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Abstract

New regional industrial path development is a key concept in economic geography, as it contributes to explaining regional economic inequalities and forms the basis for place-based innovation policies. So far, particularly scholars within the Utrecht school of evolutionary economic geography have pioneered research on this topic. In this paper, we critically discuss their work and conclude that their understanding of path development is too narrow. We develop 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.

Key words: new regional industrial path development; multi-actor approach, multiscalar approach, inter-path relations

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1. Introduction

New regional industrial path development and path dependence are key concepts in economic geography, as they help to explain regional economic inequalities and form the basis for context-specific, place-based regional innovation policies (Barca et al., 2012). New regional industrial path development (that is, the emergence and development of new economic activities and industries in regions¹), in particular, attracts much attention, both among 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.

Particularly scholars within the paradigm of evolutionary economic geography (EEG) have devoted much attention to the question of how new path development unfolds in space and over time. It is currently arguably the most popular paradigm in economic geography. To overcome the static nature of neoclassical regional economics and institutional economic geography, EEG takes an explicit dynamic perspective as it deals with ‘the processes by which the economic landscape—the spatial organization of economic production, distribution and consumption—is transformed over time’ (Boschma and Martin, 2007, 539). 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, which have “... largely been considered a local process ...” (Schamp, 2017, 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 criticised for not paying enough attention to the role of the social, cultural and institutional environment of economic activities (MacKinnon et al., 2009; Hassink et al., 2014; Pike et al., 2016). It has only been very recently that EEG scholars have begun to zoom in on the role of institutional settings (Boschma and Capone, 2015) and institutional entrepreneurship (Boschma et al., 2017) in new path development.

In a similar critical vein, this paper aims at appraising both 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 criticize the narrow understanding of new path development by evolutionary economic geographers. This partly resonates with more general criticism towards an overdose of evolutionary rationalization in economic geography (Bathelt et al., 2017), and recurrent calls for broader conceptualizations of new regional industrial path development (e.g. Dawley, 2014; Isaksen and Trippl, 2016; MacKinnon et al.,

¹ Following Binz et al. (2016), Steen and Hansen (2018, p. 191) ‘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’.

2018a,b). 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 (i) a multi-actor approach that also directs due attention to the critical role played by agency at different levels; (ii) a multi-scalar view that takes non-local sources of and influences on new industrial paths seriously; (iii) 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 (iv) broader conceptualizations of inter-path relations and dependencies.

This paper is structured as follows. In Section 2, we will critically discuss 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 will then be discussed in Section 3. Section 4 will conclude with a research agenda and an outline of policy implications.

2. 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 EEG². 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 and 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 and Frenken, 2009, 155). By analyzing the locational patterns of new industries in the economic history of Belgium, Boschma (1997) has evidenced these arguments. Each time new industries emerged, they were located in a large diversity of regions. Secondly, a contrasting and more recent view considers emerging industries less free in choosing their location, as new industrial paths depend on existing industrial paths (see, for instance, the seminal work by Martin and Sunley, 2006; Martin, 2010). Therefore, the location of emerging industries is not a random process and varies from industry to industry. The interdependencies between new and existing industrial paths have 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 coach and cycle making sectors). In a similar interdependent vein, the concept of path creation emphasizes the significance of context, as well as strategic and mindful deviations of agents, for the emergence of new industries (Garud et al., 2010). ‘Path creation ... is constituted by the sociotechnical arrangements that shape temporal dynamics of projects as actors frame issues about the future, coordinate their actions in the present and make sense of what may have transpired in the past’ (Karnøe and Garud, 2012, 375). The emergence of the wind power industry in Jutland, Denmark, for example, has been explained with the help of this concept (Karnøe and Garud, 2012).

² The first part of this section draws on Berg and Hassink (2014).

However, the Utrecht school of EEG around Boschma and Frenken (2006, 2018) has a narrower understanding of new path development and considers it as an incremental, endogenous, technology-driven and firm-led process (Schamp, 2017; Trippel et al., 2017) 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). We consider the framework proposed by the Utrecht school as rather narrow for several reasons.

First, it very much takes the local firm (often even ‘one plant one product companies’, Schamp, 2017) as a starting point of analysis and hence neglects other actors, such as foreign companies, universities, research institutes, policy actors, etc. Secondly, local sources, processes and influences of new regional industrial path development are stressed at the expense of non-local ones. Thirdly, whilst much efforts have been devoted to explaining how ‘the past’ shapes new path development, little has been said about the potential influence of ‘the future’, i.e., how conventions, expectations and visions impair the rise and growth of new industrial paths. Fourthly, inter-path relations are narrowly conceptualized, shedding light on technological relatedness only and ignoring other vitally important linkages that might exist between different paths and influence their development. Furthermore, we consider the sole focus of supportive relations between paths at different stages of development as too limited, as competing relations also need to be taken into account. The narrow orientation of the Utrecht school towards new path development might be partly explained by the interest of their members in quantitative analyses, which may restrict their focus, as they tend evade questions that cannot be answered by quantitative data. In the following sections, we will deal with these critical issues in more detail and will extend the conceptual aspects of new path development into a more comprehensive understanding for future research.

3. Four pillars for developing a broader conceptualization of new regional industrial path development

3.1 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 (often technologically related) knowledge is (re-)combined and provides inputs to new paths (Boschma and Frenken, 2011). Technological competence is thus depicted as the most important resource and its re-combination by firms is seen as the most important activity for new path development (Mörner and Trippel, 2017a). Little is said about how other resources such as infrastructure, institutional factors (norms, values and regulations), natural resource endowments, social capital and power (Maskell and Malmberg, 1999; Bathelt and Glückler, 2005; Fagerberg et al., 2014, Laasonen and Kolehmainen, 2017; Carvalho and Vale, 2018) are used to develop new industrial paths.

EEG has hardly been concerned with the role of other actors than firms for new path development, such as universities and research institutes (Vallance, 2016; Isaksen and Trippel, 2017), policy actors and the state (Dawley et al., 2015). However, we see it as vital to employ a multi-actor perspective (see, for instance, Trippel et al., 2017) and to take account of other activities than knowledge re-combination by firms to grasp the complexity of how new industrial paths come into being and develop over time. We advance the idea that new paths need to be institutionalised and often require changes of the organisational 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 that focus on ‘lock-in’ are criticised for saying ‘little about *agency*, about how economic and other actors *create, recreate, and alter* paths’ (Martin, 2014, 619; italics in original quotation). Agency is defined as actions or interventions by actors producing particular effects (Sotarauta and 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, 769). In a similar way, mindful deviation from existing structures by entrepreneurs is said to be vitally important for path creation (Garud and Karnøe, 2001, 6).

There is also an agreement in parts of the literature that new growth paths are created through activities by a multiplicity of actors. In addition to entrepreneurs who discover new ideas and create a new venture, 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 and Karnøe, 2003, 279).

Drawing on Isaksen and Jacobsen (2017) we find it useful to distinguish analytically between two types of agency; i.e. firm level and system level agency. The differentiating feature is that firm level agency has its main field of influence within one firm or organisation, while system level agency exerts influences outside its institutional and organisational 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 the competitiveness of these. In general, system level agency is based on actors that are able to transform innovation systems to better support emerging industrial paths.

The significance of integrating system level agency into explanations of new path development finds support by recent work that suggests that more attention needs to be paid on how emerging paths become institutionalised. This occurs when a ‘new practice, activity,

norm, belief ... [is] becoming an established part of an existing system, organization, or culture' (Sotarauta and Mustikkamäki, 2015, 343). The argument of institutionalisation builds on the fact that regional innovation systems (RISs) support innovation and competitiveness of key regional industries. RISs with well-coordinated actors (firms, knowledge organisations 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, 36). Following this line of thought, many 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 and Trippel, 2013; Weber and Truffer, 2017). This necessitates 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 importance of institutional change

In principle, reconfiguration of RISs to support new regional growth paths can be of three main types (Mörner and Trippel, 2017b). First, new institutions, organisations and policy instruments can be created (layering); second, existing institutions, organisations and policy can be adapted to fit better emerging industries (adaptation); and third, existing institutions, organisations and policy instruments can be used in new ways (novel application). We interpret system level agency as actions that are able to bring about such changes in RISs. Following this line of thought, new regional path development is the outcome of firm level agency and the further development and reconfiguration of innovation systems triggered by system level agency. The notion of system level agency has similarities with institutional entrepreneurship (Battilana et al., 2009), another conceptualisation of change agents and agency, which directs attention to a broad range of different actors (ranging from policy makers to politicians, university leaders, and firm managers) who 'mobilize resources, competence, and power to create new institutions or to transform existing institutions' (Sotarauta and Pulkkinen, 2011, 98).

The case of offshore wind energy production in Germany illustrates how a multi-actor framework contributes to explaining why a new offshore wind path has emerged (MacKinnon et al., 2018a; Fornahl et al., 2012). 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 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.

3.2. Towards a multi-scalar view: taking non-local sources and influences seriously

EEG studies build on narrowly conceptualized models of endogenous path development processes. New regional industrial paths are largely seen as outcomes of local structures and development processes. They consist of a large number of local innovative firms in related industries triggering dynamic branching processes (Boschma and Frenken, 2011), local inherited knowledge and skill base (Martin, 2010), the combination of different knowledge bases in the region (Manniche, 2012), a strong endowment of regional supporting organizations (Isaksen and Trippel, 2016), a vibrant local entrepreneurial culture (Spigel, 2013), and regional knowledge circulation (Feldman, 2007). Arguably, such *ideal* conditions for endogenous regional industrial path development are primarily found in metropolitan and technology core regional contexts (Isaksen and Trippel, 2016). Several qualitative studies of the rise of new industrial paths in less-favoured places rather point to the role of exogenous development impulses such as the arrival of innovative firms from outside and other forms of inflow of external knowledge and resources (Varis et al., 2014; Dawley et al., 2015; Isaksen and Trippel, 2017). Non-local sources that initiate processes leading to the creation of new regional industrial paths are clearly underplayed by the Utrecht school of EEG. However, it is fair to note that representatives of this school have begun to add exogenous sources of path development to their research agenda (Boschma, 2017; Neffke et al., 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 (Coe et al., 2008; Cooke, 2013; Binz and Truffer, 2017). This work demonstrates that extra-regional knowledge sources may stimulate innovation activity and fundamentally challenges the prevailing focus on endogenous assets in EEG (Dawley, 2014). Recent work not only demonstrated the importance of attracting and absorbing exogenous knowledge, it also stressed the role of anchoring other resources, such as institutional factors, social capital and power for new path development (Binz et al., 2016; Trippel et al., 2017). As research on exogenous resources, however, is still scarce, we see them as a potential future research area.

However positive effects of extra-regional knowledge (brought into the region or circulated between regions by multinational firms, mobile workers, international innovation partnerships, etc.) and other resources is just one side of the coin. The other side shows that in some cases new path development is hindered by disinvestments and decoupling processes from global production networks (MacKinnon, 2012).

Moreover, the importance of exogenous sources for new path development cannot be considered *irrespective of* types of industry and region, and phases in path development³. Empirical studies show that firms and industries with an analytical knowledge base source

³ Other potentially influential exogenous sources are national and supra-national policies and regulations. As Martin and Sunley (2006, 412) remind us ‘paths in a region may be shaped by those in other regions, though intraindustry and interindustry linkages and dependencies; reliance on financial institutions elsewhere; and influence exerted by economic and regulatory policies pursued in other regions and at national level (or even beyond).

innovation inputs on a wider geographical scale than firms and industries that rely on synthetic and symbolic knowledge (Martin, 2013). Metropolitan regions with thick and diversified regional innovation systems have comparatively good access to local knowledge and resources to trigger regional industrial change than ‘thinner regions’ (Trippel et al., 2017). The importance and role of local and non-local knowledge also varies between different phases of a new path development process (see Moodysson (2008) with regard to the mode of knowledge creation and the spatial configuration (local versus global collaboration), in different phases of the innovation process of biotechnology products in Southern Sweden.

There is consequently a need to better understand how endogenous and exogenous sources can contribute to new path development and how the extent and role of the two types of sources vary with regard to different regional types, industries, and path development phases.

3.3. 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 in conditioning new path development, and by doing so it ignored expectations, visions and conventions. It is particularly Steen and his colleagues (2016a, 2016b; Steen and Hansen, 2018), who 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 socio-economic context and hence selection environment (Steen, 2016b, 1606). Individual agents do not develop expectations in isolation, but they are shared and these shared or collective expectations often benefit from collocation in clusters and regional innovation systems (Coenen et al., 2010).

Another approach to study expectations is provided by the concepts of convention and ‘worlds of production’ presented 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, 339-340). Conventions are mutual expectations of how economic actors (individuals and firms) handle different business aspects. Conventions also make up framework of actions, that are implicit rules of ‘what to do’ in specific situations. Common conventions among actors stimulate informal collaboration.

A key idea in this approach is also that 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 cluster or industry. 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 (1997, 43) maintain that ‘actors generate conventions in the situation in which they find themselves’. Like expectations, conventions are developed jointly among actors, and in regional clusters, conventions will ‘become an intimate part of the history incorporated in behaviors’ (op. cit.: 16). That is to say, historically developed conventions shared by many cluster actors also strongly influence expectations of future development in the cluster.

The relationship between expectations, visions and conventions and new path development is not only positive. The failure to meet convention-based expectations can namely also 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, which might be one of the reasons why they have been ignored by more quantitatively oriented EEG research.

3.4. Towards a better account of inter-path relations

With some exceptions (Martin and Sunley, 2006; Trippel and Frangenheim, 2017, MacKinnon et al. 2018b, Steen and Hansen, 2018), most conceptualisations and empirical studies to date have directed attention to one path or new path development activities in one industrial field only. This ‘single path view’ seems to be a limitation. Many regions host a variety of industrial paths and it is vital to understand the ways by which an industrial path is affected by other paths located in the same region. Arguably, EEG scholars do recognise the possibility of several paths developing within one region. Martin (2010) argues that such multiple paths may co-evolve and reinforce each other. Nevertheless, the nature of path interdependencies remains poorly understood. EEG conceptualisations and empirical studies have thus far only delivered partial answers to the question of how industrial paths may be related. Path relations may occur (i) between multiple established paths, (ii) between established paths and new paths, and (iii) between multiple emerging paths.

Linkages between multiple established paths

EEG scholars adhering to the Utrecht school argue that the mix of multiple full-blown industries (i.e. regional industrial paths) located in a region may reflect either related or unrelated variety. The former is seen as being not only conducive to regional growth but also offering ideal conditions for new path development. Relatedness between established paths is first and foremost conceptualised as ‘technological relatedness’, thus confining potential path interdependencies and linkages to flows of 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 conceptualise ‘variety’ in a broader way, opening up to other forms such as institutional variety (Carvalho and Vale, 2018).

Another shortcoming of EEG is that it only focuses attention on positive relationships (as an outcome of technological relatedness) between established paths. There is hardly any discussion of how several paths located in a region may hinder each other in their development. We will come back to this question 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 re-combining 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 technological knowledge assets. Little attention is paid to the question whether and under what conditions old paths may also constrain the rise of new ones (for notable exceptions, see Martin and Sunley, 2006; Boschma et al., 2017; Steen and Hansen, 2018). More research is needed to reveal which constellation of factors (such as incumbents’ strategies, vested interests, divergence of conventions, expectations and visions (see section 3.3) between ‘old path actors’ and ‘new path actors’, various forms of industrial and policy path dependencies and lock-ins) suppresses new path development to unfold and in what sense old paths form a selection environment that prevents new paths to emerge.

One can also critically ask if the ‘related versus unrelated diversification’ dichotomy suffices to fully capture how new paths are (or are not) related to old ones, i.e., to what extent and in which ways they grow out of existing ones. Recent work suggests that fine-grained typologies are required to grasp various forms of (new) path development (see Martin and Sunley, 2006; Isaksen and Trippl, 2016; Grillitsch et al., 2018; Isaksen et al., 2018). In addition to path branching, which is the diversification into a new related industry building on existing competencies and knowledge of existing industries in a region, we can distinguish several other forms of new path development that do not build on pre-existing, related regional resources. Path creation is the rise of entirely new paths based on radically new technologies, scientific discoveries, social innovation, new business models, etc. Path importation refers to transplanting and anchoring an established industry or sources for new path development from outside the region (see also Section 3.2). Path diversification is the moving into a new industry based on unrelated knowledge combinations (Grillitsch et al., 2018), whereas path upgrading is considered as a major change of an existing regional path into a new direction based on the infusion of new analytic or symbolic knowledge. This more recent work points 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 better understand which resources and activities underpin and create these outcomes. Some of the ideal types of path development mentioned above are based on the (re-)use of existing resources (path branching, path diversification, path upgrading), whilst others mainly build on the generation of entirely new resources (path creation) or the anchoring of non-local resources and knowledge that are new for the region (path importation). Arguably, in reality new paths may well result from

both ‘resource using’ and ‘resource creating’ activities (Miörner and Trippel, 2017a). The case of the rise of the new media industry in Southern Sweden is telling in this respect. Martin and Trippel’s analysis (2017) suggests that it was largely based on using existing assets residing within the traditional media and ICT industries, complemented by the creation of new symbolic knowledge and research organizations. Another example is the emergence of a functional food path in Scania (Zukauskaitė and Moodysson, 2016), which grow out of the traditional food manufacturing sector, drawing on existing knowledge assets (mobilized by bridging local universities and the industry) as well as the creation of new assets (such as developing entirely new knowledge, markets and legitimacy). These two examples also point to the powerful role played by system level agency (see Section 3.1) performed by regional policy actors to reconfigure the organizational and institutional support structure.

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 and Frangenheim, 2017). For example, the relation may be characterised 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 Section 3.2). 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 organisational 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 Section 3.1). Arguably, whether or not such favourable inter-relationships between multiple new paths will develop in a region will also depend on the question if heterogeneous actors share joint expectations and visions (see Section 3.3) or succeed in developing those over time.

4. Conclusions: Towards a future research agenda and policy implications

The Utrecht school of EEG has recently stimulated both conceptual and empirical work on new regional industrial path development in economic geography. Before the launch of EEG in the past decade, there was relatively little interest in economic geography in this important topic. However, as we have 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 endeavor, we also see the need for both integrating other strands of literature into EEG, as well as opening up to qualitative research methods. Based on our critical analysis in Section 3, we identify the following four avenues for future research.

First, 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, public sector actors and policy makers 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 et al., 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 and Suvinen, 2018) to better understand how new paths become institutionalized, and how heterogeneous actors reconfigure the organizational and institutional set-up of innovation systems.

Second, 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 industries with different knowledge bases? In what phase of path development are they of particular importance? 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? EEG could benefit from several literature strands in tackling these questions, such as global production networks (Coe et al., 2008; Yeung and Coe, 2015) and recent work on global innovation systems (Binz and Truffer, 2017).

Third, 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 colocation 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 et al., 2006).

We see a fourth future research avenue in a broader analysis of inter-path relations and dynamics. 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 other than technological 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 emerging paths competitive or supportive and why? Under what circumstances can negative effects of competition between paths over scarce resources be mitigated 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.

Overall, we are convinced that these four future avenues will lead to a better understanding why some regions succeed in nurturing the rise and further development of new paths while others fail. The research agenda outlined above can help to shed light on dimensions and factors that have thus far been underappreciated by the EEG literature. As stated in the paper, most of these deficiencies are related to the narrow quantitative methodological orientation of the school. In order to be able to do future research along the lines we have drawn above, EEG scholars need to be more open to qualitative methods and to strive for more combinations of quantitative and qualitative methods.

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 et al., 2012). Research results on new path development along the above-sketched lines will lead to more insights into the role of a broader group of resources and actors, as well as their expectations, in a multi-scalar perspective. They will hence provide regional policy-makers with more specific, tailor-made recommendations on how to support new path development.

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