Toward an entrepreneurial ecosystem research program

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Toward an Entrepreneurial Ecosystem Research Program

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Abstract

Entrepreneurial ecosystems have become a prominent concept, yet in its current state, the concept itself represents a paradox. While it draws on a rich intellectual history and provides an opportunity to synthesize different strands of research, it is also under-theorized and the mechanisms that govern ecosystem evolution are not well understood. This paper takes stock of recent advancements in ecosystem scholarship and synthesizes the empirical reality of the causal mechanisms. We use these dynamics to position ecosystems in a broader context, within and beyond the domain of entrepreneurship research, and propose a transdisciplinary research program for ecosystem research and practice.

Keywords

entrepreneurship, entrepreneurial ecosystems, context, causal mechanisms, research program

The concept of entrepreneurial ecosystems has gained enormous popularity within research, policy, and practitioner fields over the last decade. This contemporary popularity can be traced to two sources: Feld's (2012) book *Startup Communities* and Isenberg's (2010) work in the *Harvard Business Review*. The idea of entrepreneurial ecosystems was quickly adopted by governments and non-governmental organizations such as the Kauffman Foundation (Stangler & Bell-Masterson, 2015), the OECD (Mason & Brown, 2014), and the World Economic Forum (2014). This policy excitement led to a situation where research is led by policy rather than policy being guided by rigorous academic research (Stam & Bosma, 2015; Stam & Spigel, 2018). Even within the academic literature, the concept of entrepreneurial ecosystems is mainly used metaphorically with unclear relationships to other theories of innovation and (regional) economic development (Alvedalen & Boschma, 2017; O'Connor et al., 2018; Scaringella & Radziwon, 2018; Stam, 2015).

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Though entrepreneurial ecosystems quickly reached 'buzzword' status within research and policy communities and the implementation of ecosystem policies quickly outpaced its research foundation (Autio et al., 2018), the basic ideas underlying the entrepreneurial ecosystem concept are grounded in strong research traditions. Current thinking about entrepreneurial ecosystems can be seen as the result of developments in several related literatures: entrepreneurship context (Autio et al., 2014; Welter, 2011), high-growth entrepreneurship (Autio & Rannikko, 2016; Henrekson & Johansson, 2008), clusters (Delgado et al., 2010; Rocha & Sternberg, 2005; Rocha, 2004), regional innovation systems (Cooke, 2007; Sternberg, 2007; Ylinenpää, 2009), entrepreneurial environments (Gnyawali & Fogel, 1994; Van De Ven, 1993), and business ecosystems (Adner, 2017; Moore, 1993). The entrepreneurial ecosystem approach provides a way to synthesize these often-disconnected literatures to open up new research questions and avenues of inquiry into both policy-related issues regarding how to support economic growth and prosperity as well as more fundamental social science questions such as the relationship between structure and agency in modern capitalism (Spigel, 2020). Furthermore, entrepreneurial ecosystems emphasize the role of 'place' and provide a lens for understanding regional transformation through entrepreneurial action (Audretsch, 2015; Feldman & Lowe, 2018; O'Connor et al., 2018).

Given the extent of policy and research interest in entrepreneurial ecosystems it is important to critically reflect on what work has been done and what knowledge has accumulated about the contextual nature of the entrepreneurship process. It is hard to separate out reliable evidence on what types of regional factors support different types of entrepreneurship from anecdata based on exceptional case studies or analyses. There is a need to take stock of what research has found in order to understand where the field stands and in which directions it is traveling. We must ask: what is actually new about this concept or is it just a "fad" like many others (Martin, 2015)? The majority of other systemic approaches remain fuzzy due to a lack of empirical evidence of how they work and contribute to innovative and entrepreneurial activity (Markusen, 2003). This paper aims to address this issue by structuring and synthesizing the field of entrepreneurial ecosystem studies with a focus on the empirical evidence of the underlying causal mechanisms (cf. Van Burg & Romme, 2014).

This paper uses a systematic literature review to (1) explain the current state of entrepreneurial ecosystem research and develop a consensus definition for entrepreneurial ecosystems, and (2) synthesize empirical studies on the causal relationships among the ecosystem elements and how they are linked to outputs and outcomes. The aim is to develop a comprehensive understanding of the entrepreneurial ecosystem concept and how it can contribute to entrepreneurship and economic development policy and our wider understanding of the contextual nature of entrepreneurship (Webster & Watson, 2002). By doing so, it grounds the recent policy and practice popularity of ecosystems in the research literature and helps track the ways scholars engage with the topic. This is an instrumental step in building a coherent research community around entrepreneurial ecosystems that would allow for the accumulation and development of scientific and practical knowledge. Before we continue our analyses, we first define some key academic tools, which are used to build a research program: concept, framework, model, theory, and mechanisms. The entrepreneurial ecosystem research program starts with the general notion, concept, of entrepreneurial ecosystems. The concept of entrepreneurial ecosystems is an abstracted idea of a real-world phenomenon. We unpack the concept of entrepreneurial ecosystem by specifying its definition within the literature. We identify, categorize, and organize the factors deemed most relevant to understanding entrepreneurial ecosystems: a framework (cf. the entrepreneurial ecosystem frameworks by Isenberg, 2010; Spigel, 2017; Stam, 2015). This framework provides the bare bones for a model, in which the specific functional relationships among particular variables or indicators are hypothesized to operate in some well-defined set of conditions. These

hypotheses can be derived from or organized through theories, which are different ways to talk about causal mechanisms explaining development and change (cf. Van De Ven & Poole, 1995, at the organizational level).

While recent reviews of the entrepreneurial ecosystem literature (e.g., Cao & Shi, 2020; Garavan et al., 2019; Hakala et al., 2020; Maroufkhani et al., 2018; Nicotra et al., 2018) have sought to bring together this rapidly shifting field, we advance on these works in three key ways. First, we embrace a broad literature covering the entirety of the entrepreneurial ecosystem concept, rather than specific specialties such as ecosystems in emerging economies or specific domains. Second, we draw on this literature to identify the casual mechanisms which link the regional contexts in which entrepreneurship takes place with specific outcomes such as firm growth, innovation, and increases in overall welfare. Third, we develop a new typology of the conceptual microfoundations of entrepreneurial ecosystem thinking and use this to generate a research agenda designed to strengthen the conceptual and empirical basis of the literature in order to make it more relevant to policymakers and entrepreneurs as well as to researchers.

The remainder of this paper is structured as follows. The following section outlines the history of the entrepreneurial ecosystem concept, its intellectual origins and discusses the novelty and applicability of the concept. We then provide a detailed account of the systematic literature review and the analysis. An overview of the status quo of entrepreneurial ecosystem research, followed by a detailed discussion of the causal mechanisms is presented in the following two sections. Based on this description of the current stock of knowledge, we present opportunities for future research for both, sharpening the theoretical foundation and explanatory power of the ecosystem concept and how it can be applied to support policy for an entrepreneurial economy (Thurik et al., 2013). This involves multiple academic disciplines and explicit interaction with practice ("engaged scholarship," Van de Ven, 2007); in short: a transdisciplinary entrepreneurial ecosystem research program (cf. Pohl et al., 2017).

Origins of the Entrepreneurial Ecosystem Concept

While the recent interest in entrepreneurial ecosystems makes it appear novel, it builds on intellectual traditions ranging from clusters, to innovation systems and urban economics (Acs et al., 2017; Brown & Mason, 2017; Brown & Mawson, 2019; Malecki, 2018). The early roots of entrepreneurial ecosystem ideas date back a century to Marshall (1920), who studied the factors that stimulated enterprises in certain territories, so-called industrial districts. Subsequent work has built on the notion of Marshallian industrial districts (cf. Krugman, 1991; Markusen, 1996), first with the early work on national systems of innovation (Freeman, 1995; Lundvall, 1992), learning regions (Keeble et al., 1999; Malmberg & Maskell, 2002) the Triple Helix (Leydesdorff & Etzkowitz, 1996) and then with the larger literatures on regional clusters (Delgado et al., 2016; Porter, 1998, 2000) and regional innovation systems (Cooke, 2001; Cooke et al., 1997). While these approaches have divergent goals, methodologies and epistemological views of how the economy works, they are united by the central idea that there are factors outside an organization but within a region that contribute to firm-level competitive advantage (Spigel & Harrison, 2018).

The entrepreneurial ecosystem concept makes two advances over these existing approaches: it shifts the focus of enquiry and it foregrounds new types of research questions by synthesizing insights from territorial models of innovation and entrepreneurship. First, ecosystem approaches re-orient research on entrepreneurship and economic development toward *productive* entrepreneurship rather than the entirety of new venture creation and innovation. Productive entrepreneurship has been defined as "any entrepreneurial activity

that contributes directly or indirectly to net output of the economy or to the capacity to produce additional output" (Baumol, 1990, p. 30). It is often proxied with high-growth firms (e.g., Stam & Bosma, 2015), which are responsible for the bulk of new job creation in developed economies, making it a crucial target for economic development policy (Brown & Mason, 2017). Productive entrepreneurship can also include innovative start-ups and entrepreneurial employees that foster productivity in the economy (Stam, 2015). Cluster and regional innovation system theories have generally treated entrepreneurship as something that is peripheral to their main focus: major manufacturing or multinational companies. While some work on these topics has engaged with new firm formation, it rarely focused on productive entrepreneurship. Similarly, while the entrepreneurial environments literature has always focused on how entrepreneurs are affected by their broader context (Gnyawali & Fogel, 1994; Van de Ven, 1993), it has generally focused on all entrepreneurial activity, which is mostly low-growth entrepreneurship that has few broader economic impacts (Welter et al., 2017).

Research on entrepreneurial ecosystems entails a shift in the unit of analysis away from a region's total new venture population or its socio-economy to a more specific type of entrepreneurial activity—productive entrepreneurship—and the actors and factors affecting this (cf. Isenberg, 2016). More recently, there has been a further shift from productive entrepreneurship to so-called social entrepreneurship (Harms & Groen, 2017; Thompson et al., 2018), explicitly recognizing the wider effects of entrepreneurship beyond narrow economic terms (cf. Shepherd & Patzelt, 2020). Situating productive entrepreneurship at the center of research agendas allows for a closer examination of the interdependencies within networks that affect new value creation at the firm and in the economy at large. This narrower focus allows for more precise investigations into what types of internal organizational attributes and exogenous regional factors support scalable entrepreneurial endeavors. While some aspects of entrepreneurial scaling such as venture capital investment are well studied, other areas have received considerably less attention.

Second, an entrepreneurial ecosystem approach allows researchers to synthesize many different theoretical constructs (and scientific disciplines) together in order to engage with a fundamental question of social science: the relationships between individual agency and social and economic structures in economic activity (Stam, 2015). Entrepreneurial ecosystem research gives priority to the role of the entrepreneur as an organizational, innovation, and community leader. This highlights their ability to disrupt existing structures and create new paths based on their individual characteristics and circumstances. The other actors in an ecosystem—including investors, civil servants, employees—also have agency in how they choose to operate within an entrepreneurial ecosystem. This includes leverage gained from structures that extend the local ecosystem, such as supply chains, platforms or clusters (Auerswald & Dani, 2017). The implication of this idea of the entrepreneur-led ecosystem is that the causal mechanisms that drive the evolution of regional entrepreneurial ecosystems might not be the same as for other territorial models of innovation (Spigel, 2017).

Thus, entrepreneurial ecosystems represent a renewed interest in localized conditions for entrepreneurship aligned with a focus on the agency of entrepreneurial actors to create and transform their own contexts. This has helped build a vibrant research landscape that is informed by both a legacy of diverse research traditions as well as new policies being introduced in a variety of settings around the world. Some even claim that ecosystem policy is the "New Industrial Policy" (Startup Genome, 2020). However, there is a need to critically evaluate this new research and approach to policy-making in order to understand what has been learnt and what blind spots and gaps remain. In the remainder of the paper, we systematically review the extant literature on entrepreneurial ecosystems and evaluate the dominant themes and approaches.

Identification of Relevant Papers

For our systematic analysis of the entrepreneurial ecosystem literature, we applied a multistage process. In the initial stage, we searched all databases from Web of Science and Scopus for a comprehensive overview of the literature (Frank & Hatak, 2014; Martín-Martín et al., 2018; Webster & Watson, 2002). We only used journal papers and excluded book chapters and conference papers to avoid including multiple publications based on the same research. We focus exclusively on the entrepreneurial ecosystem concept, which differs from other applications of ecosystems in the management literature in terms of (1) the focus on specific types of entrepreneurship, and (2) the specific territorial boundaries that are placed on the entrepreneurial ecosystem, usually a city, a region, or a nation (Scaringella & Radziwon, 2018). Therefore, we performed a topic search (title, abstract, keywords) with the following keywords: "entrep* ecosys*" (419 results Web of Science Core Collection/434 Scopus), "startup ecosys*" (26/27), "start-up ecosys*" (18/26), "entrep* sys*" (41/60), and "sys* of entrep*" (32/46). Using a topic search enables the required breadth at this stage of the literature search. The result is an initial sample of 724 articles.[1]

In the second stage, we used the Scimago Journal Rankings and extracted the top 25% journals of the latest edition in 2017 from the following sub areas: Business and International Management; Business, Management and Accounting Miscellaneous; Management of Technology and Innovation; Strategy and Management; Economics, Econometrics and Finance Miscellaneous; Economics and Econometrics; Geography, Planning and Development; Social Sciences Miscellaneous; and Urban Studies. This step, again, aims to balance the breadth and depth of our review. Including journals from business, strategy, and management to economics, geography, and urban studies allows the inclusion of a wide variety of perspectives on entrepreneurial ecosystems and the territorial context for entrepreneurship. In doing so, this stage also excluded the publications in non-relevant disciplines such as health or robotics. While including only the top 25% journals limits the depth of the review but ensures a high level of scientific quality. The result was a list of 346 journals, with 36 being represented in our initial sample, leaving us with an intermediate sample of 183 articles.

In the third stage, we undertook an in-depth reading of all the remaining papers. Our goal was to be as inclusive as possible, identifying all empirical articles that use the entrepreneurial ecosystems concept and deal substantially with the phenomenon. We excluded one call for papers, 14 editorials, and 26 articles that did not include original, empirical research. These include review papers, methodological, and theoretical/conceptual papers. The current state of ecosystem research is fragmented and heterogenous with regard to theoretical approaches. We focus on empirical research to understand what we know about how ecosystems work compared to insights based purely on logic in theoretical work. We review the empirical literature based on a commonly accepted framework that has also formed the basis for other reviews (e.g., Maroufkhani et al., 2018; Nicotra et al., 2018), which does allow us to draw conclusions regarding the mechanisms. Further 21 articles were excluded because they used the ecosystem concept at the organizational level (e.g., universities or support organizations) and six articles because they do not report any spatial context. These articles are not conforming with our inclusion criteria regarding the systemic nature of ecosystems within a spatial context. We excluded 18 articles because they only used the entrepreneurial ecosystem concept as a label (mostly for regional characteristics or context) and 29 papers that dealt with the concept in a trivial or marginal way, without any meaningful engagement. Lastly, six articles are excluded because they neither use the entrepreneurial ecosystem concept itself nor do they engage with the principles of an ecosystem. This left us with a final sample of 62 articles, which are summarized in Appendix A.

Several review papers on entrepreneurial ecosystems have already been published, many of them organized around analyzing the empirical studies of ecosystems (e.g., Cao & Shi, 2020; Garavan et al., 2019; Hakala et al., 2020; Maroufkhani et al., 2018; Nicotra et al., 2018). Building on the insights from these reviews, we take a concept-centered approach to our review (Fisch & Block, 2018) and focus on two issues. First, we will discuss general trends in ecosystem research in the next section, particularly looking at 'how' the concept has been used in empirical research regardless of terminologies such as ecosystems or national systems of entrepreneurship. In the subsequent section, we synthesize and discuss the empirical findings and the resulting causal mechanisms that drive entrepreneurial ecosystems. This allows us to draw a comprehensive picture of the current stock of knowledge with regard to how entrepreneurial ecosystems work and provide the foundation for a new, transdisciplinary research program that will advance entrepreneurship research beyond the entrepreneurial ecosystem concept.

Entrepreneurial Ecosystem Research From 2000 to 2020

This section provides an overview of the entrepreneurial ecosystems literature over the last two decades, with an emphasis on (1) the use of ecosystems as an ontological and epistemological concept, (2) how the ecosystem concept is used in the context of different types of entrepreneurship, and (3) the metaphorical use of the ecosystem concept versus taking interdependence between ecosystem elements, a core characteristic of any system, seriously. Understanding the way in which entrepreneurial ecosystems are studied and are used to study entrepreneurship is a necessary requirement when synthesizing the findings and distilling the causal mechanisms that drive the development of entrepreneurial ecosystems.

Ontology and Epistemology

Entrepreneurial ecosystems are conceptualized in two ways in academic research, policy and practice: ontologically, emphasizing its "being" and epistemologically, focusing on "how it can be known." Entrepreneurial ecosystems are often regarded as something that can be built—an organizational form which emerges—prioritizing ontology. This strongly resonates with the entrepreneurship and sociological approaches, emphasizing how leaders co-create entrepreneurial communities (Van De Ven, 1993), and with design science approaches that conceptualize entrepreneurial ecosystems as an artefact (O'Shea et al., 2019). Roundy et al. (2017, p. 103) provide an example of this ontological mode of research: "[e]very region has some level of entrepreneurial activity and a growing number have entrepreneurial ecosystems." The ontological view holds that entrepreneurial ecosystems arise in particular regions at a certain critical point of entrepreneurial development, allowing us to speak of entrepreneurial ecosystems "being" there. Conversely, the epistemological view holds that (local, regional, national) economies are always there, but their quality as economic systems enabling (or constraining) productive entrepreneurship can be known with adequate knowledge (including both 'objective' data and subjective 'local knowledge').

The ontological view talks about entrepreneurial ecosystems emerging (Roundy et al., 2018) and particular entrepreneurial communities (e.g., concerned with particular technologies, sectors, or societal challenges) arising in countries, regions or cities. The ontological view is concerned with the processes connected with the *emergence of* entrepreneurial ecosystems. Papers in our review in this realm are typically characterized by studying ecosystems through the lens of established theories, including institutional (e.g., Stephens et al., 2019) and evolutionary theories (e.g., Colombelli et al., 2019) to name the most frequent. In this they attempt to identify the

social and economic factors associated with the emergence of entrepreneurial ecosystems and the stages ecosystems pass through as they grow, decline and ultimately disappear.

The epistemological view is focused on *emergence within* economic systems: to what extent actors and localized factors create new value as an emergent property of the system (cf. Arthur, 2013). This emergence may include new products, new organizations (Katz & Gartner, 1988) as well new industries (Garnsey et al., 2010; Yamamura & Lassalle, 2020). Studies using the ecosystem concept as a lens, typically build on economic theories (complexity economics, evolutionary economics) and network theories to analyze the factors and actors in local, regional, and national economies.

"One for All" or "All in One"

As argued above, one of the defining features of entrepreneurial ecosystems research has been a focus on productive entrepreneurship. This form of entrepreneurship is associated with new job creation and increases in the overall wealth of an economy. However, productive entrepreneurship itself remains an elusive category. It is often measured as high-growth entrepreneurship: young, owner-managed firms that have been able to grow beyond a certain performance threshold (Bos & Stam, 2014). But this is not the only empirical measure of productive entrepreneurship (cf. Davidsson, 2004; Stam, 2015), and there is a considerable amount of entrepreneurial ecosystem studies that focus on types of entrepreneurship that do not necessarily belong to the category of productive entrepreneurs, narrowly defined as contributing to aggregate economic value that can be measured in monetary terms. For example, examined ecosystems of social entrepreneurs (Thompson et al., 2018) or creative entrepreneurs (Loots et al., 2020). This calls for an opening up of the concept of productive entrepreneurship, to also include social and ecological value creation that cannot always and directly be measured in monetary terms, but which is regarded to be *valuable* for society at large. We can also imagine other ecosystems that support non-productive or even destructive entrepreneurship, such as ecosystems of lobbyists in Washington D.C. or Brussels (Sobel, 2008) or the mafia (Gambetta, 1993).

This creates a new question: do entrepreneurial ecosystems enable all forms of entrepreneurship or are productive forms of entrepreneurship affected by ecosystem context in different ways than other forms of entrepreneurship? Furthermore, are different configurations of ecosystems needed to stimulate nascent entrepreneurship, startups, and scale-ups, respectively? Some authors argue for a set of generic elements that positively affect productive entrepreneurship in general; for example, physical and institutional infrastructures. Others argue that particular types of entrepreneurship are affected differently by entrepreneurial ecosystems than contrasting types. Examples of contrasting types of entrepreneurship are female and male entrepreneurship (e.g., Hechavarría & Ingram, 2019; Sperber & Linder, 2019), and high-growth firms in retail and biotech (Auerswald & Dani, 2017).

Metaphorical Interdependence vs. *Real* Interdependence

Our review of the articles using the entrepreneurial ecosystem concept shows that a substantial part of the literature only uses the concept in a metaphorical way. These articles use the concept in name only without acknowledging its key characteristics of interdependence. The ecosystem metaphor is used to introduce the study of geographical contexts of entrepreneurship, but many of these studies focus on isolated elements as variables "explaining" the prevalence of a particular type of entrepreneurship (e.g., Civera et al., 2019). There is also a subset of studies that focus on a singular innovation project within in a spatial setting, not looking at the aggregate prevalence of entrepreneurship, nor at the interdependencies in the ecosystem at large (e.g., DiVito &

Ingen-Housz, 2019). This metaphorical use contributes little to the accumulation of scientific knowledge on entrepreneurial ecosystems. The issue of interdependence between ecosystem elements will be further explored in the next section, among other mechanisms.

Causal Mechanisms

For the identification of the causal mechanisms in entrepreneurial ecosystems we use the framework by Stam (2015) and Stam and Van de Ven (2019) to guide our analysis with the aim of linking the empirical reality to the entrepreneurial ecosystem approach in order to better understand entrepreneurial economies (Thurik et al., 2013). This entrepreneurial ecosystem framework is implicitly based on (critical) realism, postulating that there is a reality independent of the human mind, but that scientific research is able to perceive events that reflect changes in reality, which are produced by underlying causes (Sayer, 1992; Van de Ven, 2007). In particular we consider the intra-layer causation among the ecosystem elements (interdependence of elements); the upward causation—how the elements lead to outputs and outcomes; and downward causation and feedback from outputs and outcomes that shape entrepreneurial ecosystems and their elements. Lastly, we include the interaction between different ecosystems and the flow of resources and information between them (Figure 1).

Upward causation reveals how the fundamental causes of new value creation are mediated by intermediate causes, while downward causation shows how outcomes and outputs of the system over time also feed back into the system conditions. Intra-layer causal relations refer to the interaction of the different elements within the ecosystem. The links between ecosystems have been largely neglected in the literature (Schäfer & Henn, 2018; Stam, 2014), which is partially due to the ambiguity around the spatial boundary of ecosystems. The model is distinctive of existing measurements of entrepreneurial (eco)systems that do not separate inputs and entrepreneurial outputs of the system.

This approach corresponds to a complex systems perspective of the economy, in which economic agents at the micro level experiment and interact with each other to form a constantly evolving system. Many of these experiments fail, but some succeed and create wealth for society (Beinhocker, 2006). Economic development does not emerge automatically: entrepreneurs are needed to create new value which then circulates throughout the economy (Fayolle, 2007; Schumpeter, 1934). This new value creation is an emerging property of a complex system of economic agents and their interactions: the entrepreneurial ecosystem. Entrepreneurs might structurally change the economy and society, as exemplified with new sets of technologies, institutions, and organizational arrangements (Arthur, 2013; Feldman, 2014). The (regional) economy cannot be separated from the agents and institutions that it is made of but is a result of a "constantly developing set of technological innovations, institutions, and arrangements that draw forth further innovations, institutions and arrangements" (Arthur, 2013, p. 1). Therefore, entrepreneurship is simultaneously the result and mediator of evolution (Day, 1987): entrepreneurial behavior as an output is enabled by the system, while the new value created, and potential structural change as an outcome of the system is mediated by entrepreneurship.

This outcome is an emergent property of the system and redefines the nature of the system through feedback effects. Such feedback effects mean that the system and its outputs should not be interpreted as a one-way relation, as the current state of the system might be affected by previous outcomes. This comes close to the statistics problem of simultaneity, which "arises when one or more of the explanatory variables is jointly determined with the dependent variable [...]" (Wooldridge, 2013, p. 530). However, in dynamic systems analysis this is not a problem to be evaded, but an inherent characteristic of system dynamics. An overview of the contributions of the reviewed papers is presented in Table 1.[2]

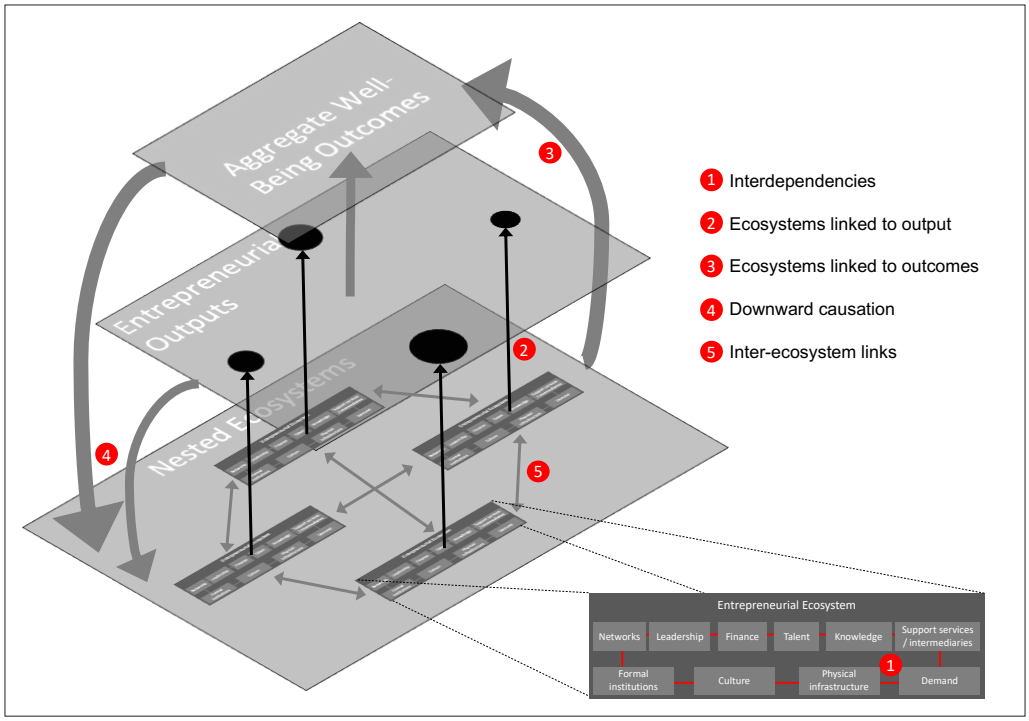

Figure 1. Causal mechanisms in the entrepreneurial ecosystem research program (after Stam, 2015).

Interdependence of Elements

In its most basic form, market-based economic systems are composed of interdependent actors, representing supply and demand. However, to understand economic development we need to look beyond these traded interdependencies and also examine the untraded interdependencies between actors that explain the differential performance of economic systems (Dosi, 1988; Lawson, 1999; Storper, 1995). Untraded interdependencies include the complementarities between actors and resources, and information flows which do not entirely correspond to the flows of commodities (Richardson, 1972; Teece, 1986, 1998; Tripsas, 1997). They represent a structured set of externalities, which is a collective asset of groups of actors within an economy, and tend to be internalized within individual companies both independently and interdependently of its network position (Whittington et al., 2009). Because of this inherent connectivity, non-linearity and openness, a complex system affords limited functional decomposability (Martin & Sunley, 2007), which suggests that the overall functioning of the entrepreneurial ecosystem cannot be deduced from knowledge of its elements but instead requires knowledge of how these elements are interrelated.

The empirical ecosystem literature is dominated by a focus on interdependence and the link between ecosystems and outputs. Spigel (2017), for example, demonstrates the feedback mechanisms caused by supporting relationships between cultural, social, and material attributes and the reinforcing relationships that occur in turn. This interdependence of ecosystem elements is all too often not reflected in innovation and entrepreneurship policy. An example is the investment in physical infrastructure without supporting the underlying cultural and social support, which turned planned innovation hotspots into empty real estate (Pugh et al., 2018). The relative

Table 1. Overview of Causal Mechanisms.

Causal mechanism	Main arguments	Focus*	Main findings	Selected empirical studies
Interdependence of ecosystem elements	Individual actors can increase connectivity and provide required resources by acting beyond their expected realm (particularly in early stages)	Accelerators	Four types of accelerator expertise—connection, development, coordination, and selection—combined lead to higher commitment among stakeholders to the ecosystem, validation through faster experimentation and ecosystem additionality	[23] Goswami et al. (2018)
			Through an open innovation approach, accelerators can support the connectedness within and beyond the ecosystem and increase the resources available within the ecosystem	[45] Pustovrh et al. (2020)
		Multiple elements	Elements are related in a unique way for every ecosystem	[30] Neck et al. (2004)
			Dealmakers are essential for fostering connectivity and knowledge spillovers in EEs	[42] Pittz et al. (2019)
		Government	Government sponsorship is an effective driver of ecosystem development beyond increasing individual recipient firms' performance	[37] Motoyama and Knowlton (2016)
		Universities	Universities as hub institutions can support the development of ecosystems through the sequential development of boundary spanning, network building, and orchestrator functions, but rely on the development of complementary support structures	[48] Schaeffer and Matt (2016)
			Learning and universities pro-actively supporting this beyond their traditional remit contribute to EE development	[43] Pugh et al. (2019)
			Universities adapt to the state of the ecosystem and contribute in multiple ways (often beyond their traditional remit of teaching and research)	[61] Wagner et al. (2019)
			Universities with a strong international focus can act as intermediaries of internationalization for the ecosystem	[13] Civera et al. (2019)
		Anchor organizations	Anchor organizations initiate and support the initial growth of ecosystems	[14] Colombelli et al. (2019)
	Feedback and (non-linear) co-evolutionary dynamics between ecosystem elements (and the wider socio-economic context)	Multiple elements	Entrepreneurial culture as well as tailored stakeholder support and collaboration lead reinforce the perception of the ecosystem	[10] Bischoff (2019)
			Ecosystems are highly integrated into the broader socio-cultural-ideological context, dynamic and constantly evolving	[21] Fraiberg (2017)
			Individual ecosystems are unique due to their co-evolving elements	[27] Mack and Mayer (2016)
			Ecosystem configurations can vary significantly and new policies/investments should develop support among underlying social and cultural attributes	[53] Spigel (2017)
			Different forms of proximity allow for development of EE even in smaller, peripheral places and the emergence of industries	[62] Yamamura and Lassalle (2020)

(Continued)

Table 1. Continued

Causal mechanism	Main arguments	Focus*	Main findings	Selected empirical studies
			Governance changes from hierarchical to relational as the ecosystem evolves; similarly, the role of different actors and support organizations evolves as the ecosystem evolves	[14] Colombelli et al. (2019)
		Government and finance	Non-linear evolution of the EE, with often contradictory developments within the various pillars	[47] Radinger-Peer et al. (2018)
	Bottom-up evolution of ecosystems through individual interactions	Institutions	Institutions are perceived differently by ecosystem actors and are constantly co-created through the interaction of these actors	[33] Lowe and Feldman (2017)
		Institutions and incubators	Incubators do not fundamentally address unfavorable institutions and only provide "symptomatic" solutions, therefore new "systemic" incubators are needed	[59] van Weele et al. (2018)
		Multiple elements	Instead of isolated investments/actions, ecosystems are adaptive and evolve through interactions of individuals with different motivations (including non-market forces)	[19] Feldman and Lowe (2018)
			Ecosystems form through endogenous, bottom-up, and time-patterned processes (rather than exogenous sources such as government action or instrumental policy goals)	[58] Thompson et al. (2018)
			Interaction of individual entrepreneurial talent/aptitudes and the ecosystem (place-based interactions)	[44] Pushkarskaya et al. (2020)
			Ecosystem evolution depends on both munificence (in the built environment) and the dynamism and behavioral responses of agents in the ecosystem	[28] Johnson et al. (2019)
		Networks	Gender issues can constrain the bottom-up evolution of ecosystems and women-only networks are not sufficient improve connectedness and engagement in entrepreneurial activities of women	[36] McAdam et al. (2019)
Ecosystems are linked to outputs	Different ecosystem configurations lead to different outputs, even different clusters within one ecosystem can produce different outputs	Multiple elements	Ecosystems are host a variety of subclusters based on organizational- and individual-level factors	[39] Neumeyer and Santos (2018)
			Start-up strategies chosen are a reflection of the perceived support from the ecosystem, the entrepreneurs' current life situation, and the intended goals	[52] Sperber and Linder (2019)
		Networks	There are social clusters within EEs that focus on particular types of entrepreneurship	[40] Neumeyer et al. (2019)
		Institutions	Four distinct institutional settings enable different types of entrepreneurship (e.g., high/medium/low-tech ventures)	[17] Dilli et al. (2018)
		Universities	Regional scientific knowledge and talent has a limited effect on the internationalization of academic spin-offs, regional demand growth has a negative effect	[13] Civera et al. (2019)

(Continued)

Table 1. Continued

Causal mechanism	Main arguments	Focus*	Main findings	Selected empirical studies
	Women and men benefit in different ways from ecosystems and their elements	Multiple elements	Globally, women benefit more from many of the ecosystem factors than men, but in some cases depending on the phase of economic development men might benefit more	[26] Hechavarría and Ingram (2019)
			Women tend to mobilize more resources than men in order to overcome support constraints, men are more confident of their capabilities	[52] Sperber and Linder (2019)
		Multiple elements	Ecosystem provide the basis for high-tech entrepreneurship	[38] Neck et al. (2004)
			The most relevant EE factors enabling the birth and activity of high-growth startups can be identified in cultural and social norms, government programs, and internal market dynamics	[16] Corrente et al. (2019)
		Government	Context makes innovative entrepreneurship difficult despite substantial government support	[9] Biru et al. (2020).
		(Informal) Institutions	Policy makers can use formal institutions to foster high-growth and social entrepreneurship, even in nations whose cultural conditions do not seem to be supportive of entrepreneurship	[24] Harms and Groen (2017)
			Institutions (economic freedom) at the regional level enable Schumpeterian entrepreneurship	[7] Bennett (2021)
		Universities and finance	Local presence of research-oriented universities, access to capital, and business concentration are correlated to the emergence of knowledge-intensive entrepreneurship	[20] Fischer et al. (2018)
			High information asymmetries impede high-tech entrepreneurial ideas based on university knowledge to attract external finance. In provinces where residents tend to behave opportunistically, the relative presence of cooperative banks magnifies the positive effect of university knowledge on high-tech entrepreneurship. Conversely, this effect is negligible in provinces with less opportunistic residents	[22] Autio et al. (2018)
	Ecosystems foster entrepreneurial activity in general (start-ups)	Multiple elements	Ecosystems (including internet access and connectivity) are linked to start-up rates in cities	[3] Audretsch and Belitski (2017)
			The framework conditions of entrepreneurial ecosystems have different influences on the reentry decisions of males and females who experience business failure	[51] Simmons et al. (2019)
			Overall quality of an ecosystem is positively related to entrepreneurial output	[54] Stam and Van de Ven (2019)
			Ventures in high-performance ecosystems perform better, higher survival chances (less important for serial entrepreneurs)	[60] Vedula and Kim (2019)
		Universities	Despite their prominence, university spin-offs are mostly not high-growth businesses and do not drive an ecosystem but depend on it in their development	[25] Harrison and Leitch (2010)

(Continued)

Table 1. Continued

Causal mechanism	Main arguments	Focus*	Main findings	Selected empirical studies
			Human connectedness to the physical environment, including urban design, buildings, and infrastructure, can affect entrepreneurial activity	[28] Johnson et al. (2019)
		Government	Ecosystems require stakeholder alignment and a holistic approach to create a fertile environment for entrepreneurial activity	[29] Jung et al. (2017)
		(Informal) Institutions	Ecosystem development is important for growing "entrepreneurial spirit" and support programs can lower the fear of failure	[41] Öner and Kunday (2016)
			Subculture rather than mainstream culture plays a key role in EEs for fostering new venture creation in the ICT sector	[4] Audretsch et al. (2019)
			Different regional institutions (the multiple dimensions of economic freedom) affect regional entrepreneurship rates in different ways	[8] Bennett (2020)
		Human capital	Entrepreneurial absorptive capacity drives knowledge-based entrepreneurial activity; high technology and cultural diversity contribute to the vibrancy of ecosystems	[46] Qian et al. (2013)
		Smart cities	Smart city policies promote entrepreneurship through fostering the ecosystem	[6] Barba-Sánchez et al. (2019)
	Ecosystems foster social entrepreneuship	(Informal) Institutions	Policy makers can use formal institutions to foster high-growth and social entrepreneurship, even in nations whose cultural conditions do not seem to be supportive of entrepreneurship	[24] Harms and Groen (2017)
	Ecosystems foster the creation of knowledge intensive business services	Multiple elements	Quality of the ecosystem positively influences KIBS formation rates and positively moderates the relationship between manufacturing specialization and the rate of new KIBS; a healthy entrepreneurial ecosystem seems essential for an effective territorial servitization	[27] Horváth and Rabetino (2019)
	Ecosystems or at least many of their elements do not impact entrepreneurial activity	Multiple elements	Several national level ecosystem aspects have no significant impact on rates of male or female entrepreneurial engagement	[26] Hechavarría and Ingram (2019)
		Universities and human capital	Regional presence of STEM talent has a negative effect on the internationalization of academic spin-offs	[13] Civera et al. (2019)
Ecosystems are linked to outcomes	Ecosystems foster economic growth and more efficient resource allocation due to knowledge spillovers	Multiple elements	Ecosystems at the country level are linked to economic growth	[2] Acs et al. (2018)
			EEs contribute to national productivity by promoting Kirznerian and Schumpeterian entrepreneurship	[30] Lafuente et al. (2019)
			Mature ecosystems enable knowledge spillovers, which increase efficient resource allocation	[31] Lafuente et al. (2016)
	Regional development through more mature ecosystems	Multiple elements	Positive impact of interaction between company–university–government on entrepreneurial development (greater for more developed regions/ecosystems)	[18] Erina et al. (2017)

(Continued)

Table 1. Continued

Causal mechanism	Main arguments	Focus*	Main findings	Selected empirical studies
	Ecosystems as a moderator for the relationship between entrepreneurship and economic development	Multiple elements	Positive moderating effect of the ecosystem on the relation between entrepreneurship (both Kirznerian and Schumpeterian) on regional economic growth	[57] Szerb et al. (2019)
			Ecosystems moderate the impact of regional entrepreneurial outputs on economic development (outcomes)	[15] Content et al. (2020)
			No moderating effect of entrepreneurial ecosystems on the relation between entrepreneurship and economic growth	[12] Bruns et al. (2017)
Downward causation and path-dependency	Path dependence and Matthew effects in regions	Multiple elements	Local/regional ecosystem characteristics are crucial for effectiveness of systemic innovation policy	[11] Brown et al. (2016)
			Individual ecosystems are unique due to their historical, cultural, and institutional heritage	[34] Mack and Mayer (2016)
			Strong path dependence in the evolution of EEs as entrepreneurial output feeds back into the regional EE	[54] Stam and Van de Ven (2019)
			EE shaped by economic development of the country and high-growth firms have greater impact on entrepreneurial ecosystem than new ventures in general	[35] Martínez-Fierro et al. (2020)
	State of the ecosystem affects individual entrepreneurs' behaviors and the influence of top-down policy interventions	Finance	Angel investments have a positive impact on firm growth, performance, survival, and follow-on fundraising, which is independent of the level of venture activity and entrepreneur-friendliness in the country; but in less mature ecosystems only more mature start-ups apply for angel investment	[32] Lerner et al. (2018)
			Nature and prevalence of finance changed due to changes in formal institutions and the resulting regulatory changes; path development of the ecosystem is strongly shaped by endogenous initiatives of foremost public authorities	[36] Radinger-Peer et al. (2018)
		Government	Ecosystems represent higher-level system in which, e.g., clusters are embedded; policy making needs to account for current state of the ecosystem and interventions have different effects on involved clusters/industries	[5] Auerswald and Dani (2017)
		Informal institutions and human capital	Entrepreneurial readiness is a more valid representation of individual-level characteristics than other individual traits and is also influenced by several dimensions of the national environment, forming a reinforcing loop	[50] Schillo et al., 2016
		Multiple elements	State of the ecosystem impacts whether entrepreneurs come/stay to start a new tech venture	[56] Stephens et al. (2019)

(Continued)

Table 1. Continued

Causal mechanism	Main arguments	Focus*	Main findings	Selected empirical studies
Links between ecosystems	Actors/ideas/practices/norms travel and migrate between ecosystems (and across spatial or cultural boundaries or language barriers)	Human capital	Ecosystems are part of a wider transnational social field that shapes and is shaped by the circulation of actors, ideologies, texts, and objects	[21] Fraiberg (2017)
			emigration, "sunshine return migration," and outmigration influence the emergence and evolution of ecosystems	[49] Schäfer and Henn (2018)
	Entrepreneurs' networks are trans-regional and -national	Networks	EEs are not static, bounded, or only mapped directly onto a global city or nation-state but are dynamic, changing, and densely knotted with other systems in and across near and distant spaces	[21] Fraiberg (2017)
	Bi-directional learning for migrant entrepreneurs and ecosystems	Multiple elements	Entrepreneurs coming to China must be prepared, flexible, associate themselves with reputable partners and take advice from those familiar with business in China to overcome cultural-cognitive barriers; regulative barriers can only be removed by the government	[55] Steinz et al. (2016)

Note. *All studies in this list include a variety of ecosystem elements, but some emphasize the role of particular element(s) as indicated in this column.

importance of ecosystem elements varies depending on the overall state of the ecosystem (Mack & Mayer, 2016). These interdependencies have been discussed in other streams of the literature and at the city-level (Fritsch & Wyrwich, 2014; Levie & Autio, 2011) and are a crucial assumption in many other ecosystem studies that focus on other causal mechanism (e.g., Audretsch & Belitski, 2017, who link ecosystems to outputs).

These co-evolutionary dynamics are the result of the interactions of individuals within ecosystems (Johnson et al., 2019; Thompson et al., 2018). The heterogeneity of ecosystem actors poses both a potentially fruitful but also challenging situation. Actors within an ecosystem might have varying motivations, even to the point of conflicting agendas (Feldman & Lowe, 2018) and might perceive institutions and, by extension, interventions, differently (Lowe & Feldman, 2017). Interventions must address the interdependence of the elements and actors beyond symptomatic solutions that target them individually (McAdam et al., 2019; van Weele et al., 2018).

The presence of these actors and factors is not sufficient for ecosystem development. They also need to be connected. Individual actors can increase connectivity and provide required resources by acting beyond their expected realm (Neck et al., 2004), including accelerators (Goswami et al., 2018; Pustovrh et al., 2020), government initiatives and policy interventions (Motoyama & Knowlton, 2016; Radinger-Peer et al., 2018), and universities (Civera et al., 2019; Schaeffer & Matt, 2016). Particularly in the early stages of ecosystem development, anchor organizations (universities, firms: see Agrawal & Cockburn, 2003; Feldman, 2003) are a crucial actor (Colombelli et al., 2019). This is in line with other empirical findings such as the 'coach' function (as opposed to pure 'scouting') of venture capital firms and how they compensate for a lack of human capital in high potential technology-based firms (Colombo & Grilli, 2010).

Outputs

In an entrepreneurial economy, overall performance does not depend on economies of scale but is more widely distributed among a variety of innovative firms and start-ups (Audretsch & Thurik, 2001; Thurik et al., 2013). Ecosystems, as entrepreneurial economies, provide the context and support for start-ups to emerge and for innovative firms and ventures to grow. Depending on their level of maturity and the particular configuration of the elements, they are said to produce not only different levels of output but also different types of output (Brown & Mason, 2017). Entrepreneurship research has in recent years overly concentrated on "gazelles" or "unicorns" and those companies with venture capital investments, despite these being extremely rare outcomes (Aldrich & Ruef, 2018; Welter et al., 2017). Ecosystems research is no stranger to this trend.

Empirical evidence is slowly emerging regarding how different ecosystem configurations lead to different entrepreneurship outputs, and even how different clusters within one ecosystem can produce different entrepreneurship outputs (Civera et al., 2019; Dilli et al., 2018; Neumeyer & Santos, 2018; Neumeyer et al., 2019). More recently, gender issues and how women and men benefit in different ways from ecosystems and their elements (Hechavarría & Ingram, 2019; Simmons et al., 2019; Sperber & Linder, 2019) and social entrepreneurship (Harms & Groen, 2017) have demonstrated how ecosystem enable particular types of entrepreneurial behavior.

The link between ecosystems and entrepreneurial activity in general, usually proxied by start-up rates, has been examined from different angles. These include how ecosystems support the university spin-offs (Harrison & Leitch, 2010; Johnson et al., 2019) as well as the interplay of government initiatives (Jung et al., 2017), institutions (Öner & Kunday, 2016), and human capital (Qian et al., 2013) with other ecosystem elements enables the formation of new ventures. Audretsch and Belitski (2017) showed that the ecosystem at the city-level with the addition of internet access and the integration of immigrants into the ecosystem fosters entrepreneurial

activity. The link between ecosystems and high-growth firms has been studied at both the regional (Fischer et al., 2018; Ghio et al., 2019; Neck et al., 2004) and country level (Acs et al., 2014; Harms & Groen, 2017).

There is also an emerging body that questions whether ecosystems or at least many of their elements impact entrepreneurial activity. These studies do, however, not account for the systemness of the ecosystem by looking at elements individually (Hechavarría & Ingram, 2019) or study a very specific type of output (Civera et al., 2019).

Outcomes

The links between ecosystems and outputs/outcomes cannot be separated, as productive entrepreneurship (in whatever form) as the output fosters aggregate value creation and economic development (in a wider sense) as the outcome (Stam, 2015). We define entrepreneurship-driven economic development as structural changes to the economy and its 'social and institutional fabric' (Acemoglu, 2012) that goes beyond GDP and productivity growth or higher employment rates and also includes other dimensions of well-being, and inequality. Therefore, this mechanism cannot be separated from the previous one, as entrepreneurship is the means for creating economic development. Rather, these two should be seen as complimentary.

The three country-level studies that are included in this review have shown a link between entrepreneurial ecosystems and economic growth (Acs et al., 2018; Lafuente et al., 2016; Lafuente et al., 2019). The studies emphasized a more efficient resource allocation of mature ecosystems due to knowledge spillovers (in line with the ecosystem conceptualisation of Acs et al., 2014; Autio & Levie, 2017). The knowledge spillover theory of entrepreneurship (Acs et al., 2009) supports the application of Stam's (2015) framework with entrepreneurship as the output of the ecosystem and as a means for economic development. The regional-level studies find some evidence for moderating effects of the entrepreneurial ecosystem on the relation between entrepreneurship outputs and economic growth.

Different ecosystem configurations can lead to different outcomes (Brown & Mason, 2017). For example, increasing self-employment can improve the resilience of an economy and its flexibility. Innovation-driven and productive entrepreneurship are important for job creation, increasing competitiveness and, eventually, economic development (Wennekers et al., 2005). This has direct implications for policymaking both at the regional and national level and is further supported by studies in economics that empirically show long term equilibria between productivity and human capital, R&D, and public infrastructure (which represent a combination of different ecosystem elements; Bronzini & Piselli, 2009).

For policy makers, this provides substantial choice regarding resource allocation and incentive structures (Wennekers et al., 2005). These can range from broader investments in education and human capital to more specialized investments and policies for supporting scale-ups and the commercialisation of research and scientific advancements. Policy makers should always consider prioritizing the bottlenecks in their ecosystem (Acs et al., 2014; Autio & Levie, 2017) and, particularly at the national level, try to create favorable conditions in which regions with different strengths and weaknesses can flourish.

Path Dependency and Downward Causation

Entrepreneurial ecosystems, like economies as a whole, are subject to path dependencies. The concept of path dependency goes back to the work by David (1988) and Arthur (1989) and "can be used to offer an understanding of why some optional developments are followed, or intentionally chosen, over others […] path dependence conditions, but does not determine, a specific

outcome" (Henning et al., 2013, p. 1350). It is this "recursive continuous process" of interaction between ecosystems (context), processes, and outputs/outcomes that shape the ecosystem and the conditions for entrepreneurs (Aldrich & Martinez, 2001).

Conceptually, path-dependencies and downward causation are an integral part of ecosystems (e.g., Stam, 2015). The studies in our review have demonstrated that path dependency is an essential part of ecosystem evolution (Brown et al., 2016; Mack & Mayer, 2016) and that the state of the ecosystem and previous outputs/outcomes shape individual entrepreneurial behavior and ecosystem development (Auerswald & Dani, 2017; Lerner et al., 2018; Radinger-Peer et al., 2018; Schillo et al., 2016; Stephens et al., 2019). The combination of upward and downward causality is evidence for how entrepreneurship (as a phenomenon) and entrepreneurial behavior (at the individual level) are subject to systemic influences but also shape this systemic context (Autio, 1997).

Downward causation can take many forms as an enabler of path dependencies. Probably the most common form is 'entrepreneurial recycling', in which successful entrepreneurs "use their newly acquired wealth, allied to the experience they have accumulated, to engage in other entrepreneurial activities, notably starting new business ventures and investing in other businesses as business angels or venture capitalists" (Mason & Harrison, 2006, p. 55). In this way, entrepreneurs and employees of new ventures who successful exit can reinforce the norms they created by returning to the ecosystem as investors, mentors, or serial entrepreneurs (Spigel & Vinodrai, 2020; Stam et al., 2008).

Path dependency manifests itself in regional institutions, which can be characterized as 'the carriers of history' (David, 1994), and a spiky resource landscape. The most prominent example of this is 'pay it forward'-culture of Silicon Valley that has developed over decades and is a distinct feature of the ecosystem. The path-dependency in ecosystems is also affected by the industries that are present in a particular territory (Neffke et al., 2011). From a policy perspective, the smart specialization approach aims to capitalize on path dependencies by building on the existing strengths in a region (cf. Balland et al., 2018). Entrepreneurial ecosystems, however, are seen to be unique by enabling cross-fertilization between industries and the sharing of business model innovation and structural knowledge, particularly in the digital context (Autio et al., 2018). This provides a means of path-breaking behavior, which has not yet been explored empirically.

While conceptually appealing, there is a general lack of empirical evidence for whether ecosystems as a whole or in part are subject to path-dependencies or *past*-dependency, in which the past influences the current options for ecosystems without completely ruling our alternative trajectories, thereby offering elasticity. Path-dependency is based on non-reversible, non-ergodic processes. However, there is no distinction yet which dynamic processes in ecosystems have these properties and which are only determined by their current state. Both are *place*-dependent mechanisms that need to be studied in their geographical context (Martin & Sunley, 2006). Especially 'organizationally thin' ecosystems often need outside investments for path renewal (cf. Isaksen, 2015; Tödtling & Trippl, 2005).

Inter-Ecosystem Links

The entrepreneurial ecosystem literature is dominated by a focus on the endogenous dynamics within specific ecosystems rather than multiscalar studies (Alvedalen & Boschma, 2017). There is also a lack of empirically demonstrated spillover effects between neighboring ecosystems' R&D activities and infrastructure and their economic performance into the ecosystem framework (Bronzini & Piselli, 2009). Furthermore, there is conceptual and empirical ambiguity around where the boundaries of entrepreneurial ecosystems are. This opens up research on

transnational entrepreneurs (Schäfer & Henn, 2018) and transnational entrepreneurial ecosystems (Velt et al., 2020). 'Transnational entrepreneurs' (Portes et al., 2002; Schäfer & Henn, 2018) and 'returnee entrepreneurs' (Kenney et al., 2013) form one of the largest groups in some of the most vibrant ecosystems. Such entrepreneurs are often key actors in their ecosystem and by keeping ties with their country of origin and, therefore, other ecosystems. In this way, they take on the role of 'modern middlemen' who "transcend the multiple institutional environments in which they are embedded" (Terjesen & Elam, 2009, p. 1093). From a knowledge spillover perspective, they "are capable of overcoming the sensitivity to distance usually associated with knowledge spillovers" (Sternberg, 2007, p. 658).

In Silicon Valley, for example, it was highly educated and skilled Asian immigrants who actively supported the growth of the ecosystem by becoming entrepreneurs and helping facilitate interactions with their home countries (Saxenian, 2002). However, such populations are not necessarily critical in the early stages of entrepreneurial ecosystems, that is, nascent ecosystems (Spigel & Harrison, 2018) or the birth phase (Mack & Mayer, 2016). This phase is usually driven by local entrepreneurs and regional policy makers through a combination of bottom-up and top-down processes. Migrant, and particularly returnee entrepreneurs, were crucial for the growth and further development of these ecosystems (Kenney et al., 2013).

Predominantly in tech and ICT sectors, many scale-ups either provide a platform themselves or are based on other platform or innovation ecosystems (Nambisan & Baron, 2013). Global linkages are important, both to prevent lock-ins from path-dependency and to maintain a high level of innovativeness (Malecki, 2018; Mason & Brown, 2014; Sternberg, 2007). With implications for regional and national (e.g., immigration) policy as well as entrepreneurial practice and ecosystem governance, the main question is how these mutually beneficial links and transnational entrepreneurs can be attracted, supported, and integrated into the ecosystem (cf. Saxenian, 2002).

The papers included in this review highlight how entrepreneurs, other ecosystem actors, and, by extension, ideas, practices, and norms move between ecosystems and across spatial, cultural, and language barriers (Fraiberg, 2017; Schäfer & Henn, 2018). The result is a bi-directional learning process for both migrant entrepreneurs and ecosystems (Steinz et al., 2016). In line with the literature on innovation networks and previous work on entrepreneurial networks, research on regional ecosystems has also emphasized that entrepreneurs' networks are trans-regional and even trans-national (Fraiberg, 2017).

Consequently, ecosystems must be situated not just in the wider economic, but also the socio-cultural-historical context. Particularly the historical context of places and the role of entrepreneurship and how it is embedded in these wider sociological and demographic processes within the ecosystem and neighboring ones has not yet been explored adequately (Stam & Welter, 2021).

An Entrepreneurial Ecosystem Research Program

Research on entrepreneurial ecosystems is evolving and this paper has sought to paint a clearer picture of what these complex socio-economic systems are and how they work. Our review has also highlighted the theoretical, conceptual, methodological, and empirical gaps. Therefore, we propose a transdisciplinary entrepreneurial ecosystem research program. The program itself is divided into four research streams (context, structure, microfoundations, and complex systems) and four cross-sectional themes (methodologies and measurements, theory, critical research, and transdisciplinary research) as illustrated in Figure 2. The research streams are shown with clear boundaries only for illustrative purposes; in reality, these streams have considerable overlap. For

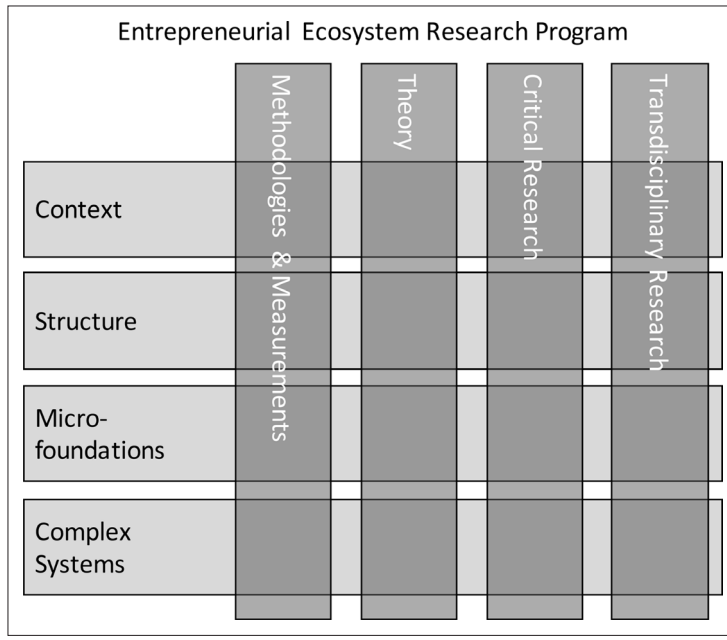

Figure 2. Entrepreneurial ecosystem research program with four research streams (horizontal) and four cross-sectional themes (vertical).

example, studying the structure of ecosystems is impossible without knowledge about the context and the processes that helped create this structure.

Both the research streams and themes are relevant for entrepreneurship scholars in general beyond the study of ecosystems (Busenitz et al., 2003; Wiklund et al., 2011; Zahra et al., 2014). We will elaborate on the individual streams and themes in the following and provide exemplary research questions to stimulate future research on ecosystems. In Table 2, we provide exemplary research questions that link each research stream to the five mechanisms that we used to review the literature. This is not a comprehensive list, but shows how this broader research agenda translates into specific new studies.

Research Streams

Context

The first area of research is ecosystems *as* contexts and the context *of* ecosystems, which links ecosystems to embeddedness and the context of entrepreneurship. Entrepreneurial ecosystems are open systems, which are to some degree dependent on or sensitive to outside conditions. This nestedness points at a 'russian doll' phenomena. For example, formal local institutions are nested in the regional level, which is nested in the national level, which is then nested within supranational institutions. Also, there might be important (competitive or mutualistic) inter-ecosystem links for example between world cities such as New York, London, and Paris. This means we should expect a substantial heterogeneity in the inputs required to build a well-functioning entrepreneurial ecosystem as well as differences in the outputs of ecosystems with similar structures. For example, research on Chinese ecosystems suggest a much larger role for the state than in Western cases for creating not just the economic conditions for high-growth entrepreneurship but the cultural and social norms as well (Chen et al., 2020).

Table 2. Exemplary Research Questions That Link Our Proposed Research Streams and the Causal Mechanisms From Our Review.

	Interdependencies	Outputs	Outcomes	Downward	Inter-EE
Context	• What is the appropriate geo-socio-political boundary of an EE? • How do these boundaries evolve over time? What role does the history of places play? • What are the relevant elements? • What is the role of external enablers in the evolution of EEs? • What is the role of polynuclear and multilevel governance for EEs?	• How are EEs linked to outputs historically? • How are different EE configurations linked to specific types of outputs? • What is the impact of EEs on the digital economy (digital marketplaces, platforms, and infrastructure)?	• How do EEs drive economic growth across varieties of capitalism? • How are different EE configurations linked to specific types of outcomes?	• How do EEs (and at which level of aggregation) absorb the positive/negative outputs/outcomes? • How and at what level of aggregation can policy influence the development of EEs?	• How do EEs benefit from/struggle due to other (neighboring) EEs? • Is there a minimum/maximum distance (social, cognitive, organizational, configurational, cultural)?
Structure	• How do entrepreneurs navigate the EE? • What are the critical links within EEs? • How are EEs intertwined with clusters and supply and value chains? • What is the role of hierarchies within EEs? • How do hyper-connected actors influence the density and connectivity of the EE?	• What is the impact of informal (e.g., mentoring) and formal (e.g., supply chains, alliances) networks within EEs on entrepreneurial behavior? • How are different network structures linked to specific types of outputs?	• How are different network structures linked to specific types of outcomes? • How do different structures increase the resilience of the EE? And is this a trade-off to performance?	• How do EEs adapt their structure following policy interventions or other significant events (e.g., big exits)? • What is the role of renascent entrepreneurs in connecting the EE and enabling the flow of knowledge and resources?	• How are EEs linked within a country and beyond? • Who are the "gatekeepers" and what is their impact? • How is the structure of an EE affected by the presence of global platform firms?

(Continued)

Table 2. Continued

	Interdependencies	Outputs	Outcomes	Downward	Inter-EE
Microfoundations	• What are the micro-foundations of EEs? • How and why do organizations and individuals go beyond their regular scope to support the EE? • What are the processes that drive the co-evolution between EE actors? • What are the processes behind resources allocation and orchestration within EEs?	• How does an EE affect different types of entrepreneurship? • How does the support or hinder product, process, and business model innovation? • How does the role of an EE different for digital and non-digital entrepreneurship?	• How are EEs linked to wider economic development (i.e., increased efficiency and wellbeing)?	• How do entrepreneurs and other actors integrate 'ecosystem knowledge' into the entrepreneurial process? • How does entrepreneurial recycling work within EEs?	• How do entrepreneurs build (global) networks? • How do gatekeepers and hyper-connected actors support the development of the EE? • How do EEs support internationalization and what is the effect of international entrepreneurship on the EE? • How is in-migration absorbed and integrated into the EE?
Complex Systems	• What are the co-evolutionary dynamics between EE elements? • What is the timescale at which different elements evolve? • Are there tipping points in the evolution of the EE? • How is learning enabled and facilitated within the EE?	• What is 'optimal' configuration, resource allocation, and strategy within different contexts?	• How does the interplay of the multitude of entrepreneurship (high-growth, social, etc.,.) lead to economic development?	• What is the role of systemic shocks and perturbations? • How are industry composition and economic complexity linked to EEs?	• What support and incentive systems are required at the national level to support EEs?

These differences call into question what is generalizable about entrepreneurial ecosystems as opposed to what is inherently bound up in local social, economic, and political contexts, and to what degree research and policy implications that are largely derived from the Anglo-American context are applicable to the Global South (Tsvetkova et al., 2019) and emerging economies (Cao & Shi, 2020). More research is necessary on how different localized contexts affect entrepreneurial ecosystems and their constitutive systems. This is particularly important when considering the policy push to use entrepreneurial ecosystem frameworks as economic development tools in very different contexts. We must ask if the (current) entrepreneurial ecosystem concept is capable of explaining entrepreneurial dynamics in a variety of contexts or whether it is limited to a small number of regions in high-income countries?

The majority of studies in our final sample investigates ecosystems at the city or regional level (44 papers), with the remaining 18 papers applying the concept to the national level. These should be seen as complementary rather than opposing applications of the ecosystem concept for two reasons. First, ecosystems are not an absolute but an artificial unit of analysis. Entrepreneurial activity is not limited to a particular territory. Many entrepreneurial ventures are part of the platform economy (Thomas et al., 2014) and innovation ecosystems (Autio & Thomas, 2014; Scaringella & Radziwon, 2018) and therefore require global links beyond the dense localized networks within the regional entrepreneurial ecosystem (Malecki, 2011). Complex products and platform technologies rely on the division of labor across regional ecosystems and often countries, and both the interactions within and outside the entrepreneurial ecosystem are vital for technological progress (Oinas & Malecki, 2002).

Second, ecosystem elements are present and interact at all spatial levels (with varying intensity) and can be (dis)aggregated. Entrepreneurial ecosystems do not replace other concepts like clusters. Industrial clusters co-evolve within the same network, often driven by cross-fertilization (Autio & Levie, 2017) as the main competitors are based outside the ecosystem (Autio et al., 2018) or 'coopetive' relationships are formed (Gnyawali et al., 2011). Entrepreneurial ecosystems represent the "higher-order complex of social, cultural, political, and economic feedback mechanisms within which the adaptive life cycle of any particular industrial cluster is embedded" (Auerswald & Dani, 2017, pp. 98–99).

Future research should adopt a more multicalar perspective that goes beyond studying interdependence of ecosystem elements at different levels of spatial aggregation but also examine the interdependence of the levels of aggregation. In combination with insights from polynuclear governance (Ostrom, 2010) and multilevel governance (Bache et al., 2016), this line of research promises both scientific advancements in our understanding of ecosystems and frameworks that can be operationalized for policy and entrepreneurial practice.

Structure

The second stream for further research concerns structure, in particular networks and connectedness. Entrepreneurial ecosystems are as much a social phenomenon as they are an economic one. The development, reproduction, and outputs of entrepreneurial ecosystems depend on the social ties between actors (Spigel, 2017). Entrepreneurs and other ecosystem actors are, therefore, not autonomous decision makers in isolation and their entrepreneurial behavior is enabled and constrained by their networks (Aldrich & Zimmer, 1986). These often-informal relationships enable the circulation of resources and know-how within the ecosystem along with communicating cultural norms and expectations that influence actors' behavior. In addition, personal relationships and networks also play a role, as entrepreneurs base decisions such as where to start or grow their business not solely on economic factors but also social factors such as the amount of encouragement they get from family and friends (Sorenson, 2018). While some work on ecosystems has involved structural network analysis to identify key players

(Motoyama & Knowlton, 2016; Pittz et al., 2019), there is room for further research on the cognitive and relational aspects of these networks. A major gap is the lack of theorization over how relational connections develop in entrepreneurial ecosystems and how these ties are affected by broader contextual factors. A social capital perspective allows for an examination not just of the resources present in networks or the nature of the ties between actors, but also the role of cultural factors like trust in how actors affect the relationships which drive the ecosystem. This requires both qualitative and quantitative research designs and longitudinal studies that combine processes and mechanisms with outputs and outcomes (cf. Hoang & Antoncic, 2003). Drawing on these perspectives allows for the use of a well-developed theoretical base around social interaction, networking, and the use of social capital to strengthen the explanatory power of entrepreneurial ecosystems research.

Microfoundations

The third area of research concerns processes at the micro-level, the microfoundations of entrepreneurial ecosystems. Agents within entrepreneurial ecosystems are expected to be heterogenous with respect to their entrepreneurial attitudes and abilities, their domain-specific knowledge, and their ability to collaborate with others (in teams, organizations, and inter-organizational arrangements). These actor characteristics are known to strongly influence the probability of entrepreneurial activities to emerge and to succeed. They are, however, also known to be influenced by the context in which agents have been situated. These microfoundations need to be researched in more detail to better understand the co-evolution of agents with entrepreneurial ecosystems and their connection with the resulting forms of entrepreneurship in their community (male and female, lifestyle and ambitious entrepreneurship, independent entrepreneurs and intrapreneurs, etc.). Although we assume that the structure of entrepreneurial ecosystems guides individuals' decisions about participating in entrepreneurial activities or ecosystem development, we can only claim that the ecosystem facilitates or constrains entrepreneurship rates in aggregates, and not individual entrepreneurial behavior. It is difficult to demonstrate causality between ephemeral phenomenons such as cultural or institutional structures with specific individual decisions. We must be aware of the ecological fallacy (Robinson, 2009), wherein researchers erroneously interpret and deduce inferences about individuals based on the group data (Terjesen et al., 2016). This means that research on ecosystem microfoundations needs to be sensitive to actors' agency within their communities rather than assuming that they are cultural or institutional 'dupes' who follow locally established norms.

Complex Systems

Fourth, research should explore the complex systems nature of ecosystems. Many ecosystem studies isolate elements and regress them on the prevalence of (some kind of) entrepreneurship output (e.g., Hechavarría & Ingram, 2019). This ignores the systemness of entrepreneurial ecosystems and thus ignores one of the main arguments of the (eco)system perspective (Fredin & Lidén, 2020; Stam & Van de Ven, 2019).

Conceptualizing entrepreneurship as emergence and 'order creating' (McKelvey, 2004) as well as a source of resilience (Roundy et al., 2017) helps to improve our understanding of the context that enables entrepreneurship, emergence and resilience of the system in the first place (cf. Arthur, 2015; Martin & Sunley, 2007). Rigorously applying principles of complex systems to ecosystems beyond a metaphorical comparison will contribute to a better understanding of the 'messiness' of ecosystems. Furthermore, complex systems approaches are more equipped to deal with non-Gaussian distributions that dominate ecosystem characteristics, despite the widespread use of Gaussian approaches (Crawford et al., 2015).

This requires both methodological innovation using models of heterogeneous agents in contrast to the use of the homogeneous agents of physics and mathematics (McKelvey, 2004) and for linking ecosystems to other emerging theories such as ‘relatedness‘ (Hidalgo et al., 2018). Related variety, for example, provides a promising avenue to integrate previous work on clusters and industrial dynamics into the entrepreneurial ecosystem framework. This could serve a means of studying the promise of cross-fertilization within entrepreneurial ecosystems. Studies in this area have, for example, demonstrated how related variety in a region enables Schumpeterian entrepreneurship (Content et al., 2019).

Cross-Sectional Themes

Methodologies and Measurements

Entrepreneurial ecosystem research is dominated by methods that emphasize observation and case studies as opposed to experiments as a research design, making it difficult to infer causality (cf. Hsu et al., 2017). These observational methods often lead to “pale copies of both the realities they attempt to model and the theoretical constructs they aim to study” (Grégoire et al., 2019, p. 284). Experimental research designs can simultaneously create rigorous theoretical knowledge as well as practical insights “by providing more reliable knowledge about what causes changes in entrepreneurs’ affect, cognitions, behaviors, and performance, about what may lead to the emergence and disappearance of entrepreneurship, and about the relationship between entrepreneurship and economic and social development” (Williams et al., 2019, p. 216).

Beyond experimentation, we call for further methodological pluralism and innovation, including more mixed-method approaches. This is required for capturing the diversity and richness of entrepreneurial ecosystems and finding new measures and data-driven approaches to modeling entrepreneurial ecosystems (Leendertse et al., 2020). With new longitudinal datasets as well as ‘big data’ approaches and innovative data sources, researchers can advance our understanding of what constitutes entrepreneurial ecosystems and their impact on entrepreneurial behavior and economic development and vice versa (Credit et al., 2018; Schwab & Zhang, 2019; von Bloh et al., 2020). Another relevant aspect in this context are replication studies as a means to accumulate knowledge and increase confidence in our findings (Davidsson, 2004). An example is the role of ecosystems as moderators for economic development, where evidence is currently mixed (Bruns et al., 2017; Content et al., 2020).

A second issue is the measurement and evaluation of entrepreneurial ecosystem policies. More work is required to synthesize academic studies and work by NGOs and private bodies such as the Kauffman Foundation, Startup Genome, or the ASPEN Institute. Building on our review of the processes and mechanisms, a key question for academics is what constitutes comprehensive assessments of ecosystem performance? Measuring ecosystems impact and performance must go beyond simple output indicators. What are the relevant processes and interactions that can provide more real-time indicators of how an entrepreneurial ecosystem is developing and allow for timely intervention if necessary?

Theory

The entrepreneurial ecosystem concept has been applied in combination with a variety of theoretical lenses, both for empirical work (as highlighted by our review) and theoretical and conceptual research. One might even regard the entrepreneurial ecosystem approach as an integrative device of existing theories. More work is required to integrate these theories, including a more nuanced discussion about underlying (and possibly competing) assumptions and their implications for entrepreneurial ecosystem research and entrepreneurship research in general. With

institutional and evolutionary as well as social capital theories being the most prominent in our research, further research is required that differentiates to how these theories apply at different levels of aggregation.

But when theorizing about entrepreneurial ecosystems, researchers must also look beyond these obvious choices. How are entrepreneurial ecosystems affected by digital governance; what role do agency, authority and uneven social, political, or economic power distributions play; and what is the link between ecosystems, architectural knowledge and business model innovation? What are the microfoundations of institutional change and how are these related to capabilities, processes, and routines? This will also help further distinguish the ecosystem concept from other systems of innovation and entrepreneurship. Table 3 provides an overview of exemplary research questions that link our proposed research streams and the 'methodologies and measurements' and 'theory' themes.

Critical Research

Policymakers are increasingly turning to entrepreneurial ecosystem approaches as cost-effective economic development and resilience tools, a strategy likely to increase as regions look toward their post-COVID-19 recovery. However, this approach reflects an implicit assumption within both research and policy communities that entrepreneurship is good for economies and that increasing the amount of entrepreneurship will lead to increases in social welfare through job creation, in-bound investment, and redistributive taxes (Spigel, 2020). But the empirical reality is less clear, with some research finding little to no connection between, for example, high-growth entrepreneurship and overall regional prosperity (Lee & Rodríguez-Pose, 2021; Lee & Clarke, 2019).

Entrepreneurial ecosystem policies often ignore the increased risk and precarity entrepreneurship places on both founders and workers and the other negative side effects of entrepreneurship (McNeill, 2016). Beyond this, numerous aspects of how entrepreneurial ecosystems work, from the role of networks to the importance of gatekeepers such as investors and mentors, create the potential for discrimination against entrepreneurs who are women, minority, older, or otherwise outside of the white, male, mainstream of entrepreneurship (e.g., Abraham, 2020; Huang et al., 2020). Due to the many avenues for exclusion and discrimination in entrepreneurial ecosystems it is not at all clear who entrepreneurial ecosystems are for and if they can play a role in reducing inequality or if they instead contribute to its reproduction. This makes it incumbent on researchers to demonstrate the normative value of entrepreneurial ecosystems to the broader community as well as to investigate the problems that emerge as entrepreneurial ecosystems grow and spur productive entrepreneurship, such as increasing housing prices and more uneven development issues. More research with critical perspectives is needed to better understand if and how entrepreneurial ecosystems are actually increasing the prosperity and social welfare of regions or if it is simply entrenching wealth within a small subset of society.

Transdisciplinary Research

The fourth research theme is concerned with a shift from research *on* ecosystems and policy to research *for* policy and practice. Work on entrepreneurial ecosystems was originally dominated by practitioners, with academic literature catching up later on. Moving forward, a better integration of research and practice is required. Entrepreneurial ecosystems are an organizing concept at the heart of a transdisciplinary, yet concentrated effort to improve socio-economic wellbeing through entrepreneurship. We propose that this transdisciplinary is reflected in research on entrepreneurial ecosystems, based on the "functional-dynamic collaboration of discipline and societal actors to investigate and handle [entrepreneurial] issues" (Pohl et al., 2017, p. 44; see also Beaulieu et al., 2018) and the principles of 'engaged scholarship' (Van de Ven, 2007).

Table 3. Exemplary Research Questions That Link Our Proposed Research Streams and the "Methodologies and Measurements" and "Theory" Themes.

	Methodologies and measurements (How can we acquire knowledge and measure EEs?)	Theory (What are the theoretical gaps? How can we make sense of data?)
Context	• How can 'big data' approaches and novel data sources such as social media be used to capturing a wider array of information and paint a more nuanced picture of EEs? • How can novel approaches to data retrieval and analysis reduce bias in self-reported data? • How can ethnographic studies and other longitudinal qualitative approaches capture more detail and change over time? • How can we provide a complete measure of the interdependencies and quality of an EE? • How can post-structuralist methods contribute to a deeper understanding of the role of different demographics within EEs?	• How can we synthesize institutional and evolutionary approaches, particularly across different spatial and temporal scales at which EE elements evolve? • How do digital governance (e.g., link to political science) and information systems linked to EEs and vice versa? • How can we better integrate and synthesize research and insights from other systemic approaches to innovation and entrepreneurship?
Structure	• How can we elicit the structure of EEs through a combination of qualitative and quantitative information? • How can we model EEs as multilayer networks and what are the relevant layers? • How can the nestedness of communities within the EE and of EEs within the larger national system be modelled and studied? • How can we aggregate the structure of EEs? • How can we measure the flow of information and spread of capabilities and resources through EEs?	• How can we integrate social network theory with other approaches to relationships such as agency theory, proximity or uneven social power and authority? • What is the role of social cohesion in EEs and the role of homophily in ego-centric networks? • How are individual characteristics, personalities, and (informal) institutions dynamically linked to the structure of EEs and vice versa? • How can we bridge research on the structure of EEs with dynamic capabilities and resources of its actors?

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Table 3. Continued

	Methodologies and measurements (How can we acquire knowledge and measure EEs?)	Theory (What are the theoretical gaps? How can we make sense of data?)
Microfoundations	• How can event-driven research and feedback thinking help link individual processes to the outputs and outcomes? • How can we use experiments such as RCTs to understand cause and effect of ecosystem actors' actions? • How can process-based measures complement output-based measures? • How can we measure spillovers from entrepreneurial behavior within EEs? • How can we integrate research on processes and structure? • How can we measure activity within EEs beyond frequency measures?	• What is the influence of uncertainty within the processes that drive EEs? • How do EEs support business model innovation? • How do we reconcile the role of strategizing, experimentation, and related concepts from organization studies for (institutional) entrepreneurs in EEs? • How is entrepreneurial orientation and cognition affected by the involvement in an EE? • How can we synthesize the microfoundations of institutional change, individuals and organizations and their capabilities, processes and routines? • How can we reconcile insights from event- and outcome driven research on EEs?
Complex systems	• How can we use simulation methods for capturing feedback effects both within and across levels of aggregation? And experimentation in a cost-efficient environment? • How can mixed-method approaches help explain the interplay of bottom-up and top-down dynamics across levels of aggregation? • How can we develop a comprehensive assessment of the performance and returns of EEs? What is the right balance between activity measure, connectivity, outputs, and outcomes? • How can we measure path-dependencies and path-elasticities in EEs?	• What is the inter-relationship between localized entrepreneurial systems and non-local systems related to industries, political networks, and mobility? • How do systemic (policy) interventions affect complex entrepreneurial systems? • How can we link EEs closer to complexity theory and how do EE become "more than the sum of their parts"? • How can we integrate learning theories at the individual and collective level? • How can we link EEs to theories of (macro) economic growth?

These efforts should cumulate in an 'entrepreneurial ecosystem knowledge platform,' which documents policy-based and researcher-led interventions and links them to an emerging body of research. Experimentation by economic actors has not yet been the subject of ecosystem research, that is, combining both failed and successful experiments and how they (even in the case of failure) shape the ecosystem and affect its actors. Furthermore, attention should be paid to how policies were designed or how firms' business models were affected by imitation and experimentation and the support from other ecosystem actors. Many studies show no or even negative relations between government support programs and entrepreneurial outputs (Hechavarría & Ingram, 2019). This does not necessarily dismiss these programs per se, but it also does not reveal a particularly high efficacy. We need to learn more about how to design and implement efficient and effective programs for improving entrepreneurial ecosystems.

Entrepreneurial ecosystem research should aim at developing a set of design principles in response to these issues (see the exemplary research questions in Table 4). Design principles complement the established links from research to practice (testing) and vice versa (generating) and support more reflective research (learning from practice) and more operationalizable entrepreneurial ecosystem interventions (Berglund et al., 2018). The principles, despite being context-dependent, would improve the implementation of ecosystem research and address the knowledge-practice gap (cf. Pfeffer & Sutton, 1999).

Conclusions

The entrepreneurial ecosystem approach provides a prominent framework for research, policy and entrepreneurial practice. Prior attempts at synthesizing the entrepreneurial ecosystem literature have provided high-level summaries of the field, but there had yet to be a critical review of the empirical evidence of the mechanisms behind entrepreneurial ecosystems. This review has shed light on the breadth of empirical ecosystem research and the variety of theoretical and methodological approaches as well as the interdisciplinary nature of the research, and the substantial and metaphorical use of the entrepreneurial ecosystem concept. With the wide-spread metaphorical use of the concept, there is a possibility that it will only be a fad that has come into fashion, and will be out of fashion sooner or later, without any meaningful accumulation of knowledge.

Our critical review of the entrepreneurial ecosystem literature has shown that the entrepreneurial ecosystem concept has sparked interdisciplinary discussions and the entrepreneurial ecosystem framework has shown the potential to synthesize a variety of research streams. However, it still lacks a consistent theoretical foundation and empirical base. The usefulness of the ecosystem concept for research and policy-making depends on an advanced understanding of the causal mechanisms discussed in this paper. Without such knowledge, we are left with little besides a 'cargo cult' policy-making based on copying the most prominent features of successful regions. The way forward must not be based on developing new and isolated micro-theories, but a better holistic understanding of entrepreneurial ecosystems, how it relates to other concepts, and the empirical reality of ecosystems. While the concept itself is subject to increasing scrutiny and is being explored from a variety of perspectives, more work is required that focuses on the interplay between these mechanisms.

Ultimately, we need more insight into whether and how entrepreneurship can be a force for good, how entrepreneurial ecosystems enable entrepreneurship that enhances regional, national and global well-being. With more data than ever on well-being, entrepreneurship and entrepreneurial ecosystem elements, accumulating knowledge has not only been easier to realize, but also more necessary than ever.

Table 4. Exemplary Research Questions That Link Our Proposed Research Streams and the "Critical Research" and "Transdisciplinary Research" Themes.

	Critical research (How can we advance EE research through problematization and critical inquiry?)	Transdisciplinary research (How can we broaden the relevance of EE research and increase co-creation?)
Context	• How are the nature of EE situated in the context of neo-liberal capitalist systems? • How are socio-political contexts imprinted on EE? • How is the evolution of the EE linked to the prevalence of stress, depression, and other mental health issues of entrepreneurs? • Is the EE concept viable with a shift in the importance of geographical proximity (e.g., working from home, remote working, digital economy)? • How is the development of EEs linked to (de)regulation?	• How can we move studies away from Anglo-American contexts to embrace the diversity of EE contexts in developing economies and non-technology-based economies? • How can we include non-economic contexts such as ethnicity, migration status, and age, and how they affect individual experiences in an EE? • How can policy cope with dynamic boundaries of EEs? • With EEs being very sensitive to initial conditions, how can practitioner and policy makers adapt insights from the literature?
Structure	• Do EEs foster or reduce spatial inequality at different spatial scales (e.g., support national economic development but increase inequality within the country)? • Do EE structures exclude certain actors based on ethnicity, gender, age, or education? • How do power structures emerge within EE and how do these structures affect the flow of entrepreneurial resources?	• How can EE knowledge be democratized in practice and shared globally? And how can this reach all actors across each EE? • How can we build communities of researchers and practitioners/policy makers? • How can we combine entrepreneurial practice, enterprise policy, and academic research into assessment tools and methods that can guide both practice and research?
Microfoundations	• What social processes within EE are associated with discrimination or exclusion? • What processes preserve existing power structures and relationships within ecosystems? • What are the processes that connect EE growth with overall economic and social improvements?	• What are the relevant processes studied in the literature and how do they map on entrepreneurial practice and EE development? • How can we build capacity for developing EEs and the required environment at different spatial scales (e.g., integrating EEs into education, specialized training, methodological support for policy makers, handbooks, toolboxes)?

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Table 4. Continued

	Critical research (How can we advance EE research through problematization and critical inquiry?)	Transdisciplinary research (How can we broaden the relevance of EE research and increase co-creation?)
Complex systems	• Who are EEs built for? Who has the ability to influence the evolution of systems? • Which types of ecosystem actors and resources are studied using simulation and experimentation methods and which are not? • Does the EE concept suggest a misleading overconfidence in our ability to actively "grow" entrepreneurship?	• How can academics and practitioners co-create an "entrepreneurial ecosystem knowledge platform"? How can policy initiatives based on the EE concept be studied systematically? • What policies or support are required at different spatial scales to develop EEs and nurture entrepreneurship?

Appendix A: Summary of included articles

ID	Authors (Year) Journal	Method (Data Source)	Theory or concept	Spatial context	Key findings
1	Acs, Z. J., Autio, E., & Szerb, L. (2014) Research Policy	Weighted index-development (based on e.g., GEM, WEF, World Bank)	Institutions, systems theory	Country (88 countries)	Ecosystem elements are interrelated at the national level with a penalty for bottlenecks among elements
2	Acs, Z. J., Estrin, S., Mickiewicz, T., & Szerb, L. (2018) Small Business Economics	Fixed effects model (GEM, Penn World Table, World Bank, WEF)	Growth theory, systems theory, agency, institutions	Country (46 countries)	Ecosystems at the country level are linked to economic growth
3	Audretsch, D. B., & Belitski, M. (2017) Journal of Technology Transfer	Exploratory factor analysis, *SEM* (Eurostat, REDI)	Cluster emergence and evolution	City (70 European cities)	Ecosystems (including internet access and connectivity) are linked to start-up rates in cities
4	Audretsch, D.B., Lehmann, E.E., & Seitz, N. (2019) Small Business Economics	Exploratory factor analysis (Census data 2011 combined with e.g., Grü nderszene.de, Urban audit, Eurostat, etc.)	Cultural amenities	Region (69 largest urban districts/ independent cities in Germany)	Subculture rather than mainstream culture plays a key role in EEs for fostering new venture creation in the ICT sector
5	Auerswald, P. E., & Dani, L. (2017) Small Business Economics	Case study with descriptive statistics (based on e.g., ACS, Inc 5000, NSF, USPTO, WoS)	Evolutionary perspective	Region (Washington, D.C.–Baltimore Combined Metropolitan Statistical Area)	Ecosystems represent higher-level system in which e.g., clusters are embedded; policy making needs to account for current state of the ecosystem and interventions have different effects on involved clusters/industries
6	Barba-Sánchez, V., Arias-Antúnez, E., & Orozco-Barbosa, L. (2019) Technological Forecasting and Social Change	Multiple linear regression	Knowledge spillover theory of entrepreneurship	City (44 Spanish Smart City initiatives)	Smart city policies promote entrepreneurship through fostering the ecosystem
7	Bennett, D.L. (2021) Small Business Economics	Panel data econometric methods (US Census Bureau Business Dynamism Statistics)	New Institutional Economic theory	Region (294 US Metropolitan statistical areas)	Institutions (economic freedom) at the regional level enable Schumpeterian entrepreneurship
8	Bennett, D.L. (2020) Small Business Economics	Panel data econometric methods (US Census Bureau Business Dynamism Statistics)	Institutions	Region (294 US Metropolitan statistical areas)	Different regional institutions (the multiple dimensions of economic freedom) affect regional entrepreneurship rates in different ways
9	Biru, A., Gilbert, D., & Arenius, P. (2020) Entrepreneurship and Regional Development	In-depth. Semistructured interviews (36 with Ethiopian entrepreneurs; 4 with support providers), document analysis and observation	Ecosystem theory (evolved from cluster theory)	Country (Ethiopia)	Context makes innovative entrepreneurship difficult despite substantial government support
10	Bischoff, K. (2019) Small Business Economics	OLS regression (106 survey respondents)	Stakeholder theory	City/region (Wuppertal and Graz)	Key success factors for a strong sustainable entrepreneurial ecosystem include an entrepreneurial culture as well as tailored stakeholder support and collaboration
11	Brown, R., Gregson, G., & Mason, C. (2016) Regional Studies	Longitudinal case study (wide range of secondary sources; 44 interviews at three points in time over 10 years)	Innovation systems, evolutionary perspective	Country (Scotland), but the discussion focusses on not-further-defined regions within Scotland	Local/regional ecosystem characteristics are crucial for effectiveness of systemic innovation policy
12	Bruns, K., Bosma, *N.*, Sanders, M., & Schramm, M. (2017) Small Business Economics	Multilevel growth regression, latent class analysis (Eurostat, GEM)	Institutions	Region (107 NUTS1-2 regions across 16 EU member states)	No moderating effect of entrepreneurial ecosystems on the relation between entrepreneurship and economic growth

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ID	Authors (Year) Journal	Method (Data Source)	Theory or concept	Spatial context	Key findings
13	Civera, A., Meoli, M., & Vismara, S. (2019) Journal of Technology Transfer	Regression analysis, difference-in-differences, propensity score matching (1568 innovative Italian start-ups)	Knowledge spillover theory of entrepreneurship	Region (Italian NUTS2 regions)	Universities with a strong international focus can act as intermediaries of internationalization for the ecosystem. Regional scientific knowledge and talent has a limited effect on the internationalization of academic spin-offs, regional demand growth has a negative effect. Regional presence of STEM talent has a negative effect on the internationalization of academic spin-offs
14	Colombelli, A., Paolucci, E., & Ughetto, E. (2019) Small Business Economics	Case study with archives, questionnaires, structured interviews, SNA	Evolutionary perspective	City (Turin)	Anchor institutes initiate and support the initial growth of ecosystems. Governance changes from hierarchical to relational as the ecosystem evolves; similarly, the role of different actors and support organizations evolves as the ecosystem evolves
15	Content, J., Bosma, *N*., Jordaan, J., & Sanders, M. (2020) Regional Studies	Latent class analysis (GEM)	Schumpeterian entrepreneurship	Region (169 NUTS-2 and −1 regions in 25 European countries)	In that way the EE is conceptualized as driving not only the level of entrepreneurial activity in a region, but also as a mediator of the effect of such activity on the economy at large
16	Corrente, S., Greco, S., Nicotra, M., Romano, M., & Schillaci, C.E. (2019) Journal of Technology Transfer	Stochastic multicriteria acceptability analysis (GEM, Eurostat EIP)	(?)	Country (24 European countries)	The most relevant EE factors enabling the birth and activity of high-growth start-ups can be identified in cultural and social norms, government programs, and internal market dynamics
17	Dilli, S., Elert, *N*., & Herrmann, A. M. (2018) Small Business Economics	PCA and OLS regression (Eurostat, OECD, World Bank)	Varieties of capitalism, institutional theory	Country (20 European countries and the US)	Four distinct institutional settings enable different types of entrepreneurship (e.g., high/medium/low-tech ventures)
18	Erina, I., Shatrevich, V., & Gaile-Sarkane, E. (2017) European Planning Studies	Factor analysis (data from 368 Latvian companies)	Stakeholder theory	Country (Latvia)	Positive impact of interaction between company–university–government on entrepreneurial development (greater for more developed regions/ ecosystems)
19	Feldman, M. P., & Lowe, N. J. (2018) Cambridge Journal of Regions, Economy and Society	Triangulating of secondary data sources; in-depth interviews and focus groups with founders	Complexity theory, evolutionary theory (mentioned only)	Region (North Carolina's Research Triangle Park and adjacent area)	Instead of isolated investments/actions, ecosystems are adaptive and evolve through interactions of individuals with different motivations (including non-market forces)
20	Fischer, B. B., Queiroz, S., & Vonortas, N. S. (2018) Entrepreneurship and Regional Development	Descriptive statistics with year-to-year variations with Heckit correction (1196 proposals to FAPESP)	Agglomeration economies	City (114 cities in the state of São Paulo, Brasil)	Ecosystem concept has to be adapted for developing economies due to influences of (dis)economics of agglomeration
21	Fraiberg, S. (2017) Journal of Business and Technical Communication	Ethnographic study (14 interviews, visits, websites, other documents)	Cultural–historical activity theory	Country (Israel)	Ecosystems are highly integrated into the broader socio-cultural-ideological context; dynamic and constantly evolving; and densely connected beyond (artificial) spatial boundaries
22	Ghio, N., Guerini, M., & Rossi-Lamastra, C. (2019) Small Business Economics	Zero-inflated negative binomial specification (792 industry/ province pairs, 8 industries*99 provinces, accounting for 3774 new high-tech firms created in the period 2012–2014, data from Movimprese, Bank of Italy)	Knowledge spillover theory of entrepreneurship	Region (Italian provinces)	High information asymmetries impede high-tech entrepreneurial ideas based on university knowledge to attract external finance. In provinces where residents tend to behave opportunistically, the relative presence of cooperative banks magnifies the positive effect of university knowledge on high-tech entrepreneurship. Conversely, this effect is negligible in provinces with less opportunistic residents

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ID	Authors (Year) Journal	Method (Data Source)	Theory or concept	Spatial context	Key findings
23	Goswami, K., Mitchell, J. R., & Bhagavatula, S. (2018) Strategic Entrepreneurship Journal	54 interviews; secondary data (49 websites, 13 online video interviews, 26 online news sources, and 301 pages of policy documents)	Socially situated entrepreneurial cognition approach (based on process-focused entrepreneurial cognition lens)	City (Bangalore)	Four types of accelerator expertise—connection, development, coordination, and selection—combined lead to higher commitment among stakeholders to the ecosystem, validation through faster experimentation and ecosystem additionality
24	Harms, R., & Groen, A. (2017) Technological Forecasting and Social Change	OLS regression (Gelfand et al., 2011; GEM, OECD, World Bank)	Institutions	Country (18 countries)	Policy makers can use formal institutions to foster high-growth and social entrepreneurship, even in nations whose cultural conditions do not seem to be supportive of entrepreneurship
25	Harrison, R. T., & Leitch, C. (2010) Regional Studies	Case study (fifteen spin-off companies from Queen's University, Belfast) and descriptive statistics (HEFCE)	(?)	Region (Belfast)	Despite their prominence, university spin-offs are mostly not high-growth businesses and do not drive an ecosystem but depend on it in their development
26	Hechavarría, D.M., & Ingram, A.E. (2019) Small Business Economics	Regression, General Method of Moments (GMM) estimator (World Bank Development Indicators, GEM APS & NES)	(?)	Country (75 countries)	Globally, women benefit more from many of the ecosystem factors than men, but in some cases depending on the phase of economic development men might benefit more. Several national level ecosystem aspects have no significant impact on rates of male or female entrepreneurial engagement
27	Horváth, K., & Rabetino, R. (2019) Regional Studies	Spatial Durbin cross-section models (EURO-STAT, GEM, REDI)	Knowledge spillovers	Region (67 EU NUTS-1 regions and 54 EU NUTS-2 regions)	Quality of the ecosystem positively influences KIBS formation rates and positively moderates the relationship between manufacturing specialization and the rate of new KIBS; a healthy entrepreneurial ecosystem seems essential for an effective territorial servitization
28	Johnson, D., Bock, A.J., & George, G. (2019) Industrial and Corporate Change	2 Case studies based on 34 interviews and document analysis	(?)	City (Edinburgh, Madison)	Ecosystem evolution depends on both munificence (in the built environment) and the dynamism and behavioral responses of agents in the ecosystem. Human connectedness to the physical environment, including urban design, buildings, and infrastructure, can affect entrepreneurial activity
29	Jung, K., Eun, J.-H., & Lee, S.-H. (2017) European Planning Studies	Q-Methodology (i.e., the systematic study of subjectivity) with 44 statements, based on semistructured interviews	Stakeholder theory	Region (around the 17 CCEIs in Korea)	Ecosystems require stakeholder alignment and a holistic approach to create a fertile environment for entrepreneurial activity
30	Lafuente, E., Acs, Z.J., Sanders, M., & Szerb, L. (2019) Small Business Economics	Data envelopment analysis (IMF, GEM, GCI, Doing Business Index)	Kirznerian and Schumpeterian entrepreneurship	Country (45 countries)	EEs contribute to national productivity by promoting Kirznerian and Schumpeterian entrepreneurship
31	Lafuente, E., Szerb, L., & Acs, Z. J. (2016) Journal of Technology Transfer	Data envelopment analysis (DBI, GCI, GEM, World Bank)	Knowledge spillover theory of entrepreneurship	Country (63 countries)	Mature ecosystems enable knowledge spillovers, which increase efficient resource allocation
32	Lerner, J., Schoar, A., Sokolinski, S., & Wilson, K. (2018) Journal of Financial Economics	Regression discontinuity (self-reported data from angel groups)	(?)	Country (angel groups in 12 countries and applicants from 21)	Angel investments have a positive impact on firm growth, performance, survival, and follow-on fundraising, which is independent of the level of venture activity and entrepreneur-friendliness in the country; but in less mature ecosystems only more mature start-ups apply for angel investment

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ID	Authors (Year) Journal	Method (Data Source)	Theory or concept	Spatial context	Key findings
33	Lowe, *N.* J., & Feldman, M. P. (2017) Geography Compass	Triangulating of secondary data sources; in-depth interviews and focus groups	Institutional theory	Region (North Carolina's Research Triangle Park and adjacent area)	Institutions are perceived differently by ecosystem actors and are constantly co-created through the interaction of these actors
34	Mack, E., & Mayer, H. (2016) Urban Studies	Semistructured interviews (23 and 122 at two points in time), archival data	Evolutionary perspective	Metropolitan region (Phoenix)	Ecosystems are unique due to their historical, cultural, and institutional heritage and co-evolving elements
35	Martínez-Fierro, S., Biedma-Ferrer, J.M., & Ruiz-Navarro, J. (2020) Business Strategy and the Environment	*SEM* (GEM, NES)	(?)	Country (62 countries)	EE shaped by economic development of the country and high-growth firms have greater impact on entrepreneurial ecosystem than new ventures in general
36	McAdam, M., Harrison, R.T., & Leitch, C.M. (2019) Small Business Economics	In-depth interviews (28, purposive sample), reflexive critical approach to data analysis	Bourdieu's (2005) theory of embodied practice	Region (a peripheral European region)	Gender issues can constrain the bottom-up evolution of ecosystems and women-only networks are not sufficient improve connectedness and engagement in entrepreneurial activities of women
37	Motoyama, Y., & Knowlton, K. (2016) Entrepreneurship and Regional Development	Semistructured interviews (46 firms and 15 support organizations)	Social network theory	City (St. Louis)	Government sponsorship is an effective driver of ecosystem development beyond increasing individual recipient firms' performance
38	Neck, H. M., Meyer, G. D., Cohen, B., & Corbett, A. C. (2004) Journal of Small Business Management	Interviews (informal with 5 VCs, semistructured with 15 founders), survey to develop genealogical model (184 responses)	Evolutionary perspective	Region (Boulder County)	Elements are related in a unique way for every ecosystem and provide the basis for high-tech entrepreneurship
39	Neumeyer, X. & Santos, S. C. (2018) Journal of Cleaner Production	Social network analysis; interviews (45 per region)	Social network theory	Region (two municipalities in the Southeast US)	Ecosystems are host a variety of subclusters based on organisational- and individual-level factors
40	Neumeyer, X., Santos, S.C., & Morris, M.H. (2019) Journal of Technology Transfer	Social network analysis; interviews (300 ecosystem participants)	Social network theory	City/municipality (Chicago, Orlando)	There are social clusters within EEs that focus on particular types of entrepreneurship
41	Öner, M. A. & Kunday, Ö. (2016) Technological Forecasting and Social Change	Regression with moderator analysis (GEM, Turkish Chamber of Commerce)	Organizational/resource-based approach	Country (Turkey)	Ecosystem development is important for growing 'entrepreneurial spirit' and support programs can lower the fear of failure
42	Pittz, T.G., White, R., & Zoller, T. (2019) Small Business Economics	Social network analysis	Social network theory, social capital	Region (Tampa MSA)	Dealmakers are essential for fostering connectivity and knowledge spillovers in EEs
43	Pugh, R., Soetanto, D., Jack, S.L., & Hamilton, E. (2019) Small Business Economics	Case study	Learning region, collective learning	Region (North-West England and Lancaster University)	Learning and universities pro-actively supporting this beyond their traditional remit contribute to EE development
44	Pushkarskaya, H., Fortunato, M.W.-P., Breazeale, *N.*, & Just, D.R. (2020) Small Business Economics	Scale construction, linear regression (semistructured interviews, focus group; 1402 useable survey responses)	Entrepreneurial self-efficacy	Region (Kentucky)	Interaction of individual entrepreneurial talent and aptitudes and the EE/place
45	Pustovrh, A., Rangus, K., & Drnovšek, M. (2020) Technological Forecasting and Social Change	Semistructured interviews (10 top executives of accelerators and 9 start-up founders), secondary data available online, public and internal materials and reports	Resource dependence theory, open innovation paradigm	Region	Through an open innovation approach, accelerators can support the connectedness within and beyond the ecosystem and increase the resources available within the ecosystem

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ID	Authors (Year) Journal	Method (Data Source)	Theory or concept	Spatial context	Key findings
46	Qian, H., Acs, Z. J., & Stough, R. R. (2013) Journal of Economic Geography	*SEM* (Business Information Tracking System, Integrated Postsecondary Data Set, Milken Institute, US Census, USPTO)	Absorptive capacity theory of knowledge spillover entrepreneurship	Region (US metropolitan statistical areas)	Entrepreneurial absorptive capacity drives knowledge-based entrepreneurial activity; high technology and cultural diversity contribute to the vibrancy of ecosystems
47	Radinger-Peer, V., Sedlacek, S., & Goldstein, H. (2018) European Planning Studies	Case study (22 semistructured interviews supported by secondary data)	Evolutionary perspective	Region (Vienna)	Non-linear evolution of the EE, with often contradictory developments within the various pillars. Nature and prevalence of finance changed due to changes in formal institutions and the resulting regulatory changes; path development of the ecosystem is strongly shaped by endogenous initiatives of foremost public authorities
48	Schaeffer, V., & Matt, M. (2016) Entrepreneurship and Regional Development	Case study (21 semistructured interviews over 12 years, supported by supplementary documents and information)	(?)	Region (Strasbourg)	Universities as hub institutions can support the development of ecosystems through the sequential development of boundary spanning, network building, and orchestrator functions, but rely on the development of complementary support structures
49	Schäfer, S., & Henn, S. (2018) Cambridge Journal of Regions, Economy and Society	27 interviews, secondary qualitative information, secondary statistics	(?)	Region (Tel Aviv Metropolitan Area)	Remigration, 'sunshine return migration', and outmigration influence the emergence and evolution of ecosystems
50	Schillo, R. S., Persaud, A., & Jin, M. (2016) Small Business Economics	Exploratory factor analysis, partial least squares-based confirmatory factor analysis, multilevel logistic regression (GEM, World Bank, GCI)	Institutions, social cognitive theory	Country (63 countries)	Entrepreneurial readiness is a more valid representation of individual-level characteristics than other individual traits and is also influenced by several dimensions of the national environment, forming a reinforcing loop
51	Simmons, S.A., Wiklund, J., Levie, J., Bradley, S.W., & Sunny, S.A. (2019) Small Business Economics	Hierarchical linear modeling (data of 8171 entrepreneurs from GEM, WDI, Flash EB Nos. 192, 283, and 354)	Stigma theory	Country (35 countries)	The framework conditions of entrepreneurial ecosystems have different influences on the reentry decisions of males and females who experience business failure
52	Sperber, S., & Linder, C. (2019) Small Business Economics	Configurational analysis based on fsQCA (data for 987 nascent entrepreneurs from Panel Study of Entrepreneurial Dynamics II)	Expectancy theory	Region/community	Start-up strategies chosen are a reflection of the perceived support from the ecosystem, the entrepreneurs' current life situation, and the intended goals. Women tend to mobilize more resources than men in order to overcome support constraints, men are more confident of their capabilities
53	Spigel, B. (2017) Entrepreneurship Theory and Practice	Case study (71 semistructured interviews with tech entrepreneurs, investors, economic development officials)	Multiple stories milieu approach	Region (Waterloo and Calgary)	Ecosystem configurations can vary significantly and new policies/ investments should develop support among underlying social and cultural attributes
54	Stam, E., & Van de Ven, A. (2019) Small Business Economics	Descriptive statistics, principal component analysis, index construction, linear regression model (Quality of Government, CBS, EU RCI, Nat Assoc of Private Equity, Birch)	Complex systems	Region (12 Dutch NUTS-2 provinces)	Strong path dependence in the evolution of entrepreneurial ecosystems. EE should be treated as a system (strong path-dependency within its evolution), with overall quality positively related to entrepreneurial output, which in turn feeds back into the regional EE

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ID	Authors (Year) Journal	Method (Data Source)	Theory or concept	Spatial context	Key findings
55	Steinz, H. J., Van Rijnsoever, F. J., & Nauta, F. (2016) Business Strategy and the Environment	43 interviews and observations from attending five meetings and five seminars	Institutional theory	Region (6 Chinese regions)	Entrepreneurs coming to China must be prepared, flexible, associate themselves with reputable partners and take advice from those familiar with business in China to overcome cultural-cognitive barriers; regulative barriers can only be removed by the Government
56	Stephens, B., Butler, J.S., Garg, R., & Gibson, D.V. (2019) Technological Forecasting and Social Change	Logistic regression and 45 semistructured, in-depth interviews with technology entrepreneurs	Institutional theory	Region (Austin, Silicon Valley, Boston, New York)	State of the ecosystem impacts whether entrepreneurs come/stay to start a new tech venture
57	Szerb, L., Lafuente, E., Horváth, K., & Páger, B. (2019) Regional Studies	OLS regression models (EURO-STAT, GEM, REDI)	(?)	Region (121 EU regions, including NUTS-1 and NUTS-2)	Positive moderating effect of the ecosystem on the relation between entrepreneurship (both Kirznerian and Schumpeterian) on regional economic growth
58	Thompson, T. A., Purdy, J. M., & Ventresca, M. J. (2018) Strategic Entrepreneurship Journal	Structured interviews (10 social entrepreneurs, 15 ecosystem stakeholders) supported by secondary data (public records, web sites, news outlets, and blogs to capture web pages, documents)	Field theory	Region (Seattle)	Ecosystems form through endogenous, bottom-up, and time-patterned processes (rather than exogenous sources such as government action or instrumental policy goals)
59	van Weele, M., van Rijnsoever, F. J., Eveleens, C. P., Steinz, H., van Stijn, N., & Groen, M. (2018) Journal of Technology Transfer	Multi-case study (90 semistructured interviews in Western Europe and a total of 191 in the other four regions)	Institutional theory	Region (regions in four Western European countries; plus Silicon Valley; greater Boston area; and regions in Israel and Australia)	Incubators do not fundamentally address unfavorable institutions and only provide 'symptomatic' solutions, therefore new 'systemic' incubators are needed
60	Vedula, S., & Kim, P.H. (2019) Industrial and Corporate Change	Index development, semiparametric Cox hazard regression (data from a variety of public and private secondary sources, Kauffman Firm Survey)	(?)	Region (301 US MSAs)	Ventures in high-performance ecosystems perform better, higher survival chances (less important for serial entrepreneurs)
61	Wagner, M., Schaltegger, S., Hansen, E.G., & Fichter, K. (2019) Small Business Economics	Multiple embedded case studies (secondary data on selected support programs; primary data covered participant observation, workshops, interviews, and desk research)	Knowledge spillover theory of entrepreneurship, theory of change	Region (three German regions: Augsburg, Lueneburg, Oldenburg)	State of the ecosystem determines the required actions by its actors (often beyond their traditional remit)
62	Yamamura, S., & Lassalle, P. (2020) European Planning Studies	Qualitative case study with 10 expert interviews and industry and national institutions' reports	Proximity	Country (Malta)	Different forms of proximity allow for development of EE even in smaller, peripheral places and the emergence of industries

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Notes

1. Search date: 12 March 2020.
2. The structure of the table is adapted from Clough et al. (2018).

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