Emerging industries: Institutions, legitimacy and system-level agency

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Abstract

Economic geographers have studied emerging industries in regions from various perspectives, such as lifecycle, evolutionary economic geography, and systemic approaches. However, so far, they have insufficiently conceptualized the effects of institutional structures on new industry emergence. This special issue on "Emerging industries: institutions, legitimacy and system building" therefore shows recent work that seeks to advance emerging industries by drawing on institutional approaches. The present introductory article identifies key characteristics of 'emerging industries', establishes a heuristic for the conceptualization of the institutional dynamics in emerging industries, applies it with the special issue papers, and outlines a future research agenda.

JEL codes: L60, L6, R10, R1

Keywords: emerging industries; institutions; economic geography; heuristic

1 Introduction

The emergence of new industries in regions is a central topic of regional studies and economic geography. This is not surprising, since emerging industries are typically associated with innovation, creativity and entrepreneurial activities which are of crucial importance for regional economic development (Feldman and Lendel, 2010; Li et al., 2021; Tanner, 2014). Recently, emerging industries are also increasingly seen as a catalyst for transformative change toward green, clean or more sustainable regional development trajectories (Trippl et

al., 2020; Binz et al., 2016b). Accordingly, 'emerging', 'nascent', 'introductory' and 'emergence stage' industries, as well as the dynamics of new industrial path development in regions (Hassink et al., 2019; MacKinnon et al., 2019), have received considerable interest in academic research and policy making (e.g., Tödtling and Trippl, 2018; Forbes and Kirsch, 2011; Binz et al., 2016b; Gustafsson et al., 2016; Boschma, 2017).

Economic geographers have studied emerging industries in regions from various perspectives. While some contributions adopt a lifecycle or phase models approach (Martin, 2010; Menzel and Fornahl, 2010), others, primarily the evolutionary economic geography approach, focus more on regional preconditions in the form of inherited industrial structures, capabilities or knowledge specializations (Boschma and Frenken, 2011; Frenken et al., 2007; Boschma, 2017) to explain why new industries emerge in some regions and not in others. More recently, systemic approaches have gained prominence (Bergek et al., 2008a; Binz and Truffer, 2017; Zukauskaite et al., 2017). They pay attention to a broader set of preconditions (including not only historically grown industrial structures but also organizational support structures and institutional configurations) and move beyond knowledge dynamics, casting light on a wider range of resource formation (Binz et al., 2016b) and asset modification processes (Trippl et al., 2020). What is more, they have begun to highlight the critically important role that is played by the institutional agency performed by both firm and non-firm actors in initiating and consolidating regional industrial change (Isaksen et al., 2019; Grillitsch and Sotarauta, 2020).

These different strands of literature have created important insights into the knowledge dynamics that condition regional industrial path development, but thus far conceptualized

the institutional structures and dynamics that influence new industry emergence only to a limited extent (e.g., Glückler and Eckhardt, 2021). Much thus remains to be researched when it comes to the complex (de-)institutionalization, legitimation and system (re)configuration processes that go hand in hand with new industry emergence in regions. Against this background, we believe that developing approaches that combine the perspectives outlined above with key insights from neo-institutional sociology and organization studies holds considerable potential to improve existing conceptualizations and explanations of the emergence of novel industries in regions.

This special issue on "Emerging industries: institutions, legitimacy and system building" accordingly aims at showcasing recent work that seeks to advance state-of-the-art theories on emerging industries by drawing on institutional approaches from neo-institutional sociology, organization studies, management literature and related fields in the social sciences. The present introductory article has three objectives. First, based on a broad literature review, we aim to identify key characteristics of 'emerging industries'. Second, building on extant work in economic geography and regional studies, we establish a heuristic for a deeper conceptualization and exploration of institutional dynamics in emerging industries. The contributions to this special issue will then be discussed via our heuristic. Finally, we outline the contours of a future research agenda that emerges from the contributions to this special issue.

2 Emerging industries: defining characteristics

Over the last few decades, scholars from different backgrounds (e.g., management, organization studies, evolutionary economics, institutional theories, innovation system approaches and transitions literature) have studied various aspects of emerging industries, employing different conceptual and theoretical perspectives (for comprehensive overviews, see, for instance, Phaal et al. (2011) and Gustafsson et al. (2016)). However, little consensus has been reached on what an emerging industry entails. In the rest of this subsection we will review some key definitions provided by the literature, and based on that, reflect upon the key features of emerging industries.

Some scholars follow a life-cycle approach when defining emerging industries (Klepper, 1996). Van de Ven and Garud (1987), for example, see emerging industries as industries that are in their earliest stage of development. Industry emergence accordingly corresponds to the earliest phases of industry development, when the population of firms is still small, a dominant design or product architecture are missing and product innovation is common (Phaal et al., 2011). Based on previous systematic overviews on emerging industries (e.g., Forbes and Kirsch 2011; Phaal et al., 2011), Gustafsson et al. (2016) further distinguish between three key phases in this early industry emergence process: an initial phase in which the stage for the emergence of an industry is set; a co-evolutionary stage in which the different elements (e.g., organizational, technical, product and service innovations) of the emerging industry co-evolve and converge to form a new industry; and a growth stage in which the sales of the newly formed industry take off.

Other scholars are more interested in the driving forces behind the emergence of a new industry. In this regard, one definition that has been taken up by many scholars was developed by Porter (1980), who defined emerging industries as "newly formed or re-formed industries that have been created by technological innovations, shifts in relative cost relationships, emergence of new consumer needs, or other economic and sociological changes that elevate a new product or service to the level of a potentially viable business opportunity" (quoted in Phaal et al., 2011, p. 217). Two aspects of this definition complement the life-cycle definitions. First, an emerging industry can either be an industry that is newly formed (e.g. based on a radical scientific breakthrough), or it can be an industry that is re-formed, or transformed—meaning that it inherits competences and capabilities from pre-existing industries. However, such a re-formed industry needs to show some emergent features that its predecessors do not possess. This brings us to the discussion of the different pathways through which an emerging industry can potentially be initiated. While new path creation, defined as the creation of new-to-the-world industries (Binz and Gong, in this issue; Boschma et al., 2017) is considered as one pathway for developing emerging industries, we argue that path transformation characterized by radical innovation activities within existing industries (Baumgartinger-Seiringer et al., 2021b; Miörner and Trippl, 2019) or the recombination of activities in two (or several) hitherto unrelated industries (Frenken et al., 2007), can also lead to the emergence of new industrial activities.

Second, new industries may emerge not only from technological breakthroughs, but also from market-based or institutional dynamics. In contrast to the technology-centered perspectives that have long dominated in economic geography (Tanner, 2014; Feldman and Lendel, 2010), Porter (1980) also highlights the important role that non-technical factors

may play in inducing new industries. Factors such as “shifts in relative cost relationships, emergence of new consumer needs, or other economic and sociological changes” (quoted in Phaal et al., 2011, p. 217) point to institutional dynamics that may cause new industries to emerge. Yet, these dynamics have been left under-researched for a long time. Only more recently, some scholars have begun to assess emerging industries from valuation and market formation perspectives (Jeannerat and Kebir, 2016). Furthermore, some researchers have argued that forces such as social innovations, or shifts in socio-cultural, institutional and policy dimensions as well as in user preferences may trigger the emergence of new industries in space (Lee and Malerba, 2017).

Third, institutional theories and in particular institutional organizationalism have emphasized the institutional dimensions related to industry emergence. At a most basic level, this literature has dealt with the question how new industrial activities that have no predecessor in the social order may overcome their ‘liability of newness’ (Aldrich and Fiol, 1994). Among others, the issue of industry legitimacy in early development stages has received considerable attention recently. Aldrich and Fiol (1994) examine the social processes surrounding the emergence of new industries by differentiating between cognitive and sociopolitical types of legitimacy. Whereas the former refers to the extent of taken-for-grantedness of the novel activities, the latter highlights the extent to which a new form conforms to recognized principles or accepted rules and standards. Examining the link between demonstration events and the birth of new organizations in the early American automotive industry, Rao (2004) claims that the creation of a new industry is a project in which institutional activists play a central role in securing constitutive legitimacy for the new industry. More recently, scholarship at the interface of economic geography and transition

studies has also approached the active build-up and contestation of legitimacy for emerging industries (Markard et al., 2016; Binz et al., 2016a; Heiberg et al., 2020; Rohe and Chlebna, 2021).

Our review of scholarly work indicates that emerging industries are approached differently by different streams of literature. Instead of attempting to come up with a unifying definition, we believe that it is more useful to distil some key features of emerging industries from the discussion above. Overall, emerging industries share the following characteristics:

- They are industries at an early development stage, before a dominant design or product architecture has emerged and self-reinforcing dynamics have set in
- The starting point of an emerging industry can either be radical technological breakthroughs or novel ways of (re)combining preexisting competences and capabilities
- Technology innovation is a key driver behind industry emergence, but non-technological innovations, shifts in demand/ market structure, as well as institutional or policy changes can also be relevant driving forces
- An emerging industry is subject to the liability of newness and thus lacks widespread diffusion and legitimacy, pushing its proponents to engage in collective system-level agency and (de-)institutionalization processes

Understanding these inherent features has deep implications for regions that aim to develop and anchor an emerging industry (Feldman, 2005). The next section provides a short overview of various strands of literature and how they have dealt with (de-

)institutionalization, legitimation and system-level agency processes, which are the focus of this special issue.

3 Exploring the institutional dynamics of emerging industries in space: towards a meta-level heuristic

In this section, we briefly discuss how the industry lifecycle, evolutionary economic geography and regional innovation studies literatures have addressed institutional dynamics around emerging industries. Juxtaposing their strengths and weaknesses will allow us to derive a holistic heuristic of key institutional dynamics and how they condition the early industry formation phase.

According to the industry or cluster lifecycle approach, industry emergence in space can be differentiated into qualitatively different phases (Klepper, 1996; Martin, 2010; Menzel and Fornahl, 2010). Martin (2010), for instance, differentiates between preformation, path creation and path development phases when exploring regional industrial evolution. Menzel and Fornahl (2010), in turn, distinguish between four stages of cluster evolution, i.e., emergence, growth, sustainment, and decline. Baumgartinger-Seiringer et al. (2021b) show that regional industrial path *transformation* can also be differentiated into several stages, including an initiation, acceleration and consolidation stage. While differing in terms of the criteria for categorizing stages of development, these contributions share an emphasis on differentiating the key path development mechanisms and how they shift as an emerging industry moves from one stage to another in the industry lifecycle.

In many of those lifecycle perspectives, institutional dynamics, legitimation and system-level agency are covered rather implicitly – if at all. Key forces that drive evolution from one stage to another are rather framed as technological, knowledge-related or firm-based learning and innovation patterns, as well as regional agglomeration economies or increasing returns on industrial specialization. Institutional perspectives are largely absent from Klepper's (1996) work, while Menzel and Fornahl (2010) defined institutions as (non-firm) organizations in an evolving cluster.

Evolutionary economic geography, in turn, highlights how history and in particular preexisting regional industrial structures and knowledge specializations influence the probability of new industry emergence in space (Boschma, 2017; Boschma and Frenken, 2011; Frenken et al., 2007). The regional diversification literature holds that new industries are more likely to emerge in locations where technology and skills of preexisting industries are related to the new industries (Boschma and Frenken, 2011; Boschma, 2017). Scholars have termed this phenomenon "regional branching" (or related diversification) and referred to "the principle of relatedness" as an empirical principle describing the probability that regions enter or exit an economic activity as a function of the number of related activities present in that location (Hidalgo et al., 2018). Here, institutions are rather seen as macro-level structures that support or hinder path development potentials much in parallel with knowledge or capability-based factors. Boschma and Capone (2015) employ a varieties of capitalism framing to explain why certain regions diversify more into related or unrelated industrial activities. The literature that is very eloquently summarized by Martin (2010) also treats 'institutional hysteresis' as one among many macro-level factors that push regional industries into a path-dependent trajectory.

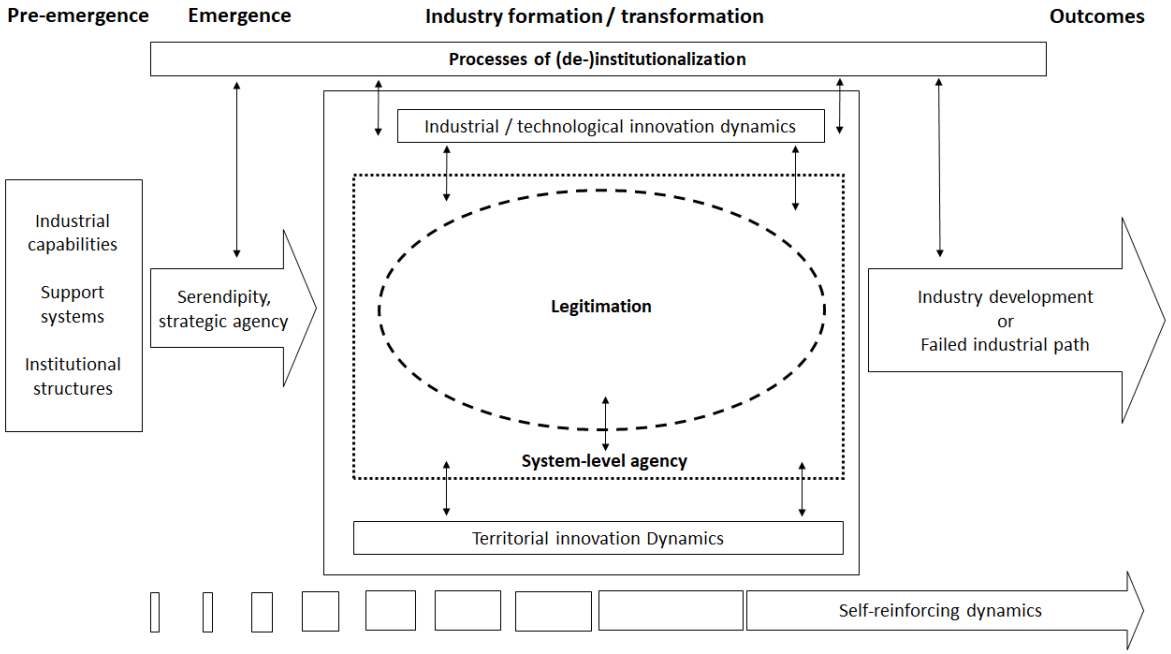
The third approach, which we call “systemic approach”, is rooted in regional and technological innovation system frameworks (Binz and Truffer, 2017; Tödtling and Trippl, 2018; Bergek et al., 2008a; Hekkert et al., 2007). This approach challenges, complements and extends the aforementioned approaches in several ways. For instance, scholarship on regional innovation systems has highlighted that pre-existing industrial structures are not a sufficient condition for industry emergence, but that one also needs to understand how a broader systemic environment, comprising organizational support structures and institutional structures inherited from previous rounds of industrial evolution shape the rise of new industries in regions (Trippl et al., 2020). Systemic approaches have furthermore disentangled different ideal-type industrial path development processes and begun to emphasize the role of embedded agency in explanations of industry emergence in regions.

Those studies share a critique of firm-centric and endogenous understandings of regional industrial development. They rather stress the significance of complex interactions between firms and non-firm actors as well as institutional dynamics in the industry formation process. Concepts such as system building (Musiolik and Markard, 2011; Musiolik et al., 2012), system reconfiguration and asset modification (Chen, 2021; Miörner and Trippl, 2019; MacKinnon et al., 2019; Trippl et al., 2020), resource mobilization and anchoring (Binz et al., 2016b), institutional entrepreneurship (Grillitsch and Sotarauta, 2020; Sotarauta and Mustikkamäki, 2015), institutional work (Binz and Gong, in this issue; Fuenfschilling and Truffer, 2016; Yang et al., 2021), or industry legitimation (Bergek et al., 2008b; Binz et al., 2016a; Hekkert et al., 2007; Markard et al., 2016; Heiberg et al., 2020), have contributed to a more nuanced understanding of the complex structure-agency dynamics that condition regional industrial

path development processes. At the same time, these perspectives have also tended to conceptualize institutional structures and dynamics as being either supportive or constraining to the evolution of new industrial paths in regions. As the contributions to our special issue show, a more nuanced view is needed to address the relevant mechanisms and change dynamics in emerging industries.

Arguably, the three perspectives outlined above provide highly complementary insights to understanding industry emergence in space. Apart from a few exceptions (Benner, 2021; Gong and Hassink, 2019a; Glückler and Eckhardt, 2021), they have directed relatively limited attention to the institutional structures and dynamics that influence new industry emergence. In the remainder we will thus try to combine generic insights from these three lines of thinking into a meta-level framework that will allow us to capture the institutional dynamics and to position (de-)institutionalization, legitimation and system building dynamics around emerging industries in a guiding heuristic (Figure 1). After outlining the key features of this heuristic, we will explore key institutional mechanisms in emerging industries in more depth through the articles included in this special issue and update the framework with novel insights and topics that are under-represented in the existing literature (section 4).

Figure 1. Generic heuristic for the institutional dynamics around industry emergence



A first step in building our heuristic is synthesizing insights from industry/cluster lifecycle approaches (e.g., Martin, 2010; Menzel and Fornahl, 2010) and seeing industry emergence as a process that evolves through a pre-emergence, emergence and industry formation / transformation phase. In order to successfully develop novel industries, relevant actors first and foremost depend on initial regional conditions, which we define in line with regional innovation system studies as the pre-existing industrial capabilities, institutional structures and organizational support systems (Trippl et al., 2020). These initial structures influence what industries are more or less likely to successfully develop in a region, but they far from pre-determine what paths will ultimately materialize.

In the subsequent emergence stage, entrepreneurial actors will selectively draw on these initial conditions and/or combine them with resources mobilized from elsewhere when developing first commercial activities in a new industry. As the industry is still novel and a

supportive innovation system is missing or not adapted to the emerging industry, chance events, serendipity, emergent dynamics or the strategic agency of pioneering actors will be a key impetus for further industrial development (Boschma, 1997). Extant work points out that knowledge and other forms of (e.g., institutional, market) relatedness are important platforms for initiating the birth of a new industry in the region (Boschma, 2017; Carvalho and Vale, 2018; Tanner, 2014). At the same time, loose extra-regional networks and (technological, institutional or organizational) templates borrowed from elsewhere play a decisive role in this early phase, as well (Binz et al., 2016a; Heiberg et al., 2020).

If the emerging industry manages to provide a proof of concept, locally validates its new practices or products and points to significant future growth potentials, it may move into a next development stage, in which active industry formation and transformation processes play a significant role. Analyzing the relevant path development processes entails detailing some key processes through which industrial and technological dynamics get connected with and embedded in territorial institutional dynamics (Martin, 2010; Menzel and Fornahl, 2010). In this phase, processes of institutionalization, legitimation and pro-active system-level agency arguably play a key role.

A second step in defining our heuristic thus relates to further defining the key mechanisms that influence industry emergence in some more detail. *First*, processes of *(de-)institutionalization* go hand in hand with industry emergence in all development phases. Actors will have to find collective strategies for adapting the regional regulative, normative and cognitive structures in ways that make them more conducive / adapted to the emerging regional path. Relevant forms of collective agency comprise "… practices that aim at the

mobilization of resources and such that target the (de-)construction of rationales" (Fuenfschilling and Truffer, 2016, p. 300). The former is based on the application of rather tangible resources and is closely related to the discussion about '*system-level agency*' or *'system building'* in the innovation system literature (Isaksen et al., 2019; Musiolik et al., 2020). Practices that aim at the (de-)construction of rationales are characterized by a more cognitive and discursive nature (although tangible practices such as (dis)continuing funding for certain activities are also not uncommon). It primarily concerns the development of narratives that establish what is morally wrong with old practices and how the new industry might solve relevant problems by means of strategic communication (Bergek et al., 2008b; Binz et al., 2016a).

Processes of (de)institutionalization are also closely intertwined with both industrial/ technological and territorial innovation dynamics (Fuenfschilling and Truffer, 2016; Hassink et al., 2019; Li et al., 2021; Menzel and Fornahl, 2010). Regarding the interface between technological/industrial and institutional dynamics, recent research has shown that institutionalization strategies are distinctively different as the emerging industry moves from one development stage to another (Geels and Verhees, 2011; Markard et al., 2016; Musiolik et al., 2020; Binz et al., 2016a). They reportedly also differ systematically between industries that are embedded in different types of sectors, global innovation systems or socio-technical system configurations (Binz and Truffer, 2017). The interface between territorial innovation dynamics and institutional change has, in turn, been analyzed in depth by economic geographers, devoting substantial attention to the local and non-local factors that create institutional stability or change in regional contexts (Baumgartinger-Seiringer et al., 2021b; Binz et al., 2016b; Gong and Hassink, 2019b; Hassink et al., 2019; Trippl et al., 2020;

Zukauskaite et al., 2017). Lately, economic geographers have also begun to draw on the literature on institutional entrepreneurship (Battilana et al., 2009; DiMaggio, 1988) to uncover how institutionalization processes of new practices and activities within an innovation system unfold during the development of a new path (Sotarauta and Mustikkamäki, 2015).

Second, *system-level agency* denotes the collective and distributed activities enacted by firms, non-firm actors and intermediaries in developing and adapting the relevant supportive innovation system structures around an emerging industry. In economic geography and transition studies, scholarly work has highlighted the role of strategic actions by so called 'system level agents (or entrepreneurs)' and 'system builders' who intentionally create, maintain and change system resources (such as shared visions, support programs and standards all actors can employ). The agency of system level agents / system builders in forming and reconfiguring technological/regional innovation system structures, by developing or mobilizing resources and networks and how this plays out in different settings (Musiolik et al., 2012, 2020; Binz et al., 2016b), have become important themes in this stream of the literature. Importantly, there seems to be a growing consensus that the creation of favorable regional environments for emerging industries should be understood as the outcome of deliberate actions pursued by both firms and non-firm agents including the state, academia, NGOs and a variety of other stakeholders operating at multiple spatial levels (Trippl et al., 2020).

Third, *legitimation* is another key mechanism that is closely related to institutionalization processes and system-level agency. It revolves around the question of how social objects like

individuals, organizations, or political systems become embedded in (and increasingly taken for granted) in a given context. This question has been a core focus of sociologists, political scientists and social psychologists for decades and legitimacy is arguably one of the foundational concepts of these social sciences (Zelditch, 2001). How emerging industries gain or lose legitimacy has only quite recently received focused attention by innovation scholars and economic geographers (Bergek et al., 2008b; Markard et al., 2016; Binz et al., 2016a). Industry legitimation can broadly be defined as the process of increasing an industry's fit with existing institutional structures (Markard et al., 2016). This fit can be achieved by either shifting the (narratives about the) emerging industry to better align with taken-for-granted institutional structures or by engaging in institutional work (often through system-level agency) that adapts institutions in such a way, that they better fit the industry's institutional demands (Markard et al., 2016; Binz et al., 2016a).

Finally, the interplay between the mechanisms outlined above may lead to different outcomes; either a successful establishment of the emerging industry in the region, leading to a self-reinforcing path with its own path-dependent trajectory or a failure of the emerging path with a discontinuation or re-orientation of the industrial activities built up in prior phases. In parallel, the relevant institutional structures in a region will either be structurally transformed through the industry emergence process or experience a backlash to / persistence of old structures. In the next section, based on insights from the contributions to this special issue, we will further elaborate on this heuristic by juxtaposing it with key insights on (de-)institutionalization, legitimation, system-level agency and additional institutional mechanisms that condition emerging industries.

4 Contributions to this Special Issue

Table 1 provides an overview of the articles included in this special issue. They span a broad range of regional, sectorial and institutional contexts, as well as different stages of industry development, which overall provides a great starting point for further elaborating and improving our generic heuristic. While all of them relate to one or several of the path creation mechanisms laid out above, they also emphasize key elements that point to novel avenues of research that were not mentioned before, such as the reconceptualizing of how initial regional conditions influence industry emergence from a neo-institutional perspective and how the embedding in contextual sectoral or industrial structures conditions industry formation dynamics. In the remainder, we will add these two dimensions to our heuristic (see Figure 2) and discuss the respective contributions in our special issue papers in more depth (section 4.1).

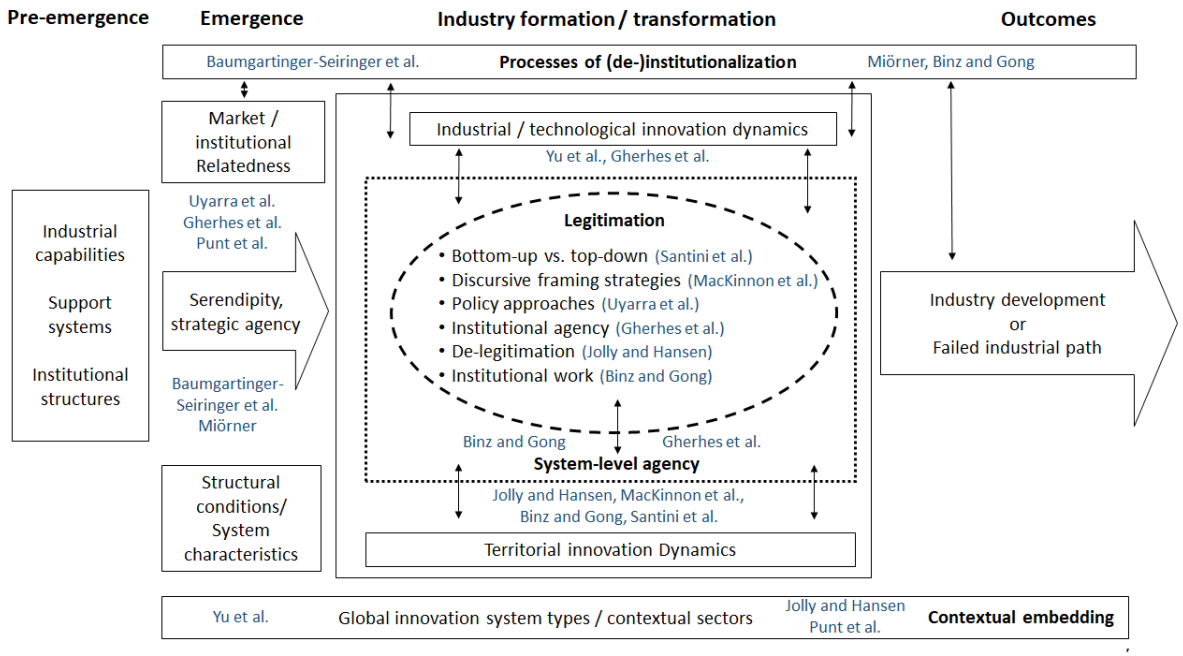
Table 1. Summary of the Special Issue papers

Authors	**Industry and location**	**Main focus**	**Conceptual relevance**	**Methods**
Baumgartinger-Seiringer et al.	Automotive industry in West Sweden and Austrian Triangle	Institutional infrastructure	Opportunity space (regional structural conditions); Process of institutionalization	Comparative case study: interviews
Binz and Gong	Potable water reuse in California, the US; video games in Hamburg, Germany	Legitimation dynamics, relationship btw system building and legitimacy; new-to-the-world vs. new-to-the-region industries	Legitimation; system-level agency; interplay; contextual embedding (newness); territorial innovation dynamics	Comparative case study: interviews, document analysis
Forrer et al.	Mechatronics industry in	Bottom-up and top-down legitimation	System-level agency; legitimation;	Interviews, online survey

	Vicenza and Trento, Italy		interplay; territorial innovation systems	
Gherhes et al.	AI industry in Montreal, Canada	Detailed change of system-building agency over stages of development by trailblazers, anchors and the state, less so on legitimation	Strategic agency/serendipity (knowledge relatedness); legitimation; interplay; technological innovation dynamics	Single case study: interviews, document analysis
Jolly and Hansen	Biogas industry in Sweden	Legitimacy spillovers	Legitimation; system-level agency; contextual sectors; territorial innovation dynamics	Single case study: interviews, document analysis
MacKinnon et al.	Offshore wind in the UK, Germany, and Norway	Legitimation narratives. Spatialized analysis of legitimation process, outlining the basis of an EG of legitimation that emphasizes national and regional institutions, industrial evolution and regional growth paths	Legitimation (discursive framing); territorial innovation dynamics	Comparative study: interviews, document analysis
Miörner	Digital games in Scania, self-driving cars in West Sweden	System selectivity, regional reconfiguration	Strategic agency/serendipity (system characteristics); system-level agency	Comparative study: interviews, document analysis
Punt et al.	Renewable energy cooperatives in Germany	Institutional relatedness, market formation for new technologies	Strategic agency/serendipity (institutional relatedness); contextual embedding	Organizational ecology to investigate legitimacy spillovers stemming

			(contextual sectors)	from institutional relatedness
Uyarra and Flanagan	UAV industry in Galicia, Spain	Legitimacy of means (policy instruments), goals (visions), and place	Strategic agency/serendipity (knowledge relatedness, application relatedness); system-level agency	Interviews
Yu et al.	AI industry in China	Key resource mobilization—knowledge, finance, legitimacy, market; data as a foundational resource that has own spatiality	Contextual embedding (GIS type); technological innovation dynamics; system-level agency	semi-structured interviews

Figure 2. Special issue papers positioned in the heuristic for the institutional dynamics around industry emergence



4.1 Strategic agency and serendipity in the emergence phase

In terms of strategic agency and serendipity in the emergence phase, some articles in this special issue cast light on the importance of relatedness in new industry emergence. Uyarra and Flanagan (in this issue) point to the relevance of market/application relatedness and argue that region-specific problems and societal challenges in Galicia (Spain) present actual or latent demands and thus markets for the emerging uncrewed aerial vehicle industry in the region. Punt et al. (in this issue) investigate the effects of institutional relatedness and show that renewable energy cooperatives in Germany can leverage the organizational knowledge

and the legitimacy gained by cooperatives active in other industries in the same district. Gherhes et al. (in this issue) (implicitly) claim that knowledge and institutional relatedness are important in explaining the emergence of the artificial intelligence industry in Montreal.

Some articles also challenge the understanding of the role of regional initial conditions in the emergence phase, explaining regional industry emergence from a neo-institutional perspective. In contrast to the conventional view of regarding regional preconditions as either enabling or constraining for certain forms of industrial change, the contributions by Baumgartinger-Seiringer et al. (in this issue) and Miörner (in this issue) reveal that a more nuanced understanding of the role of regional preconditions is needed. Drawn upon insights from the work on 'institutional infrastructures', Baumgartinger-Seiringer et al. (in this issue) propose to focus on the degree of institutional elaboration and coherence as decisive features of regional structural conditions for regional path development. Miörner (in this issue), on the other hand, suggests that 'system selectivity', which includes factors such as regional imaginaries, power relations and directionality, can shape system-level (re)configuration in fundamental ways.

4.2 Processes of (de-)institutionalization

Although several contributions touch upon processes of institutionalization, the contribution by Baumgartinger-Seiringer et al. (in this issue) most clearly focuses on it. The advanced and comprehensive framework developed by the authors goes beyond the simple dichotomy hitherto used in economic geography between constraining and enabling structural conditions in industrial change in regions by allowing for four different configurations,

namely established, contested, aligned/emerging and fragmented configurations, which, in turn, are different combinations of high and low elaboration, and high and low coherence. Moreover, Binz and Gong (in this issue), apply institutional work in their comparative analysis of two extreme cases of path development, which do not only differ concerning the industry under consideration but also concerning the degree of newness (new-to-the-world vs. new-to-the-region), and show the differences in processes of institutionalization. Finally, Miörner (in this issue) develops a framework for understanding reconfigurations of regional innovation systems for the development of new industries, in which the two processes of institutionalization figure prominently, namely the reconfiguration of both tangible resources through asset modification and intangible resources through regional imaginaries.

4.3 System-level agency

The role of system-level agency is explicitly addressed in several articles of this special issue. Gherhes et al. (in this issue) adds to our understanding of how system-level agency may develop over time, evolving from rather distributed and uncoordinated efforts in the pre-formative phase to more strategic efforts in the formative phase. Binz and Gong (in this issue) address a related research gap, that is, how system-level agency is a precursor to certain forms of institutional work that are employed to legitimize a new industry. The authors cast light on the collective, strategic agency by diverse actor groups that supports the development of new industrial activities in two distinct industry formation trajectories.

Other articles in our special issue highlight the role of particular agents when zooming in on structure-agency dynamics. Uyarra and Flanagan (in this issue) shed light on the role of public actors' system-level interventions in developing the new uncrewed aerial vehicle industry in the peripheral region of Galicia (Spain). Their analysis reveals the ways in which those actors may act as 'custodians' of place-based assets and how they can stimulate the rise of new economic activities by shaping processes of legitimation, external knowledge anchoring, and market formation in less-developed regions. Yu et al. (in this issue) pay attention to the role of system-level agency in coupling both local and non-local system resources and shaping a favorable (institutional) selection environment to support and sustain an emerging industry. Finally, Miörner (in this issue) builds on recent findings that suggest that new economic activities are inextricably linked to the reconfiguration of established regional innovation system structures by system-level agents. Such a reconfiguration is deemed vital to enable the provision of assets to new or transforming industries.

4.4 Legitimation

Processes of industry (de-)legitimation emerged as one of the core themes in this special issue and the mechanisms that enable / hinder the legitimation of emerging industries are approached from a refreshing breadth of vantage points. Several articles in this special issue engage with this theme and explore in depth the embedded agency that regional actors employ for improving an emerging industry's fit with the relevant regional (and broader industrial/sectoral) institutional structures (Gherhes et al.; Binz and Gong; Baumgartinger-Seiringer et al.; Forrer et al.; Miorner, in this issue). Not very surprisingly, these studies find

that firms, the state, academia and various intermediaries have to coordinate their activities and 'run in packs' in order to influence incumbent institutional orders. Also, how structure/agency dynamics play out both inside the focal region and in an industry's or sector's broader international networks is discussed to some degree (Yu et al., Gherhes et al., MacKinnon et al., in this issue). MacKinnon (in this issue) and Forrer et al. (in this issue), for example, show that the maturity of the technological innovation system and markets in other parts of the world allowed local actors to legitimize their industries by pointing to (imagined) future regional value creation potentials (for a similar argument see Gong, 2020).

Second, several studies depart from a well-known distinction between socio-political and cognitive legitimacy (Aldrich and Fiol, 1994), when analyzing how legitimacy is created differently in the general public vs. expert circles that comprise key regulators, firms and high-profile decision makers. Forrer et al. (in this issue) and Uyarra and Flanagan (in this issue) both point to the variegated ways in which local policy makers may take on a pro-active role in legitimizing an emerging industry, e.g. by strategically fostering demand for innovative technologies or re-directing regional resources to the new industry with top-down policy strategies. Forrer et al. (in this issue) furthermore show how in traditional manufacturing areas with thick pre-existing institutional and cognitive structures, legitimacy may also be construed through bottom-up activities at an industry level, without pro-active government interventions.

Third, MacKinnon et al. (in this issue) contribute with an expanded discursive lens on legitimation dynamics that opens the theme to the political aspects of path creation and a spatialized assessment of differences in the legitimacy levels of the same industry in

different regional contexts. Their study on the offshore wind industry in the UK, Germany and Norway shows that politics matter in legitimacy trajectories and that the advocates of an emerging industry need to skillfully adapt their narratives to different region's structural preconditions. This aspect of adaptation of legitimizing narratives also appears in other articles in this special issue.

Finally de-legitimation (Jolly and Hansen, in this issue) as well as spatial and sectoral spillovers (Jolly and Hansen, Binz and Gong, in this issue) are explored in some depth. The question of how emerging industries may lose their legitimacy posed by Jolly and Hansen (in this issue) is a pertinent one that receives too scant attention in the literature to date. Their case in the Swedish biogas sector convincingly shows that spillovers from related sectors, policy activism, as well as spillovers from other regions may contribute to the loss of legitimacy. Binz and Gong (in this issue) second this point, especially for the potentially detrimental influence of (unpredictable) policy interventions and organized public opposition in the early development stages.

A last important point highlighted is that legitimation and innovation system building are highly complementary mechanisms that closely co-evolve in emerging industry development. The study by Gherhes et al. (in this issue) and Binz and Gong (in this issue) point to the importance of understanding this co-evolution most directly and provide novel analytical frameworks for analyzing it.

4.5 Contextual embedding of path development processes

While not covered in our initial heuristic, multiple papers in our special issue also point to the relevance of contextual factors in influencing whether, how, where, and how fast novel industries emerge in a region. We thus added an additional mechanism to our heuristic named 'contextual embedding'. Three key issues of contextual embedding are mentioned in our special issue, namely 1) whether the industry is new-to-the-world or new-to-the-region, 2) what sector type or global innovation system the industry is embedded in, and 3) how the focal industry is influenced by changes in contextual sectors.

Regarding the first issue, Binz and Gong (in this issue) make a strong claim that the 'liabilities of newness' of emerging industries (and the ways in which actors may overcome them) fundamentally differ between new-to-the-region and new-to-the world industries (thus generally corroborating the insights from Boschma et al., 2017). Being new to-the-world means that all supportive system elements and institutional structures need to be constructed and legitimized 'from scratch'. New-to-the-region industries, in contrast, may build on technical, organizational and institutional templates imported from elsewhere when justifying the local industrial path. This point gets further illustrated when comparing the different empirical cases comprised in this special issue. The contributions that deal with new-to-the-world industries like artificial intelligence, uncrewed aerial vehicle or potable water reuse emphasize the importance of pro-active institutional work in the immediate territorial contexts of the emerging industry (often at sub-national to national scales), combined with loose international networks mostly in the knowledge dimension (Yu et al.; Gherhes et al.; Uyarra and Flanagan; Binz and Gong in this issue). Papers analyzing more 'mature' industries such as offshore wind, videogames or automobiles, in turn, emphasize the importance of meta-narratives e.g. related to job creation, industrial imaginaries, or

global market potentials, in combination with strong extra-regional knowledge pipelines (Forrer et al.; Miorner; MacKinnon et al., in this issue).

Second, the embedding of an emerging path in specific sectoral structures or global innovation system configurations determines to some degree what spatial-institutional change processes can be expected. Miörner and Baumgartinger-Seiringer et al. (in this issue) make the strongest claims about how new industries are drawing on routines, resources and capabilities that they have inherited from a given sectoral background, thus keeping their scope for change agency on a leash and directing their regional innovation trajectories in certain directions. Closely related, Yu et al. (in this issue) emphasize that the global innovation system type an emerging industry is embedded in strongly influences where the key innovation and valuation activities will happen. Two case studies on the artificial intelligence industry (Yu et al. and Gherhes et al., in this issue) provide highly interesting case studies. Artificial intelligence is a platform innovation whose influence transcends various sectors at once and data is its main resource, which is often strongly conditioned by national regulations. According to the authors, in such contexts, emerging industries are confronted with the dual challenge of getting embedded into state-of-the-art global knowledge flows and attracting key talent, while also navigating local data protection legislation in a way that entrepreneurial experimentation is not stymied.

Third, this special issue illustrates how dynamics in related industries and sectors influence the evolution of an emerging industrial path. Recent calls exist in the literature to explore the role of 'inter-path' relationships or 'sectoral context' more deeply (Frangenheim et al., 2020; Bergek et al., 2015). Here, Jolly and Hansen (in this issue) provide a highly interesting

contribution, which emphasizes that the legitimacy of an emerging regional industry may be eroded by contextual dynamics playing out in other regional industries that compete for the same resources, the same industry in other geographic contexts, or by broader sectoral strategies or policy interventions in the region. Punt et al. (in this issue) emphasize an opposite dynamic, in which institutional scripts and organizational forms transposed from a contextual sector are a key explanandum of successful path creation. Putting the symbiotic or destructive nature of inter-path relations more center stage is thus of crucial importance for a deepened understanding of the institutional dynamics around emerging industries (Frangenheim et al., 2020).

Overall, our special issue illustrates that there is no one-size-fits-all trajectory for regional industry emergence, but that the relevant structures and dynamics need to be tailored to sectoral, technological and territorial characteristics. Developing spatially more sensitive conceptualizations of industry legitimation, (de-)institutionalization and system-level agency dynamics advances theories of regional industrial path development. Cross-fertilization with relevant literatures in organization studies and neo-institutional sociology has just begun and there remains ample space for improving the heuristic sketched out in this editorial.

5 Conclusions and avenues for future research

The heuristic developed in this editorial and - more importantly - the contributions to this special issue, illustrate that developing a more nuanced understanding of the institutional dynamics around emerging industries is of crucial importance for improving economic geographers' take on regional industrial path development. At the same time, more work is

still needed to truly capture the emergence of new industries in space. Here, we suggest three interrelated avenues for future research.

First, based on the identified key characteristics of emerging industries, it is important to further dive into the complex structure-agency and (de-)institutionalization dynamics that condition early industry formation phases. Our special issue shows that beyond radical technological breakthroughs and re-combinations of related capabilities and knowledge stocks, institutional change, valuation and legitimation dynamics play a key role in understanding why an industry develops in one region and fails in another. Pre-existing organizational and institutional structures play a highly important role in influencing the later evolutionary patterns, yet in less deterministic ways than what is often assumed in the existing literature (Baumgartinger-Seiringer et al., Forrer et al., Miörner, in this issue). Relatedly, a clearer conceptual distinction is needed between truly new-to-the-world industries and those that emerge from the transformation of existing industries or the recombination of capabilities from incumbent industries, as the system-level agency and legitimation processes can be expected to be fundamentally different in these different situations (Binz and Gong, in this issue). Finally, some industries may not even have their origins in technological innovations at all, but depend largely on social innovation. Changes in the social context may be the key trigger for the emergence of a new industry, as in the case of management consulting (David et al., 2013). Little research exists that focuses on the conditions that trigger this sort of industry formation process.

Second, our special issue highlights that institutional dynamics cannot be fully addressed from a single-region perspective, but that a multi-scalar and multi-locational perspective

needs to be further developed. The multi-scalar nature of legitimation dynamics has already been addressed to some extent in this special issue (Yu et al., Binz and Gong, in this issue), but much more can obviously be done (see e.g. Heiberg et al., 2020; 2022). Promising avenues of research are not restricted to a legitimacy lens, but equally concern multi-scalar interactions in system-building, (de-)institutionalization and of course contextual embedding processes. In particular, how the manifold interfaces between territorially embedded and sectoral institutional structures and dynamics influence early industry emergence could be teased out in much more conceptual and empirical depth. One inroad to exploring this interface would be focusing on the connections between regional and global/technological innovation systems and regimes (Fuenfschilling and Binz, 2018; Rohe and Chelbna, 2021; Miörner and Binz, 2021). Connecting the theoretical lenses discussed here with additional literatures that analyze supra-regional dynamics, i.e. global political economy, world polity or global production network lenses appears like another highly promising venture.

Finally, the specific contexts in which emerging industries are embedded need to be explored in more detail. Contributions to our special issue have pointed to key contextual conditions, such as the technological characteristics of a focal industry, changes in closely related sectors, or changes in the broader sociopolitical, geographical, sectoral and cultural context as key enablers of barriers to regional industry formation. The interactions of a focal industry with related industries and their (technological) innovation systems is a particularly pertinent theme that is explored in economic geography more broadly (Bergek et al., 2015; Frangenheim et al., 2020). Empirically assessing, systematizing and ultimately theorizing the relevance of different contextual factors to the development of emerging industries in space

is therefore a third promising avenue for future research, which warrants an in-depth research agenda on its own.

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