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Regional resilience through the lenses of the capability approach

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Abstract
Regional resilience has been widely studied in economics and economic geography. The extant literature proposes different measures and definitions, without achieving a unitary view of the concept. In this paper, an interpretation of regional resilience thorough Sen's capability approach is proposed. In particular, resilience emerges as a collective capability and "being resilient" as a collective functioning. Individual characteristics of the agents operating in a region and the interaction between them lead to this interpretation. The definitions adopted by the extant literature appear to be parts of a whole, which is difficult to capture in a single analysis.

Keywords Regional resilience · Capability approach · Interactions

JEL Codes R11 · R50

1 Introduction

Economists have borrowed the concept of resilience from physics, ecology (Holling 1973), industrial ecosystems (Zhu and Ruth 2013) and psychology as Mamouni-Limnos et al. (2014) recall, using it to study economic units and systems from an evolutionary point of view (Mamouni-Limnos et al., 2014; Martin and Sunley 2015, 2020 and 2023). Indeed, resilience may be viewed both as a static and as a dynamic

The research presented in this paper is not based on data involving human beings.

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characteristic of an observational unit, be it a single agent or a set of agents homogeneously constituting a "body." Resilience is intimately linked to the ability of an organism to respond to individual and systemic shocks and, in the end, to survive and is of the utmost interest not only for evolutionary economists, but also for economists in general (Reggiani et al. 2002 and Martin 2012). The extant literature generally describes resilience as the ability of a system to return to its original equilibrium after being perturbed. This concept of resilience has fascinated economists, who are taught about the importance of equilibria from their very first contact with the discipline. However, from an evolutionary perspective, resilience can entail something different from just returning to some initial equilibrium. Mixing physics with psychology and biology, resilience may also be interpreted as the ability of a subject or of a group of subjects constituting a complex organism to evolve to some (new) equilibrium after a shock (Zhu and Ruth 2013). In this sense, it is the capacity of surviving and evolving after being hit by some shock and, possibly, after internalising it. Adopting this view, resilience is an adaptive process that starts whenever the initial conditions change: whoever is able to adapt to the new conditions survives, the others perish, no matter whether they return to the initial situation or evolve towards a new equilibrium (Carmeli and Markman 2011 and Doeksen and Symes 2015).

Economic geography has focused on the resilience of economic systems at regional level (Simmie and Martin 2010) and on the capacity of a given area to respond to shocks successfully (i.e. surviving and evolving towards some new equilibrium). However, economic geographers (Frenken and Boshma, 2007) also recognise that the very core of resilience grounds on the micro level (Gilly et al. 2014 and Duschl 2016): a region is economically resilient to the extent to which the economic agents (Weick 1993 and Weick and Roberts 1993) and the interactions between them are resilient (Martin and Sunlyey, 2020; Grabner 2021 and Sutton and Arku 2022). The microeconomic literature on the topic is wide and considers the issue from different perspectives; beyond the regional dimension, resilience may be considered at both firm and supra-regional level. With the aim of interpreting resilience in the light of the capability approach, the strand of literature that focusses on firm and organisational resilience (Gibson and Tarrant 2010) is of particular interest. This part of the literature refers to the ability of a firm to organise itself internally and externally to be resilient when facing a shock. However, firms are not atomistic agents; rather, they are part of territorial (regional) systems, whose resilience partially depends on and influences that of the firms existing there. Regional economies are indeed complex systems of interactions between different actors: firms, people (e.g. Miller and King 1971) and political institutions (e.g. Gertler 2010), as, for example, the triple helix model explains (e.g. Rodrigues and Melo 2012 with particular reference to responses to economic crises). These relationships are particularly relevant to determine the level of resilience of a regional system.

This paper will explore the concept of resilience in the light of the notion of collective capabilities (Ibrahim 2006). However, despite this focus on the collective dimension, some references to the individual conceptualisation of capabilities by Sen (1993, 1999 and 2002) will be useful to account for the micro foundations of the capability approach and its relationship with individual and regional resilience. The

complex system of interactions between economic actors in a region is interpretable in terms of individual and collective capabilities: indeed, the extant literature suggests that regional resilience entails both individual and collective resilience, for the latter does not exist without the former. Such a process is typical of the survival of human communities and populations, which depends on individual and collective decisions and actions: those able to achieve collective capabilities have survived, the others have perished (Diamond 1997 and 2012). In particular, the paper will show that resilience cannot emerge as a capability nor be attained as a functioning, without interactions between different economic agents, operating within a collective structure and process. Moreover, as regional resilience entails the interaction between several economic and institutional agents first to be achievable and then to be attained, it is a collective capability and a collective functioning. The proposed theoretical discussion will employ the triple helix model (Etzokowitz and Leydersdorff, 2000) to exemplify the relationship between regional resilience mechanisms and the capability approach. Indeed, this model clearly highlights how territorial agents cooperate to produce innovation (e.g. Bristow and Healy 2018 and Di Caro and Fratesi, 2018), so increasing the chances of a region to be resilient to negative shocks.

Policymakers and scholars have contributed to ensure regional resilience over time, by analysing, designing and enacting policies shaped by different economic schools and orientations (e.g. Kakderi and Tasopoulou 2017). However, a capability-inspired perspective in the design of resilience-enhancing policies appears to be under-explored in the literature. Therefore, adding this perspective could be useful to complement more traditional approaches (Alkire 2005; Blečić and Cecchini 2020), especially in developed countries. A reason for this lack of attention to the capability approach (Andreoni et al. 2021) may be the absence of theoretical and conceptual literature that shows its relevance in the field of regional resilience. Therefore, this paper aims at bridging this gap, showing that, as a collective capability, regional resilience is more than just the sum of individual capabilities and, therefore, policies aimed at enhancing it would benefit from considering also theories based on the capability approach. In other words, often economic policies target only one side of the market, or both, while leaving political and administrative institutions unaffected. Instead, reading resilience as a collective capability highlights that it depends on the interplay of both the market (supply and demand sides) and the political and administrative institutions, so requiring comprehensive policies, which embrace all these actors.

Public intervention is often necessary to ensure resilience (Caldera Sánchez et al. 2015), given the interdependence of economic and institutional public agents in a (broadly defined) region. For example, firms' resilience depends on infrastructures, which only the public sector can provide (George et al. 2016 and Li et al. 2025). Examples of these are transportation infrastructures; however, also tax policies are relevant to foster (or hinder) resilience (e.g., Daly 2023). The public intervention is therefore crucial to ensure the resilience of firms. However, many of these public policies need funding, which are generally collected from economic agents through taxation. Private agents alone could not provide several infrastructures and interventions, which are financed through taxation, especially during recessions, when

revenues and profits shrink. The public sector, instead, can rely on different financial sources, including public debt.

Looking at resilience through the lenses of the capability approach helps to underline the complexity of resilience and the nature of its dependence on the different individual economic agents. Moreover, the capability approach frames resilience in a context often used in development economics, making it relevant in the debate on economic development. Furthermore, this paper highlights the very cooperative nature of resilience, as collective capabilities necessitate cooperation between the economic agents. This part of the discussion will provide evidence about the way to design and enact policies, which should rely on and foster cooperation, as it is a fundamental ingredient of collective capabilities. Finally, and perhaps more theoretically in terms of contribution, the text will argue that the following discussion aims at showing that regional resilience is an emergent[1] collective capability, although the difficulties existing in measuring capabilities (Walby 2012) may represent a limitation.

Finally, it is important to stress that the analysis presented in this paper holds for regional systems widely defined and any complex system of economic agents may be interpreted as a region. The choice of framing the paper within the literature on regional economic resilience responds to the need of contextualising the analysis in a stream of literature, where resilience has been widely studied as a response of complex systems to shocks.

2 Resilience

This section is divided into two parts: the first presents a review of the main definitions of resilience used in the economic literature; the second will provide a summary of the main empirical contributions to highlight how resilience is measured by the academic literature and which variables, individuated the theoretical literature, are relevant to promote resilience. The second sub-section will present a mix of theoretical and empirical contributions, as often works present a mix of these two approaches, which are mutually complementary.

2.1 Conceptualisation

Economists have borrowed the concept of resilience from ecology, which studies complex systems, where interactions between agents are fundamental as in economics. Pimm (1984) stressed the idea of dynamicity, stating that it is "how fast the variables [of a system] return to their equilibrium following perturbation."[2] and "Resilience is not, therefore, defined for unstable systems."[3] The emphasis placed on both the equilibrium and the adjustment path is of particular interest to economists,

[1] On the concept of emergence used here, see Martin and Sunley (2012).
[2] Pimm (1984), p. 322.
[3] Ibidem, p. 322.

as both concepts are central in their theoretical models. However, these allow for the existence of multiple equilibria, which might be more or less favourable to the agents. Thus, defining resilience as the ability to return to one of the possible equilibria, when many exist, implies that resilience in the sense depicted by Holling and Pimm may not always lead to a favourable (or optimal) outcome for the agents involved.

From a general point of view, a number of different perspectives taken from ecology, psychology, disaster studies and others allow to define resilience as "a return to normalcy"[4] after some shock, i.e., a shocked system is resilient if it is able to go back to its initial state in some time (Pendall et al. 2010). In case of multiple equilibria, resilience is equivalent to reaching one of the admissible equilibria, after displacement from another. However, moving from a relatively stable to a less stable equilibrium is interpretable as a reduction in the system's resilience[5]. Pendall et al. (2010) present an interpretation of resilience "beyond equilibrium," which characterises adaptive systems in particular. Indeed, a system may respond to a shock through continuous evolution; hence, in this case, there are no equilibria and resilience is the ability to evolve in adaptation to the mutated and mutating conditions of the framework in which the system is embedded. Finally, resilience can be seen as the ability to absorb shocks (Martin and Sunley 2015). A system may return to some (previous) equilibrium, evolve continuously, or keep the initial equilibrium. In this last case, the shock does not alter the original situation as if the system were insensible to the perturbation. These aspects are of utmost importance, as policies wanting to promote regional resilience should avoid paths leading to an equilibrium that is worse than the initial. While policymakers cannot know in advance where the new equilibrium will be, theoretical models (and empirical analyses) can guide the adoption of policies that were successful in the past. While it is true that shocks are different from each other, analogies exist, which can help policymakers to maximise the chance of success (Reinhart and Rogoff 2009). Martin and Sunley (2015) propose an evolutionary definition of resilience, by individuating four steps of response to a shock: exposure, depth of reaction, extent and nature of the adjustment and post-shock growth path.

Regional economists and economic geographers have often adopted the approach "beyond the equilibrium" presented by Pendall et al. (2010), which may be often referred to as an evolutionary perspective of regional resilience (Boschma 2015). In fact, Boschma (2015) extends the concept of adaptive resilience beyond the ability to cope with shocks to that of developing new growth paths. It is necessary to stress that, for the author, evolution and adaptation are different concepts, although sometimes equated, as resilience overcomes "the tensions between adaptability and

[4] Pendall et al. (2010), p. 72.

[5] According to Pendall et al. (2010), an equilibrium is less stable than another if a small perturbation moves the economy outside the equilibrium in the first but not in the second case. The authors are not specific about the concept of "small perturbation"; however, an economy situated in the less stable equilibrium is less resilient than one situated in a more stable equilibrium because the perturbation does not require any adjustment to the second to reach an equilibrium again.

adaptation."[6] In fact, adaptation refers to "changes within preconceived paths"[7], which "reproduce existing structures."[8] However, while path dependence characterises economies, in the presence of an unexpected shock, changes to previous structures could be necessary (teleworking during the COVID-19 pandemic being an example), therefore challenging simple adaptation as a sufficient mechanism for resilience. Instead, adaptability moves forward, as it identifies the ability of evolving abandoning – at least partially – the past paths. For this reason, the literature has often viewed adaptability as a better base for resilience than adaptation. Nevertheless, Boschma (2015) argues that resilience should ground on a mix of adaptation and adaptability, as the ability of starting new growth paths (as the author defines resilience) rests on the institutional and economic legacy of regions, which are therefore essential for the construction of new growth paths.

2.2 Factors enhancing resilience

Several factors are related to resilience and contribute to its emergence and enhancement. According to Boschma (2015), resilience grounds on two main pillars: the strength of the region's industrial base and the territorial institutional context. With reference to the former, the author highlights that related variety and skilled-related industries render regions resilient (see also Quatraro 2010). Moreover, he shows that spillovers and cooperation potentialities that arise from regional knowledge networks allow local systems to evolve in accordance with the market needs and to cope with negative shocks. Additionally, Boschma (2015) stresses the role of institutions: these help to make regions resilient if they are coherent, open to radical changes and able to reform themselves aftershocks. In fact, institutions, infrastructure, innovation (at both firm and territorial levels), natural environment and socio-economic factors are all relevant to ensure resilience (Modica and Reggiani 2015). All the elements mentioned by the cited articles are ingredients of positive resilience, i.e. the attainment of an equilibrium that is not worse than the initial; in this second case, indeed, resilience would be negative[9]. It is important to stress that the presence of the factors associated with positive resilience increases to probability that an economic system will be positively resilient, but does not guarantee it.

Regional economic resilience is a process, which structural diversity (i.e. variety between productive sectors) and diversified specialisation (i.e., specialisation in different sectors)[10] can enhance, as they render the region stronger when confronted

[6] Boschma (2015), p. 737.

[7] Boschma (2015), p. 735.

[8] Grabher (1983) quoted in Boschma (2015), p. 735.

[9] In both cases (positive and negative resilience), a system can be defined "resilient" in the sense that it converges to a new equilibrium. However, this last can be either better than the initial one (positive resilience) or worse (negative resilience).

[10] The presence of different sectors in a region does not mean that it is automatically specialised in some (any) of them: a region is generally definable as specialised in a sector, when the share of the regional GDP (or employment or turnover) generated by that sector is larger than the share of the same sector in the national (or any other reference aggregate at a level above the region) GDP (or other relevant variables).

with shocks and more able to recover afterward (Martin and Sunley 2015). Resilience arises from the co-presence of and interactions between different agents, including firms, educational and governmental institutions, as suggested by the triple helix model and is, therefore, related to structural diversity. This model recalls the importance of innovation (Boschma 2015; Erayidin, 2016; Rocchetta and Mina 2019 and Filippetti et al., 2020) and the interactions between agents (firms, people, educational institutions and political bodies) needed to render regions resilient (e.g., Kaufmann and Tödtling 2001 and Coriat and Weinstein 2002). Diodato and Weterings (2015) and Eraydin (2016) highlight that interactions between workers and firms are necessary for resilience, but not sufficient. Institutions that ease labour mobility and the quality of the educational system are crucial elements in determining the resilience of a regional labour market. In particular, many works (see Zupancic 2023 for a literature review) highlight the relevance of innovation as a major factor that allows and enhances resilience. From a theoretical point of view, indeed, innovation is one of the main results of the triple interaction theorised by the triple helix model and several empirical studies (e.g. Bristow and Healy 2018) confirm it. Innovation allows new productive processes that can enhance competitiveness through a reduction in inputs and costs and new products that can foster firms' sales and profit recovery (hence resilience) after a shock.

While the role of institutions to help economic systems to achieve resilience is clear in particular at regional level (Rodriguez-Pose, 2013), Hudson (2009) noted that focussing on a single region may be misleading, as the resilience of some area may undermine that of another: in a global world, regions and countries are interdependent and the policies enacted by local actors have consequences elsewhere. Moving from the regional to a wider level, the number of actors involved in ensuring resilience grows – see for instance Davies (2011) on EU regions after the 2008 crisis.

Some studies have empirically tested the relevance of the aforementioned factors to enhance regional resilience, as the following works witness. Martin et al. (2016) analyse UK regions between 1971 and 2013, finding evidence of evolutionary resilience and of the ability of the examined regions to go beyond the initial equilibrium. In particular, both the industrial and the institutional structure at the regional level generate and enhance regional resilience. Fast employment recovery, small numbers of job losses during a crisis and higher levels of employment after than before the shock are indicators of resilience in such a case. Innovation processes are particularly important: abundant empirical evidence exists that more innovating regions are more resilient to negative shocks than less innovating areas. For instance, Bristow and Healy (2018) and Filippetti et al. (2020) show that this happened in Europe, when economies responded to the 2008 international crisis. Similarly, knowledge accumulation and learning capacity at regional levels were found to be associated to stronger innovation capacity and prompter and better resilience (Câmara Viana et al. 2023). Focussing on labour markets, during the response of European region to the crisis triggered by the subprime mortgages, Muštra et al. (2020) highlight that resilience concerns also the labour market: the more innovative regions displayed indeed more resilience also in occupational terms. However, Pike et al. (2017) highlight the existence of regional peculiarities in terms of both institutions and economic

situation, suggesting that the best measure of resilience can depend on the analysed context.

2.3 Possible limits of research on economic resilience

A caveat is in order before concluding this section: despite the large number of studies on (regional) resilience, Martin (2012) claimed that the concept of resilience was (and perhaps still is) far from being clearly delimited and defined. Indeed, despite several attempts at systematising, reordering and providing some taxonomy, there are still many indicators, used for the same purpose, showing that (some) regions are resilient, while (some) others are not. Indeed, Cellini and Torrisi (2014) and Dubé and Polèse (2016) claim that resilience is an elusive concept, as when different measures and different dimensions of resilience apply to the same set of regions (those of Italy and Canada in the case of the cited articles) disentangling resilient and non-resilient regions is difficult. In addition, only small differences between regions are detectable over the long run. Designing effective policies in this uncertain scenario may be difficult; for this reason, an interpretation in terms of collective capabilities could be helpful, as policymakers may draw from the set of interventions and policies used to enhance and promote virtuous capabilities.

3 Capabilities and the role of institutions

This section presents the main concepts taken from the capability approach, which will be useful to the theoretical discussion that is going to follow.

3.1 Collective capabilities and their relationships with individual capabilities

The original formulation of the capability approach focusses on individuals (Sen 1993, 1999 and 2002 and Nussbaum 2000): the authors were indeed concerned with individual empowerment and development as the engine of the socio-economic process of development. Because of this, already in its first micro-level formulation it contained some idea of collectiveness, which was explicitly developed by Ibrahim (2006), who builds on the literature on the interconnections and interdependence between each individual and others (i.e. the society). Durkheim (1972), Granovetter (1985) and Putnam (1993) had already given the individual a central place in a networked and interconnected society, where social interactions and relationships are the daily basis for progress and development. From these interdependencies and interactions, the concept of collective functionings and capabilities arises. These are those capabilities and functionings that cannot be reached individually and exist only as the consequence of collective actions (Stewart 2005).

What allows the sum of coordinated individual actions to become a new, collective, capability is, according to Ibrahim (2006), social capital and social innovation, which she connects to each other.[11] It is noteworthy that they are not simply the sum of individual capabilities and functionings (as regional resilience is not the simple sum of individual resiliencies): a single resilient firm (or the sum of single atomistical individuals) does not ensure regional resilience. Ibrahim (2006) emphasises the role and relevance of social structures, collective institutions and social capital that allow collective capabilities and functionings to emerge. In particular, she stresses that these are made possible by collective actions, which entail cooperation between several agents with a common goal, which they can achieve only through cooperation. This means that some states (functionings) and opportunities (capabilities)[12] are reachable and emerge only from common and collective actions; persons acting individually would not be able to attain collective functionings and capabilities, as experiences of self-help in Egypt witness (Ibrahim 2006). There, the populations of some poor districts built essential infrastructures (e.g., water pipelines) not provided by the public authorities, relying on voluntary work and contributions from the same people living in those districts, to buy the necessary materials. Ibrahim (2017) deepens her analysis of collective capabilities, presenting them as an experience of social innovation emerging from a bottom-up process. Individual agents allow collective capabilities to emerge and can attain them following a path, which starts from the conscientisation of a problem, goes through conciliation of individual and collective interests and uses collaboration between the agents. In particular, she stresses that the link between the individual, collective and institutional levels is the basis for collective capabilities and functionings to emerge and be achievable. The two contributions of Ibrahim highlight the necessary interplay between agents collectively organised and public institutions. Community-based organisations can, therefore, activate and achieve capabilities, which would be precluded to individuals (Tonon 2018).

Finally, Ibrahim (2020) highlights the link between the original, apparently individualistic, formulation of the capability approach and the collective development that she proposed in 2006: the author underlines that, in fact, individuals are embedded in their societies and, therefore, their actions affect the other members of the society. In addition, through their social links, they build collective subjects (i.e. groups of people), where the individual, through coordinated and cooperative actions, enables collective capabilities and functionings. Therefore, these last are simply a necessary social phenomenon stemming from individual functionings and capabilities. In this sense, the individual and the collective approach are necessarily complementary.

[11] See Putnam (1993) for a definition of social capital.

[12] In the theory of the capability approach, functionings are the states achieved by individuals (such as being educated, being healthy, etc.), while capabilities are sets of functionings (e.g., living a healthy life, which includes the different functionings – for example being fed, being able to access healthcare, etc. – needed to achieve a healthy life).

3.2 The role of institutions

Social links entailed by collective capabilities and functionings express themselves through informal and formal institutions that mediate between the individual and the collective levels. Migheli (2011) stresses the social dimension of capabilities and functionings, claiming that social interactions allow people to reach new capabilities (i.e. to enlarge their set of possible lives): networks enable people to consume relational goods, to access crucial information and in general the resources embedded in social networks and to benefit from the spillovers. In particular, the author stresses the contribution of social capital – an informal institution – in enabling collective capabilities rendering them achievable.

Social interactions are a sort of informal institution based – at least to a certain extent – on formal institutions (associations, political elections, etc.). Ballet et al. (2007) highlight the role of individual responsibility to the community as a major source of collective capabilities: "Responsibility expresses the capability to feel and be responsible, not only *ex-post* (i.e. once freedom has been exercised), but also *ex-ante*, by the capacity to exercise self-constraint on a voluntary basis in order to satisfy one's obligations towards others."[13] The aforementioned definition involves principal-agent relations and agent-agent interactions. On the one hand, such relationships can be established on a voluntary basis and rely on trust, reputation and social capital, which are informal institutions. However, complex relations require formal institutions: innovation and knowledge transfer via patents and the school system, and democratic processes via constitutional rights and laws are examples of social interactions and goals that necessitate formal institutions. These last are relevant also to enhance collective capabilities; indeed, as these are freedoms to achieve functionings, there must exist institutions that grant those freedoms (Tsai 2011). Many of such institutions should therefore be formal – laws, judicial systems and constitutions are examples – as they should define freedoms, regulate and defend them.

The role of institutions is, therefore, to prepare a fertile ground for capabilities and functionings to be achieved. On the one hand, for this goal, agents need freedom of choosing and acting: formal institutions work to establish, promote and defend such freedom, for instance through laws and courts. On the other hand, people need to develop those informal institutions (such as trust) that are at the basis of capabilities and functionings both at individual and collective level. Again, formal institutions can provide the necessary environment for informal institutions to emerge and develop. Finally, formal institutions are responsible for designing and implementing policies, some of which aim to promote capabilities and improve people's well-being (Van Staveren, 2024).

[13] Ballet et al. (2007), p. 185.

3.3 Agency: how to relate the micro and the macro levels

Of particular interest for the discussion presented here is the role of agencies in the context of regional development (Ibrahim 2017 and Huggins and Thompson 2019): the authors offer a perspective that interrelates the micro level, represented by personality psychology, to the macro level, represented by socio-spatial culture. In particular, they argue that the interplay between these two levels determines the players' behavioural intentions, which translate into actual behaviours that affect regional development through the mediation of agencies. Individuals and groups are able to activate this process of translation through access to "power through their social positions and relations."[14] This theoretical framework provides substantiation for the idea that economic achievements (including the realization of regional resilience) are functionings (beings), as well as policies (doings), which are made achievable by the capabilities created by the institutional framework.

In sum, collective capabilities require the coordinated and collaborative action of individuals – generally human beings – in a framework (see Ibrahim 2017), where such capabilities are allowed to exist by formal and informal institutions. Moreover, existing and achieved capabilities and functionings at both individual and collective level may generate new capabilities and functionings. It is important to highlight that as collective capabilities exist, so collective functionings can or cannot. The discussion presented in this section clarifies why policies that aim at promoting human development through capabilities need to target both individuals and institutions, for without such comprehensiveness, they would be ineffective.

4 Regional resilience, collective capabilities and collective functionings

The goal of this section is to show that resilience is a collective capability, matched with its collective functioning "being resilient." Closing the circle of the reasoning in this way will indeed allow to stress the necessary complementarity of institutions and market sides and, thus, the need for policies to include all these actors in comprehensive interventions. A terminological distinction between "resilience" as an opportunity and "being resilient" as a being is crucial for the discussion that will follow. Resilience is indeed defined as the "ability of being resilient," and as such matches the definition of capability as one of the states (lives) that can be reached. Instead, simply "being resilient" is an achieved state and, thus, a functioning. The extant literature on resilience that is summarised in the second section of the paper does not pay much attention to this distinction, which is both theoretical and practical.

The first step will be to show that regional resilience is a capability and then that it is of a collective type, at least in economics.[15] Overcoming and unifying the

[14] Huggins and Thompson (2019), p. 139.

[15] Indeed, in psychology, resilience is a concept that refers mainly to each individual person.

existing definitions, resilience is the opportunity to respond positively (i.e. securing healthy survival) to some shock. Such an opportunity is definable as a capability, because it is one of the possible outcomes for a region, among those in the feasible set of results when a negative shock hits. Stagnation, stagflation and de-growth are indeed other possibilities. In regional economic systems, economic agents and public institutions interact with each other, exploiting informal institutions such as social capital and trust. These necessary interactions and interdependences render resilience a collective capability and its achievement a collective functioning.

4.1 Regional resilience and its factors are collective capabilities

To demonstrate that regional resilience is a capability, some considerations about the nature of the ingredients of reliance can be useful. In particular, showing that also these ingredients are capabilities will be helpful. Considering innovation, which is an important factor of resilience, as an example can be useful to understand why regional resilience is a collective capability. Innovation stems from a process of cooperation and interaction between educational institutions, such as universities, firms and their R&D centres and political and administrative institutions, which provide the rules of the game, i.e., the incentives and the conditions for a fertile R&D environment (the triple helix model). Innovating is therefore a capability, which firms may attain or not, depending on the functionings they are able to develop. The key point in this process is that some of the functionings that require innovation necessitate interactions with other actors: for instance, firms with R&D units must hire researchers, who come from the educational system. This implies that schools and universities respond to the needs of the firms and understanding these needs requires a constant dialogue between these actors. In addition, firms and public institutions interact to demand and supply norms (e.g. those protecting the intellectual property) and services (e.g. the judicial system that protects the intellectual property) apt to establish fertile conditions fostering R&D. Moreover, technological artifacts enable subjects, which did not produce them, to reach new capabilities (Oosterlaken 2011); in this way innovators participate in third parties' building and achieving new functionings and capabilities, which are collective, as they result from interactions between different actors.

Following Ibrahim (2020), the process of innovation is interpretable as a collective capability, stemming from the interaction between individual functionings. Indeed, R&D needs researchers, who are individual persons, each with some specific ability and knowledge (learnt also thanks to schools and universities). Being a researcher, being a scientist, being a student, etc. are individual functionings, which allow to produce innovation, once they are combined both at individual and collective level; indeed, the cooperation and the collective work of several researchers is at the basis of technological and scientific progress. Even when an invention is *per se* developed by one person, in reality it is the result of (at least indirect) cooperation: each innovation rests on the work of the innovator and on the knowledge produced by others before. However, the innovator is very often a team of researchers working together to the same goal: each member of the team performs a task and the final

innovation id the result of the combination of the results of each task, whose product is generally not stand-alone but only a part of the final innovation. This renders innovation essentially a collective effort and result. Therefore, within the framework of collective capabilities, innovation – and consequently the resilience stemming from it – is a collective capability. The previous discussion highlights how the results of R&D derive from collective capabilities and functionings, which may be crucial for the resilience of an area, as the adoption of new technologies enhances the probability of being resilient to negative events. In addition, R&D represents a pillar of another capability, resilience.

Another example derives from considering one of the dimensions (measures) of resilience, employment, which depends on several regional functionings. These include for workers being skilled, trained and adequately educated: indeed, the quality of workers is essential for firms to recover after a shock and have innovative capacity[16]. Being well-educated, producing related varieties, etc. are functionings, as they are classifiable as beings and doings. Some of them have a clear collective characteristic: the production of innovation at regional level, for example, depends on the presence of different firms producing such varieties. Education itself is a collective capability: it is possible only in the presence of people willing to invest in human capital on the one side and schools and universities of high standing on the other side. In other words, several actors are necessary for educating people and achieving the functioning "being educated." Quality schools and universities provide quality education, which may translate into better responses to shocks in the labour market also through their contribution to the ability to innovate. Quality education may also foster the establishment of innovative clusters of firms, easing movements of workers between firms and allowing reductions in the duration of unemployment. Occupational and economic resilience is therefore more probable in presence of a territory investing in quality education.

The question that is relevant at this point is: are the ability to innovate and promote employment collective capabilities? The answer is yes. As already discussed, collective capabilities and functionings emerge from interactions and interdependence between agents: they do not operate alone, as if they were self-sufficient islands. Firms and workers interact through the labour market; institutions, firms and workers meet in the market of education and interact through elections, policies, negotiations. The presence of one single well-trained and well-educated worker among a number of poorly trained and poorly educated workers would not be enough to allow a regional labour market to be resilient; a single innovative firm amid several others that do not innovate will never suffice to secure resilience. In addition, training programs for the unemployed, education policies that respond to the changing needs of the labour market, policies oriented to promote R&D are fundamental for resilience to be part of the feasible set of the possible outcomes after a negative shock. For all these reasons – and others may exist – resilience is a collective capability.

[16] This capacity may be understood both as the ability of producing innovation and as that of adopting new technologies that enable resilience.

The capabilities of innovating and promoting employment can translate into the respective functionings (i.e., "being innovative", "being a promoter of employment") once the economic agents achieved those capabilities. These functionings at the level of firms (and more in general, economic agents) give regions the possibility to be resilient (i.e., resilience as a regional capability). At this point, the role of institutions becomes crucial, as the next sub-section will illustrate.

4.2 Collective regional functionings and the role of institutions

Capabilities come after the achievement of some functionings. "Being innovative," "being well-trained," "being well-educated," and "being able to move from a firm to another (because of variety relatedness)" are examples of individual functionings that allow employment resilience in the set of the possible achievable worlds after a negative shock. Such functionings are applicable to both individual agents and regions. In other words, resilience arises from the presence of a mix of individual (for example "being well-educated") and collective (for example "innovating") functionings; moreover, the first must be achieved by the largest share of players as possible to increase the probability of achieving resilience. Indeed, once this last becomes a feasible opportunity, i.e. is a capability for a regional economic system, such a system must aim at "being resilient", which means transforming that capability into the corresponding functioning. "Being resilient" at the regional level, therefore, becomes possible if there are enough resilient individuals and their resilience is strong enough to extend to the regional level: the condition of "being resilient", therefore, entails the co-working of several different players in the same region.

Organised economic players may activate resilience as a capability, even when it is initially absent. Indeed, they may work together and induce policymakers to build the institutional infrastructures (which are functionings), which render resilience a feasible outcome after a shock. In other words, contexts that are lacking the necessary collective functionings may have the capability of stimulating those that are necessary to activate resilience. Such a process may explain why in the short run some regions are more resilient than others, but in the long run such a diversity is hard to find, as Cellini and Torrisi (2014) show. Regions that were not able to be resilient at a given time were able to activate the functionings necessary to render resilience a feasible option. Indeed, it is not a fixed property that is present or absent; rather it is a collective capability, which the presence of the necessary collective functionings may activate. However, policy interventions may be necessary to achieve – or at least facilitate – these results.

Bristow and Healy (2014) stress that agencies play a relevant role contributing to organise people, institutions and firm at regional level, linking them to each other. The authors argue that the regional context and boundaries become of particular importance for resilience, as agencies are particularly relevant at this geographical level. Their perspective is important of the discussion presented in this paper, as Ibrahim (2017) and Huggins and Thompson (2019) point out that agencies are fundamental to make collective functionings and capabilities emerge. The fact that agencies are common factors to both resilience and collective capabilities

is suggestive that they share the same nature and originate from the same collective process.

5 Resilience as a collective capability at non-regional level

The discussion presented in the previous section suggests presents regional resilience as a collective capability at the regional level. However, as already highlighted, economic agents operating in a region include firms, which are aggregates of individuals. On the one hand, regional resilience depends on that of the firms; on the other hand, firm resilience is a collective capability itself. Finally, at a more macro level, regional resilience contributes to that of wider geographical aggregates.

This last part of the discussion starts from firms, for which resilience is a matter of collective capabilities and functionings, although at a lower (perhaps smaller) level than the regional one. Considering again the role of innovation for regions, the same reasoning applies to firms: those being more able to innovate have more chances to survive negative shocks (Kyrdoda et al. 2023). Innovation and resilient management of firms are collective capabilities themselves, as they depend on cooperation at different levels. Indeed, as Eddleston et al. (2008) highlight, firm governance is a collective process stemming from collective decision-making and actions; this is particularly visible in family-owned businesses, where families contribute to firm resilience through social interactions and strategic planning. Nevertheless, also (perhaps, especially) in large companies, top managers' decisions need the cooperation of the other employees to be enacted, thus rendering the process a collective action, which may be interpreted as a collective capability. The literature on firm resilience is thus aware of the collective nature of firms and of the necessary interactions between workers to secure resilience. An in-depth look into firms suggests that their resilience is therefore both a collective capability and a collective functioning as it is for regions. In addition, it is noteworthy that the more resilient a region is, the more opportunities of resilience it offers to the individuals (including firms) that are located in it: collective capabilities at different levels enhance each other and are interdependent. Effective and efficient private-public relationships, institutions, networks etc. supply economic agents with valuable assets to be exploited to the goal of individual resilience.

The ability to preserve employment, innovation, generation of value added, income, etc. at the regional level strongly depends on how firms react to a shock. Yet, they are composite – i.e. collective agents, as they are aggregations of people working together for that organization. The resilience of a region entails that of the agents operating there and vice-versa. Of course, not all of these agents are resilient when a region is; however, for the last outcome to be realised, many of the agents must be resilient. The extant literature has studied firm resilience from many points of view and in the face of many happenings.

Furthermore, it is noteworthy that the discussion presented in the previous section cannot be confined to regions, if we want to obtain a more complete understanding of what resilience is when we analyse it through the capability approach. Indeed, regions are aggregates of agents and relationships between them, working together

to allow organizations to be resilient. Therefore, as a capability, regional resilience has an emergent nature (Martin and Sunley 2012), as it results from the interaction and cooperation of several actors. Indeed, the economic landscape is a self-organising complex system that is constituted by several self-organising sub-systems (e.g. firms), that interact with each other to activate the collective capability of resilience. This very same reasoning, which applies to regions, can in fact be extended to any aggregate of economic and institutional actors. Framing the reasoning in a regional setting is useful to present the argumentation but does not rule out extensions to national or supra-national areas. Of course, as the number of agents involved in the process grows, so do coordination costs, rendering policies and resilience increasingly complex as the geographical scale grows.

A final consideration on policies and policymakers is important. Indeed, the theoretical reasoning presented in the last three paragraphs suggest that comprehensiveness should shape policies at any level: policymakers need to consider people, firms and institutions as single agents and collective bodies interacting with each other to design effective policies. This might be complex, but is the only way to maximise – and perhaps achieve – resilience at any scale.

6 Conclusions

This paper proposes an interpretation of resilience through the lenses of the capability approach. Here resilience is a capability and "being resilient" is its associated functioning, i.e. the act derived from the power that resilience represents in an Aristotelean sense. The analysis highlights also the relevance of producing innovation for resilience: the ability of innovating is a collective capability itself, as it stems from relationships existing between agents, such as firms, political and educational institutions, in a given area. The recalled triple helix model helps to understand this mechanism. The main purpose to show that resilience is a collective capability is to stress that policies aimed at enhancing it should target a comprehensive set of agents as the interventions that foster capabilities do.

The outcome of the conceptual reasoning presented in the paper is that regional resilience is a collective capability, while its realisation is a functioning: both require institutional and structural prerequisites to be achievable. Economic agents that operate in areas where resilience is not a capability may however organise to induce institutional changes, which allow resilience in the set of the feasible choices. In other words, they may use another functioning – the ability of influencing the existing institutions – to reach a new capability and a new functioning: policies that are not spontaneously designed by institutions may be elicited by economic agents. Being resilient is a prerequisite for surviving and furthering the economic and social life of a region, which will produce innovation both at the technological and social level. The paper highlights that while regional resilience is a collective capability and its realization a collective functioning, so is the resilience of the firms operating in a region.

A complete discussion of the issue, however, cannot neglect that shocks could be positive (Holling 1973 and Pimm 1984). Hence, if resilience implies that systems

return to their original equilibrium, then recessive processes should activate after a positive shock, but they would be negative and would cancel the benefits of the initial positive shock. While the paper has taken a positive perspective, presenting resilience as a positive phenomenon in the light of the capability approach, negative sides may deserve further research. Nevertheless, the perspective offered by the role of innovation in promoting resilience likely excludes the possibility that a regional economic system bounces back after a positive shock. Indeed, innovation is a progressive process, in the sense that it pushes economies forward rather than back; therefore, while regressions after positive shocks may be interpretable as sings od resilience in general, this is not the way resilience is meant in economics.

Policy makers can facilitate resilience, by creating and incentivising the conditions that allow it to emerge. As discussed earlier, interaction between the regional actors is necessary to build regional resilience. From a practical point of view, the policy makers may intervene through the constitution of advisory boards that include the representatives of all the economic and political agents in a specific area. In other words, policy makers should build and activate the functionings that are necessary for regional resilience to emerge. These boards should serve to identify the problems common to the economic agents, to design appropriate policies (for example the activation of training programmes for unemployed or unskilled workers) that may help the region to cope with negative shocks. Indeed, policy makers may have only partial knowledge of existing problems and limited ability in identifying the correct interventions; advices from the economic agents hit by negative shocks may instead provide them with relevant information. Similarly, the dialogue between economic agents and educational institutions may help the latter to better understand the needs of the formers and to design educational programmes that are respondent to the real needs of the territory. When this type of cooperation exists, resilience may emerge easier, than when such interactions are absent. Policy makers may intervene here through incentives to both economic agents and educational institutions, which engage in such a cooperative process. In addition, scholarships for students enrolling courses born from these collaborations may constitute another intervention. Finally, countries – such as those of continental Europe – with strong and large public educational institutions and research centres may invest directly in innovation and education to strengthen regional and national resilience. The Italian National Recovery and Resilience Plan[17] is an example of this direct public intervention to build resilience (Fabbrini 2022) as a collective capability.

As noted in the introduction, Andreoni et al. (2021) claim that existing economic policies lack comprehensiveness, as they very often target only some specific agents, without understanding processes as collective capabilities. This is one reason why policies are often suboptimal and do not fully reach their goals. Interpreting resilience as a collective capability shows its complexity and, at the same time, calls for policies that include such complexity, addressing interventions to different and interacting economic and institutional agents at the same time. Therefore,

[17] *Piano nazionale di ripresa e resilienza* in Italian.

the conceptualisation offered in this paper should push policymakers to design their policies in a more inclusive way.

Although the discussion presented in the paper may apply to areas of different extension, the regional dimension is crucial for resilience to be a collective capability and for "being resilient" to be a collective functioning; indeed, economic systems require different agents to operate and interact between each other. Indeed, regional economic systems are generally more integrated with local institutions than wider or narrower systems. In fact, the first might be too large to significantly interact, for instance, with educational institutions: the existence regional productive specialisations may indeed incentivise local educational institutions to educate people in the direction of the present specialisations; such an incentive is weaker for schools and universities located elsewhere. This strategy creates the bases for the relational network between institutions and economic agents, which allows a region to be innovating and resilient. What may be puzzling, however, is the definition if "region" itself: many works in the literature take ready-made definitions, such as NUTS-2 and NUTS-3. While it is true that such a choice may ease the analysis, the meaning of "region" adopted in the present paper may diverge (i.e. being wider or narrower, depending on the case) from the traditional definitions adopted.

Data availability The paper is not based on any data.

Declarations

Conflict of interest The authors have no conflict of interest to declare.

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