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Towards a comprehensive understanding of new regional industrial path development

Robert Hassink^a , Arne Isaksen^b  and Michaela Trippl^c 

ABSTRACT

Path creation is a key concept in economic geography. So far, particularly scholars within evolutionary economic geography have pioneered research on this topic. This paper critically discusses their work and proposes a broader understanding of how new economic activities emerge in regions, which is referred to here as 'new regional industrial path development'. The paper develops a future research agenda, which stresses the need to develop a multi-actor and multi-scalar approach, to integrate the future into analyses of path development, and to offer a broader view on inter-path relations.

KEYWORDS

path creation; new regional industrial path development; multi-actor approach; multiscale approach; inter-path relations

JEL O33, R11, R58

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INTRODUCTION

Path dependence and path creation (also referred to as new path development) are key concepts in economic geography. Path creation or new path development (defined as 'the emergence and growth of new industries and economic activities in regions'; MacKinnon, Dawley, Pike, & Cumbers, 2018a, p. 3), in particular, attract much attention among both scholars and policy-makers, as it creates hope for the creation of new employment and economic growth. Where new industries generally emerge in space is a broader question economic geographers are interested in and have theorized on (Chapman & Walker, 1991; Storper & Walker, 1989).

As evident, there is no commonly agreed terminology for the subject that is the focus of this paper. Some scholars (Binz, Truffer, & Coenen, 2016; MacKinnon et al., 2018a, 2018b; Steen & Hansen, 2018) follow Martin and Sunley (2006) and adopt the notion of 'path creation' as an umbrella term to refer to the rise of new industries in regions. They also point to different sources of new paths. These range from indigenous creation, heterogeneity and diversity, transplantation, diversification into related industries, and upgrading of existing industries. Other scholars (Grillitsch, Asheim, & Trippl, 2018;


Isaksen & Trippl, 2016; Isaksen, Tödtling, & Trippl, 2018) prefer to use the notion 'new path development' as a generic term and offer differentiated typologies of how the development of new economic activities takes place in regions. In their work, new path creation is only one potential type (defined as the rise of entirely new industries based on radically new technologies, scientific discoveries, social innovation or new business models). Other forms of new path development included in their typologies are path importation (referred to as the attraction and anchoring of established industries from outside the region), branching and unrelated path diversification (defined as moves into a new industry based on related or unrelated knowledge combinations) (Grillitsch et al., 2018), and path renewal (considered as major changes of an existing regional path into a new direction based on the infusion of new analytic or symbolic knowledge). Arguably, it is mainly differences in the adoption of terms that divide the field. In the present paper, we follow Isaksen and Trippl (2016) and others and use the notion of 'new path development' as an umbrella term for various forms of the rise of new economic activities in regions.

Particularly scholars within the paradigm of evolutionary economic geography (EEG) have devoted much


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attention to the question of how new path development unfolds in space and over time. Processes of the birth and death of firms and sectors, as well as the role of innovation and the co-evolution of firms, are at the centre of EEG research. Research in EEG values geographical differences in the sense of assuming economic action to be contextual rather than driven by a maximization calculus. Moreover, it also pays more attention to the micro-foundation of economies as it stresses the importance of organizational routines. In addition to populations of firms in industries, it also directs attention to paths and trajectories in technologies, firms and industries that have 'largely been considered a local process ...' (Schamp, 2017, p. 5).

Next to path dependence and new regional industrial path development, other important explanatory notions in EEG include regional diversification, lock-ins, related variety and unrelated variety. While EEG is currently arguably the most popular paradigm in economic geography, it has also been criticized for not paying enough attention to the role of the social, cultural and institutional environment of economic activities (Hassink, Klaerding, & Marques, 2014; Henning, Stam, & Wenting, 2013; MacKinnon, Cumbers, Pike, Birch, & McMaster, 2009; Pike, MacKinnon, Cumbers, Dawley, & McMaster, 2016). It has only been very recently that EEG scholars have begun to zoom in on the role of institutions in new path development (Boschma & Capone, 2015; Boschma, Coenen, Frenken, & Truffer, 2017).

In a similar critical vein, this paper aims to appraise both the strengths and weaknesses of the explanations offered by evolutionary economic geographers on how industrial paths emerge and grow over time. Based on that appraisal, we see a scope for a broader understanding of new path development in EEG, an understanding that goes beyond the related and unrelated diversification dichotomy. As already noted above, we suggest a more fine-grained view on different types of path development (Grillitsch et al., 2018; Isaksen et al., 2018; Tödtling & Trippel, 2013) with a wide range of sources, mechanisms, and local and non-local capabilities. Following suggestions in the recent literature (Binz et al., 2016; Steen & Hansen, 2018), we define a new industrial development path 'as a set of functionally related firms and supportive actors and institutions that are established and legitimized beyond emergence, and are facing early stages of growth and developing new processes and products ...' (Steen & Hansen, 2018, p. 4). Arguably, this comes with a stronger focus on institutional elements, conditions and dynamics.

Our arguments resonate with recurrent calls for broader conceptualizations of new path development (e.g., Dawley, 2014; Isaksen & Trippel, 2016; MacKinnon et al., 2018a, 2018b), also by the main EEG advocates themselves (Boschma, 2017; Boschma et al., 2017; Boschma & Frenken, 2018). We identify several, so far largely neglected, issues by EEG, which are essential for a more comprehensive understanding of new path development. More precisely, we argue for (1) a multi-actor approach that also directs due attention to the critical role played by agency at different levels; (2) a multi-scalar view that takes non-

local sources and influences on new industrial paths seriously; (3) the integration of expectations and visions in analyses of new regional growth paths to acknowledge that not only the past but also the future can shape their development; and (4) broader conceptualizations of inter-path relations and dependencies.

The paper is structured as follows. The next section critically discusses the EEG concepts of new regional industrial path development in broader terms, as well as concerning some specific weaknesses. The main building blocks of a comprehensive understanding of new regional industrial path development are then discussed in the third section. The final section concludes with a research agenda and an outline of policy implications.

NEW REGIONAL INDUSTRIAL PATH DEVELOPMENT IN EVOLUTIONARY ECONOMIC GEOGRAPHY: A CRITICAL APPRAISAL

Where paths emerge also has to do with the broader theoretical question of the emergence of new industries in space, which has been tackled within EEG.¹ Two contrasting theoretical views exist in explaining this phenomenon. First, the locational freedom of newly emerging industries is stressed by the concepts of windows of locational opportunity and new industrial spaces (Boschma, 1997; Storper & Walker, 1989). According to these concepts, windows of locational opportunity are relatively open for emerging industries, because sector-specific institutions that could attract the newly emerging industries to certain locations do not yet exist and basic institutions can be found anywhere in a country (Boschma & Frenken, 2009, p. 155). By analyzing the locational patterns of new industries in the economic history, Boschma (1997) has evidenced these arguments. Each time new industries emerged, they were located in a large diversity of regions. Second, a contrasting and more recent view considers emerging industries less free in choosing their location, as new industrial paths depend on existing industrial paths (for instance, see the seminal work by Martin, 2010; and Martin & Sunley, 2006). Therefore, the location of emerging industries is not a random process and varies from industry to industry. The interdependence between new and existing industrial paths has been shown, for example, by Boschma and Wenting (2007) in their study on the emergence and location of the British automobile industry, which was dependent on the availability of knowledge and skills in related industries (such as the coach and cycle-making sectors).

Most research in EEG, which has been recently reviewed by Boschma and Frenken (2018) and Boschma (2017), has a narrow understanding of new path development and considers it as an incremental, endogenous, technology-driven and firm-led process (Schamp, 2017; Trippel, Grillitsch, & Isaksen, 2018) that underpins regional branching (or what has been called 'related diversification'). Recently, more radical forms of change and unrelated

diversification processes have also been addressed (Boschma, 2017; Boschma et al., 2017). We consider the framework proposed by EEG as (too) narrow for several reasons.

First, it very much takes the local firm as a starting point of analysis and hence neglects other actors, such as foreign companies, universities, research institutes, policy actors, etc. Second, local sources, processes and influences of new regional industrial path development are stressed at the expense of non-local ones. Third, whilst many efforts have been devoted to explaining how ‘the past’ shapes new path development, little has been said about the potential influence of ‘the future’, that is, how conventions, expectations and visions impair the rise and growth of industrial paths. Fourth, inter-path relations are narrowly conceptualized, shedding a light on the positive effects of technological and skill relatedness only and ignoring other vitally important linkages that might exist between different paths and influence their development. Furthermore, the sole focus of supportive relations between paths at different stages of development obscures the role of competing relations. The following sections will deal with these critical issues in more detail and extend the conceptual aspects of new path development into a more comprehensive understanding for future research.

FOUR PILLARS FOR DEVELOPING A BROADER CONCEPTUALIZATION OF NEW REGIONAL INDUSTRIAL PATH DEVELOPMENT

Pillar 1: Towards a multi-actor approach

EEG has hitherto understood new path development mainly as a firm-driven process. Particularly highlighted is the process in which existing skills and (often technologically related) knowledge are (re-)combined and provide inputs to new paths (Boschma & Frenken, 2011). Traditionally, EEG has hardly been concerned with the role of other actors than firms for new path development, such as universities and research institutes (Isaksen & Trippel, 2017; Tanner, 2014; Vallance, 2016), policy actors and the state (Dawley, MacKinnon, Cumbers, & Pike, 2015).

Recent contributions, however, have begun to bring into focus other actors besides firms and entrepreneurs (Isaksen et al., 2018; MacKinnon et al., 2018b) and other assets than technological knowledge and skills (Carvalho & Vale, 2018; MacKinnon et al., 2018a). In line with this work, we see it as vital to employ a multi-actor perspective (e.g., Trippel et al., 2018) and to take account of other activities than the recombination of knowledge by firms to grasp the complexity of how new industrial paths come into being and develop over time. We also advance the idea that new paths need to be institutionalized and often require changes of the organizational and institutional configurations of innovation systems. As will be argued below, these activities are performed by heterogeneous actor groups.

Two main types of agency

One possible starting point for a multi-actor approach to new path development is to zoom in on the role of human agency. Standard path dependence models are criticized for saying ‘little about *agency*, about how economic and other actors *create, recreate, and alter* paths’ (Martin, 2014, p. 619; original emphasis). Agency is defined as actions or interventions by actors producing particular effects (Sotarauta & Suvinen, 2018). In line with this definition, the role of human agency for new path development has been understood through the notion of purposive action. Thus, the creation of new paths requires ‘social action by knowledgeable pioneering individuals, universities, companies and/or governments’ (Simmie, 2012, p. 769). In a similar way, mindful deviation from existing structures by entrepreneurs is said to be vitally important for path creation (Garud & Karnøe, 2001, p. 6).

There is also an agreement in parts of the literature that new growth paths are created through activities by multiple actors. In addition to entrepreneurs who discover new ideas and create new ventures, other actors also need to be incorporated into analyses of how new paths come into being. These other actors include ‘those who develop complementary assets ... , those in institutional forums ... , and customers who offer critical inputs that shape emerging paths’ (Garud & Karnøe, 2003, p. 279).

Drawing on Isaksen et al. (2018), we find it useful to distinguish analytically between two types of agency, that is, firm- and system-level agency. The differentiating feature is that firm-level agency has its main field of influence within one firm or organization, while system-level agency exerts influences outside its institutional and organizational borders. An example of firm-level agency is actors who start new innovative firms or initiate new activities in existing firms with the potential to create new growth paths. An example of system-level agency that transcends institutional spheres is a research institute that develops new knowledge together with regional firms, clusters or industries with the aim of enhancing their competitiveness. In general, system-level agency is based on actors that are able to transform innovation systems to support emerging industrial paths better.

The notion of system-level agency resembles other recent conceptualizations, such as institutional entrepreneurship (Battilana, Leca, & Boxenbaum, 2009), which direct attention to a broad range of different actors (policy-makers, politicians, university leaders, firm managers, etc.) who ‘mobilize resources, competence, and power to create new institutions or to transform existing institutions’ (Sotarauta & Pulkkinen, 2011, p. 98). Further, it coincides with the idea of innovating actors that ‘commit themselves to system building as they set up or adapt broader institutional structures that support the emerging business field’ (Musioliik, Markard, & Hekkert, 2012, p. 1032), and with the work that path advocates do to ‘legitimate and empower the emergent regional path by developing supportive linkages with broader institutional environment’ (MacKinnon et al., 2018a, p. 20).

System-level agency comes in various forms and can be approached differently. Our approach is to use the concept of system-level agency as a ‘focusing device’ that ‘helps to organize and focus the analysis, ... to foresee what is going to happen, [and] ... to explain what has happened’ (Lundvall, 2007, p. 99). The role of system-level agency for new path development is thus an important topic to study in addition to the role of firm-level agency. Future research could investigate the various roles of firm- and system-level agencies for new path development in different types of regions (core versus peripheral ones), in various industries, and in nations dominated by different forms of capitalism (coordinated versus liberal market economies; Hall & Soskice, 2001).

The significance of integrating system-level agency into explanations of new path development finds further support by recent work on institutionalization processes of emerging paths. This occurs when a ‘new practice, activity, norm, belief ... [is] becoming an established part of an existing system, organization, or culture’ (Sotarauta & Mustikkamäki, 2015, p. 343). This argument builds on the fact that regional innovation systems (RISs) support innovation and competitiveness of key regional industries. RISs with well-coordinated actors (firms, knowledge organizations and support agencies) and stable rules are ‘prone to lock-in and path dependency and largely geared to generate incremental innovations and gradual change’ (Boschma et al., 2017, p. 36). Following this line of thought, one could argue that RISs often hamper entrepreneurship and innovation in areas that are new for a region and are therefore not necessarily supportive to the development of new growth paths (Tödtling & Trippl, 2013; Weber & Truffer, 2017). This calls for both firm-level agency and adaptation and development of RISs so that the systems facilitate emerging growth paths and do not only back the extension of existing regional strongholds.

The case of offshore wind energy production in Germany illustrates how a multi-actor framework contributes to explaining why and in what way a new offshore wind path has emerged (Fornahl, Hassink, Klaerding, Mossig, & Schröder, 2012; MacKinnon et al., 2018a). The German offshore wind sector builds on a distinctive set of preconditions, such as an established base of turbine manufacturers and specific technical and research-led knowledge. The path-creation mechanisms include a diversification strategy by Siemens and system-level agency by the federal state and regional policy actors. The state has introduced several demand-side measures and support for emerging industries through research and development (R&D) schemes, the encouragement of science–industry collaboration and financial instruments (MacKinnon et al., 2018a). Local assets are identified and harnessed by policy-makers in Bremerhaven. At the regional level, Fornahl et al. (2012) point at interesting differences between regions in northern Germany in the speed and intensity of new path development depending on the initiative of regional policy-makers, intermediaries and research institutes.

Pillar 2: Towards a multi-scalar view – taking non-local sources and influences seriously

EEG models portray new regional industrial paths as outcomes of local structures and development processes and underestimate non-local sources and influences. Developing a multi-scalar view and establishing greater clarity and specification of the role played by exogenous factors should receive due attention in future work. Two aspects of the extra-regional dimension of new path development require particular attention, namely (1) non-local flows of knowledge and other assets; and (2) the impact of national and supranational institutional environments.

Non-local flows of knowledge and other assets

Conventional EEG studies build on narrowly conceptualized models of endogenous path development. They foreground the importance of a large number of local innovative firms in related industries, triggering dynamic branching processes (Boschma & Frenken, 2011), local inherited knowledge and skill bases (Martin, 2010), a strong endowment of regional supporting organizations (Isaksen & Trippl, 2016), a vibrant local entrepreneurial culture (Spigel, 2013), and regional knowledge circulation (Feldman, 2007). Arguably, such ideal conditions are primarily found in core regions (Isaksen & Trippl, 2016). Studies of the rise of new industrial paths in less-favoured places rather demonstrate the role of exogenous impulses such as the arrival of innovative firms from outside and other forms of inflow of external knowledge and resources (Dawley, 2014; Dawley et al., 2015; Isaksen & Trippl, 2017; Varis, Tohmo, & Littunen, 2014). Non-local sources that initiate processes of new path development are clearly underplayed by EEG. However, it is fair to note that representatives of this school have begun to add exogenous sources to their research agenda (Boschma, 2017; Neffke, Hartog, Boschma, & Henning, 2018). EEG frameworks could benefit from a stronger integration of insights from the literature on global production and innovation networks and multi-scalar innovation systems (Binz & Truffer, 2017; Coe, Dicken, & Hess, 2008; Cooke, 2013; Yeung & Coe, 2015) and the significance of non-spatial proximity as supplements to geographical proximity (Boschma, 2005).

A core question for future research concerns the link between the directionality of asset flows and new regional industrial path development. While recent work has highlighted the importance of attracting and anchoring firms and assets from elsewhere (Binz et al., 2016; Trippl et al., 2018), the effects of internationalization activities of home-grown companies (Njøs, Orre, & Fløysand, 2017) and outflows of firms and highly skilled people on path development have hardly been investigated and remain poorly understood. As Crescenzi and Iammarino (2017, p. 110) put it:

A more accurate understanding of the consequences of regional attractiveness towards inwards flows – and the long-term processes of specialization and diversification

able to reconfigure local economic and institutional advantages – must be coupled with the study of regional outward reaching, from both domestic MNEs [multinational enterprises] and small and medium-sized enterprises (SMEs), which can provide new knowledge links and a reorientation of the local industry structure and economic functionality.

Zooming in on both in- and outflows of knowledge and other assets and investigating how internationally mobile firms and workers affect new path development is thus a key issue for further research. Particular attention should be devoted to scrutinizing both positive effects of such flows and their potential negative impact (e.g., through increasing competition between regions over mobile assets, disinvestments and decoupling processes from global production networks; MacKinnon et al., 2018a) on new path development in core and non-core regions (MacKinnon, 2012; Trippi et al., 2018).

National and supranational institutional environments

Other potentially influential exogenous sources are national and supranational policies and regulations. As Martin and Sunley (2006, p. 412) remind us, ‘paths in a region may be shaped by ... reliance on financial institutions elsewhere; and influence exerted by economic and regulatory policies pursued in other regions and at national level (or even beyond)’. Conceptual and empirical work on how multi-scalar institutional environments and policy actions influence new path development is scant. One notable exception is the study by MacKinnon et al. (2018b) on the rise of off-shore wind paths in various countries in Europe. They illustrate the significant role of state institutions at different spatial scales and of nation-states in particular in mediating strategic coupling of assets to mechanisms of new regional industrial path development. More analyses of this kind are needed to gain deeper insights into which national (and supranational) institutional environments facilitate or hinder the emergence and growth of new economic activities and the ways by which regional policy initiatives designed to nurture new paths interact with and become aligned to innovation and industrial policies pursued at higher spatial scales. It is also intriguing to explore how path actors navigate through and transform multi-scalar institutional environments in order to create favourable conditions for new growth paths. Providing systematic evidence of how such processes take place in different industries and types of regions would advance understanding of the relation between multi-scalar institutional dynamics and new regional industrial path development.

Pillar 3: Towards integrating the future

Expectations have been largely ignored in the economic geography literature on new path development, although they potentially play a key role (Steen, 2016a, 2016b). Particularly, the EEG literature has strongly emphasized routines and history (see Henning, 2018, for an insightful critical discussion of the treatment of time and history within EEG frameworks) conditioning new path

development, and by doing so it ignored expectations, visions and conventions. Steen (2016a, 2016b) and Steen & Hansen (2018) have recently paid attention to this topic. They convincingly argue that agencies are inter-temporal; in their ongoing innovation activities it is not only their past (experience) that counts, but also their future expectations and visions. Since the latter steer investments and the selection of activities, they are key in understanding and explaining new path development. The articulations of expectations and visions can be seen as both an important resource as well as a part of the socioeconomic context and hence selection environment (Steen, 2016b, p. 1606). Individual agents do not develop expectations in isolation, but they are shared and these shared or collective expectations often benefit from co-location in clusters and RISs (Coenen, Raven, & Verbong, 2010).

This points more generally to the importance of ‘context’ or ‘environments’ in which firm- and system-level agency occurs. ‘It is a truism that individual decision-making is *always* embedded in some context or situation’ (Clark, 2018, p. 205; original emphasis), which also is ‘a critique of the “atomized view of economic agents”, which dominates conventional economics’ (p. 205). The underlying idea here is that expectations of the future, and thus decision-making, are highly influenced by common ‘world-views’ in particular regions, community of practice and so on.

One approach to study the development and importance of joint expectations is provided by the concept of conventions² as interpreted by Storper and Salais (1997). Conventions are seen as ‘shared understanding and norms of behaviour that allows actors to reduce uncertainty about each other’s decision-making’ (Sunley, 2011, pp. 339–340). Conventions are mutual expectations of how economic actors (individuals and firms) handle different business aspects. Conventions also make up framework of actions, which are implicit rules of ‘what to do’ in specific situations.

Conventions influence the opinion of economic actors of how specific industrial activity should take place, for example, whether a specific type of product should be tailored to specific customers or whether it should be mass production of standard products. In this sense, conventions include expectations about future economic activity within a specific industrial path. The concept of conventions as applied by Storper and Salais (1997) can also provide a link between EEG’s focus on routines and history and the idea of future expectations as important for current decisions. Thus, Storper and Salais maintain that ‘actors generate conventions in the situation in which they find themselves’ (p. 43). Like expectations, conventions are developed jointly among actors. They ‘become an intimate part of the history incorporated in behaviors’ (p. 16). That is to say, historically developed conventions shared by many actors also strongly influence expectations of future development in the industrial path.

The relationship between expectations, visions and conventions and new path development is not only positive. The failure to meet convention-based expectations

can lead to strong disappointments, damaging reputations and hence an obstacle to new path development. Isaksen (2018) interprets shared conventions among entrepreneurs and firm leaders to build (expensive) craft boats in small batches as one important reason why a former dynamic regional cluster of leisure boat-building firms in Norway collapsed in the wake of the financial crisis in 2008. Overall, expectations are very important for new path development or the failure of it, but they are at the same time hard to grasp, particularly if researchers confine themselves to quantitative data sets.

Pillar 4: Towards a better account of inter-path relations

With some notable exceptions (Martin, 2010; Martin & Sunley, 2006), most conceptualizations and empirical studies to date have directed attention to one path or new path development activities in one industrial field only. EEG conceptualizations and empirical studies have thus far only delivered partial answers to the question of how industrial paths may be related. Path relations and interdependencies may occur (1) between multiple established paths, (2) between established paths and new paths, and (3) between multiple emerging paths. The latter, that is, linkages between new paths, have thus far largely been ignored by EEG scholars, whilst the former (i.e., relations between old paths, on the one hand, and links between old and new paths, on the other) have mainly been portrayed as being supportive. Negative path interdependencies and inter-path competition over scarce assets and markets are missing elements in EEG frameworks (Trippel & Frangenheim, 2018).

Linkages between multiple established paths

EEG scholars argue that the mix of multiple full-blown paths located in a region may reflect either related or unrelated variety (Boschma, 2017). Related variety is seen as being not only conducive to regional growth but also as offering ideal conditions for new path development. Relatedness between established paths is first and foremost conceptualized as 'technological or skill relatedness', thus confining potential path interdependencies and linkages to flows of skills and (technological) knowledge between industries. In line with recent work, we see a need to revisit the notion of relatedness (Cooke, 2012), to extend it beyond technological knowledge to market and institutional knowledge (Steen, 2016a), and to reflect upon and conceptualize 'variety' in a broader way, opening up to other forms such as institutional variety (Carvalho & Vale, 2018). Another shortcoming of EEG is that it only focuses attention on positive effects of relatedness between established paths. There is hardly any discussion of how several old paths located in a region may hinder each other in their development through competition over scarce assets and other forms of negative path interdependencies that operate through market or value chain linkages. We will come back to this weakness of EEG concepts below.

Linkages between established paths and new paths

Similar critical remarks apply to EEG accounts of the relationship between established paths and new paths. According to EEG scholars, related diversification reflects a positive relationship between old and new paths: new paths are said to grow out of existing ones, drawing on and recombining existing knowledge and competences residing within old paths. In other words, old paths provide an enabling environment for the new ones. They facilitate them by providing knowledge assets and skills. Little attention is paid to the question whether and under what conditions old paths may also constrain the rise of new ones (Boschma et al., 2017; Martin & Sunley, 2006; Steen & Hansen, 2018). More research is needed to reveal which constellation of factors (such as incumbents' strategies, vested interests, divergence of conventions, expectations and visions between 'old path actors' and 'new path actors', various forms of industrial and policy path dependencies and lock-ins, or competition between established and emerging paths over scarce resources (e.g., Steen & Hansen, 2018) suppresses new path development.

One can also critically ask if the 'related versus unrelated diversification' dichotomy suffices to capture fully how new paths are (or are not) related to old ones, that is, to what extent and in which ways they grow out of existing ones. As noted in the introduction, recent work suggests that fine-grained typologies are required to grasp various forms of (new) path development (Isaksen et al., 2018; Isaksen & Trippel, 2016; Martin & Sunley, 2006). In addition to path branching (i.e., diversification processes into a new related industry building on existing competencies), one can distinguish several other forms of new path development that do not build on pre-existing, related regional resources. Path creation, importation and diversification based on unrelated knowledge combinations (as defined above) point to a wide range of sources and mechanisms at play in the development of new regional industrial growth paths. However, more work is needed to understand better which resources and activities underpin and create these outcomes in variegated spatial contexts.

Linkages between new paths

Finally, scholarly accounts of new path development have thus far neglected potential relationships between multiple new paths that may emerge in a region at more or less the same time and consequently little is known about how they shape each other's evolution.

Inspired by insights from the literature on technological innovation systems and transition studies (Bergek et al., 2015), recent work suggests that the relation between new industrial paths may take several forms (Trippel & Frangenheim, 2018). For example, the relation may be characterized by competition over scarce local resources (such as skilled labour, private risk capital, policy support) or market shares. Dynamic development of one new path may then limit the growth potentials for other new paths, unless additional resources are created (by launching new educational programmes to increase the pool of skilled

workers, public–private venture capital provision, public procurement and other measures directed to enlarge the demand) or sourced from outside the region (see above). Alternatively, the relationship between two (or more) new paths may be also a mutually supportive one. This is the case when new paths complement and reinforce each other in their emergence and further development. Such beneficial relations may stem from opportunities for cross-industrial knowledge flows, or may also reflect potentials for joint activities in other areas such as market formation, institutional change, and the transformation of the organizational support infrastructure in the region and beyond. System-level agency may play a powerful role in shaping such inter-path relations and triggering changes that benefit more than one path (see above). Arguably, whether or not such favourable interrelationships between multiple new paths will develop in a region will also depend on the question if heterogeneous actors share joint expectations and visions (see above) or succeed in developing those over time.

CONCLUSIONS: TOWARDS A FUTURE RESEARCH AGENDA AND POLICY IMPLICATIONS

EEG has recently stimulated both conceptual and empirical work on new regional industrial path development in economic geography. However, as argued in this paper, we now see the need to rethink the research of this school on new path development and steer future research also in new directions. In order to realize this endeavour, we also see the need for both integrating other strands of literature into EEG, as well as opening up to more qualitative research methods. Based on our critical analysis, we identify the following four avenues for future research:

- Future research should extend the analytical focus beyond firms as actors and pay more attention to the question of how non-firm actors such as users, universities, intermediaries and policy actors shape new regional industrial path development. In relation to these non-firm actors, what resources, other than technological knowledge, do they mobilize, use and create when co-developing new paths? What roles do infrastructure, institutional factors, natural resource endowments, social capital and power play for them? And what are the drivers of these actors to develop new paths other than innovativeness and competitiveness? Concerning the latter question, EEG scholars could benefit from integrating literature on a broader set of drivers of economic activities, such as de-growth, sustainability and social justice, into their explanations (Aoyama, Murphy, & Hanson, 2011). Concerning the role of non-firm actors, particularly system-level actors, much can be gained by forging stronger links to the literature on institutional agency (Sotarauta & Suvinen, 2018) to understand better how new paths become institutionalized, and how heterogeneous actors reconfigure
 - the organizational and institutional set-up of innovation systems.
 - We see great potential in paying more attention to the multi-scalarity of sources, relations and influences on new path development in future research. How does the significance of non-local sources and relations vary between different industries? What are the differences of non-regional sources and relations in new path development in different kind of regions (metropolitan, peripheral and old industrial regions) and how are they anchored in the respective types of regions? When do non-local linkages facilitate the growth of a new path and under what conditions do they form barriers to new regional path development? How do inflows and outflows of actors and assets affect new path development? In what ways do non-local institutional environments and policy actions shape new growth paths?
 - Expectations, visions and conventions are key to analyze in future research on new path development. How do shared expectations, visions and conventions come into place and what role does co-location play in that process? How do they influence new path development? Why do shared expectations, visions and conventions in some cases contribute to new path development and why do they in other cases block new path development? In answering these questions, EEG scholars can, as suggested by Steen (2016b), draw on the literature from socio-technical transitions and the sociology of expectations (Borup, Brown, Konrad, & Van Lente, 2006).
 - We see a fourth future research avenue in a broader analysis of inter-path relations. What is the nature of path interdependence in regional economies and how does that nature influence new path development? Which forms of variety and relatedness play a role? How do existing paths affect emerging paths? Whilst much work in EEG has focused on explaining how old paths facilitate the rise of new ones, little is known about which factors related to existing paths prevent new paths to emerge. How do multiple new paths shape each other's evolution? Are the interdependencies between multiple paths competitive or supportive and why? Under what circumstances can competition between paths over scarce resources be neutralized by tapping into non-local resources? How do expectations, visions and conventions affect path interdependencies? What is the role of system-level agency in shaping inter-path relations? EEG could benefit from building stronger connections to the literature on technological innovation systems and transition studies (Bergek et al., 2015), where relationships between multiple technologies (and industries) have been discussed (Tripl & Frangenheim, 2018).
- Overall, we are convinced that these four future avenues will lead to a better understanding of why some regions succeed in nurturing the rise and further development of new paths while others fail. In order to perform future

research along the lines drawn above, there is a need to strive for more combinations of quantitative and qualitative methods (see also Boschma, 2017; Boschma & Frenken, 2018; Henning et al., 2013).

Finally, we are convinced that future research informed by our extensions will have positive implications for a comprehensive place-based, context-specific regional innovation policy (Barca, McCann, & Rodríguez-Pose, 2012). Research results on new path development along the above-sketched lines will lead to more insights into the role of a broader set of resources and actors, as well as their expectations, in a multi-scalar perspective. Hence, they will provide regional policy-makers with more specific, tailor-made recommendations on how to support new path development.

DISCLOSURE STATEMENT

No potential conflict of interest was reported by the authors.

NOTES

1. The first part of this section draws on Berg and Hassink (2014).
2. The introduction and adoption of new conventions are also core elements of management science approaches to the emergence of industries (e.g., Gustafsson, Jääskeläinen, Maula, & Uotila, 2016).

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