 to the recent French RIO Country Report, «systematic mechanisms do not seem to have been
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34 565 introduced so as to ensure that these various strategies and the decisions to which they lead are
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36 566 in alignment: *co-ordination, where it exists, occurs ad hoc and is not always effective* (Levratto
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38 567 *et al.* 2017, p. 220, *emphasis added*). Moreover, as an interviewee pointed out, «the system
39
40 568 continues to be affected by fragmentation, and radical simplification strategies appear in their
41
42 569 concrete effects much less radical than what was announced»⁸. The next parts of this section
43
44 570 describe these various strategies in-depth.

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46 571 After the above-mentioned reform of 1999, the first action taken to limit the traditional
47
48 572 excessive state interventionism on innovation was the introduction, in 2005, of a new pact for
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50 573 research. Its aim was to modernize the French public research system in which universities had
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52 574 little autonomy, it being instead the domain of private research bodies to furnish knowledge to
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54 575 businesses. The national government also launched the “Competitiveness Poles” (*Pôles de*
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56 576 *compétitivité*) in the same year. Their governance was entrusted to the industrial private sector,
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58 577 often in partnership with local authorities with the purpose of stimulating the dynamism and
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60 578 attractiveness of the French regions in response to growing international competition and the

⁷ Cf. Interviews with European officials, Directorate-General for Research and Innovation Directorate A — Policy Development and Coordination Unit A.4 — Analysis and monitoring of national research policies.

⁸ Cfr. Interview with a representative from *Caisse de dépôts et consignations, DG Réseau et Territoires*.

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3 579 phenomenon of relocation. Although over the course of a decade 71 clusters were created in
4 this area, multiple surveys questioned the effectiveness of this scheme (RIO Report 2015).

5 580
6 581 In 2009, the Sarkozy Presidency (2007-2012) launched the “Investments for the Future
7 Programme” (*Program d’Investissements d’Avenir* - henceforth “PIA”) for the period 2010-
8 582 2020. Its aim was to strengthen the growth potential of the French economy in five strategic
9 583 sectors: research, higher education and training, digitalization, sustainable development, and
10 584 industry. While introducing new initiatives, PIA did not eliminate the previous instruments.
11 585 According to a senior ministerial official interviewed, “this choice has had quite a few
12 586 consequences on the overall functioning of this program in France. [...] I take the liberty to say
13 587 that this decision has been the cause of many small local failures, this being the most important
14 588 program on innovation issues that we have had over the years in our country. In fact, there has
15 589 been such an overlap of skills among different entities ... small, large, new, old ... that we have
16 590 often created chaos over who should do what, how and when ... I speak of many administrative
17 591 structures of no small importance, such as the Technology Transfer Offices, the Institutes of
18 592 Technological Research and the Institutes for the Energy Transition».⁹

19 594 While confirming the PIA, the Hollande Presidency (2012-2017) enacted two additional
20 595 measures: the “Industrial Revival Plan” (*Plan de relance pour l’industrie*) in 2013, and the
21 596 “France Europe 2020 Research Policy Agenda” (*Agenda stratégique “France Europe 2020”*)
22 597 in 2014. The former identified 34 strategic initiatives in which the government would invest in
23 598 R&D activities in order to relaunch productivity. France launched the latter as a response to
24 599 the Horizon 2020 Program.

25 600 France has then introduced several incremental reforms in recent decades. If these
26 601 reforms have tried to overcome the traditional French policy style focused on national
27 602 champions, in effect, as pointed out by an interviewee, «they have produced a proliferation of
28 603 so many intervention tools that they have done nothing but increase the complexity of the whole
29 604 [...] so that the final beneficiaries no longer understand anything».¹⁰ In other words, these
30 605 incremental reforms have developed an innovation policy focused on a wide set of governance
31 606 solutions and tools. In 2015, for example, a study surveyed 62 different tools for promoting
32 607 innovation, many of which were small (CNEPI 2016).

33 608 In this general context characterized by increasing fragmentation and poor horizontal
34 609 coordination, the national government has strengthened the link between innovation policy and

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⁹ Cf. Interview with national official, *Ministère de l’Enseignement supérieur, de la Recherche et de l’Innovation*.

¹⁰ Interview with a representative from *Bpifrance, Banque Publique d’Investissement*.

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3 610 grand challenges contextually with the launch, in 2015, of the SNR. Nevertheless, in line with
4
5 611 the path dependence hypothesis, this happened within a process of promoting structural
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7 612 adjustments and new approaches to growth strongly conditioned by the previous legacies. More
8
9 613 in detail, SNR addresses the nine grand challenges set forth, in 2014, by the Europe 2020
10
11 614 Agenda: climate change, sustainable energy, industrial renewal, health and well-being, food
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13 615 safety, sustainable mobility, an information and communication society, an innovative society,
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15 616 and freedom and security for Europe. Moreover, the second phase of the “New Industrial
16
17 617 France Programme” (*Nouvelle France Industrielle*, henceforth ‘NFI’) launched in the same
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19 618 year focused on nine industrial solutions (eco-mobility, data economy, smart objects, medicine
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21 619 of the future, sustainable cities, digital trust, new resources, transport of tomorrow, smart food
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23 620 production), which received funds from the PIA to commercialize new technologies. The NFI’s
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25 621 main aim was thus to modernize French industrial assets and to transform the business models
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27 622 of the French firms operating in these sectors. With innovation continuing to be at the core of
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29 623 the French policy for growth, these governmental actions were then intended to reinforce the
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31 624 development of young firms and start-ups. The Macron Presidency’s initiatives went in this
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33 625 direction through the establishment of a €10 billion fund as part of a broader agenda for the
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35 626 digital transformation of France as a “start-up nation”.

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37 627 Following this innovation path, France devoted a €4 billion emergency package to start-
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39 628 ups in response to the COVID-19 crisis. It used an array of indirect financing instruments that
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41 629 provided tax credit to stimulate the competitiveness of start-ups and their R&D efforts. Based
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43 630 on the EU framework, R&D spending on environmental and digital transition are two of the
44
45 631 three main targets of the *France Relance* Recovery Plan, respectively for a budget of €30 and
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47 632 €35 billion. These actions parallel the launch, in 2021, of the fourth edition of the PIA. Like
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49 633 the previous reform trajectories, a proliferation of so many measures makes it difficult to find
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51 634 a clear transition model characterizing these recent actions, above all when compared with that
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53 635 of Germany. As regards ‘green innovation’, for example, a €2.6 billion package has been
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55 636 allocated to a large number of objectives that include the following: green transition of
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57 637 industries, actions to improve the resilience of cities to health risks and climate changes,
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59 638 development of the green hydrogen sector, biotechnologies, recycling, the decarbonation of
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639 key industries. Furthermore, the national government has developed various measures besides
640 the PIA, and they are only partially integrated with each other.

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642 *Governance mechanisms used to ensure legitimization and coordination*

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3 644 In the French semi-presidential system, the President of the Republic (Head of State) decides
4 645 innovation policy, in consultation with the Prime Minister (Head of Government). The
5
6 646 Ministries of Industry and Research are mainly responsible for the implementation of the
7
8 647 policies defined by the French government. Within the latter, the Inter-ministerial Mission for
9
10 648 Research and Higher Education has ensured inter-ministerial coordination since 2001. This is
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12 649 a collegiate body made up of representatives of the ministries responsible for R&I.

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14 650 Under the Sarkozy Presidency, the main measure concerning the governance system
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16 651 was the establishment, in 2010, of a new structure – the “General Commission for Investment”
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18 652 (*Commissariat général à l’investissement*, henceforth ‘CGI’) – responsible for management of
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20 653 the subsequent national investment program on innovation. The same Presidency suppressed,
21
22 654 in 2008, an executive agency – the “Industrial Innovation Agency” (*Agence de l’innovation*
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24 655 *industrielle*). The ex-President Jacques Chirac commissioned this agency with a view to
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26 656 consolidating the national champions of French industry through public-private collaboration.
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28 657 The following Hollande Presidency further simplified the ‘galaxy’ of executive agencies by
29
30 658 completing the merger, in 2005, of three different bodies into a single entity, namely the
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32 659 investment bank *BpiFrance*.

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34 660 Until 2013, the “Interministerial Committee for Scientific and Technological Research”
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36 661 (*Comité interministériel de la recherche scientifique et technique*) and the “High Council for
37
38 662 Science and Technology” (*Haut Conseil de la science et de la technologie* - henceforth
39
40 663 ‘HCST’) were the main consultative bodies for definition of French innovation policy. The
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42 664 former body consisted of representatives of the ministries responsible for defining the national
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44 665 research and innovation strategy, and it carried out consultative activity on national priorities
45
46 666 and strategies. The Prime Minister chaired it, while the Ministry of Higher Education and
47
48 667 Research coordinated it. The latter body, the HCST, provided technical assistance on
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50 668 innovation issues. The HCST consisted of twenty high-level scientific advisors appointed by
51
52 669 the President of the Republic. With a view to streamlining the governance system, the
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54 670 “Strategic Research Council” (*Conseil stratégique de la recherche*), composed of experts and
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56 671 parliamentarians appointed by the Prime Minister, replaced these two bodies after December
57
58 672 2013. This new body had the task of submitting to both the Head of State and the Prime Minister
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60 673 a strategic proposal developed through consultation with an operational committee made up of
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62 674 ministerial officials and managers of large companies and research institutions.

63
64 675 The Hollande Presidency also established, in 2013, an *ad hoc* advisory body, namely
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66 676 the “2030 Innovation Commission” (*Commission Innovation 2030*). It defined proposals for
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68 677 launching an open competition able to attract international investments and channel them into

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2
3 678 high-impact initiatives in crucial sectors (Lauvergeon 2013). Moreover, in 2014, the Hollande
4 Presidency created a committee composed of representatives of the ministries and regional
5 679 governments with the task of coordinating technology transfer. While traditionally absent from
6 680 innovation policy the French regional administrations have become increasingly involved in
7 681 the past decade, even if only to complement government measures – above all in the framework
8 682 of state-region project contracts, competitiveness clusters, academic research and industrial and
9 683 commercial activities. However, their involvement has resulted in an increase of procedural
10 684 complexity, with an effective implementation of national guidelines by the French public
11 685 research system and by these sub-national authorities that continues to be problematic in the
12 686 absence of an institutional transformation of the general system itself (OECD 2014a; Levratto
13 687 et al. 2017; Interviews with European officials¹¹).

14 688
15 689 Finally, whilst France has timidly introduced the notions of ‘open innovation’ and ‘open
16 690 society’,¹² – such as the adoption, in 2014, of an ‘open data’ policy by *Bpifrance* – the
17 691 governance system continues to evolve, attempting to introduce top-down actions to strengthen
18 692 the links between research actors and regional socio-economic stakeholders. For example, in
19 693 2016, the “National Research Agency” (*Agence Nationale de la Recherche*) introduced a grant
20 694 for French research centers to enhance their capacity to develop partnerships with the private
21 695 sector. Following the same logic, calls for projects within the PIA are pushing for the
22 696 development of public-private linkages and the strengthening of innovation ecosystems within
23 697 the above-mentioned Competitiveness Poles. In the meantime, however, conditions have
24 698 changed and innovation policy in France is no longer the preserve of large corporations linked
25 699 with the government; rather, it is more open and with more closely-woven links with the
26 700 scientific community.¹³ In general, as a recent French RIO Country Report has underlined
27 701 (Levratto et al. 2017, p. 273), innovation policy in France is recognizing that responses to social
28 702 and environmental challenges must now be multidisciplinary, and it is trying to mobilize a
29 703 variety of actors, and flexible public-private partnerships – e.g., quality higher education is now
30 704 closely linked to research, with the *grandes écoles* awarding many doctorates. However, «this
31 705 has been only a partial evolution» (Ibid.).

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¹¹ Cf. Interviews with European officials, Directorate-General for Research and Innovation Directorate A — Policy Development and Coordination Unit A.4 — Analysis and monitoring of national research policies.

¹² Cf. Innovation Policy Platform, Available at: <https://www.innovationpolicyplatform.org/www.innovationpolicyplatform.org/frontpage/index.html>.

¹³ Cf. Interviews with European officials, Directorate-General for Research and Innovation Directorate A — Policy Development and Coordination Unit A.4 — Analysis and monitoring of national research policies.

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708 **7. Discussion**

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710 As regards the working hypothesis of this study, its findings on how transformative
711 change is happening in Germany and France have shown that institutional contexts continue to
712 influence domestic policies despite pressure for convergence by the EU, whose governance
713 architecture based on the OMC is only able to ensure the circulation of knowledge. In line with
714 the ‘customization’ theory adopted by EU multi-level policy implementation studies, the
715 organizational structures of domestic administrations and the historical development path
716 pursued in the field of innovation policy are able to filter the European impulse. This translates
717 into the implementation in the MSs of differentiated packages of instruments whose
718 formulation and implementation is delegated to different bodies and coordination mechanisms.
719 This study has in fact shown different reform trajectories in Germany and France, with the
720 previous consolidated institutional context/framework for innovation that strongly conditioned
721 them. In general, this transition seems to be favored in Germany by the legacy of a domestic
722 institutional context that, within a federal system, appears more inclined to a transformative
723 transition. Table 2 summarizes their main difference and similarities. This table also
724 synthesizes what transformative innovation policies would look like for each outcomes
725 observed, on the basis of the information on the EU policy framework presented in the first
726 part of the article, where what transformative innovation policy means in the context of national
727 framework was explained.

728

729

[Insert Table 2 here]

730

731 As regards the choice of policy mix to address grand challenges, Germany has pursued
732 an incremental evolutionary path that rests on the legacy of robust informal collaborative
733 relationships among bureaucracies, research institutions and large manufacturing companies.
734 A range of additional tools has gradually grown around the consolidated body of tools for R&D,
735 with the various editions of the HTS collecting them. In the past decade, the link between
736 innovation and grand challenges has gradually been reinforced in this direction towards a clear
737 model and focused on a set of well-chosen measures, in particular sustainable mobility and
738 energy transition. On the other hand, the previous French policy in response to the crisis of
739 ‘technological Colbertism’ translated into an incremental, but not coordinated, transformative

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3 740 change with the development of an innovation policy articulated around a large set of
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5 741 governance solutions and tools. Overall, simplification **measures** introduce instability **into the**
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7 742 system without curbing the inflation of the instruments, **with the consequent complexity** for the
8
9 743 regional and local beneficiaries. The only front on which progress has been recorded is **the one**
10
11 744 **relating to** the management of subsidies **due to the** centralization of governance into the hands
12
13 745 of two entities, respectively *BpiFrance* and the HCI. State interventions continue to suffer from
14
15 746 a lack of coherence and strategic focus, and they are **only partially effective in** developing
16
17 747 innovation in France in response to new societal and environmental challenges. Moreover, the
18
19 748 COVID-19 crisis has led **in both MSs** to the injecting of funds **through the** pre-existing plans
20
21 750 and instruments, in the broader context of the EC, whose ability to coordinate national
22
23 751 economic policies **is still weak**.

22 751 **Also the choice of the** governance mechanisms mainly used to ensure legitimization
23
24 752 and coordination has been influenced by the two different institutional contexts, and above all
25
26 753 **by their traditions of** cooperative relationships. **Whilst both MSs adopted in the last decade a**
27
28 754 **two-headed structure centered around the Ministries of Economy and Research**, inter-
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30 755 ministerial coordination was stronger in France, reflecting the historically greater capacity for
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32 756 control of the executive by the Head of State. On the other hand, the traditional French
33
34 757 administrative centralization within a unitary state inhibited the consolidation of vertical and
35
36 758 horizontal coordination processes **among** different public and private bodies. In this system,
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38 759 transparency and widespread participation plays a very limited role, with only more recent
39
40 760 attempts **being made** to institutionalize collaboration **among** different levels of government, as
41
42 761 well as public-private links to connect research actors and regional socio-economic
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44 762 stakeholders. Overall, the French governance system has **a considerable proven capacity** to
45
46 763 cope with the emerging challenges of the new millennium, such as the creation of new
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48 764 institutions and the adaptation of the regional and local implementation arrangements to new
49
50 765 contexts, but «this adaptation remains unfinished business» (Levratto et al. 2017, 278). **By**
51
52 766 **contrast, as a result** of the traditional German model of consensual democracy consolidated
53
54 767 over the decades within this federal system, coordination is instead well established in
55
56 768 Germany contextually **with close involvement** of the *Länder* and the regional stakeholders in
57
58 769 the development and implementation of the HTS initiatives. This widespread transparency **of,**
59
60 770 **and participation in,** legitimizing transformative change also reflects on the use of high-level
771
772 policy panels with a plural composition, as well as on the attempt to consolidate actions to
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activate German civil society participation, by following the EU notion of ‘open innovation’.

774

8. Concluding Remarks

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777 Drawing on an institutional approach, this article has analyzed how **the transition to the TCA**
778 **is happening in different European contexts. By focusing on two specific dimensions of this**
779 **third, emerging, approach to innovation that in recent years the EC has placed at the core of the**
780 **EU debate, it has investigated the institutional factors** that help explain different reform
781 trajectories in the MSs.

782 Following the **political science literature** that interprets transposition in the EU as a
783 bottom-up implementation, the comparative analysis of the French and German cases has
784 highlighted two different development trajectories of innovation policies which are associated
785 with the use of different mixes of tools, **thereby reaffirming the importance** of dependence on
786 national historical paths (Evans 1995; Mako and Illesy 2015; Rodrik 2007).

787 **These results have specific policy implications for the building of innovation systems**
788 **in Europe, at both the national and regional level. Some policy recommendations can therefore**
789 **be advanced in regard not only to the consolidation of the EU policy framework, and the**
790 **alignment of national domestic policies with transformative innovation policies, but also to**
791 **how European regions, including the less developed ones, can partake in transformative**
792 **change.**

793 **As this study has highlighted, transition towards the "transformative change" paradigm**
794 **entails the central importance of analysis of, and public debate on, the nature of the problems**
795 **to be addressed. This requires an infrastructure that furnishes data and organizes the**
796 **comparison among the various public and private actors on innovation policies at both national**
797 **and regional level (Edler and Fagerberg 2017). The European impulse should therefore be**
798 **focused on the construction of systemic capacity based on the monitoring of the domestic**
799 **governance architectures. More in detail, what the EC can propose in terms of policy**
800 **framework is the establishment of reward mechanisms that, beyond the mere coordination**
801 **ensured by the OMC, are able to effectively follow up on the use of the principles of the TCA,**
802 **in particular concerning aspects related to the involvement of the various public and private**
803 **actors in the innovation governance, including the participation of civil society. The EU policy**
804 **framework should therefore focus not only on the prescription of principles to be followed in**
805 **a context of transformative change, but also on the design of new and original persuasion**
806 **instruments, such as reward mechanisms for those MSs that effectively incorporate such EU**

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3 807 principles as “open science”, and “open innovation” into their domestic framework for
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5 808 innovation.

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7 809 This systemic capacity at the domestic level should therefore be assessed with reference
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9 810 to an MS’s ability to deploy flexible tools based on widespread participation practices, and
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11 811 taking into account the complementarity of the tools themselves, which are embedded in a
12
13 812 holistic configuration. This means that the domestic tools cannot be reformed in isolation;
14
15 813 rather, it is necessary to consider their interaction with the other components of national
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17 814 innovation systems. If this study has shown that construction of this systemic capacity has been
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19 815 different in the two MSs analyzed – greater in Germany and lesser in France, due to the
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21 816 presence in the former MS of an institutional context more predisposed to transformative
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23 817 change – it has also implicitly argued that the European impulse has often been filtered by the
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25 818 different degree of attention paid over the years to such matters by the national governments
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27 819 that have followed one another in the two EU countries considered. A closer alignment with
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29 820 the transformative change principles could therefore be achieved by entrusting greater
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31 821 responsibilities to external agencies, outside the electoral circuit, as has happened in the past
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33 822 in various MSs for the implementation of other regional policies.

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35 823 These policy implications are particularly valid for the development and consolidation
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37 824 of regional innovation policies. As suggested by the results of this research, in fact, the
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39 825 construction of systemic innovation capacity at the regional level is conditional on the
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41 826 institutional context of development of innovation policies; and the immediate acquisition of
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43 827 best practices in other European sub-contexts is not always desirable or sufficient. The effective
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45 828 adoption of partake in transformative innovation policies by regions could be achieved through
46
47 829 constant support action by central actors, also in order to help sub-national authorities provide
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49 830 them with the skills and competences that they lack. This particularly concerns the less
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51 831 developed European regions in which – as also seen in the case of the implementation of other
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53 832 regional policies – partnership mechanisms are often weaker, and policy choices aimed at
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55 833 responding to emerging environmental and social challenges are not always present on the
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57 834 political and institutional agenda.

58
59 835 To conclude, some policy considerations can be also advanced as regards the recent
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836 actions put in place in response to the COVID-19 crisis. These are characterized by a single
837 ascertainable effect, i.e. the increase in public spending to support innovation. The risk is that
838 the urgency of the response can compromise the potential impact of the emergency as an
839 opportunity for transformative change at the domestic level. As suggested by this study, in fact,
840 the construction of systemic capacity requires time to consult the actors that the crisis has hit

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3 841 **hardest.** Crises can trigger changes only if there are actors ready to seize **the opportunities**
4
5 842 associated with the emergency to promote new development models, **and also if** these actors
6
7 843 enjoy stable cooperative relationships. **Furthermore,** recent EU initiatives (EC 2020d; 2020e)
8
9 844 require a level of coordination of national policies that, based the results of **this study,** the
10
11 845 current configuration of the European Semester is still unable to ensure. **A still open question**
12
13 846 **is therefore** the EU's ability to consolidate an innovation policy really able **to provide answers**
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15 847 to the new, emerging grand challenges.

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2
3 853 **References**

4 854

5
6 855 Acciai C.; Capano G. (2021), Policy instruments at work: A meta-analysis of their applications.
7 856 *Public Administration*, 99, pp. 118 – 136.8
9 857 Beffa, J.L. 2005. *Pour une nouvelle politique industrielle*. Paris: La Documentation française.10
11 858 Bevir, M. (2009), *Key Concepts in Governance*, SAGE Publications Ltd.12
13 859 Bonaccorsi, A. 2016. Beyond Success Stories in Innovation Policies: The Need for Middle-
14 860 Level Theories. *Stato & Mercato* 106: 69-81.15
16 861 Boon, W. and J. Edler. 2018. Demand, challenges, and innovation: Making sense of new trends
17 862 in innovation policy. *Science and Public Policy* 45: 435-447.18
19 863 Borras, S. 2015. Reforms of National Innovation Policies in Europe: Coordinating
20 864 Sensemaking across Countries, in S. Borras and L. Seabrooke (a cura di), *Sources of National*
21 865 *Institutional Competitiveness*. Oxford: Oxford University Press.22
23 866 Borras, S. 2018. Changes in European Research and Innovation Governance: Coordination
24 867 Effects & Membership Effects, in D. Simon, S. Kuhlmann, J. Stamm e W. Canzler (eds),
25 868 *Handbook of Science and Public Policy*. Cheltenham: Edward Elgar.26
27 869 Borras, S and C. Edquist. 2013. The choice of innovation policy instruments. *Technological*
28 870 *Forecasting & Social Change* 80: 1513-1522.29
30 871 Borras, S. and C. Edquist. 2019. *Holistic Innovation Policy: Theoretical Foundations, Policy*
31 872 *Problems and Instrument Choices*. Oxford: Oxford University Press.32
33 873 Blatter, J. & M. Haverland. 2012. *Designing Case Studies: Explanatory Approaches in Small-N*
34 874 *Research*, Basingstoke: Palgrave Macmillan.35
36 875 Braun, D. 2008. Lessons on the political coordination of knowledge and innovation policies.
37 876 *Science and Public Policy* 35: 289-298.38
39 877 Breznitz, D., D. Ornston and S. Samford. 2018. Mission critical: the ends, means and design
40 878 of innovation agencies. *Industrial and Corporate Change* 27: 883-896.41
42 879 Budd, L. 2013. “Europe 2020: A Strategy in Search of a Regional Policy Rationale?” *Policy*
43 880 *Studies* 34 (3): 274–290. doi:10.1080/01442872.2013.771056.44
45 881 Bürzel, T.A. (1999), Towards Convergence in Europe? Institutional Adaptation to
46 882 Europeanization in Germany and Spain. *JCMS: Journal of Common Market Studies*, 37: 573-
47 883 596.48
49 884 Casula 2019, Centralizing Cohesion Policy in times of Austerity: Evidence from the Policy
50 885 Cycle, in “Policy Studies”, FirstView.51
52 886 Casula 2020, Economic Growth and Cohesion Policy Implementation in Italy and Spain.
53 887 Institutions, Strategic Choices, Administrative Change, Palgrave.54
55 888 Casula, M., Rangarajan, N. & Shields, P. (2021). The potential of working hypotheses for
56 889 deductive exploratory research, *Quality & Quantity*, 55, 1703–1725.57
58 890 CEU. 2000. *Presidency Conclusions-Lisbon* European Council. Brussels: Author.59
60 891 Cohen, E. 2007. Industrial Policy in France: The Old and the New. *Journal of Industry,*
61 892 *Competition and Trade*, volume 7, pages 213–227.62
63 893 CNEPI. 2016. *Quinze ans de politiques d'innovation en France*. Parigi: Commission nationale

- 1
2
3 894 Committee of the Regions. 2014. *Charter for Multilevel governance in Europe*, Brussels:
4 895 Committee of the Regions.
5
6 896 Darvas, Z. and A. Leandro. 2015. *The Limitations of Policy Coordination in the Euro Area*
7 897 *Under the European Semester*. Bruxelles: Bruegel.
8
9 898 De Ruiters, R. 2010. Variations on a Theme: Governing the Knowledge-Based Society in the
10 899 EU through Methods of Open Coordination in Education and R&D. *Journal of European*
11 900 *Integration* 32: 157-173.
12
13 901 della Porta, D., and Keating, M. (2008). Comparing approaches, methodologies and methods.
14 902 Some concluding remarks. In D. Della Porta and M. Keating (Eds.), *Approaches and*
15 903 *Methodologies in the Social Sciences: A Pluralist Perspective* (pp. 316-322). Cambridge:
16 904 Cambridge University Press.
17
18 905 della Porta, D., (2008). Comparative analysis: case-oriented versus variable-oriented research,
19 906 In D. Della Porta and M. Keating (Eds.), *Approaches and Methodologies in the Social*
20 907 *Sciences: A Pluralist Perspective* (pp. 198-222). Cambridge: Cambridge University Press.
21
22 908 EFI. 2016. *Research, Innovation and Technological Performance in Germany: Report 2018*.
23 909 Berlino: ExpertenKommission Forschung und Innovation.
24
25 910 EFI. 2017. *Research, Innovation and Technological Performance in Germany: Report 2017*.
26 911 Berlino: ExpertenKommission Forschung und Innovation.
27
28 912 EFI. 2018. *Research, Innovation and Technological Performance in Germany: Report 2018*.
29 913 Berlino: ExpertenKommission Forschung und Innovation.
30
31 914 Edler, J. and J. Fagerberg. 2017. Innovation policy: what, why, and how. *Oxford Review of*
32 915 *Economic Policy* 33: 2-23.
33
34 916 Edler, J., P. Cunningham, A. Gök and P. Shapira. 2016. *Handbook of Innovation Policy Impact*.
35 917 Cheltenham: Edward Elgar.
36
37 918 Edquist, C. 2019. Towards a holistic innovation policy: Can the Swedish National Innovation
38 919 Council (NIC) be a role model? *Research Policy* 48: 869-879.
39
40 920 Efstathiou, K. and G.B. Wolff. 2018. *Is the European Semester effective and useful?* Bruxelles:
41 921 Bruegel.
42
43 922 European Commission (2012), *Responsible research and innovation. Europe's ability to*
44 923 *respond to societal challenges*. Bruxelles: European Commission, Directorate-General for
45 924 Research and Innovation.
46
47 925 European Commission. 2013. *Lessons from a Decade of Innovation Policy*. Bruxelles:
48 926 European Commission.
49
50 927 European Commission. 2014. *Research and Innovation Performance in the EU: Innovation*
51 928 *Union Progress at the Country Level*. Bruxelles: European Commission, Directorate-General
52 929 for Research and Innovation.
53
54 930 European Commission, 2017a. *LAB-FAB-APP. Investing in the European Future We Want,*
55 931 *Report of the independent High-Level Group on maximising the impact of EU Research &*
56 932 *Innovation Programmes*. Bruxelles: European Commission, Directorate-General for Research
57 933 and Innovation.
58
59 934 European Commission, 2017b. *Europe's Future: Open Innovation, Open Science, Open to the*
60 935 *World, Reflections of the RISE group (Research, Innovation and Science Policy Experts),*
60 936 European Commission, Brussels.

- 1
2
3 937 European Commission. 2018a. *A renewed European Agenda for Research and Innovation -*
4 938 *Europe's chance to shape its future*. Bruxelles: COM(2018) 306 final.
- 6 939 European Commission. 2018b. *Accelerating Breakthrough Innovation: Full set of*
7 940 *recommendations from the Independent High-Level Group of Innovators on establishing a*
8 941 *European Innovation Council*. Bruxelles: European Commission.
- 10 942 European Commission. 2018c. *Science, Research and Innovation Performance of the EU 2018*.
11 943 Bruxelles: European Commission.
- 13 944 European Commission, 2018d. Transitions on the Horizon: Perspectives for the European
14 945 Union's future research and innovation policies, Final report from project BOHEMIA, 'Beyond
15 946 the horizon: Foresight in support of the EU's future research and innovation policy', European
16 947 Commission, Directorate-General for Research and Innovation, Brussels.
- 18 948 European Commission, 2019. Reflection Paper: Towards a Sustainable Europe by 2030,
19 949 European Commission, Brussels.
- 21 950 European Commission, 2020a. Transformative innovation and socio-technical transitions to
22 951 address grand challenges, Luxembourg: Publications Office of the European Union, 2020.
- 23 952 European Commission (2020b), European Innovation Scoreboard 2020, Luxembourg:
24 953 Publications Office of the European Union, 2020.
- 26 954 European Commission. 2020c. *Science, Research and Innovation Performance of the EU 2018*.
27 955 Bruxelles: European Commission.
- 29 956 European Commission. 2020d. *Delivering on Europe's recovery through research and*
30 957 *innovation*. Bruxelles: European Commission.
- 32 958 European Commission. 2020e. *Protect, prepare and transform Europe: Recovery and*
33 959 *resilience post COVID-19. ESIR Policy Brief no. 1*. Bruxelles: European Commission.
- 35 960 Evans, P.B. 1995. *Embedded Autonomy: States & Industrial Transformation*. Princeton:
36 961 Princeton University Press.
- 37 962 Fagerberg, J. 2016. Innovation Systems and Policy: A Tale of Three Countries. *Stato &*
38 963 *Mercato* 106: 13-39.
- 40 964 Fischer, F. and Forester, J. (Eds) (1993). *The Argumentative Turn in Policy Analysis and*
41 965 *Planning*. Durham & London: Duke University Press.
- 43 966 Flanagan, K. and E. Uyarra. 2016. Four Dangers in Innovation Policy Studies. *Industry and*
44 967 *Innovation* 23: 177-188.
- 46 968 Flanagan, K. E. Uyarra and M. Laranja. 2011. Reconceptualizing the Policy Mix for
47 969 Innovation. *Research Policy* 40: 702-713.
- 48 970 Hall, P. and D. Soskice (eds.). 2001. *Varieties of Capitalism*. Oxford: Oxford University Press.
- 50 971 John, P. 1999. "Ideas and Interests; Agendas and Implementation: An Evolutionary
51 972 Explanation of Policy Change in British Local Government Finance." *The British Journal of*
52 973 *Politics and International Relations* 1 (1): 39-62.
- 54 974 IPI. 2008. *Innovazione Industriale e Competitività: Francia, Germania, Regno Unito e Spagna*
55 975 *a confronto*. Roma: Istituto per la Promozione Industriale.
- 57 976 Kaiser, R. and H. Prange. 2004. Managing diversity in a system of multi-level governance: the
58 977 open method of co-ordination in innovation policy. *Journal of European Public Policy* 11: 249-
59 978 266.
- 60

- 1
2
3 979 Kattel, R. and M. Mazzucato. 2018. Mission-oriented innovation and dynamic capabilities in
4 980 the public sector. *Industrial and Corporate Change* 27: 787-801.
- 5
6 981 Kirs, M., E. Karo and K. Ukrainski (2021) Transformative change and policy-making: the case
7 982 of bioeconomy policies in the EU frontrunners and lessons for latecomers, *Innovation: The*
8 983 *European Journal of Social Science Research*, First Vier, DOI:
9 984 10.1080/13511610.2021.2003186
- 10
11 985 Kuhlmann, S., Rip, A., 2014. The Challenge of Addressing Grand Challenges. A Think Piece
12 986 on How Innovation Can Be Driven Towards the “Grand Challenges” As Defined Under the
13 987 European Union Framework Programme Horizon 2020, Report to ERIAB.
14 988 <https://doi.org/10.13140/2.1.4757.184>.
- 15
16 989 Larédo, P. and P. Mustar. 2001. French Research and Innovation Policy: Two Decades of
17 990 Transformation. In: P. Larédo e P. Mustar (eds) *Research and Innovation Policies in the New*
18 991 *Global Economy. An International Comparative Analysis*. Cheltenham, UK, Northampton
19 992 MA, USA: Edward Elgar.
- 20
21 993 Lauvergeon, A. 2013. *Un principe e sept ambitions pour l’innovation*. Paris: La Documentation
22 994 française.
- 23
24 995 Levratto, N., S. Lhuillery and T. Zacharewicz. 2018. *RIO Country Report 2017: France*.
25 996 Lussemburgo: Joint Research Centre of the European Commission.
- 26
27 997 Littig, B. 2011. ‘Interviews, Expert.’ In *The International Encyclopedia of Political Science*,
28 998 ed. Badie B., D.
- 29
30 999 Lowndes, V. 2005. “Something Old, Something New, Something Borrowed.” *Policy Studies*
31 1000 26 (3–4): 291–30
- 32
33 1001 Mahoney James (1999), Strategies of Causal Assessment in Comparative Historical Analysis,
34 1002 *American Journal of Sociology*, Vol. 104, No. 4 (January 1999), pp. 1154-96.
- 35
36 1003 Mahoney, James and Gary Goertz 2006. ‘A Tale of Two Cultures: Contrasting Quantitative
37 1004 and Qualitative Research’, *Political Analysis* 14(3): 227–49.
- 38
39 1005 Mako, C. and M. Illesy. 2015. *Innovation Policy Review: National and European Experience*.
40 1006 QuInnE Working Paper. Bruxelles.
- 41
42 1007 McAdam, Doug, Sidney Tarrow and Charles Tilly 2001. *Dynamics of Contention*. Cambridge
43 1008 University Press.
- 44
45 1009 NKR. 2017. *Bureaucracy Reduction, Better Regulation, Digital Transformations: Annual*
46 1010 *Report 2017*. Berlino: Nationaler Normenkontrollrat.
- 47
48 1011 OECD. 2014a. *OECD Reviews of Innovation Policy: France 2014*. Paris: OECD Publishing.
- 49
50 1012 OECD. 2014b. *Public Procurement for Innovation: Good Practices and Strategies*. Paris:
51 1013 OECD Publishing.
- 52
53 1014 Peters, B. G. 1999. *Institutional theory in political science*. London: The Tower Building.
- 54
55 1015 Pierson, P. 2011. *Politics in Time: History, Institutions, and Social Analysis*. Princeton:
56 1016 Princeton University Press.
- 57
58 1017 Rodrik, D. 2007. *One Economics, Many Recipes: Globalization, Institutions, and Economic*
59 1018 *Growth*. Princeton: Princeton University Press.
- 60

- 1
2
3 1019 Ruffa, C., & Evangelista, M. (2021). Searching for a middle ground? A spectrum of views of
4 1020 causality in qualitative research. *Italian Political Science Review/Rivista Italiana Di Scienza*
5 1021 *Politica*, 51(2), 164-181. doi:10.1017/ipo.2021.10
6
7 1022 Rueschemeyer, Dietrich 2003. 'Can One or a Few Cases Yield Theoretical Gains?', in
8 1023 Mahoney and Rueschemeyer (eds.), pp. 305–36.
9
10 1024 Schot, J. and W.E. Steinmueller. 2018. Three frames for innovation policy: R&D, systems of
11 1025 innovation and transformative change. *Research Policy* 47: 1554-1567.
12
13 1026 Serger, S.S., E. Wise and E. Arnold. 2015. *National Research & Innovation Councils as an*
14 1027 *Instrument of Innovation Governance*. Lund: VINNOVA Swedish Governmental Agency for
15 1028 Innovation Systems.
16
17 1029 Skocpol, Theda and Margaret Somers 1980. 'The Uses of Comparative History in Macrosocial
18 1030 Inquiry', *Comparative Studies in Society and History* 22(2): 174–97.
19
20 1031 Smits, R., Kuhlmann, S., Shapira, P., 2010. *The Theory and Practice of Innovation Policy: An*
21 1032 *International Research Handbook*. Edward Elgar, Cheltenham UK.
22
23 1033 Soete, L. 2007. From industrial to innovation policy. *Journal of Competition and Trade* 7: 273-
24 1034 284.
25
26 1035 Sofka, W. 2015. *RIO Country Report 2014: Germany*. Lussemburgo: Joint Research Centre of
27 1036 the European Commission.
28
29 1037 Streeck, W. and K. Thelen (eds.). 2005. *Beyond Continuity: Institutional Change in Advanced*
30 1038 *Political Economies*. Oxford: Oxford University Press.
31
32 1039 Thomann, E. 2015. Customizing Europe: transposition as bottom-up implementation, *Journal*
33 1040 *of European Public Policy*, 22:10, 1368-1387.
34
35 1041 Thomann, E. 2019. Customized implementation of European Union food safety policy: United
36 1042 in diversity? Cham: Palgrave Macmillan, International Series on Public Policy.
37
38 1043 Thomann, E. and F. Sager (eds). 2018. *Innovative Approaches to EU Multilevel*
39 1044 *Implementation: Moving beyond legal compliance*. Routledge, ISBN: 978-0-8153-6000-
40
41 1045 Zhelyazkova A. and E. Thomann (2021) 'I did it my way': customisation and practical
42 1046 compliance with EU policies, *Journal of European Public*
43 1047 *Policy*, DOI: 10.1080/13501763.2020.1859599
44
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Table 1. Main Indicators for Research and Innovation in France and Germany: An International comparison

Main R&D Indicators	Year					
	2005	2014	2015	2016	2017	2018
<i>Percentage of Gross domestic expenditure on R&D (GERD) financed by the government</i>						
France	38.6	34.3 ^{b p}	34.8	32.4	32.4 ^p	31.6
Germany	28.5 ^d	28.7 ^d	27.9 ^d	28.5 ^d	27.7 ^d	27.8 ^d
EU27 (from 01/02/2020)	35.6 ^{ee}	32.9 ^e	32.2 ^e	31.2 ^e	30.1 ^e	30.0
OECD-Total	29.7 ^{ee}	27.3 ^e	26.8 ^e	25.7 ^e	25.0 ^e	24.6
<i>Business enterprise expenditure on R&D (BERD) as a percentage of GDP</i>						
France	1.27	1.45	1.44	1.45	1.44 ^p	1.44 ^p
Germany	1.69	1.95	2.01	2.00	2.11	2.15 ^e
EU27 (from 01/02/2020)	1.05 ^e	1.27 ^e	1.28 ^e	1.30 ^e	1.34 ^e	1.37 ^e
OECD-Total	1.43 ^e	1.60 ^e	1.60 ^e	1.62 ^e	1.66 ^e	1.72 ^e
<i>Business enterprise expenditure on R&D (BERD) as a percentage of value added in industry</i>						
France	2.15	2.51	2.50	2.51	2.51 ^p	2.51 ^p
Germany	2.62	3.06	3.16	3.14	3.31	3.38 ^e
EU27 (from 01/02/2020)	1.64 ^e	2.03 ^e	2.04 ^e	2.07 ^e	2.13 ^e	2.18 ^e
OECD-Total	2.17 ^e	2.47 ^e	2.47 ^e	2.51 ^e	2.57 ^e	2.65 ^e
<i>Percentage of business enterprise expenditure on R&D (BERD) financed by the government</i>						
France	10.1	7.8	8.8	7.7	8.0 ^p	7.5 ^p
Germany	4.5 ^e	3.4 ^e	3.3	3.4 ^e	3.2	3.1 ^e
EU27 (from 01/02/2020)	7.3 ^e	6.2 ^e	6.2 ^e	5.4 ^e	5.1 ^e	5.3 ^e
OECD-Total	6.8 ^e	5.9 ^e	5.9 ^e	5.2 ^e	5.0 ^e	4.9 ^e
<i>Percentage of business enterprise expenditure on R&D (BERD) financed by the business enterprise sector</i>						
France	80.7	82.8	82.0	83.2	83.2 ^p	83.8 ^p
Germany	92.1 ^e	91.4 ^e	89.9	89.7 ^e	90.4	90.4 ^e
EU27 (from 01/02/2020)	84.6 ^e	83.8 ^e	83.3 ^e	84.4 ^e	84.8 ^e	84.7 ^e
OECD-Total	89.3 ^e	86.7 ^e	86.5 ^e	86.7 ^e	86.2 ^e	86.4 ^e

Note: Detailed metadata: <http://metalinks.oecd.org/msti/20210316/5d8c>

Source: OECD (2021), *Main Science and Technology Indicators, Volume 2020 Issue 2*, OECD Publishing, Paris, <https://doi.org/10.1787/0bd49050-en>.

Table 2. Implementing the EU transformative innovation policy in Germany and France: Outcomes Observed and Main Explanatory Dimensions

Dimensions of the “transformative change approach”		Outcomes expected based on the EU notion of national innovation policy in a context of transformative change	Outcomes Observed in	
			Germany	France
Policy mix to address grand challenges	Horizontal Coordination	System transition to horizontally coordinate policies from various domains and specific sectoral policies	Very high, with actions set under the umbrella of the HTS	Where it exists, it occurs ad hoc and is not always effective
	Innovation model	Innovation is expected to address a set of well-chosen grand challenges	Incremental actions to favor injection of innovation into manufacturing companies (e.g., companies devoted to export) Focus on a set of well-chosen grand challenges, in particular sustainable mobility and energy transition	Governmental actions aimed to reinforce the development of young firms and start-ups. A proliferation of so many measures that it makes it difficult to find a clear transition model (e.g. identification of nine major grand challenges)
	COVID-19 measure(s)	As part of the Recovery and Resilience Facility, R&I is in association with digital and green transformation	Funds to support the expansion of venture capital that finances start-ups As part of the <i>Wumms</i> Recovery Plan, a focus on well-chosen environmental challenges, in particular sustainable mobility and energy transition. Actions set under the umbrella of the HTS 2025	An emergency package dedicated to start-ups As part of the <i>France Relance</i> Recovery Plan, a proliferation of so many measures that it makes it difficult to find a clear transition model (e.g., a plurality of objectives related to “green innovation”)
Governance mechanisms to ensure legitimization and coordination	Type of governance model	Efforts to link top-down and bottom-up initiatives, co-producing innovation values in the policy process, with new spaces and coordination mechanisms for public debate, deliberation, learning and experimentation	A combination of top-down and bottom-up governance models, together with a lead role played by the central government to promote vertical and horizontal cooperation, as well as collaboration with the main regional clusters, and bottom-up engagement	Strongly top-down development, with a lead role played by the Head of State
	Inter-departmental coordination	Establishment of strong cooperative relationships among the sectoral ministries, in order to avoid horizontal coordination failures	Still in an institutionalization phase	High, reflecting the control capacity of the Head of State
	State-regions coordination	Establishment of strong cooperative relationships between the central and the sub-national levels of governments, in order to increase vertical coordination mechanisms	Strong, ensured by the “Unified Conference for Science”	Present, but with a strong top-down control
	Innovation support bodies (agencies, committees, etc.)	Introduction of new support bodies to be fully involved in the policy-making process	Prevalence of high-level panels with a plural composition, and decision-making role	Prevalence of consultative bodies, mainly chaired by the Head of Government
	Involvement of regions and regional stakeholders in implementation	Innovation implies constructing transformative coalitions, and bringing “open science” and “open innovation” by fully mobilizing and involving sub-national authorities, regional stakeholders, end-users and citizens in the implementation phase	Consolidated	Present, but with a strong top-down control and too much overlapping of competencies
	Involvement of civil society in implementation		Very high, with several experimentations	Very limited
<i>Explanatory Dimensions related to the domestic institutional context/Policy Legacies</i>				
Institutional architecture of the country			Federal System	Unitary System

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State approach to innovation	Establishment of a model of consensual democracy characterized by the dispersion of power among a plurality of actors	A traditional state interventionism - "technological Colbertism"
Dynamics of inter-institutional cooperation	Consolidation of cooperative relationships between the central government and the sixteen <i>Länder</i> Strong involvement of non-university research companies, with a large network of state-owned laboratories	Prevalence of Top-down mechanisms Very marginal role played by sub-national public and private actors
Entrepreneurial fabric	Prevalence of large companies in the medium-high-tech manufacturing sector, in fields such as the automobile and chemical sectors Prevalence of a strong network of highly specialized small and medium-sized enterprises, also very inclined to export	Prevalence of large national programs in the military and civilian fields Very marginal role played by the universities and the small and medium-sized enterprises in the French innovation dynamics

Source: Authors' elaboration

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