13 Industry 4.0 and transformative regional industrial policy¹

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13.1 Introduction

It can be argued that modern EU regional policy was introduced in the 1990s with the reform of the Structural Funds and the introduction of a clear set of objectives aimed at reducing income disparities across the EU via multi-level governance. This marked a shift away from a pure redistributive mechanism whereby funding was re-allocated from the richer to the poorer Member States (Bailey and De Propris, 2002) towards a bottom-up process that introduced regions as key actors in the policy-making process. Indeed, the new process enabled regions to enter into dialogue directly with the EU and meant that regions could spend EU funds on interventions that they would design and implement within an operating framework with broad objectives set by the EU and national governments.

Between the 1990s and 2013, the allocation of EU funding still had an underlying compensative rationale to the extent that the share of the allocated funding privileged low-income regions. In fact, EU regional and cohesion policies were designed to compensate low-performing and lagging regions for the possible costs they would have had to incur to cope with asymmetric shocks, whether internal or external. The introduction of the Smart Specialisation Strategy in the 2014–2020 cycle marked a further step change as EU policy became very much a growth-driven policy or a regional-level innovation policy.

As a new post-2020 cycle is dawning, one can see via DG Regio announcements that ‘EU regional policy is an investment policy. It supports job creation, competitiveness, economic growth, improved quality of life and sustainable development’.² A decade on from the Global Financial Crisis and with austerity increasingly questioned, attention should shift to identifying clear, well-funded and achievable growth targets; however, the EU finds itself firefighting on many fronts, including Brexit, trade wars and an anaemic level of enthusiasm towards the EU encouraged by populist parties from north to south.

Against this backdrop, the EU risks underestimating the fundamental role that policy and public interventions must play just as the economy and wider society are embarking on transformations that will shape work, industry, mobility, communications and more broadly our way of life for the next 50–60 years,

as has been detailed in this volume. These are times of radical and disruptive change, and inevitably – we would argue – EU regional and industrial policies must move towards having truly transformative power; this could, for example, render smart specialisation strategies with a heightened level of attention paid towards the creation and adoption of Fourth Industrial Revolution (FIR) technologies in different regions.

The objective of this chapter is to reflect on the extent to which technological change will require adjustments to EU regional and cohesion policies in order to allow the latter to have a ‘transformative’ power. To do so, we start by considering the evolution of EU policies in terms of vision, objectives and instruments since the 1990s. Priorities have changed over time, but, we argue, have always been underpinned by a fundamental concern for inter-regional socio-economic cohesion. The ever-present trade-off between efficiency and equity in recent EU integration (Bailey and De Propriis, 2002) has often been reconciled by having declarations of a grand aspiration for growth and jobs that are then complemented by much of the funding being allocated to lagging regions to reassure the latter of the equitable nature of EU membership.

The disruptions brought about by the technologies of the FIR have the potential to introduce new layers of socio-economic divides. We will discuss if and how new technologies will widen economic divergence between low- and high-performing regions and states or, alternatively, if and how they might allow some regions to ‘leap-frog’ with a consequent faster catching up.

The chapter proceeds as follows: Section 13.2 discusses the evolution of EU cohesion policy over time, highlighting the shift from compensation to smart upgrading; Section 13.3 notes the effort to upgrade regional development via smart specialisation approaches; Section 13.4 summarises the scale of change coming with the FIR; Section 13.5 reviews current levels of digital disparities and considers the impact of the FIR on spatial disparities going forward; Section 13.6 issues a ‘call to arms’ for a transformative industrial policy given the scale of change coming; and Section 13.7 concludes the chapter.

13.2 EU cohesion policy so far: from compensation to smart upgrading

While reforms to EU regional policy in the late 1970s and early 1980s brought about minor changes and budget increases, it was the 1988 reform which essentially redesigned the entire framework of regional support. The overhaul was wide-ranging as the Structural Funds were required to make an impact on the less developed regions and countries of the EU in order to compensate them for the imbalances brought about by the completion of the Single Market (Bliss and de Macedo, 1990) and to enable them to catch up with the wealthier regions (Bailey and De Propriis, 2002).

The key concern was over a polarisation of wealth and diverging growth paths across different regions: ‘to ward off the threat of a two-speed Europe, the EC has reformed the structural funds. The aim is to give the weakest regions

the resources to catch up progressively by making more rapid progress than the others, in spite of their handicap' (European Commission, 1992, p. 10). Following on from this change, we would argue that the rationale of EU support for lagging Member States has since evolved over time, from being redistributive at the national level (pre-1990s) to being compensative at the regional level (1990s–2013) and currently to favouring regional upgrading (2014–2020). The link between regional development and innovation became more explicit with the Lisbon Strategy, where one can read the aspirational nature of policy:

The Union has [today] set itself a new strategic goal for the next decade: to become the most competitive and dynamic knowledge-based economy in the world capable of sustainable economic growth with more and better jobs and greater social cohesion.³

After the launch of the Lisbon Strategy in 2000, the EU pursued a growth agenda that was then reinforced by the adoption of the 'Europe 2020 Strategy' in 2010 that aimed to drive the EU towards smart, sustainable and green growth. Ever since, innovation has underpinned EU policies and especially regional and cohesion policies (which had traditionally been associated with equity priorities by reducing income disparities). Indeed, the two rounds of Structural Funds over the periods 2007–2013 and 2014–2020 have seen an increased emphasis on funding destined for research and development (R&D) and related interventions.

Since the entry of Greece, Spain and Portugal in the early 1980s, which saw a significant widening of socio-economic disparities across Member States, social and economic cohesion has been a paramount concern for EU policy makers, given the fear that deep divisions between Member States might undermine the EU project. The +12 enlargement over the period 2004–2007 and in parallel the creation of the eurozone further heightened concerns over widening inter-regional disparities. The external shock of the 2008 Global Financial Crisis hit EU Member States severely, deeply and also asymmetrically. The simultaneous processes of internal deepening and enlarging together with austerity post-2008 left some EU Member States and regions on a path of virtual zero growth for almost a decade. The result is that now, after three decades of EU intervention through regional and cohesion policies, many regions still have gross domestic product (GDP) per capita levels below 75% of the EU average.

13.3 Upgrading regions with smart specialisation strategies

The concept of smart specialisation was introduced in the late 2000s (Foray, David and Hall, 2009) as a new way of tackling regional development. Foray (2015, p. 1) proposed that 'the notion of smart specialisation described the capacity of an economic system (a region for example) to generate new specialities through the discovery of resources and competences in these domains'. The approach has become the cornerstone of EU regional and cohesion policies and has been implemented through the Research Innovation Strategies for Smart Specialisation (RIS3) in the 2013–2020 funding round.

A number of elements of this approach are worth noting as relevant specifically for this chapter. One is the aspiration to drive regional upgrading via ‘structural changes’ (Foray, 2017b, p. 39) that can open up new development paths. With the term ‘smart’, it is suggested that RIS3 must be designed to allow regions to build on their existing specialisations by creating innovation capabilities that are compatible with such sectors. Framed as sector-specific innovation policies, RIS3 arguably re-invests governments with the task of developing capabilities that are connected with their territory, without being accused of ‘picking-winners’. This idea went against the previous tendency, whereby policy makers were seen as jumping on the bandwagon of pursuing sectors that were seen as fashionable or desirable, but completely disjointed from their existing specialisations (Foray, 2015).⁴ However, it is crucial to highlight that in reality, RIS3 has encouraged regions to upgrade or create a ‘competitive advantage’ in sectors in which they were already active rather than pursuing a true structural change.

The second element is the idea of embeddedness (McCann and Ortega-Argiles, 2015). Indeed, some form of path dependency is acknowledged whereby ‘for many regions, the point is not innovating at the frontier, but rather (to) generate innovations complementarities in existing sectors’ (Foray, 2017, p. 47). Smart specialisation was conceptualised at a time when the technological paradigm was known and consolidated. The adoption and multiplication in countless incremental variants of the dominant technologies in different sectors and regions were perceived as crucial keys to unlock some form of *specialised diversification* (McCann and Ortega-Argiles, 2015) in regions that were lagging behind or underperforming. Smart specialisation also drew upon a well-established literature that understood the systemic nature of innovation with its spatial and connected prerogatives. In order to do this, it endorsed reliance on delivery infrastructures such as regional innovation systems with their triple helix approach.

The third element to note here is the process of entrepreneurial discovery that would motivate firms and institutions to explore and experiment with different interventions over what opportunities might arise (Foray, 2015). The novelty here is to envisage that policy makers have the ingenuity and risk-taking outlook – as well as the institutional capacity⁵ – to explore and experiment with policy objectives and tools. In other words, policy design and implementation requires some entrepreneurial spirit not only from firms, but also from other key stakeholders in the regional system of innovation, underpinned by what Foray (2015) calls entrepreneurial knowledge that can reside not only within businesses but is also dispersed systemically.

So, in terms of regional policy, smart specialisation has been used to emphasise the need to exploit related variety, build regional embeddedness and enable strategic diversification. This relates to a final feature, notably the need for regional actors (government, firms, universities, research institutions, etc.) to collaborate, recognising the current starting point for the region in terms of skills, technologies and institutional governance, and then to build on these capabilities rather than trying to start ‘from scratch’.

This approach sees the capacity of territories to root their economic activity in the local institutional fabric as being central to their economic success, through the generation, acquisition and exchange of knowledge. Yet such knowledge is uncertain and is embedded in localities; this needs to be uncovered through participatory and bottom-up processes to build consensus and trust (Barca et al., 2012). This place-based smart specialisation approach has strong parallels with Rodrik's (2004, 2008) perspective of industrial policy as a process of discovery requiring strategic collaboration between the private sector and state in unlocking growth opportunities, but set within a framework of multi-level governance so as to enable a process of local collaboration and discovery.

In this vein, industrial and regional policies which facilitate a process of discovery through strategic collaboration are seen as relevant under smart specialisation perspectives and require appropriate institutions to engender this. In fact, this is largely how modern, intelligent industrial policy design is conceived of in contemporary debates (see Rodrik, 2004, 2008), with industrial policy ideally having the quality of 'embedded autonomy', whereby it is not captured by firms and sectors, but where, as noted above, it focuses on the discovery process, where firms and the state learn about underlying costs and opportunities, and engage in strategic coordination. Given the uncertainty generated by the FIR and the need for a process of knowledge discovery, we will return to policy implications below.

13.4 Technological change and the FIR

As has been stressed throughout this volume, a wave of new technologies is arguably driving a shift in our techno-socio-economic paradigm (Perez, 2010). Indeed, these technologies are expected not only to change the organisation of production inside and between firms, as well as the balance between capital and labour, but to fundamentally change the workplace, the physical environment and the way we live our lives. There include artificial intelligence (AI) biotech, nanotech, neurotechnologies, green and renewables, information and communications technology (ICT) and mobile tech, cloud technology, big data, 3D printing, the Internet of Things, robotics, sensing, space technology and drones.

The introduction of these technologies was first noticed through a debate in the late 1990s and early 2000s on the importance of general purpose technologies (GPTs) and key enabling technologies (KETs). As the name suggests, GPTs are those that can find a myriad of applications across different sectors and markets (Bresnahan and Trajtenberg, 1995). These have included nanotechnology and biotechnologies, ICT and the internet. On the other hand, KETs 'act as a platform for the diversification of firms' competencies into a broader set of technologies fields' (Corradini and De Propriis, 2017, p. 198); in other words, KETs tend to be multi-disciplinary to the extent that their adoption can generate technologies that in turn can feed into diverse applications. These include micro-/nano-electronics, nanotechnology, photonics, advanced

materials, industrial biotechnology and advanced manufacturing technologies.⁶ Some of the current debate on the FIR (Rifkin, 2011) suggests that these new technologies are indeed KETs. Certainly, there is little doubt as to their pervasiveness and disruptive potentials.

13.5 Current levels of digital disparities

Much of the literature on the impact of technological change on socio-economic disparities has focused on IT first and more recently on internet and digital technologies. Serious concerns have been raised about the risk of so-called *digital divides* (OECD, 2001) which could emerge between regions in the same country, between countries and, more crucially, between the rich and poor in society (Hundley et al., 2003).

We focus in this chapter on cross-country divides that technological change can trigger. The EU has always been concerned with income disparities – as mentioned above – but there is evidence that these can in turn underpin broader variations in terms of access to and adoption of technology, which can subsequently result in wider socio-economic disparities.

There are many factors that can cause digital divides and these include differences in human capital and human capital development, infrastructural capabilities, institutional set-ups and policy, access to finance and culture (including attitudes to risk and failure) (Hundley et al., 2003). Going forward, knowledge will matter more than ever in relation to understanding and using new technologies. However, knowledge is embedded in people and for this it is uneven, cumulative and sticky. Human capital endowments will give some places advantages that others will not have; equally, knowledge will age quicker than before, so human capital development cannot stop with education, but must stretch into lifelong learning, training and retraining.

This takes us to the second discriminating factor, i.e. that infrastructural capability includes education and innovation systems. These again can vary greatly in terms of quality and content, although the EU has made huge progress in aligning qualifications to enable frictionless labour mobility across EU Member States. The EU has favoured the conservation of national and regional institutional set-ups and policy frameworks that reflect the peculiarity of Member States. This was very much endorsed by the subsidiarity principle adopted as a cornerstone of the reform of Structural Funds. This means that the mechanisms for change that are driven by policy and institutions also vary greatly. In terms of access to finance, for example, firms face a more similar landscape; indeed, according to Hundley et al. (2003), the EU overall lacks risk capital that enables the formation of new and innovative firms, especially at times of high risk, such as when technology is changing – this goes hand in hand with an overall more risk-averse attitude in the EU than the US for instance (*ibid*).

Some evidence presented below will show that EU Member States and regions present clear divides and that a major issue for EU policy makers is

the extent to which technological change will lock regions into some path-dependency development that will ultimately exacerbate such cleavages. Indeed, recent evidence from the EU Regional Innovation Scoreboard confirms that when considering aggregate innovation inputs and outputs, certain innovation leaders and laggards across the EU can be identified. Here we take two indicators to sketch the complexity of the situation. If we look at the number of firms across EU Member States that employ ICT specialists as a proxy for *digital skills*, a clear divide emerges between northern European countries and southern and eastern ones (see Figure 13.1). Equally, considering the level of automation and digitalisation in the production process, the evidence shows that countries characterised by industries reliant on scale economies and that are therefore larger in size, such as Germany, tend to have a greater number of enterprises whose business processes are already automatically linked to suppliers/customers. This can of course deliver greater efficiency and labour productivity (see Figure 13.2). Finally, the degree of digital penetration can be measured by people's digital skills; however, data shows that the picture is quite different; core EU countries show much less digital dexterity than Italy, Spain, the UK and the Scandinavian economies (see Figure 13.3). The reasons for this might be manifold, including the extent of infrastructural investment and societal readiness.

13.6 Towards a new, transformative industrial policy?

The scale and speed of the challenge posed by the FIR brings into focus both the need and possibilities for a broader canvass on which to draw transformative industrial and regional policies approaches. Space constraints preclude exploring this in detail in this chapter, but this could include, for example, fostering regional industrial policy as a process of discovery so as to identify opportunities and challenges and ways to overcome such challenges (Rodrik, 2004, 2008), new forms of technology policy to ensure that the 'general purpose' nature of new technologies reaches different sectors and regions, skills and (re)training policy, access to finance and support for small and medium-sized enterprises (SMEs), policies to support 'reshoring' as global value chains change and so on.⁷

Firstly, on training, the FIR will see AI and automation both destroy jobs and also create new ones (see World Economic Forum, 2018). This raises a profound risk of further labour market polarisation, and there will be a need to not only develop the skills required for the FIR to be applied in different sectors and regions, but also, as noted above, a need to develop more of a lifelong approach to training and retraining throughout workers' careers. On this, European countries and regions might learn from successful experience elsewhere, such as in Singapore with its 'Skills Future' programme, as well as regional examples in the EU itself. An instructive example is industrial policy since 2015 in Emilia-Romagna, particularly through its 'Patto per il Lavoro' (Pact for Employment and Growth) (Bianchi and Labory, 2018). The Pact lays out a long-term vision

Figure 13.1 Enterprises that employ ICT specialists (% of enterprises).

Source: Authors' elaboration from EUROSTAT.

for regional development, comprising a shared understanding of challenges and a joint approach to foster investment, growth and better jobs, with interventions to leverage the region's strategic assets.⁸

Secondly, and picking up from earlier discussions, on technology policy, policy makers will have to nurture and engage with ecosystems of open, interconnected networks of stakeholders, cooperating to a much greater extent through strategic partnerships (Bachtler et al., 2017). Such ecosystems will be more dependent on their business environments to source knowledge regionally

Figure 13.2 Enterprises whose business processes are automatically linked to suppliers/customers.

Source: Authors' elaboration from EUROSTAT.

Note: Enterprises with at least ten employees, NACE sectors, 2009–2017.

and internationally. A number of factors are relevant here for value creation and capture in ecosystems as Bailey et al. (2018) highlight.

Thirdly, the rapid pace of technological and other changes inherent in the FIR pose considerable uncertainty and risks for firms and governments alike (Andreoni and Chang, 2016). Managing this calls for the pooling of resources and risk-sharing, and requires the use of joint support services and infrastructures. On this, Bachtler et al. (2017) highlight, for example, 'living-labs' where multi-national companies and start-ups can interact and benefit from each other's competencies. Such ecosystem support needs to be regionally provided, but positioned within a multi-level governance framework, and to be able to integrate with innovation systems internationally. Moreover, as

Figure 13.3 Internet skills (individuals who have carried out five out of six internet-related activities).

Source: Authors' elaboration from EUROSTAT.

Notes: Internet skills are measured using a self-assessment approach, depending on how many internet-related tasks have been carried out, without these skills being assessed, tested or actually observed. The internet-related tasks are as follows: used search engine, sent mail with attachment, posted messages to chatrooms/newsgroups or online discussion forum, made phone calls, done peer-to-peer file sharing or created a webpage. Individuals' ages 16–74. Year 2013.

Bailey et al. (2018) stress, these need regular reviewing to ensure consistency with regional needs.

Fourthly, disruptive innovation often requires inter-disciplinary approaches and 'open' models of collaboration (Chesbrough, 2003). As the OECD (2016) has noted, 'pieces of knowledge required come from various actors and activities are rarely available inside a single organisation ... it is important therefore to support the generation, diffusion and use of many sorts of knowledge and

types of collaboration' (OECD, 2016, p. 68). For this 'mixing' to occur, an open and collaborative environment is needed, built on established relationships and trust. This in turn highlights the need for well-developed institutions capable of nurturing collaboration and networks both regionally and internationally (Amison and Bailey, 2014) and, in industrial policy terms, in bringing actors together in the knowledge-discovery process.

Finally, as global value chains change and small-scale production possibilities emerge once again closer to innovation, there may be scope for industrial policy to help 'repopulate' manufacturing ecosystems in the UK and Europe. Recent research, for example by Bailey et al. (2018) looking at 'home sourcing' in Spanish manufacturing, suggests that policy may well have a role to play, but not in trying to bring back labour-intensive activities (these will in any case be susceptible to wage rate and exchange rate shifts, and footloose in nature as relative unit labour costs shift). Instead, recent Spanish experience suggests that activities undertaken by R&D-intensive manufacturing firms producing non-standardised products are more likely to be reshored (*ibid.*). This would suggest that reshoring is unlikely to re-create large numbers of manufacturing jobs (in line with the work of De Backer et al. (2016) and Bailey and De Propris (2014)), and certainly not low-skilled jobs that have been offshored or outsourced abroad. In addition, while reshoring as global value chains change is indeed a real opportunity, it is not a foregone conclusion, as its actual logistics can be challenging (Bailey and De Propris, 2014). Whether reshoring benefits mature EU regions will depend, *inter alia*, on the availability of skills, innovation capacity, the supply chain base, support services and the role of institutions. Maintaining an ecosystem of firms and agencies provides firms with a 'deal-breaking' anchor, making home-sourcing a viable option (this correlates to the US and British reshoring experience; see Bailey and De Propris, 2014).

13.7 Concluding comments and policy recommendations

To conclude, policy interventions should form part of a more holistic industrial strategy for stimulating business investment and new firm formation to rebuild value creation and capture, and safeguard manufacturing ecosystem competitiveness. Policy needs to take this on board, for example, in private-public-sector dialogue to identify opportunities to rejoin supply chain functions. This would be in line with modern conceptions of industrial policy as a collaborative process of discovery of information involving the public and private sectors.

As the FIR will play out differently across sectors and regions, this will have implications for the focus and innovation aspirations of EU cohesion policy. The integration of sectors with new technologies will be fundamental in allowing the former to be truly transformed in the light of the new technologies. A transformative industrial policy therefore needs to 'join up' technologies,

sectors and places. The challenge for the new round of RIS3 will be to acknowledge the transformative necessity of policy intervention as against a more incremental upgrading.

A transformative industrial policy needs to think beyond sectors alone and instead identify, nurture and diffuse the key cross-cutting technologies (e.g. digitalisation, the Internet of Things, robotics and AI) that have an enabling role across manufacturing and services. Linked to this, industrial strategy needs to recognise and exploit such technologies by making them accessible to businesses in different regions. Furthermore, a transformative industrial strategy needs to be developed both nationally and regionally in a holistic sense (for example, on skills, access to finance, clusters, supply chains and innovation) so as to enable policy to be better suited to the distinctive characteristics and advantages of different scales. This could entail examining what a regional industrial strategy might look like, identifying sectoral trends, analysing emerging strengths and opportunities identified, and carrying out analysis of the export potential of key sectors in which the region already holds emergent strengths and which can be built on in a ‘smart specialisation’ sense.

Such an approach requires regionally based industrial development strategies promoting ‘related diversification’ capitalising on the FIR. Such strategies need to recognise: (i) the need to bring together different but related activities in a region via cross-cutting FIR technology platforms (such as via living-labs or digital demonstration hubs); and (ii) the differing potentials of regions to diversify, due to different industrial, knowledge and institutional structures linked to specific regional historical trajectories. Rather than ‘starting from scratch’ or applying ‘one-size-fits-all policies’, regional industrial strategies for the FIR instead require tailor-made policy actions embedded in and linked to the specific needs and available resources of regions, starting with the existing knowledge and institutional base in that region. These need to capitalise on region-specific assets rather than attempting to replicate and apply policies that may have worked in quite different places (Bailey et al., 2018).

However, to transform the region’s potential based on ‘unrelated variety’ and to broaden and renew the region’s industrial structure by helping it branch into new related activities, policy could encourage crossovers between manufacturing (and service) industries and between manufacturing and new technologies. This could come via knowledge transfer mechanisms that connect related *and* unrelated industries (see Grillitsch et al., 2018), such as by: (i) enhancing entrepreneurship from unrelated industries (targeting such entrepreneurs would not only increase the likelihood of successful policy, but could also contribute to regional diversification); (ii) encouraging labour mobility between related and unrelated industries, as it transfers knowledge between industries and may lead to new ‘recombinations’ of knowledge (such labour mobility could also increase the level of human capital, as firms and employees learn from experience in related sectors, and in turn could help regional resilience as workers can move between sectors); (iii) promoting exposure to new technologies via

institutional intermediaries; and (iv) supporting collective research collaboration with partners from related and unrelated competences (ibid).

Other elements would involve, *inter alia*, the need for: new skills to be developed and constant reskilling and upskilling processes as the FIR progresses; enabling SMEs to have access to funding and finance to embrace digital technologies; recognising and exploiting possibilities to reposition firms, industries and regions on new parts of the global value chain as the value added of manufacturing changes over time; seizing reshoring opportunities as relocation opportunities open up, involving policies to rebuild supply chains in Europe; infrastructure investment to embrace new technologies (e.g. 5G) and so on as part of a holistic regional industrial policy.

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Notes

- 1 This chapter builds on and develops the discussion in Bailey and De Propriis (2019).
- 2 http://ec.europa.eu/regional_policy/en.
- 3 www.europarl.europa.eu/summits/lis1_en.htm.
- 4 The term 'specialisation' is in a sense misleading as 'smart diversification' better represents this line of thinking.
- 5 This can be challenging. Relating to the earlier reform of the structural funds, for example, Bailey and De Propriis (2002) stressed that the 1988 reform of the EU Structural Funds gave EU regions an entitlement to participate in the design and implementation of regional policy, but that some of the weakest regions lacked the institutional capacity to actually access and implement the funds allocated to them. Regional inequalities subsequently increased and only later started to narrow. Only after a process of institutional capacity building and learning were some regions able to interact with the European Commission and national governments on regional policy issues, and only then where gatekeeping Member States allowed it.
- 6 http://ec.europa.eu/growth/industry/policy/key-enabling-technologies_en.
- 7 In the context of the FIR, this could involve more radical forms of change, including path diversification and path change (see Grillitsch et al., 2018).
- 8 On some lessons from Germany's training system being applied internationally, see Wiemann and Fuchs (2018).

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