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Skills Development for the Twin Transition: Building Transnational Skills Ecosystems Through Experimentalist Governance

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ABSTRACT

The twin transition to a green and digital economy is linked to the need for new skills in the workforce. However, given the scale and speed of change, it is challenging for policymakers, employers, and educational institutions to predict what skills will be in demand and how to create them. In addition to strategic uncertainty, European policymakers are confronted with a diversity of national and regional skills systems and a multi-polar power distribution. Based on our governance framework combining the concept of skills ecosystems with experimentalist governance, we find that policymakers rely on experiments to create and sustain transnational skills ecosystems. These enable local actors to cooperate in a bottom-up way and to develop novel skills solutions. We draw on the iterative policy cycle of experimentalist governance to conceptualize the components necessary for governing transnational skills ecosystems. The expanding European Centers of Vocational Excellence are analyzed to illustrate our argument.

1 | Introduction

The move toward a greener and more digital economy requires new skills in the workforce. Developing these skills is not a trivial task for the actors in skill formation, which include employers, unions, state actors, and educational providers (Bonoli and Emmenegger 2022). Given the scale and speed of change, it is difficult to predict what types of skills will be in demand and how best to create them. In addition to strategic uncertainty, European policymakers seeking to facilitate skills development and a European Education Area are confronted with a wide diversity of national and regional (subnational) skills systems and a multi-polar distribution of power.[1] In this context, we find that European policymakers have recently created transnational skills ecosystems (TSEs) that enable local actors to collaborate at the regional and European levels to develop innovative solutions to the challenges posed by the twin transition and to tackle skills shortages. Skills ecosystems are typically defined as networks of interdependent and interacting actors involved in skills and knowledge production in specific regions and within economic sectors, often motivated by joint challenges like structural or technological changes (Martinez-Fernandez and Weyman 2013). This paper examines: How can skills ecosystems—typically situated in individual regions or nations—be successfully created and sustained in a transnational context? Our aim is to explain how TSEs for joint skills development can be established and institutionalized at the European level and to explore the related multi-actor and multi-level governance issues. In this paper, we argue that the TSEs build on a challenge-based governance approach and that their creation and maintenance become feasible through the application of experimentalist governance (XG) for which European policymaking represents a key catalyst.

EU soft coordination enables mutual policy learning through voluntary, transnational exchanges (Egeberg and Trondal 2009) in the form of XG (e.g., Sabel and Zeitlin 2012; Rohde-Liebenau and Graf 2024). In cases of a multi-polar power distribution, diversity, and uncertainty (Kristensen and Morgan 2012; Sabel and Zeitlin 2012), hierarchical goal setting for policy reforms is often unfeasible, and command-and-control plays a limited role (Héritier and Rhodes 2011). However, XG lets principals orchestrate iterative policy cycles, using local experiences for monitoring and benchmarking to improve outcomes (Blauberger and Rittberger 2015), with European policymakers learning from ground-level practices.

We find that the European Union (EU) has stepped up its efforts to apply XG to promote the transition to a sustainable and digitalized knowledge economy. These efforts have intensified in recent years, despite the EU's limited competence in the field of education and training (Graf, Marques, et al. 2023; Marques et al. 2023, 2025). In the last 25 years, the European Commission (EC) has launched a range of policy initiatives to strengthen cooperation among its Member States and associated countries in matters of education and training to build a European knowledge society (EC 2003; Soriano and Mulatero 2010; Pagliarello 2022). There are a number of examples of the extensive work carried out by the EC to enhance cooperation among education and training organizations, such as the development of the European Education Area (Council of the European Union 2021; Alexiadou and Rambla 2022), the European Vocational Education and Training (VET) policy (see Powell and Trampusch 2012; Graf and Marques 2022), the European Higher Education and Research Areas (see Keeling 2006; Marques 2024; Felder-Stindt 2025), or a wide range of mobility programmes (see Dvir and Yemini 2017; Marques et al. 2022).

The launch of the Copenhagen Process for VET in the early 2000s was a milestone for VET governance in Europe, strengthening the European dimension in national education systems (Powell and Trampusch 2012; Ante 2016). The Erasmus+ Centers for Vocational Excellence (CoVEs) initiative (hereafter the CoVE initiative) represents the latest development in this evolving European VET governance process, fostering cross-border, bottom-up partnerships through TSEs while maintaining the nation state's key role in VET. A central aim of the CoVE initiative is to enhance the reform capacity of European, national, and local stakeholders in view of the uncertainties related to the green and digital transitions.[2]

To explore how it may be possible to create and sustain skills ecosystems in a transnational context, we study the case of the newly established CoVEs. We aim to unpack both the policy initiative at the European level and the individual CoVE level to get a better understanding of TSEs and their role in the promotion of the green and digital transitions. For this purpose, we develop a novel combination of XG theory (e.g., Sabel and Zeitlin 2012) and the concept of skills ecosystems (e.g., Finegold 1999; Buchanan et al. 2017). This combination allows us to explore the building, maintenance, and governance of TSEs beyond national or regional borders. Methodologically, we provide a content analysis of policy documents related to the initiative and statements of aims and objectives of Erasmus+ CoVE partnerships. We also include insights from our quantitative mapping of the full set of 69 CoVEs that were established by 2025. In addition, we adopt a qualitative approach to the analysis of three explorative semi-structured expert interviews to triangulate our core data.

We find that the CoVE initiative represents an innovative experimentalist instrument for policy implementation that enhances reform capacity in the context of the twin transition. In this context, actors on the ground are key players in an iterative policy cycle. In such forums for soft coordination, the most common tools are comparison (Nóvoa 2013; Tveit and Lundahl 2018) and learning (Lange and Alexiadou 2010), which support policymaking at the European, national, and regional levels (EC 2019b). As intermediary platforms between different governance levels, the CoVEs enable various stakeholders within and between skills ecosystems in different countries to come together and deliberate on innovative policies and concrete activities, with key insights being transferred back to the European policy level, which is key to tackling the major uncertainties related to the skill needs for the twin transition.

Specifically, we show that European policymakers build on a challenge-based governance approach and XG's iterative policy cycle to provide the ingredients to create and sustain TSEs. Applying our conceptual framework, we find that XG (A) acts as a catalyst for TSEs by setting relevant framework goals, (B) builds and strengthens linkages between interdependent actors by delegating responsibility to local and transnational networks, (C) provides nourishment for cooperation within and between TSEs by promoting peer review and regular reporting, and (D) offers a generally supportive host environment for the maintenance and development of TSEs through the periodic re-evaluation of framework goals, measures, and methods.

We next review relevant developments in European educational policy. This is followed by an explanation of our conceptual framework, methods, and data. We then unpack the building of TSEs through XG. In this context, we combine findings from the analysis of the European level (i.e., the level of the relevant European policies) and the organizational level (i.e., the level of the CoVEs). The paper concludes with a discussion regarding the transnational governance of skills.

2 | A New Generation of European (Skills) Policies

The EU has recognized the importance of skills development as key to economic growth, social inclusion, and innovation since the early 1950s (Powell and Trampusch 2012; Ante 2016; Salajan and Roumell 2021). However, only in the past two decades has its approach to skills policy evolved significantly, responding to socio-economic changes, technological advancements, and grand challenges. Cooperation among European countries and social partners in skills policy reached new heights with the Copenhagen Process (2002), Bruges Communiqué (2010), and Riga Conclusions (2015), setting a strategic vision for a modern, appealing European VET agenda and shaping a distinctive European skill formation model (Trampusch 2009; Powell and Trampusch 2012; Graf and Marques 2022). This was reinforced by legal developments, like European treaty articles on education and training, and soft governance tools such as the Open Method of Coordination (OMC) and, more recently, the

European Semester (Haas et al. 2020). The European Semester, in particular, has been influential in guiding national skills policies through reporting that fosters consensus on their strategic direction (Eeva 2021; Rambla and Alexiadou 2024). During this phase of europeanizing VET, attention centered on policy tools like the European Credit System for Vocational Education and Training (discontinued in 2021) and the European Qualification Framework, which emphasized competence-based, modular approaches with a strong employability focus (Markowitsch and Hefler 2019).

At the center of VET policymaking are major economic and social challenges, such as youth unemployment, digital transformation, and climate change, that steered the direction of European policy developments over the last two decades. In particular, the 2008 financial crisis had a profound impact on the European labor market, exposing systemic vulnerabilities in school-to-work transitions and leading to a sharp rise in youth unemployment across the continent (O'Reilly et al. 2018). In response, the EU significantly expanded its skills policies. Among others, the Youth Guarantee was launched to ensure that all young people under the age of 25 receive a quality offer of employment, education, training, or an apprenticeship (Escudero and López Mourelo 2015). Simultaneously, the European Alliance for Apprenticeships (EAfA) was established to address skills mismatches and to strengthen the alignment between education systems and labor market needs (O'Reilly et al. 2018; Graf and Marques 2022).

In the mid-2010s, European skills strategies advanced further. Recognizing the impact of digitalization and technological change, the EU adopted the New Skills Agenda in 2016 (EC 2016), emphasizing lifelong skills development. By the 2020s, the focus shifted toward sustainability and digital transformation (Durazzi et al. 2024), reflecting the broader priorities of the European Green Deal and the Digital Decade Strategy. In 2020, the European Skills Agenda was updated, introducing ambitious targets such as achieving 50% adult participation in learning annually by 2025, equipping 120 million Europeans with basic digital skills by 2025, and promoting green skills to support sustainable growth (EC 2020). It also launched the Pact for Skills, encouraging partnerships among businesses, education providers, and governments to boost skills in priority sectors like clean energy, healthcare, and manufacturing. That same year, the Osnabrück Declaration positioned VET as central to recovery and just green and digital transitions, highlighting the CoVEs as a key EU initiative, which is to be supported also at the national level.

The CoVE initiative was established 2 years prior, in 2018, under Key Action 2 of the Erasmus+ Programme, alongside other "Partnerships for Excellence" programmes such as the European Universities initiative. These initiatives are "expected to trigger modernisation and reinforce the response of education and training systems [...] to the main challenges of today's world [including] environmental sustainability [and] digital transformation" (EC 2018, 104). The CoVE initiative represents a new European dimension to the development of "vocational excellence". This is achieved by fostering collaborative innovation among various relevant actors at interconnected levels: regional, national, and transnational. The initiative follows a lump-sum funding model, with a maximum EU grant per CoVE of €4 million, with most applicants requesting close to this amount. However, given the large number of members involved, many participating organizations invest substantial own resources.

The initiative brings together local stakeholders—especially VET providers, higher education institutions (HEIs), and businesses—from different countries to address regional needs. CoVEs engage in strategic partnerships to foster knowledge exchange and joint projects in areas of shared concern, evolving into locally grounded TSEs. These concerns include developing innovative solutions to economic and societal challenges (such as climate change and digitalization), promoting sector-specific collaboration, and the enhancement of "quality, effectiveness and outreach of the CoVEs in different countries" (EC 2024b).

These efforts represent a new direction for VET policies, considering the desire to foster and develop not only regional skills ecosystems that meet the demands of a rapidly changing world but also drive sustainable economic growth and social cohesion.

3 | Analytical Framework

We next introduce the concept of skills ecosystems, and the key elements needed to create and sustain them. Subsequently, we introduce XG that can be applied to advance European policy goals in a field like education in which the main authority remains with the nation states. Finally, we combine XG's iterative policy cycle with the key elements of skills ecosystems to derive theoretical expectations about how TSEs can be governed and contribute to skills development.

3.1 | Key Elements Needed to Create and Sustain Skills Ecosystems

At the core of skills ecosystems are regional and sectoral networks in which skills are developed to be applied in labor markets and production processes (Finegold 1999). Thus, they are about the creation and maintenance of skills conducive to the structure of jobs in a particular region and economic sector. This process of skill development is often supported by favorable institutional and policy frameworks (Buchanan et al. 2017). According to Hall and Lansbury (2006), the notion of skills ecosystems draws attention to "[...] the interdependency of multiple actors and policies in creating and sustaining the conditions under which appropriate skills can be developed and deployed in clusters of firms in particular regions" (576). Thereby, the analytical category of skills ecosystems draws on an analogy with ecology to "[...] capture the often organic and dynamic relations associated with the skills political-economic development nexus" (Buchanan et al. 2017, 446).

In his seminal work on skills ecosystems, Finegold (1999) analyzed high skills ecosystems around biomedical and computer hardware and software firms in California to identify the following four key elements (a, b, c, d) that are needed to create and sustain a skills ecosystem:

a. First, a *catalyst* is required to initiate the building of a skill system, namely "some event or external trigger that initiates the living reaction" (Finegold 1999, 66). This catalyst can be, for instance, public policies, government spending, or innovations brought forward by educational and research organizations.

b. Second, skills ecosystems rely on a *high degree of interdependence*: "part of what makes this a system, and not simply a group of separate organisms [...] is that they are mutually interdependent" (Finegold 1999, 66). In turn, this refers to the high intensity of interactions between actors within knowledge-sharing networks (Windsor 2008) who often come together through intermediaries (Buchanan et al. 2017).

c. Third, *nourishment* or fuel is necessary "to sustain the growth of life on an ongoing basis" (Finegold 1999, 66). One example for nourishment is the continuous supply of know-how and innovative ideas and the possibility to exchange and coordinate with relevant experts in the field about ongoing and envisaged innovations.

d. Fourth, skills ecosystems require a *supportive host environment*, or "a set of environmental conditions that enables young creatures to grow to maturity" (Finegold 1999, 66). This can be infrastructure that adjusts to evolving demands by the stakeholders and a regulatory regime that provides conditions for continuous innovation.

Thus far, the literature on skills ecosystems has focused on regional skills ecosystems embedded in national contexts (e.g., Finegold 1999; Windsor 2008; Hall and Lansbury 2006; Martinez-Fernandez and Weyman 2013; Buchanan et al. 2017), without paying attention to recent efforts to foster transnational skills development despite their emergence worldwide. Examples of initiatives focused on cross-border skills development, potentially contributing to the formation of TSEs, include the Gulf Cooperation Council skills alignment (see Matu and Paik 2021), the Australia-Pacific Training Coalition (Al-Jaiashi et al. 2023), the Belt and Road Initiative and related VET initiatives (Musyimi et al. 2018), or the ASEAN mutual recognition agreement for qualifications (Hamanaka and Jusoh 2018). All these initiatives embody nested fields for skills development that exhibit a transboundary character, although their scope and depth vary.

In this paper, we introduce the concept of transnational skills ecosystem (TSE) and define it as a dynamic and interdependent network of actors, institutions, and resources operating across national borders to develop, deploy, and sustain skills. These ecosystems are characterized by collaborative relationships among local and national stakeholders—including policymakers, educational institutions, employers, and various associations—who collaborate transnationally to address shared challenges and seize opportunities in skills development. TSEs can encompass varying degrees of cooperation, ranging from informal arrangements, such as ad hoc knowledge-sharing networks between cross-border educational institutions, to formalized partnerships, such as bilateral agreements on mutual recognition of professional qualifications. The Erasmus+ CoVE initiative can be seen as the most advanced attempt to create TSEs in a structured way. The initiative creates TSEs that enable cross-border mutual learning and joint solution finding within the same organization (i.e., a CoVE) across national borders. This adds a layer of complexity to skills governance. However, it also implies new possibilities to carry out experiments and to mutually learn in view of joint, self-selected grand challenges (like the twin transition) that affect VET actors across borders.

We move on to introduce the scope conditions for XG and then XG's iterative policy cycle, which will subsequently be applied to theorize how TSEs can be built and maintained.

3.2 | Experimentalist Governance and Its Scope Conditions

The application of XG to study the creation of genuinely new educational organizations at the transnational level is novel: In VET systems—as multi-actor systems in which various private and public actors cooperate—the creation of TSEs steered through XG represents a new governance approach.

XG is a mode of soft governance that can be used by policymakers to achieve overarching policy goals in the context of (a) *strategic uncertainty*, (b) a *multipolar distribution of power*, and (c) the presence of significant internal *diversity*, for instance, in terms of regional differences (Sabel and Zeitlin 2012). XG is particularly well fitted for transnational, multi-level governance contexts characterized by heterogeneity and interdependence (Sabel and Zeitlin 2012). In the following, we argue that all these scope conditions for XG are met in the case of European policymakers aiming to promote skills development for the twin transition:

The twin transition is associated with substantial *strategic uncertainty* on the part of all the involved stakeholders in skill formation from the European to the national to the regional level. That is, knowledge and experiences about strategies regarding how skills can best be created to account for and support rapid green and digital transitions are not easily available. For instance, policymakers cannot simply ask employers what skills they may need in this context, as many employers are themselves in a phase of exploration regarding this very question. However, European policymakers may resort to experimental strategies along the lines of XG to support collective solution finding.

In addition, European policymakers are confronted with the situation that they cannot simply implement policies in a centralist, top-down way, considering the distinct EU's competence capacity in education (supporting competence) and employment (shared competence), which limits its regulatory capacity in the field of skill formation. Instead, they can aim to orchestrate activities around skills development in the European governance context that is characterized by a *multipolar distribution of power*. For this, they need to actively engage stakeholders at the local level of implementation. This implies granting agency and autonomy to the actors on the ground, who often face similar challenges regarding the twin transition, and who can learn from their respective processes of finding solutions.

Furthermore, European policymakers would be ill-advised to come forward with one-size-fits-all policies in view of the vast

diversity of national and regional skills regimes. These skill regimes have evolved historically, built on distinct comparative advantages, and are deeply embedded in the wider economic, social, and political contexts of the respective nation or region. However, a policy that aims to foster skills development for the twin transition in Europe can try to turn this diversity into an advantage when it allows the stakeholders in the respective national or regional settings to learn from their diverse experiences and to advance innovative solutions through the exchange of best practices.

In sum, we argue that all scope conditions for XG, namely strategic uncertainty, a multi-polar distribution of power, and internal diversity, are in place in the efforts by European policymakers to promote skills development for the twin transition.

How then can European policymakers try to turn the challenges related to the abovementioned scope conditions into an advantage? The foundational work on XG (Sabel and Zeitlin 2012) has shown that this is where the iterative policy cycle of XG comes into play. We next introduce the four stages of this cycle (A, B, C, D) and then link them to expectations about how uncertainties related to skills development in the twin transition can be addressed.

A. The first stage of this cycle is that policymakers at the European level set *broad framework goals*, in our case regarding skills development for the twin transition. These goals shall give orientation and motivate actors, but are intentionally broad to allow the actors on the ground to find their own solutions to the related challenges they face. This approach acknowledges the presence of strategic uncertainty, e.g., that European—and, indeed, national and regional—policymakers do not by themselves have the answers to how to best deal with the twin transition, nor is there another actor that would have the answers and could simply tell them.

B. The second stage then involves *delegating responsibility to networks*, whereby local units are given broad discretion to pursue these goals in their own way (Sabel and Zeitlin 2012, 169–170). The idea is that actors on the ground shall begin to jointly experiment with finding solutions to skills development for the twin transition based on their own interests, perspectives, and capacities. For this, European policymakers put in place an incentivizing scheme that provides funds for the actors in each network to carry out the real-world experiments and to strengthen cooperation.

C. The third stage focuses on *regular reporting and peer review*. This stage serves to balance the significant autonomy granted to local actors on the ground and ensures that these do not go adrift or misuse funds by checking performance relative to the framework goals. Even more importantly, this stage is about maximizing the capacity for mutual learning between the networks, so that they can benefit from their respective experiences and best practices. This is relevant to turn XG into a "machine for learning from diversity" (Sabel and Zeitlin 2012, 175) and acknowledges that the networks often deal with similar basic challenges, in our case how to develop skills for the twin transition.

D. The fourth stage involves the *periodical re-evaluation of framework goals, measures, and methods*. Here, the focus is on the review of the overall structure of the policy and related framework goals and funding instruments, based also on the insights gathered in the third stage. This final stage typically involves widening the number of actors involved in the policy to increase its impact (Zhou and Cai 2024). This fourth stage thus serves to launch a new round of the iterative policy cycle, building best practices and adding new local networks to the existing set and/or incentivizing or otherwise encouraging an enlargement of the existing networks.

In sum, we argue that the iterative policy cycle of XG can operate across levels and foster networks of interdependent actors directly engaging local actors in European policy. XG puts a strong emphasis on mutual learning not only at the level of European or national policymakers, as in the case of the classic OMC (EUR-Lex 2024), but especially also at the level of the local stakeholders on the ground (Sorensen and Graf 2024) who are actually the experts in operating skills development in specific regions or sectors. This is one of the main reasons why we opted for the XG framework for our analysis. While there exist different approaches to unpacking the EC's activities to promote European education policies in a field in which the main authority remains with the nation states (i.e., education and training), XG has a focus on exploring the engagement of local-level stakeholders in experimentation (Sabel and Zeitlin 2012). XG is thus well attuned to study new phenomena like the CoVE initiative (or its sister policy in higher education, namely the European Universities initiative), at the core of which are regional actors cooperating across borders in a bottom-up experimental way to build joint organizations that are more than loosely coupled networks. In contrast, for instance, the OMC perspective is typically used to study the structured exchange between national (rather than regional) level representatives in a less experimental context.

Critical commentaries of XG include that without a sufficient scale of common measures for monitoring progress, policies promoted through XG may mostly serve the building of awareness and the promotion of a shared European understanding on certain policy issues rather than creating genuine policy learning to solve tangible problems (Harmsen 2015). Furthermore, XG has been criticized for its sometimes overly optimistic view of the capacity of experiments to enhance "directly-deliberative democracy" (Sabel and Zeitlin 2012) through engaging actors on the ground (in our case: VET stakeholders at the regional level) into European policy processes. For this democratic potential to realize, it is important that the respective policy initiative is accessible to a wide range of diverse actors and that the involved processes indeed enable mutual learning and the bottom-up diffusion of best practices rather than strengthening the EC's "shadow of hierarchy" through expanding technocratic bureaucracy (Börzel 2012; Sorensen and Graf 2024). Our application of XG to the CoVE initiative is conscious of these possible limitations of the XG approach.

We next bring together XG and skills ecosystems to theorize how TSEs can be built and sustained.

TABLE 1 | The creation and maintenance of skills ecosystems linked to XG's iterative policy cycle.

Iterative policy cycle of experimentalist governance (Sabel and Zeitlin 2012)	Elements needed to create and sustain a skills ecosystem (Finegold 1999, 66)
A. Setting of broad framework goals	a. Catalyst—"some event or external trigger that initiates the living reaction"
B. Delegation of responsibility to networks (whereby "local units are given broad discretion to pursue these goals in their own way", p. 169–170)	b. High interdependence—"part of what makes this a system, and not simply a group of separate organisms [...] is that they are mutually interdependent"
C. Peer review and regular reporting to foster mutual learning	c. Nourishment of fuel—"to sustain the growth of life on an ongoing basis"
D. Periodical re-evaluation of framework goals, measures, and methods	d. Supportive host environment—"a set of environmental conditions that enables young creatures to grow to maturity"

Source: Authors' own based on our combination of Sabel and Zeitlin (2012) and Finegold (1999).

3.3 | Bringing Experimentalist Governance and Skills Ecosystems Together

Our initial argument is that European policymakers strive to create or enhance regional skills ecosystems to address the twin transition and that these shall be transnationally linked. Based on Finegold (1999), we furthermore argue that for this, they need to put in place the four key elements needed for skills ecosystems as outlined above. However, here they cannot simply use a top-down strategy. Instead, we argue that in the European context, the three main scope conditions for XG are given, namely strategic uncertainty, a multi-polar power structure, and substantial internal diversity. Hence, we expect to observe a process in which elements of XG are applied to work toward the goal of promoting TSEs within Europe. In this context, Table 1 provides our combined model of how the four stages of XG's iterative policy cycle (A, B, C, D) can be linked to the four key elements needed to build and maintain a TSE (a, b, c, d).

Based on the above considerations, we are now able to derive expectations regarding the creation and maintenance of skills ecosystems. First, to build a TSE, we would expect to see that European policymakers set *broad framework goals*, combined with financial incentives, that serve as *catalysts* or external triggers for actors on the ground to engage in or intensify their activities around building a TSE (see line A in Table 1).

Second, it is likely that the European policymakers would *delegate responsibility* to local and transnational networks that are relatively free in terms of how they want to work toward addressing the broad framework goals, allowing scope for experimentation. In this way, policymakers foster networks of actors that progressively interact and become *increasingly interdependent*. In view of grand challenges, it can be the case that solutions are best identified if actors in Europe that have different types of expertise but face similar challenges work together, in this case experts from the VET field responsible for skills development in specific sectors. Through the establishment of TSEs, the respective actors become more dependent on each other to find solutions, but it is a dependence that is voluntarily chosen with the idea that it is beneficial to learn from each other to advance problem-solving. This is facilitated by a context of increased uncertainty in view of grand challenges (e.g., the twin transition), in which it is difficult for individual actors or single nations to identify respective solutions on their own.

Third, following the XG logic, European policymakers can be expected to provide *nourishment* to TSEs by supporting mutual learning. For this, they can build up structures for *reporting, peer review*, or exchange that maximize the possibilities for knowledge-sharing within and between TSEs. In this way, the continuous supply of know-how, experiences, and ideas is facilitated.

Fourth, we expect that policymakers are interested in offering a *supportive regulatory environment* that continuously adjusts to enable improvement, innovation, and the enlargement of the set of networks and actors involved. This can be facilitated through the *periodical re-evaluation of framework goals, measures, and methods*, which, in turn, define the conditions and goals for the next round of XG's iterative policy cycle.

We next introduce our methods and data.

4 | Methods and Data

For the empirical analysis and to illustrate our model, we select the most prominent case of European policymakers striving to promote skills ecosystems in view of grand challenges and especially the twin transition, namely the CoVE initiative. As the CoVE initiative is still relatively recent, the process of uncovering its origins and deployment is critical at this stage. The CoVE initiative matters not least because of the great number of participants, all of whom signed up for this initiative voluntarily. We observe significant engagement with this initiative among various relevant VET stakeholders, which would not be the case if these stakeholders did not perceive long-term benefits from their participation, given the substantial investment required to establish and maintain such international partnerships. Thereby, the CoVEs are affecting individuals, organizations, and institutions within their respective skills ecosystems. However, we are not aiming to focus on analyzing and evaluating the impact of the CoVE initiative. Rather, our focus is on exploring its creation

and evolution in the first few years of its existence. We are especially interested in how the EU is trying to achieve its current goals in the field of skill formation in view of the twin transition and how its corresponding policies—specifically the CoVE initiative initiating partly new VET governance structures—are unfolding.

We guide our analysis with the structure of an explorative study (Swedberg 2020) to develop knowledge regarding a novel topic on which there exists only very little scientific literature. We aim to both pursue a deep exploration of the empirical data, as well as employ theoretical tools to advance our understanding of the policy initiative and the wider implications for the governance of skills.

Our goal is to analyze the CoVEs, looking at both the policy and organizational levels. To this end, we gathered and analyzed several data sources. Using the EC as the authoritative source for policy information, we collected a set of the most relevant European policy documents on the CoVEs to represent the policy initiative, namely the programme description for the CoVE initiative (EC 2022a), the Erasmus+ Programme Guide (EC 2022b), the initial 2019 Call for Proposals (EC 2019a), and subsequent documents related to the calls.

At the organizational level, we collected CoVE mission statements, memoranda of understanding, "About-Us" sections of the CoVEs' websites, official project summaries and leaflets (including "Factsheets" published by the EC), action plans and strategy papers, position papers, and any official documents that could provide a general overview of the CoVEs' institutional frames. We used these sources to create our project database (that we call CoVE Database) that helped us to gain a systematic and detailed overview of the past and existing CoVEs and that, in turn, informed our empirical analysis of the CoVE landscape. More specifically, from 2019 to 2025, 69 Centers of Vocational Excellence partnerships were created, all of which are included in our CoVE Database. The pilot calls took place in 2019 (five CoVE partnerships created) and 2020 (seven CoVE partnerships created). The funding for all 12 pilot CoVEs has now concluded, but we chose to include them in our analysis to trace the developments over time. Subsequently, 13 CoVE partnerships were launched following both the 2021 and 2022 calls, 15 in 2023, and 16 in 2024. Beyond constructing the CoVE Database, we carried out an in-depth analysis of the mission statements of the first 12 CoVEs funded in the pilot calls in 2019 and 2020. Mission statements are studied by scholars, for instance, as a representation of an organization's priorities and self-image. This is an established mode of analysis, largely because mission statements are an essential tool in understanding organizational identity and values—organizations belie their strategic actorhood by way of such mission statements (e.g., Krücken and Meier 2006).

Our qualitative content analysis of the mission statements of the first 12 CoVEs, as well as of the set of the abovementioned major European policy documents, was carried out with the support of the MAXQDA software for qualitative data analysis. This helped us to organize and structure our analysis, enabling a more systematic identification and examination of the key characteristics and themes related to the CoVE initiative and the CoVEs themselves. In addition, we carried out three expert interviews to provide further context and to triangulate our core data: two with Brussels-based experts at the EC knowledgeable about the development and implementation of the CoVE initiative (Interview_EC1, Interview_EC2) and one with the project coordinator (Interview_CoVE) of a pilot CoVE with 8 partners (from 5 European countries), 3 affiliated partners, and 15 associated partners. The interviews were carried out via videocall and subsequently transcribed for a thematic analysis (Braun and Clarke 2021).

Our exploratory analysis of (policy) documents, websites, mission statements, and interviews was guided by the categories from XG and skills ecosystems outlined above, bringing coherence to the research design for both policy and organizational levels. To promote reliability, we triangulated findings from different data sources.

5 | Analyzing Transnational Skills Development in the Twin Transition

We present the results of our analysis both at the policy and organizational levels to understand the process of the development of TSEs. The section is organized by the four stages of XG's iterative policy cycle (see Table 1, first column).

5.1 | Setting of Broad Framework Goals at the European Level

Our data shows that at the European level, policymakers have indeed defined common framework goals that served as a catalyst to motivate and orient the building of TSEs. We find that the most salient *broad framework goals* of the CoVE initiative are related to cooperation and learning, which points to the important network-character of TSEs: "They bring together VET providers, employers, research Centers, development agencies and employment services to develop innovative approaches to upskill and reskill, empowering young people and adults to thrive in the future world of work" (EC 2024a).

Beyond cooperation and learning, we identify in the various data sources (see Methods and Data) goals like innovation, CoVE operational effectiveness, smart specialization, and, importantly, tackling societal challenges such as sustainability and inclusion. Intended teaching and learning approaches emphasize inclusiveness and diversity, mobility, and lifelong learning. While learner-focused goals are prominent, continuous professional development for teachers and trainers is an explicit aim.

Labor market orientation is also central. The notion of vocational excellence and the need to respond to dynamic labor market demands are core to the CoVEs' mission. Erasmus+ CoVE funding proposals must demonstrate how the transnational cooperation will contribute to the achievement of the various goals of the European VET policy priorities (Council Recommendation on VET for sustainable competitiveness, social fairness and resilience). They must also cover the circular and green economy transition and digital skills, as identified in

the Osnabrück Declaration, with further relevant policy documents, including, for example, the European Skills Agenda, identified in other supporting guidance (see EC, n.d.). The CoVE initiative, which offers project funding for setting up new transnational CoVEs, is thus an incentive-based funding instrument that relies on specific regulations to nudge actors on the ground to cooperate within networks and thereby contribute to the initiatives' goals.

We find that goal-setting is linked to some taken-for-granted resources, in particular the idea that business and education are inherently interconnected, the presence of shared values across stakeholders (even transnationally), the fact that there is an added value in cooperating across Europe, that quality employment and an inclusive, just, sustainable economy are not mutually exclusive, and that there is innovation and creative potential in VET learners. The most frequently identified resource is that of transnationally shared common interests.

In this regard, we find that the greatest novelty regarding goal setting within the CoVE initiative is that it follows a *challenge-based governance approach*. That is, it focuses squarely on addressing major societal and economic problems such as the digital and green transition through the co-creation of TSEs, which operate at the regional, national, and European levels. The CoVEs shall bring together European actors from very different contexts, but united by the goal of addressing specific self-selected challenges in the transition to a more sustainable and digital economy. This challenge-based governance approach, which is increasingly prominent also in the Europeanization of higher education (see Marques and Graf 2024), is intended to serve as an important driver for the transnational partnerships, enabling them to overcome difficulties related to transnational cooperation, including legal differences between participating states.

Global and European perceptions of how education contributes to solving socio-economic challenges influence VET developments at national and local levels (Graf 2023). Focusing on the case of the CoVE initiative, we find that the constitutive shared conceptions of social reality that pierce through at the policy level can be subdivided into (a) conceptions on the fundamental challenges Europe is facing today, and (b) the resources that are available to overcome them. In this context, the twin transition is seen not just as a challenge but as an opportunity for innovation in VET: "The world of work is changing rapidly. People with the right skills are needed. Vocational Education and Training Centers have an opportunity to support people to manage the digital and green transitions" (EC 2024a). Crucially, this is related to topics of upskilling and reskilling. One of our interviewees describes CoVEs as "lifelong learning hubs" and that "they should really be the connectors that are [...] putting together all these players, companies, maybe regional development agencies, municipalities, chambers, and they really try to make sure that we bring adults back to training" (Interview_EC2).

Overall, we see that CoVE partnerships operate under the shared framework goal that joint innovation in skills development is essential for achieving broader EU goals linked to sustainability, digitalization, and inclusiveness.

5.2 | Delegation of Responsibility to Networks: Fostering Cooperation

A basic starting point for the CoVE initiative is that VET systems look very different across European countries and regions. Therefore, as one CoVE coordinator states, "To define a common lab for all places in Europe is something that we don't see as possible". Instead, "Each centre must be autonomous to do their own strategies and their own networking" (Interview CoVE). Within the CoVE initiative, such autonomy is made possible by promoting cooperation and partnerships among actors within and across countries and regions. This is in line with research showing that the expansion of collectively governed VET often depends on the creation of innovative organizational structures for collective governance (e.g., Culpepper 2003; Busemeyer et al. 2022; Graf, Strebel, and Emmenegger 2023).

5.2.1 | A Systematic Bottom-Up Approach

At the European level, we find that the CoVEs emerge as part of a new policy initiative that intends to transform European VET cooperation by fostering structures for the co-creation of new and interconnected skills ecosystems at the European, national, and regional levels. Our analysis of the policy documents shows that a systematic bottom-up approach is key in the governance of the CoVE initiative. This highlights that the CoVE initiative crucially relies on the VET actors on the ground to find innovative solutions for existing major challenges. As one would expect from EU policy, there is a long list of minimum requirements that CoVE proposals must meet, including the design of a long-term action plan. The policy documents also come with clear suggestions as to what types of actors should participate in the programme. All the projects connect multiple regions. Thereby, each CoVE must involve at least eight organizations: one company, industry, or sector representative (e.g., chambers or trade associations), and at least one VET provider (at secondary and/or tertiary level)—with one partner acting as the coordinator (EC 2019a, 2).

5.2.2 | Nature and Type of Stakeholders

The analysis of our CoVE Database shows that the actual number of participants in a specific CoVE is wide-ranging, from as few as eight to as many as 26 full members (average number of full members is 18), with 35 of the 69 CoVEs also including associate/affiliated members (between two and 70, with 16 on average). The number of represented countries varies between four and 11 per CoVE, with an average of six (increasing only slightly between the pilot projects and those funded post-2021). Due to the design of the initiative, the CoVEs include members from all corners of Europe, with a handful of members from non-European countries as well.

We observe some geographical patterns, as the CoVE initiative demonstrates a regional disparity in organizational participation, as depicted by Figure 1 below. For example, Southern Europe noticeably leads in terms of the number of full member organizations involved across CoVEs (43%), with the other regions represented fairly evenly (between 11% and 16%) following

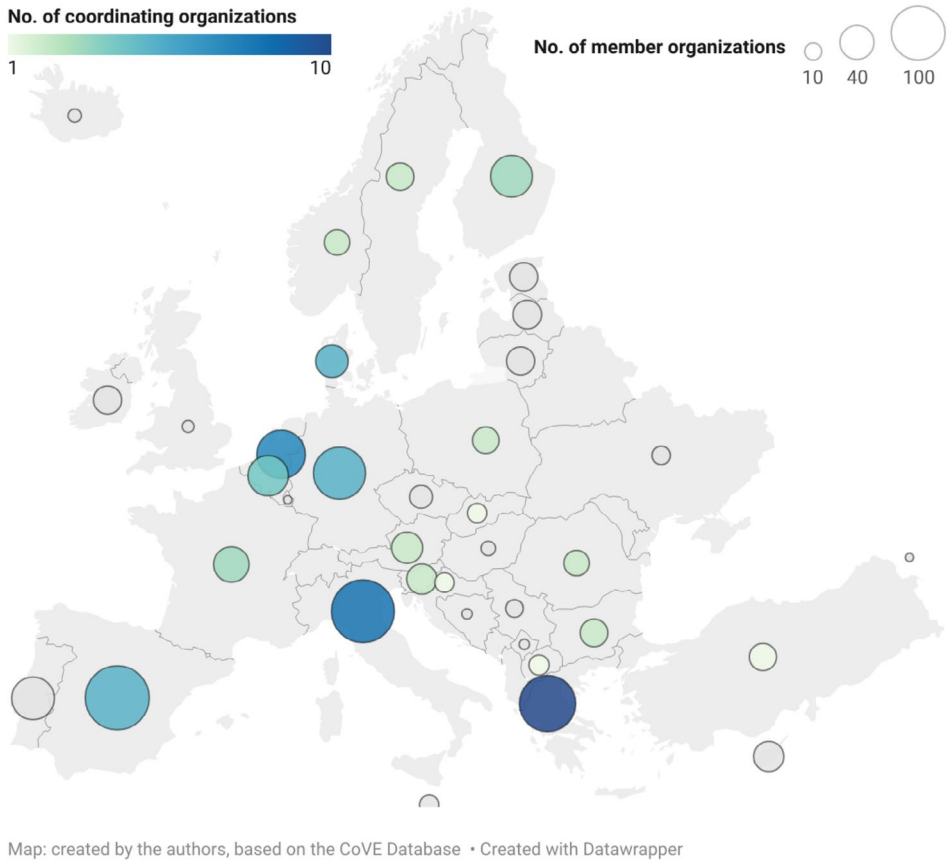

FIGURE 1 | Centers of vocational excellence—participation and leadership by country (Europe only).

the latest (2025) expansion. The lowest participation is that of non-European organizations (some 3%). The spread of the coordinating partners follows the same pattern, with the highest number of coordinating organizations (42%) being located in the Southern European states. Some countries recur more often than others: for example, Greece, Italy, and the Netherlands are home to most CoVEs' coordinators (ten, eight, and seven, respectively) (CoVE Database).

Furthermore, the analysis of our CoVE Database shows that full member institutions ($n = 1214$ in the 69 CoVEs) include varied types of organizations, although the dominant types reflect both the strong focus on VET within the CoVEs and the calls criteria: 241 member institutions are VET providers, 216 are HEIs (present either or both as VET providers or leading research and innovation in the CoVEs) and 39 other educational institutions, including technical secondary schools and private training entities. There is also a strong presence of companies (218), including in particular small and medium enterprises (172), highlighting their important role in the skills ecosystems. The presence of industry clusters (41), cooperatives and collaborative networked organizations (10), and innovation hubs (12) highlights the collaborative nature of the CoVEs and their focus on industry-led innovation. Employers and VET organizations at large are further represented through 124 associations and 62 industry representatives and social partners, helping connect educational providers with industry demands and bringing in insights into industry challenges and emerging trends. We also observe significant government and public sector involvement in supporting and shaping the CoVEs, with 61 public authorities and 50 quasi-governmental organizations taking part. Participation of 44 research or technological centers/institutes from 2021 on reflects the increasing focus on research and technological development through the CoVEs. We note both increased diversity and the emergence of new stakeholders, such as Healthcare Providers and Science/Technology Parks, in the projects funded from 2021 onwards, suggesting an expanding scope and a more inclusive approach of the evolving initiative. Besides the full members, to date, almost 580 organizations have been involved as associate or affiliate members. These include the same types of organizations as the full members, but their role in the CoVEs is more limited, for example, to an advisory role in specific projects or activities (CoVE Database).

5.2.3 | Varieties of Organizing TSEs

A variety of governance and organization types exist under the scope of the CoVE initiative. While some CoVE structures do not seem overly complex, e.g., with primarily VET providers and HEIs involved, other partnerships consist of a variety of different actor types in different regional or national groupings coming together to form a transnational CoVE partnership under this initiative. At least two types of organizational structures emerge. One is that the partners collaborate horizontally, communicating as needed, and each representing themselves. The other is the hub model, where activities of the CoVE are usually administered by the institution identified as the project lead in the funding application (CoVE Database).

The partnerships design projects to develop a skills ecosystem around specific themes, ranging from broad topics like innovation to a specific subject or sector, such as apiculture, hydrogen economy, or advanced manufacturing. Each partnership determines its own activities and outputs related to three required clusters: "Teaching and Learning", "Partnerships and Cooperation", and "Governance and Funding". Although the combination of activities varies between the CoVEs, as the description of the three clusters' activities became more elaborate in the calls for projects after the 2019 and 2020 pilot calls (and because the results of the pilot projects are now available, allowing new CoVEs to reflect on the best practices of their predecessors), many activities recur across the CoVEs. Examples include setting up an observatory "to know new trends and new needs from companies" (Interview_CoVE) in the relevant sector, to predict skills needs; creating platforms for collaboration between VET providers, businesses, and other stakeholders; designing innovative curricula and training programmes including those aimed at upskilling and reskilling; developing assessment and certification tools for vocational skills; producing learning materials and digital tools for educators; organizing workshops, conferences, and other events to share best practices; and establishing mobility programmes for learners and trainers (CoVE Database).

Importantly, experimentation is fostered by CoVEs, for instance, as these promote the co-creation of research, innovation, and new technologies (Interview_CoVE; Interview_EC2). This happens, for instance, through the inclusion of universities and by connecting them at the regional level to companies doing R&D (Interview_EC2). Many or most of the CoVEs are not just trying to offer new education for their students, but also new avenues for the future of VET as holistic (encompassing initial, further, and higher education) and thus related to a wide range of EQF levels and relevant stakeholders.

5.2.4 | Relevance of VET Excellence

However, in comparison to other recent policy initiatives for education and training, as in the case of the European Universities initiative that focuses on reimagining the sector of higher education (Marques and Graf 2024), the CoVE initiative's more inward focus on VET quality, labor market orientation, and SMEs demonstrates a pragmatic approach to the cooperation of these actors for skills development. Thereby, this cooperation is aimed at both preparing learners for future labor markets and ensuring that firms have access to the skills they need to thrive in times of the twin transition. In this context, we observe an orientation of some CoVEs toward professional skills, as well as ongoing learning (CoVE Database). CoVEs aim to prepare students and adults for the labor market to secure skills for firms in the future. The labor market orientation of CoVEs serves to balance demand for and supply of skills. In this sense, trainees should be able to have "fulfilling" professional careers, while firms can profit from their abilities. Crucially, the actors involved in balancing these interests are mainly educational providers, policymakers, companies (most often SMEs), and industry associations, while worker representatives are rarely included (CoVE Database).

Another joint understanding is the relevance of VET excellence—a concept that permeates the discourse around VET's contribution to a successful educational and labor market structural transition of Europe in times of major challenges. Examining the CoVE networks, we see that they indeed represent a new model for European VET cooperation that follows a challenge-based governance approach, advancing the societal and economic (third) mission, with a focus on tackling the twin transition, as best illustrated by the objectives identified for each partnership by its members: the most prominent are objectives emphasizing developing and enhancing skills aligned with industry needs (e.g., digital skills), addressing skill gaps, adapting to new technologies (e.g., green technologies), and preparing workers for the future of work by focusing on practical skills and work-based learning. Many specific objectives refer to goals directly linked to the twin transitions, aiming to integrate innovation and technology into VET and/or emphasizing sustainability, both environmental and economic. Interestingly, several CoVEs focus explicitly on topics around the "twin transition" or "green and digital transitions" (with a noticeable prevalence in the projects funded from 2021 onwards), while others implicitly integrate green and digital aspects in their broader objectives, without explicitly mentioning both (CoVE Database). This can be interpreted reflecting both the evolving policy context and stronger emphasis on the transitions as evident also in the call criteria for the CoVE projects after the pilot phase of the initiative, and/or the growing awareness and understanding of the interconnectedness of the digital and green transitions (e.g., related to the role of e-mobility in lowering carbon emissions) and the need to equip the workforce with the necessary skills to navigate these shifts.

Overall, the twin transition is seen not just as a challenge but as an opportunity for innovation and new forms of cooperation in VET. In partnerships of VET excellence, discretion is granted to CoVEs in terms of how these can implement the broad framework goals of the CoVE initiative. While being granted significant autonomy, they operate under a shared understanding that skills development is essential for achieving broader EU goals of sustainability, digitalization, and inclusiveness.

5.3 | Peer Review and Regular Reporting

5.3.1 | Quality Assurance and Dissemination of Knowledge

At the European level, we find that the CoVE initiative has built-in processes to support knowledge-exchange and peer learning (EC 2024b). The CoVE initiative has a strong focus on high quality skills and employment and, in turn, comprises creating or sustaining quality assurance mechanisms, as well as accreditation and validation procedures. In this regard, the governance of CoVEs is practiced as flexible and experimental and, crucially, as a combination of best practices. It prioritizes the dissemination of knowledge after insights are produced: "Centers of Vocational Excellence work as a kind of a motor whereby, thanks to this cooperation and collaboration, good ideas emerge, good practices are worked out that can then be disseminated" (Interview_EC1). Each proposal for the funding of a CoVE must include a budget for the exchange of good practices and mutual learning (EC 2024b). Iterative feedback structures and equal representation in knowledge-exchange and learning processes

indicate a permeation of values (e.g., continual progress, reciprocal learning, and equality) into the organizational structure of the CoVEs: "We cannot do anything alone. We need to collaborate with others, and maybe to learn and understand how others are facing and understand the same issue" (Interview_CoVE). CoVEs can also be called "Collaborative learning factories" (Interview_CoVE) that are helpful not only but also when certain countries or places lack relevant facilities or equipment. In such cases, it is, for instance, possible to foster a "virtualization of opportunities" and to "let other countries enter into a virtual way" (Interview CoVE) to foster mutual exchange.

5.3.2 | Transparency and Reporting on Outcomes

CoVEs can thus be understood as "transnational platforms to enable the exchanges between different countries" (Interview_EC2). Crucially, the Erasmus+ programme guide states that "The project achievements will be evaluated on the outcomes completed" (EC 2024b, 262). We find that, for instance, most of the pilot projects' webpages that are still active include extensive reporting on both processes, collaboration, and "project" outcomes, offering a rich repository of experiences from project implementation to strategic dissemination and quality assurance. Some of them, like PoVE Water (2024b) and the European Platform for Urban Greening (2024a, 2024b), describe in detail how a CoVE can be established, and several CoVEs report on best practices, offering concrete, actionable examples of successful initiatives. For instance, the "3LoE Results Cooperation" report (Hanse-Parlament 2024) evaluates the establishment, ongoing work, and transnational cooperation among CoVE members, while the "ECOVEM Dissemination Report" (Rafopoulos 2022) focuses on the strategies and channels used to disseminate project results across CoVEs. As stated by one CoVE coordinator, "we are working as an agent in regional ecosystems with other agents in regional ecosystems, and it is our role to bring everything back to our ecosystems and spread it around" (Interview_CoVE).

5.3.3 | Community of Practice and External Monitoring

Among the prominent peer review and knowledge-sharing elements of the CoVE initiative is the *Community of Practice* (COPCOVEs), a European platform for transnational CoVE exchange, that has been set up in a bottom-up way to allow project leaders to share experiences, best practices, and lessons learned from their CoVE projects, whilst addressing common issues that are of interest to all CoVEs. In the CoVE Community of Practice, the project leaders of all Erasmus+ CoVEs come together for the exchange of best practices (COPCOVEs 2024). In the corresponding Annual Forum of Vocational Excellence, the CoVE project leaders meet to exchange and to review their progress. These forums include structured formats to report and discuss within and between sectors and include systematic documentation like booklets on best practices (COPCOVEs Forum Report 2024). They also serve as platforms to exchange with national and European policymakers and to transfer key insights from the CoVE experiments to higher (i.e., European) governance levels. Between the Annual Forums, various smaller workshops take place that, for instance, bring together actors from CoVEs facing similar challenges and that further enhance peer reviewing and mutual learning. The Community of Practice also creates impact reports and open-access tools for CoVEs (e.g., tools for "Peer Review", "Stakeholder Analysis", and "Online Collaboration") (COPCOVEs 2024). The activities of CoVEs are also externally monitored, as exemplified by two recent reports funded by the EU and produced by the European Training Foundation, namely "CoVEs in the Digital Transition" (Lunkeit, Hansen, et al. 2023) and "CoVEs in the Green Transition" (Lunkeit, Thomsen, et al. 2023).

In sum, we find that regular reporting and processes of peer review are core elements in the policy cycle of the CoVE initiative.

5.4 | Periodical Re-Evaluation of Framework Goals, Measures, and Methods

5.4.1 | Co-Creation as a Premise for Re-Evaluation

The periodical reevaluation of framework goals is taking place through various channels and links to the expansion of the CoVE initiative and the inclusion of new actors, especially related to each new Call for the establishment of CoVEs.

First, the reevaluation is premised on co-creation, i.e., on European policymakers' conviction that "if you look at the Centers of Vocational Excellence, this is the main idea that we should work in very close cooperation to create the future, to co-create the change". Thus, "this is the main idea that you, instead of trying to kind of catch up with the development, you are part of the chain, you are part of the process of co-creation, you are part of the ecosystems" (Interview_EC2). What this indicates is a commitment by European policymakers to a collaborative bottom-up approach that enables actors on the ground to become active agents of change not only within their own ecosystem but also regarding inputs into the continuous development of the CoVE initiative at the European level. This openness on the side of European policymakers is not least motivated by the uncertainties they face in defining the content of skills for the twin transition without insights from experiments carried out by actors on the ground.

Second, one concrete channel to integrate innovation is adjustments to the program guide in each new call for CoVEs. We find that over the years, in the annual calls (2019–2024) for the establishment of CoVEs, adjustments and extensions have taken place. For instance, the elaboration of the possible activities of the CoVEs has become more extensive. It is also interesting to note that initial calls were focused more generally on green or digital skills, while the later calls emphasize more explicitly skills for the twin transition—stressing the interconnectedness of green and digital skills solutions.

5.4.2 | Linkage to Broader EU Initiatives and Increasing Impact

Furthermore, the revisions of the CoVE initiative aim to widen the circle of European policies and actors that support the framework goal of developing skills for a changing world of work.

Here, the European dimension plays an important role, for instance, as the European policy documents emphasize that the CoVE initiative is and should be increasingly linked to several other existing EU initiatives, including the Pact for Skills, the Sector Skills Alliances, and the European Training Foundation (CoVE Database). The latter is said to play a key role in developing the international dimension of the CoVE initiative beyond EU borders. Also, in our analysis of CoVE mission statements, we see that EU policy goals play an important role, as they mention several references to various EU initiatives, including the Pillar of Social Rights, the EU Skills Agenda, and the 2015 Riga Declaration (CoVE Database). This, too, points to the ambition to enlarge the circle of actors and, in this way, the impact of the CoVE initiative as it evolves.

Overall, we find that the CoVE initiative actively promotes insights from the experiments on the ground that are integrated into the further development of the initiative. We also see that there is an ambition to integrate more actors and related policies to enlarge the initiative's reach and innovativeness.

6 | Discussion and Outlook: Redrawing Boundaries in European Skill Formation

We find that XG offers a way to redraw boundaries in European skill formation through the creation of TSEs as intermediary platforms for innovation. European policymakers have built on the iterative policy cycle of XG to provide the ingredients needed to create and sustain TSEs. XG, as a mode of soft governance, (A) acts as a catalyst for TSEs by setting relevant framework goals, (B) builds and strengthens linkages between interdependent actors by delegating responsibility to local and transnational networks within TSEs, (C) provides nourishment for cooperation within and between TSEs by promoting peer review, recursive learning, and regular reporting, and (D) offers a generally supportive host environment for the maintenance and development of TSEs through the periodical reevaluating of framework goals, measures, and methods. All of this occurs in a context of strategic uncertainty, a multipolar power distribution, and substantial diversity within European skill formation and labor markets.

Empirically, we have explored the case of the newly established CoVEs, which encourage local actors in various European regions to develop solutions within TSEs in a bottom-up and networked way. We found that the CoVE initiative is particularly aligned with the broader EU agenda of tackling grand challenges (see Kaldewey 2018; Marques and Graf 2024) through education and training, with an emphasis on the twin transition. We find that the CoVE initiative emerges as a new policy initiative deployed to transform European VET cooperation by building structures for the co-creation of skills ecosystems at the regional, national, and European levels.

The CoVEs demonstrate the EU's new commitment to fostering bottom-up innovation, relying on the active engagement of local VET providers, companies, and various sectoral actors to address complex challenges and overcome uncertainties. The CoVE initiative allows the possibility to embrace an XG approach to policymaking, where the EC orchestrates the partnerships but encourages significant autonomy for the actors involved. This setup enhances iterative learning, as local solutions are tested, adapted, and scaled up to the European level (Sabel and Zeitlin 2012). The reliance on soft coordination tools such as benchmarking and mutual learning reflects broader trends in EU governance, where traditional hierarchical mechanisms have often proven inadequate in addressing multi-level, cross-border challenges (Egeberg and Trondal 2009). The importance of TSEs, developed through cooperation among diverse stakeholders, can be highlighted as a critical innovation in European VET policy, traditionally rooted in national and regional spaces.

The CoVEs represent a novel policy initiative within the EU's strategy to promote transnational cooperation in VET, with the specific focus on addressing the skill needs for the twin transition. Our analysis has shed light on how these new partnerships aim to transform the European model of VET. We could reveal the CoVEs as a dynamic instrument for advancing VET governance in Europe, particularly in the face of uncertainties around the digital and green transitions.

The creation of TSEs builds on an experimentalist, challenge-based governance approach and creates fertile ground for mutual learning and innovation. By embedding regional and national skills ecosystems into a broader European framework, the CoVE initiative attempts to address both needs on the ground and transnational challenges. As with other EU policy initiatives, the success of the CoVEs will depend on the extent to which the involved actors can navigate these complexities while fostering genuine innovation and inclusiveness. Thus, the initiative's long-term success will depend on its ability to scale up local innovation from the regional to the European level, maintain coherence across diverse governance structures, and ensure that the partnerships remain responsive to changing labor market needs and skills shortages. Here, it is critical that the institutionalization of the initiative keeps alive the spirit of mutual learning and bottom-up innovation, rather than leading to an expansion of technocratic bureaucracy (Börzel 2012) or the exclusion of relevant actors (Harmsen 2015).

The CoVE initiative is recent and still ongoing. As the CoVE initiative matures, future research is needed to assess the long-term impact these partnerships have on national skill formation systems, as well as on the broader economic and societal outcomes for the regions and economic sectors involved. Another fruitful task for further research would be to analyze the interactions with other recent skills policies at the European, national, and regional levels.

By integrating XG theory with the skills ecosystems framework and proposing a definition of transnational skills ecosystems, we advance ongoing European debates on transnational skills development. Our study's insights can be applied to other cases of transnational skills development, such as the abovementioned Belt and Road Initiative or activities of multinational firms to build local structures for the collective governance of skills in various world regions (Jürgens and Krzywdzinski 2016; Fortwengel and Jackson 2016). More generally, our XG approach to the challenge-based governance of skills ecosystems can offer a useful perspective for those involved in studying or implementing complex multi-level and multi-actor systems of skills provision in national and especially transnational contexts.

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Conflicts of Interest

The authors declare no conflicts of interest.

Data Availability Statement

The data that support the findings of this study are available from the corresponding author upon reasonable request.

Endnotes

[1] In this paper, we use the term "regional" to refer to *subnational* regions.

[2] An example of a CoVE is "The Platform of Vocational Excellence Water" (PoVE Water). It was funded as a pilot project in 2019 and continued as a Scale Up in 2021. It brings together a network of 23 international partners active in the water sector (e.g., vocational schools, higher education institutions, companies, and associations). The platform is led by the CIV Water Initiative of Friesland College (Netherlands) and organized into five regional CoVEs across Europe. The PoVE pilot project established the network and guaranteed the necessary infrastructure for vocational excellence in the water sector. The PoVE Scale Up focuses on the effective training of VET students to become digitally skilled and sustainably orientated to secure the workforce of the water sector (PoVE Water 2024a; CoVE Database).

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