Cohesion Policy and its Contribution to Enhancing Regional Resilience against Emerging Challenges

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Group of high-level specialists on the future of Cohesion Policy

The European Commission, the Directorate-General Regional and Urban Policy (lead) and the Directorate-General Employment, Social Affairs and Inclusion (associated) have set up a Reflection Group on the future of Cohesion Policy. The group includes high-level members from academia and practice and in 2023 will meet nine times to reflect on current and future needs and the functioning of Cohesion Policy.

The group will offer conclusions and recommendations that will feed the reflection process on Cohesion Policy post-2027 including through the 9th Cohesion Report in 2024 and the mid-term review of Cohesion Policy programmes in 2025.

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Disclaimer

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Acronyms

AI	Artificial Intelligence
EU	European Union
GDP	Gross Domestic Product
MNEs	Multinational enterprises
S3	Smart Specialization Strategy
UK	United Kingdom
US	United States

Introduction

The paper will be part of the reflection on how Cohesion Policy could further strengthen regional resilience and responsiveness to shocks. The eighth Cohesion Report (European Commission 2022b) has identified a set of challenges, including demographic change, climate transition, technological change, and globalisation. These will unevenly affect regions and territories, leading to new disparities between and within Member States. To promote regional resilience is one of the key tasks taken up by Cohesion Policy, especially where it concerns vulnerable regions, less developed regions and disadvantaged groups.

This report will make a distinction between two dimensions on regional resilience (Boschma 2015). The first dimension concerns the ability of regions to cope with and dampen the negative effects of a variety of shocks, such as economic crises, climate change, digitalization (automation of jobs), or pandemics (such as COVID). For instance, it is inevitable that regions are confronted with economic stagnation and decline in their main activities at some point of time. Climate change and digitalization also pose threats to some activities in regions, especially in regions that depend heavily on fossil-fuel-based activities (oil, gas, coal). The second dimension of regional resilience concerns the ability of regions to exploit new opportunities that shocks also bring. For instance, climate change is boosting innovation, new investments, and opening up new job opportunities in a wide range of activities such as water management, waste treatment, new energy sources (such as solar and wind) et cetera. Some regions have a better potential than other regions to benefit from such opportunities and develop new activities (industries, technologies, jobs).

This paper will focus mostly on the second dimension but will also address the first dimension of regional resilience. This is because the two are not entirely disconnected (as Schumpeter understood well, proposing the notion of creative destruction), and both have implications for regional disparities in the EU. This makes that regions need to develop new activities, and upgrade or reorientate existing activities on a continuous basis, and to address societal challenges, such as the green and digital transitions. We argue that regions differ to a large extent in achieving resilience in both of its dimensions. This requires understanding which regions are more resilient and why, and how this might affect regional disparities in Europe. Against the above background, the overall objective of the reflection paper is to assess how Cohesion Policy could support regions in exploiting their potential to diversify in new activities.

More specifically, the paper aims to investigate the following research questions:

1. what capabilities do regions need to diversify successfully in new, innovative technologies, embedding innovation in their economic and social development?
2. what and how Cohesion Policy needs to do further to support regions on this path and enhance their resilience and responsiveness to emerging challenges?

a. how can Cohesion Policy strengthen further the role of innovation, building on smart specialisation?
b. how can the policy support broad based digital transformation, while addressing potential negative effect of automation and artificial intelligence?

This short paper will draw from previous research, outline the available empirical evidence, and add some up-to-date ideas and recommendations linked to the potential future of Cohesion Policy, as a mechanism for promoting the resilience of regions. Doing so, it aims to

support the work of the Reflection Group and allow the Commission to further define the future work and orientations of Cohesion Policy post-2027.

The structure of the paper is as follows. Section 2 will discuss the relationship between innovation and regional inequality. Section 3 will focus on the role of regional capabilities and how they may affect the resilience of regions in term of their ability to take on and develop new activities and accommodate possible negative outcomes as much as possible. Section 4 will discuss implications for Cohesion Policy. Section 5 concludes.

1 Regional Inequality and Innovation

Since 2001, less developed regions in Eastern Europe have demonstrated high growth in GDP per capita, reducing their GDP gap with the rest of the EU. At the same time, they are confronted with challenges, as their low-cost advantages and returns on infrastructure are under pressure (European Commission 2022b). Capital regions have outperformed other regions in terms of GDP growth per capita since 2001, especially in southern and eastern Europe. And there is a group of middle-income regions, often those with a substantial presence of manufacturing, and less developed regions, especially in southern EU, that seem to be stuck, showing structural economic stagnation and decline.

Innovation is a driving force behind regional disparities (Iammarino et al. 2019)[1]. Higher-income regions benefit disproportionately from innovation, because they are well-endowed with human skills, a variety of activities, the best knowledge infrastructure, and excellent connections to centres of innovation elsewhere. Knowledge creation and innovation are cumulative, localized, and path-dependent processes that leave a geographical imprint. As knowledge does not diffuse easily, knowledge spillovers are often geographically bounded and spatially concentrated (Jaffe et al. 1993).

This is especially true when it concerns complex knowledge (Balland and Rigby 2017). Complex activities combine a range of capabilities that are hard to copy and therefore provide a source for regional competitive advantage (Hidalgo and Hausmann 2009). This stands in contrast to less complex activities that can be diffused more easily. As a consequence, complex activities are more geographically concentrated while low-complex activities can be mastered and produced by many regions instead. There is indeed evidence that the most complex activities concentrate in the richest cities[2] in the US, and that there is a positive correlation with their long-run economic performance (Balland and Rigby 2017). Pintar and Scherngell (2021) showed that knowledge complexity in metropolitan regions in Europe had a positive effect on Gross Regional Product growth.

While technological change and innovation have a tendency to contribute to regional divergence, core-periphery patterns are less stable in the longer run, especially due to technological breakthroughs (Kemeny et al. 2022). This became very visible in the 1970s and 1980s with the rise of the Sunbelt states in the US, and Silicon Valley in particular, and the simultaneous decline of manufacturing in the Rust Belt states suggested an unprecedented shift of the innovation landscape in the US. In Europe, countries like the UK,

[1] Concentration of innovative activity in cities often goes hand in hand with intra-regional inequalities (Lee and Rodríguez-Pose 2013).

[2] The higher the complexity of the economy of a country, the lower the wage inequality (Hartmann et al. 2017). At the sub-national scale, a positive relationship between economic complexity and inequality has been found (Sbardella et al. 2017).

Belgium and Germany witnessed a drastic change in their geographies of innovation, with Northern regions in the UK (North East, West Midlands) and Germany (Ruhr area) and Southern regions in Belgium (Walloon region) deindustrializing and falling behind, while the South East in the UK, Bavaria and Baden-Wurttemberg in Germany, and parts of Flanders in Belgium became the new centres of innovation in their countries.

2 Regional Capabilities and Regional Resilience

What these regional dynamics remind us of is how crucial it is for regions to be resilient. It is inevitable that existing activities will stagnate and decline in the long run. To sustain long-term economic development, regions need to develop new and upgrade existing activities. At the same time, regions are confronted with specific challenges, such as climate change and digitalization. These challenges put under pressure some of their existing activities but also provide new opportunities to move into new growth paths. Below, we argue that some regions are more resilient than other regions because they have relevant capabilities to bounce back and exploit these new opportunities.

2.1 Local capabilities and regional resilience

Research on regional resilience shows that regions differ in their ability to accommodate and exploit shocks (Boschma 2015). The regional diversification literature (Boschma 2017) has focused on the ability of regions to enter new activities (such as new technologies, new industries, new occupations), and how that depends on local capabilities that are at their disposal (Neffke et al. 2011). Local capabilities consist of many dimensions such as knowledge, skills, institutions. Because regions have different capabilities, they also have different diversification opportunity spaces (Pinheiro et al. 2022a). Regions cannot just diversify into any activity such as AI. When required capabilities are simply lacking, it will be very hard for a region to develop that new activity.

What regions often do when they diversify is to stay close to their own capabilities. A large body of studies has confirmed that technological capabilities (using patent data), industrial capabilities (using sector data) and skill capabilities (using occupational data) in regions had an impact on their ability to diversify into new technologies (Boschma et al. 2015), new industries (Neffke et al. 2011), and new occupations, respectively (Boschma 2017).

This holds for diversification of activities in general, and for activities that rely on complex knowledge in particular. Balland et al. (2019) found that many regions have the ambition to diversify into complex activities but lack the capabilities to do so. Regions in Europe diversify less in complex activities because it is very difficult to do, unless they build on related capabilities in the region. Rigby et al. (2022) showed that cities in Europe that diversified into more related and complex technologies witnessed relatively higher growth rates of GDP and employment in the period 1981-2015.

Regions also differ in their ability to take up societal challenges such as the Green or Digital transition because they lack the required capabilities. Research is showing that green technologies and green jobs do not start from scratch, but rather draw on existing technological capabilities in regions (Montresor and Quatraro 2019; Van den Berge et al. 2020; Santoalha and Boschma 2021). This applies to green technologies in general and to specific green technologies, such as renewable energy (Li et al. 2021). European regions also differ in their ability to contribute to the development of new digital technologies (Ménière et al. 2017). Balland and Boschma (2021a) showed that the ability of regions in Europe to

develop Industry 4.0 technologies such as Artificial Intelligence and Autonomous Vehicles is depending on the local supply of relevant capabilities. Regions in Germany, France and the UK show the highest potentials, while many European regions suffer from a weak potential to contribute to new Industry 4.0 technologies.

Besides technological capabilities, scientific capabilities turn out to be important for regional diversification as well. Since long, studies show that scientific knowledge and universities can act as a source of innovation in regions. Jaffe et al. (1993) demonstrated that university research is beneficial for innovation in a region, as knowledge spillovers from universities and academic research institutes are often geographically bounded. Balland and Boschma (2022) showed that local scientific capabilities in specific domains provide opportunities to regions in Europe to develop new technologies but not necessarily so, and not in all regions, as there may be obstacles that hamper university-industry collaboration in regions. A key factor is that local firms often lack the absorptive capacity to benefit from scientific excellence in a region (Bonaccorsi 2017).

Institutional capabilities of regions also have an impact on their ability to innovate and develop new growth paths. Rodríguez-Pose and Di Cataldo (2015) have shown that a poor quality of government forms an obstacle for regional innovation. Cortinovis et al. (2017) found that poor institutions such as combination of a low quality of government and excessive bonding social capital in regions might impact negatively on their diversification opportunities, especially in peripheral regions. So even when regional capabilities are in place, a weak institutional structure might prevent a successful diversification process in regions. Institutional agents are also considered crucial, because they trigger new initiatives, collectively mobilize resources, build legitimacy, and create new and transform existing institutions (Garud et al. 2002).

Access to external knowledge is often considered to be crucial for innovation. Regions with strong capabilities to connect to other regions are therefore crucial to get access to such external knowledge. Such network capabilities also matters in the diversification process of regions and thus affect their resilience. This ability of regions to tap into external knowledge differs between regions: some regions are well connected, but many others are poorly connected. A key factor is the absorptive capacity of regions: the higher the absorptive capacity, the higher the capacity to connect and get access to crucial knowledge, and the higher the capacity to benefit from external knowledge. Balland and Boschma (2021b) investigated the role of co-inventor linkages and demonstrated that such linkages with other regions that provide access to complementary capabilities are very relevant for regions in Europe to diversify into new technologies. They found that inter-regional linkages enhanced the probability of regions to diversify, especially those linkages giving access to new capabilities that are related to existing capabilities in the region.

Finally, the capacity of regions to attract external agents of change such as MNEs and migrants has been considered important for regional diversification. MNEs transform the economic structures of their host regions. First, MNEs can act as agents of change, in the sense that they can make regions diversify in activities that are unrelated to existing activities in the host region (Neffke et al. 2018). Second, knowledge spillovers from MNEs to local firms in host regions are more likely to happen when MNEs invest in activities that are closely related to the activities of local firms. Cortinovis et al. (2020) found that MNE spillovers across industries that are mediated through industrial relatedness enhance employment levels in Europe, especially in low-income regions. There is also strong evidence that another external agent that induces diversification in regions is the inflow of migrants (Bahar et al.

2020; Caviggioli et al. 2020; Diodato et al. 2021). Miguelez and Morrison (2022) looked at the role of migrant inventors for technological diversification in regions. Their study found that migrant inventors act as carriers of knowledge across borders that induce unrelated diversification in receiving regions in Europe.

2.2 Regional diversification and regional inequality

The crucial question for Cohesion Policy is whether regional diversification enhances regional inequality in Europe. The literature tends to suggest that regional diversification is more likely to contribute to widening income disparities across regions. This is not because high-income regions necessarily diversify more than low-income regions (Xiao et al. 2018), but because high-income regions have a stronger capacity to diversify more into complex activities that also bring higher economic benefits (Rigby et al. 2022).

Pinheiro et al. (2022a) looked at both technological and industrial capabilities to estimate the diversification potentials of regions in high- and low-complex technologies and industries across Europe. They found that the diversification opportunity spaces between low-income and high-income regions completely differ: low-income regions tend to be close to simpler technologies and industries, while high-income regions tend to be close to more complex technologies and industries. Core regions in Europe with a high GDP, complexity, and population density are more capable of entering high-complex activities, while lagging regions rely more on low-complex activities when diversifying. These results suggest that income disparities across regions in Europe are more likely to be reinforced, not reduced, due to diversification processes.

It looks like the three types of regions that Cohesion Policy differentiates (more developed, transition, and less developed regions) have very peculiar sets of diversification opportunity spaces, although systematic empirical evidence on these three types of regions is still lacking. I will discuss the sets of diversification opportunities for three types of regions (major urban regions, old industrial regions, and peripheral regions) that comes close to this threefold distinction in Cohesion Policy. One has to bear in mind these are presented as ideal types while in practice, there might be huge variations within each type, like a peripheral region in Sweden is very different from a peripheral region in Rumania.

Broadly speaking, major urban regions have many opportunities to move into complex activities, and few opportunities to move into low complex activities (Balland et al. 2019; Pinheiro et al. 2022a). They have the most advanced research infrastructure, a rich supply of human capital, a diversity of activities, and international connectivity. These are factors that contribute to their capacity to diversify in new complex activities, to move the technological frontier, to develop new technological breakthroughs, and to make jumps, also known as unrelated diversification (Pinheiro et al. 2021b).

Old industrial regions show a very different opportunity space. Some old industrial regions that are stuck in a low-complexity trap: they have opportunities to move in low-complex but not in high-complex activities (Balland et al. 2019). Other old industrial regions shows a diversification opportunity space that are neither close to complex nor to simple activities (Pinheiro et al. 2022a). Their opportunity space is not anymore in simple activities only, but they still miss relevant capabilities that prevent them to move into more complex activities. Their high labor and other costs make it hard for old industrial regions to retain their competitiveness in mature labor-intensive industries and compete with low-income regions, while they also lack capabilities to develop knowledge-intensive industries and compete with

core regions. This lack of adaptability of old industrial regions has been attributed to lock-ins of different kinds, such as cognitive, economic and political lock-ins (Grabher 1993). Iammarino et al. (2020) use the notion of development traps to describe the situation of many old industrial regions that once belonged to the wealthiest regions in Europe but that have been losing manufacturing activities for decades. They got stuck in such trap because their production factors were of too low quality.

Peripheral regions also have a very different diversification opportunity space. One set of peripheral regions has some opportunities to develop new activities of low complexity, in tourism for example (which means strong competition with many other regions), but not complex ones that might offer them higher economic returns (Pinheiro et al. 2022a). Another set of peripheral regions concerns low- to medium-income regions that experienced sustained growth but got stuck at some point of time (Iammarino et al. 2020). In all cases, they are trapped in a 'low complexity' state: the only way out is to make a sort of jump which is hard to achieve as local capabilities are not of immediate relevance.

2.3 Local capabilities as shock-absorbers

So far, we have looked at regional resilience as the ability of regions to diversify into new activities and to take up new societal challenges, given their local capabilities. Below, we explore another part of regional resilience that concerns the ability of a region to dampen negative effects of structural decline and the twin transitions. This covers the more conventional take on regional resilience in terms of the ability of regions to withstand or absorb shocks. We follow the same capability logic, but the focus shifts to local capabilities that are considered crucial for regions to accommodate the destructive side of shocks. As regions have accumulated different capabilities over time, regions have different capacities to absorb such shocks.

No matter whether shocks are general (such as recessions, climate change, or automation) or industry- or occupation-specific, they affect some activities more than other activities in regions. When regions are confronted with activities in decline, their capacity to accommodate such shocks depends on the capabilities present in the region. Studies have examined the consequences for local labor markets. A crucial variable is the match or mismatch between the skills of local people that have become redundant and local demand for skills. When there are plenty of job opportunities in the region that require the same or similar skills, the region will show resilience. Studies show indeed that local activities that are skill-related to the activities that are in decline enhance the labor matching process and therefore function well as shock-absorber (Neffke and Henning 2013; Diodato and Weterings 2015). This prevents the destruction of human capital in the region and outmigration of high-skilled people (brain drain). Major urban regions clearly have an advantage here, as they have a more diversified economic structure.

This stands in contrast to activities in decline that are unrelated to other activities in the region. This leads to structural unemployment and requires a serious effort from policy to re-educate and reintegrate the redundant workers in the local labor market. A good example is the decline and loss of manufacturing jobs in many old industrial regions that were built around one particular industry or plant, without any job opportunities in alternative local activities in which their skills were still relevant. This has contributed to the rise of the discontents who are often living in declining regions that once used to have a thriving manufacturing base that brought prosperity and welfare. According to Dijkstra et al. (2020), economic and industrial decline in combination with a lack of decent job opportunities and low levels of education resulted in anti-EU voting behavior.

Digital revolutions have major impacts on labor markets (Brynjolfsson and Mcafee 2011). Studies are assessing the consequences for labor markets, in particular the types of jobs and work tasks that are at risk (Autor 2015). Previous digital revolutions have been associated with the automation of repetitive physical work, but the current one also involves the automation of non-routine work tasks. In Cohesion Policy, focus of attention is on the digital transformation, and how it moves at different speeds in various parts of Europe, like access to high-speed Internet, the development of digital skills, and adoption of IT equipment (European Commission 2022b). Less attention is yet focused in Cohesion Policy on the possible negative effects of the digital transition for regions in terms of jobs that might be replaced, which regions will be most affected, and which regions have better capabilities (in terms of skill-related activities) to bounce back. What one might expect is that regions in Europe that are well endowed with activities that are skill-related to activities (occupations, tasks) under threat will be more resilient and absorb better this negative effect of digital automation. However, such studies are yet missing because of a lack of high-quality labor statistics across European countries (Tessarin et al. 2023).

Decarbonization to tackle climate change is another challenge regions have to respond to. The European Commission (2022b) is aware of the fact that the green transition will boost employment in some activities and reduce it in other activities. This last issue is a wicked one in regions that heavily depend on carbon-based activities, such as coal mining regions (Breul and Atienza 2022). Alves Dias et al. (2018) found obstacles that made it difficult for redundant workers in coal mining to find alternative jobs. Kapetaki et al (2020) did find important opportunities for clean technologies in coal-mining regions in Europe.

In sum, if we look at both the creative and destructive side of regional resilience, there is some evidence that the bright side of innovation (boosting new activities) concentrates in other regions than where the dark side of innovation is doing its destructive work. For instance, the US witnessed in the last decades the rise of the Sunbelt states alongside the decline of the Rustbelt states that belonged previously to the top-income regions of the US. Current debates on possible regional effects of digitalization focus on the question whether regions that will experience job creation due to automation are different from the regions where jobs are at risk (Muro et al. 2019).

3 Implications for Cohesion and Smart Specialization Policy

Building on the previous insights, this section aims to define what Cohesion Policy needs to do to enhance the resilience of regions to emerging challenges. In particular, how can Cohesion Policy strengthen further the role of innovation, building on smart specialization, and how can Cohesion Policy support the digital transition while addressing potential negative effects of automation and Artificial Intelligence.

To start with, Cohesion Policy should account for local capabilities as much as possible. As stated before, regions have different capabilities, implying 'one-size-fits-all' policies should be avoided. This follows the Smart Specialization principle that regions should focus on their capabilities when boosting diversification and responding to societal challenges. Local capabilities provide directionality to policy, as they condition which opportunities are more feasible to develop in regions, and which particular societal challenges can be taken up realistically by regional policy. Such a policy promises to be more effective, as it builds on and exploits existing capabilities the region is familiar with. This implies regions should refrain

from policies that aim to develop new activities from scratch in which they have no relevant capabilities whatsoever (Foray et al. 2012).

There may be circumstances in regions though that may call for a policy focus on unrelated diversification. This might be a good option for regions that are trapped in low complex activities, that is, when their opportunities for (related) diversification are restricted to low complex activities (Pinheiro et al. 2022a). The only way out is to make a sort of jump. This is unlikely to happen without the support of strong policy intervention, as existing local capabilities are not of immediate relevance, and other factors enabling unrelated diversification are not in place (Pinheiro et al. 2022b). To escape from such low complexity trap requires massive and concerted policy effort, as it requires the build-up of completely new capabilities (knowledge, skills and institutions) and the attraction of external agents as return migrants and MNEs (Neffke et al. 2018).

A good starting point is Balland et al. (2019) who proposed a policy framework that accounts for the very different diversification opportunity spaces that regions have, as defined before. They discussed four types of policy along the dimensions of relatedness and complexity. Relatedness refers to the costs of moving into a new activity. These costs will be lower the higher the overlap between the required capabilities of the new activity and the supply of existing capabilities in the region. The more related they are, the less risky and less costly it is to develop this new activity. Complexity refers to the potential economic benefits of diversification. The benefits will be higher the more complex activities are (Hidalgo and Hausmann 2009). This results in a distinction between different policy strategies that represent different risk-return profiles (Balland et al. 2019).

The policy framework of Balland et al. (2019) incorporates the different opportunity spaces of regions. If regions turn out to have diversification opportunities in complex activities, policy could target those complex activities at relatively low risk and exploit existing capabilities in the region. This requires strong policy intervention, as many such diversification potentials in regions are not activated in practice (Boschma 2017). Market and system failures need to be tackled through the public support of entrepreneurship, educational reforms, research capacity-building, and institutional change, to ensure local opportunities are exploited. This implies the removal of obstacles that make regions fail to diversify into and connect to related activities, such as laws and regulations that discourage the mobility of entrepreneurs and workers from related industries, a poor entrepreneurial culture, weak university-industry linkages, and a lack of venture capital.

Other regions may not have opportunities in complex but in low-complex activities instead. This would require a policy that mobilizes and activates local capabilities to develop new activities though of low complexity. An alternative is to follow a policy that aims to break out of such low-complexity trap, especially when opportunities in low-complex activities are also scarce. That would imply policy targeting activities that are far removed from the knowledge base of the region. This involves a high-risky strategy that requires strong and massive policy intervention (Alshamsi et al. 2018). While the chances of policy success might be low due to their focus on developing something completely new and complex, when successful, it would move the region up the complexity ladder, yielding high economic benefits. Nevertheless, such policy focus may run the risk of creating cathedrals in the desert that are not embedded in the region, and with no significant spillovers when local firms lack the absorptive capacity, local people have simple skills, and local institutions are rather weak (Karo and Kattel 2015; Rodríguez-Pose and Wilkie 2015). Besides, there is a serious risk of policy duplication in which all regions would go for the same when priorities are not made region-specific.

Thus, a strong focus on regional specificity is required in policy because opportunity spaces of regions look very different. Studies that examined systematically the process of priority-setting in Smart Specialization strategies in the EU showed this is only partly done in practice. Although Smart Specialization strategies make choices to some extent (McCann and Ortega-Argilés 2016), the priorities are often broadly defined. Regions also tend to focus on priorities which do not always reflect their local capabilities. Marrocu et al. (2022) argued that S3 strategies in European regions target and activate new growth paths that leverage their local capabilities only to a limited extent.

So what should and can be done? The remaining will briefly discuss policy options for the three stylized regions we introduced before: major urban regions, old industrial regions, and peripheral regions.

The key objective of Cohesion Policy is to reduce income disparities across regions in the EU. This might imply there is less need for a policy focus on the more developed regions. According to the European Innovation Scoreboard, the more developed regions score high on innovation, belonging to the groups of leader innovators and strong innovators (European Commission 2022b). We also saw earlier that the diversification process is disproportionately benefitting the more developed regions, because their capabilities enable them to move into complex activities with high economic returns. This is in line with the allocation of ERDF funding in support of Research, Development and Innovation for the period 2021-2027, in which most of the funding is concentrated on the less developed regions (59 per cent) and the transition regions (about 25 per cent).

However, having many opportunities to move into complex activities does not necessarily mean that the most advanced regions do not need policy support. On the contrary, they do, and Cohesion Policy could contribute to that. First of all, it is well-known that market and system failures prevent major urban regions to exploit their opportunities (Hausmann and Rodrik 2003). Policy should take away bottlenecks to ensure that diversification opportunities are being exploited, by improving research excellence, education and training, entrepreneurship, science-industry relationships, access to finance, laws and regulations, and research collaboration. With regard to the latter, it is striking that, by far, most collaborations in the EU still do not cross national borders, even where it concerns the most advanced regions in Europe (Balland 2022; European Commission 2022a). This fact signals a major system failure in the European innovation system that justifies strong policy intervention. Moreover, advanced regions in the EU are world-leading in some technologies, such as green technologies (European Commission 2022a). To ensure they continue to move the technological frontier in these fields requires strong policy interventions, due to fundamental uncertainty (Hausmann and Rodrik 2003) and transformational failures (Schot and Steinmuller 2018). Where the EU lags behind with respect to the US, such as in digital technologies, policy action is needed to avoid that the EU will fall further behind (while China is rapidly catching-up), as this could seriously undermine the absorptive and diffusion capacity of European organizations. Finally, and perhaps most relevant for Cohesion Policy, such a strong policy on the more developed regions could benefit other regions in the EU when certain conditions are met.

Peripheral regions are a major source of concern. There is a serious policy challenge to promote innovation and diversification in regions where firms lack absorptive capacity, people have low skills, and institutions are weak (McCann and Ortega-Argilés 2015). The message of the European Innovation Scoreboard is crystal clear: none of the less developed

regions scores high on innovation. During the period 2016-2021, the less developed regions have even fallen further behind (European Commission 2022b). As noticed before, many peripheral regions have few diversification opportunities, and these opportunities are primarily in low-complex, not high-complex activities (Pinheiro et al. 2022a).

There is some evidence that less developed regions have a tendency to set a large number of broad priorities in their Smart Specialization strategies that are also likely to strengthen well-established local activities (Trippl et al. 2020). A more viable policy strategy would be to search and explore for new potential activities that are related to local activities, preferably in new activities that would lift the overall complexity of their regional economies. Such policy would avoid building scientific cathedrals in the desert that are disconnected from the local context. But also policy that would support the development of less complex activities that build on existing local capabilities could work, as it would reflect a relatively low-risk strategy (Balland et al. 2019): it needs to be activated by public policy, as there are likely to be serious bottlenecks in peripheral regions that block related diversification, such as a lack of finance, low education, poor research infrastructure, lack of entrepreneurial culture, missing regulations, and corruption. Improving institutional governance is considered to be a prerequisite to develop effective Smart Specialization strategies (Karo and Kattel 2015; Rodríguez-Pose and Wilkie 2015), as low quality of government prevents the successful exploitation of diversification opportunities in peripheral regions in Europe (Cortinovis et al. 2017).

To what extent are there opportunities for peripheral regions to move out of their 'low complexity' state? This implies they have to make a jump which is very hard to achieve, as local capabilities are too weak and not of immediate relevance. What might work though is to connect to other regions (Grillitsch and Nilsson 2015). Balland and Boschma (2021b) showed that peripheral regions in Europe tend to diversify less, but when they connect to other regions that provide access to complementary capabilities, it increased their capacity to diversify (Miguelez and Moreno 2018). De Noni et al. (2018) showed that firms in lagging regions increased their innovative performance when involved in collaborative networks with knowledge-intensive regions. Other possible effective policy actions could focus on attracting external firms (Neffke et al. 2018), establishing new research collaborations (Uhlbach et al. 2022), and encouraging the inflow of skilled (return) migrants (Caviggioli et al. 2020; Miguelez and Morrison 2022), because studies have shown these helped regions to diversify in less related activities.

As noted before, the case of old industrial regions is again a very different story. It concerns a group of regions that used to belong to the most prosperous regions but have fallen behind in the last decades, due to a decline of their main specializations (Iammarino et al. 2020). As noticed before, the key problem of many old industrial regions is that diversification opportunities are often found in low, not in high complex activities. Having said that, there may still be opportunities to break out of this low-complexity trap while building on existing capabilities. An example is how local capabilities in non-renewables such as oil and gas can actually enhance the ability of regions to develop new renewable technologies (Van den Berge et al. 2020), but for coal mining regions, such opportunities seem to be more limited (Alves Dias et al. 2018). Another way out of such a low-complexity trap is promoting unrelated diversification. However, this remains a very risky strategy (Balland et al. 2019). Most probably, it requires strong institutional capacities that some old industrial regions like the Basque country in Spain have, in contrast to many peripheral regions. Such strategy might also be achieved by making and mobilizing connections to other regions (through migration, foreign investment, research collaboration, *et cetera*).

In sum, we suggest first and foremost that diversification needs to be promoted in Cohesion Policy where such opportunities exist and have been identified. We also argue that some sort of policy with a focus on unrelated diversification might be warranted in situations when lagging and transition regions are trapped in low-complex activities, with no real alternatives or low-hanging fruits locally available. However, this requires identification of these traps, and thorough rethinking of policy practices to overcome and avoid them.

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