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Beyond territorial conceptions of entrepreneurial ecosystems: The dynamic spatiality of knowledge brokering in seed accelerators

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Abstract: In spatial terms, entrepreneurial ecosystems are mostly conceptualized as confined to a specific territory. At the same time, the growing relevance of entrepreneurship in digital fields is underlined. This paper argues that this is contradictory since territorial thinking underestimates the disruptive qualities of new entrepreneurial practices in the digital economy. Using process-based, qualitative case studies on seed accelerators from four regions: Amsterdam, Berlin, Detroit and Hamburg, this study seeks to explore knowledge brokering in entrepreneurship ecosystems and analyzes the corresponding spatial dynamics. Our findings imply that startups in digital fields share knowledge about business models and technologies in a way that is unattainable in classical knowledge clusters. Moreover, we show that most of the observed entrepreneurial practices in seed accelerators crucially rely on extra-regional resources and thus remain only incompletely embedded into the respective regions. Against the background of these results, we suggest that entrepreneurial ecosystems should not be primarily viewed as territorial phenomena. Instead, we suggest that the territorial view on entrepreneurship ecosystems should be complemented with a topological view that foregrounds entrepreneurship as a trans-locally shared practice that is tangent to different regions in different ways.

Keywords: Accelerators, Entrepreneurial Ecosystems, knowledge brokers, Trans-locally shared practices.

1 Introduction

The proliferation of digital technologies has given rise to new organizational forms and increased the importance of business model innovations (Autio et al. 2018). High-growth entrepreneurship is no longer restricted to high-tech ventures, instead many startups with digital business models have grown almost unprecedentedly in the past decade. Not by coincidence, the family of territorial innovation models (Moulaert/Sekia 2003) has recently welcomed a new member: Entrepreneurial ecosystems (EEs), which provide a holistic (Audretsch/Belitski 2016) or systemic (Alvedalen/Boschma 2017) approach to entrepreneurship. The EE approach seeks to integrate all aspects that contribute to the entrepreneurial process and the multiple ways in which they interact. Despite some disagreement on the dimensions, almost all authors include a territorial dimension as a distinctive feature of EEs (for an overview: Malecki 2018).

In this paper, we argue that the shift towards digital entrepreneurship should entail a more fundamental reconsideration of the underlying assumptions about the territorial embeddedness of EEs. Firstly, most of the territorial innovation models date back to the pre-digital times of the 1980s and 1990s. Since then, many of these concepts have been modified (e. g. by differentiating between “local buzz” and “global pipelines” Bathelt/Glückler 2011) to include the emerging conditions. Yet still, many authors argue that these modifications do not adequately recognize the disruptive qualities of the digital revolution (e. g. Shearmur et al. 2016). Secondly, territorial approaches to innovation have been criticized on conceptual grounds. The self-imposed empirical focus on territorial units of analysis has produced static representations of innovation processes (Ibert et al. 2015). A dynamic view offers new insights into the spatial dimension of innovation. Research on innovation biographies, for instance, demonstrates that most innovation processes are mobile and multi-local and thus evade the territorial boundaries of single regions (Ibert/Müller 2015; Tanner 2018). From this point of view, single territories no longer delimit innovation. Rather, regions can be starting points, transit stations or prelimi-

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nary termini of innovation processes (Schmidt et al. 2018). A static view on innovation would be particularly misleading when studying entrepreneurship, which is a complex process by definition, in which participants face shifting challenges and seek for different types of support at different stages (Müller 2019). In this case, the required resources and expertise are socially distributed and spatially dispersed. Therefore, during the process of developing a venture, participants rely on territorial *and* extra-territorial resources. Entrepreneurs may change the way they utilize their spatial contexts and move through space to access additional opportunities.

In this paper, we seek to explore the dynamic dimensions of innovation and digital entrepreneurship by focusing on a strategically decisive layer of EEs. Seed accelerators (Miller/Bound 2011; Drori/Wright 2018) are a novel organizational form, which systematically advances the entrepreneurial process, thereby disenchanting the once mysterious process of entrepreneurship. Recently, this new type of entrepreneurial assistance has proliferated globally (Hochberg 2016). Analyzing EEs through the lens of seed accelerators implies a shift from studying territorial units to studying relational dynamics. Seed accelerators are intermediary organizations that mobilize and redistribute financial, social and intellectual resources related to firm formation. With their focus on high-growth entrepreneurship and orientation on the diverse actors and resources mobilized during the process, this new organizational form seems to reside right inside the core of EEs (e. g. Spigel 2017; Malecki 2018).

We highlight the dynamic properties of entrepreneurship as a coordinated, collaborative and interdependent *process* (Packard et al. 2017). Seed accelerators provide a permanent organizational framework within which they launch temporary programs for cohorts of promising startup enterprises to develop their business models and eventually foster growth. Hence, key challenges change over time and different resources and actors may ascend to central roles (or may retreat) in the course of events (Müller/Ibert 2015; Müller 2019). In our analysis we ask how accelerator programs mobilize regional *and* extra-regional resources and in what spatial constellations these resources are integrated into entrepreneurial projects – a topic under-explored in recent literature on EEs (Alvedalen/Boschma 2017). We argue that territorial embeddedness of entrepreneurship is not treated as an *a priori* assumption, but as a dynamic variable requiring empirical exploration and substantiation.

Furthermore, we are concerned with knowledge-brokering as a crucial mechanism to facilitate entrepreneurship.

Autio et al. (2018) suggest that in the digital era, most newly founded firms focus on digital business model innovations instead of product or service innovations. Due to this shift, startups that compete in different markets can share business-related knowledge, even if they are competing with similar digital technologies. An atmosphere of voluntary collaboration goes beyond what is prevailing in classical sectoral clusters. It is therefore relevant to distinguish between the horizontal knowledge dynamics amongst startups, and the vertical knowledge dynamics between startups and their suppliers and customers.

This paper proceeds as follows: In the first section, we critically review the debate on EEs and define the current understanding of seed accelerators as knowledge brokers. Subsequently, we describe our research design, which is based on qualitative case studies in four regions: Berlin, Hamburg, Detroit, and Amsterdam. In the main body, we explore the spatialities of entrepreneurial practices and the prevalent knowledge dynamics within seed accelerators. Finally, we draw conclusions by discussing the relevance of our findings on seed accelerators for the conceptualization of EEs.

2 Seed accelerators as knowledge brokers in entrepreneurship ecosystems

2.1 From islands of innovation to islands of entrepreneurship?

EEs “represents the presence of multiple overlapping sets of attributes and institutions that encourage entrepreneurial activity and provide critical resources that new ventures can draw on as they expand or evolve” (Spigel 2017: 8). As such, EEs can be characterized as a holistic (Audretsch/Belitski 2016) or systemic (Alvedalen/Boschma 2017) approach to entrepreneurship. The concept seeks to integrate the magnitude of factors that contribute to the entrepreneurial process and the multiple ways in which these factors interact. Apart from this generic understanding, there is no single agreed upon definition of EEs (Spigel/Harrison 2017). However, almost all definitions include a territorial dimension as another distinctive feature (Stam 2015; Mack/Mayer 2016; Acs et al. 2017; Spigel 2017; Brown/Mason 2017; for an overview: Malecki 2018). As such, the literature on EEs builds on and expands existing debates on the endogenous drivers of

uneven spatial development (Brown/Mason 2017; Sorenson 2017). More specifically, the general idea of territorial innovation models (Moulaert/Sekia 2003), such as clusters or regional systems of innovation, is updated and variegated once more. The distinctive feature in comparison to these pre-existing concepts is the analytical focus, which is no longer on firms' competitiveness in general (cluster theory) nor on innovation (as the systems of innovation approach), but on entrepreneurial processes.

Some authors argue that the discourse on EEs should pay more attention to digital capitalism as an increasingly important driver of contemporary entrepreneurship. So far, the rise of the Internet and related technologies (e. g. online platforms, Langley/Leyshon 2016), as well as the impact of virtual socio-technical practices (e. g. online communities, Amin/Roberts 2008; Grabher/Ibert 2014), are greatly underdeveloped in territorial models of innovation (Shearmur et al. 2016). Due to the rising dominance of (digital) business model innovations, in a recent contribution, Autio et al. (2018) are among the first, who consider EEs as inherently linked to the digital economy, instead of just seeing digitalization as one of many aspects.

In their pioneering work on knowledge clusters, Malmberg/Maskell (2002) introduced the distinction between horizontal and vertical knowledge dynamics. The former represents knowledge sharing between firms who occupy the same position within the value chain, while the latter denotes forms of sharing knowledge between firms in a supplier-customer relationship. In traditional clusters, which stronger rely on product and process innovation, voluntary sharing of knowledge occurs mainly along the vertical dimension between users and producers, as both share an interest to advance new knowledge specific to the sector. In contrast, comparable firms who operate on a horizontal level, and serve similar markets, are usually seen as competitors and thus tend to employ secretive practices. If knowledge sharing takes place on a horizontal level in clusters, it is mostly conceived as involuntary knowledge spillovers (Schmidt 2015) and enabled through indirect means such as via market monitoring or labor market circulation.

In contrast, within EEs the focus on (digital) business model innovations has given rise to unprecedented forms of "voluntary horizontal knowledge spillovers" (Autio et al. 2018: 74). Digital ventures might use similar (mostly digital) business models, yet penetrate different market segments and different industrial sectors. Due to the absence of direct competition, it becomes more advantageous for the respective firms to share organizational, operational and technological knowledge voluntarily. Therefore, knowledge about the entrepreneurial process

(ibid.) circulates more freely within startup communities and provides startups with unprecedented opportunities to scale-up quickly. Hence, EEs are "largely industry agnostic" (Spigel/Harrison 2017: 158).

Most accounts on EEs accentuate a relational view. Drawing on a long tradition in entrepreneurship research, Alvedalen/Boschma (2017) refer to the significant importance of social networks for the entrepreneurial process in general and suggest integrating these insights into the conceptualizations of EEs. Along similar lines, Motoyama/Knowlton (2016) point out the relevance of studying the architecture of entrepreneurial networks rather than merely listing the components of EEs. Van Weele et al. (2018) highlight relational dynamics around the entrepreneurial process by drawing on the communities of practice terminology. In their view, closely knit "startup communities" unfold within single sites of work, but also within wider city-regions.

We argue that this relational dimension is highly relevant for EEs because it emphasizes the social mechanisms that facilitate knowledge flows between startups. While the role of regional network intermediaries for entrepreneurship has been studied before (Zook 2004, Ferrary/Granovetter 2009), the voluntary horizontal knowledge sharing identified above presents a new component that has not been identified before. The possible implications for the spatial and territorial boundaries of EEs are yet to be explored, which leads us to the core investigation undertaken in this paper.

We are concerned with the strong (Malecki 2018) and potentially premature emphasis put on the territorial dimension of EEs. The current debate runs the risk of projecting from "islands of innovation" (Amin/Cohendet 2004) to islands of entrepreneurship. While conceptualizations of clusters increasingly seek to integrate distant relations (e. g. Bathelt/Cohendet 2014), the EE discourse tends to start again with having an epistemological preference for proximate relations over distant ones ("proximity bias"; Grabher/Ibert 2006). We argue that the boundaries of regions should not be mistaken as the boundaries of the playing field of entrepreneurship. On the contrary, we seek to explore the geographies of EEs empirically and openly. We suggest that territories should not be defined *ex-ante* as the spatial entities to frame the empirical analysis. Instead, our approach is to trace the entrepreneurial process through space and time to identify practices of knowledge-sharing at different stages and to register their respective spatial dimension and dynamics. Our purpose is not to deny the relevance of a territorial dimension, but to treat **regions as a variable** that might or might not be mobilized in entrepreneurial processes, and if so,

for different reasons and in different ways. Procedural approaches have a long tradition in entrepreneurship studies (Steyaert 2007), but have become more popular for geographic inquiries only very recently (Ibert et al. 2015).

2.2 Seed accelerators as a structural feature of entrepreneurship ecosystems

Recent contributions to the EE discourse address various new mechanisms which facilitate voluntary horizontal knowledge sharing that are absent in traditional cluster theories, such as hackathons, pitch competitions, co-working and mentoring programs (Autio et al. 2018). Seed accelerators fit right at the heart of EE conceptualizations as they do not only use all of these new mechanisms but even combine them in fruitful ways. Therefore, seed accelerators are among the few “characteristic structural elements” of EEs (Autio et al. 2018). They are mostly found in central districts of large cities (Schmidt et al. 2016) and believed to provide a valuable “startup infrastructure” (Bliemel et al. 2018). We regard them as a key layer of EEs as it is difficult to imagine seed accelerators without integration into EEs. A focus on seed accelerators thus follows Malecki’s (2018: 5) recommendation to study EEs by focusing on their core recipes.

Seed accelerators evolved in the mid-2000s (Miller/ Bound 2011) and have experienced a remarkable proliferation in recent years (Hochberg 2016). Several hundreds of similar organizations have emerged globally, giving rise to a remarkable diversity of forms and approaches (Pauwels et al. 2016). However, despite this diversity, it is possible to synthesize some core elements of seed accelerators to a common reference model: As a “unique organizational form” (Drori/Wright 2018), seed accelerators offer a permanent organizational structure and material workaround for temporary programs (lasting between three to six months) to ‘accelerate’ the development of a cohort of entrepreneurial teams (startups). Access is granted only to a limited number of startups who prevail in a competitive application process. Seed accelerators typically address early-stage startups often comprising of only a small team of company founders, few employees, and a limited customer base, if any. The startups must also have promising growth prospective. During the program period, accelerators provide the participating startups with a variety of support to boost their development. Seed accelerators provide initial funding and non-monetary services like access to software and office spaces. After successfully accomplishing the program, the firms graduate from the program and leave the accelerator while the investment is upheld.

2.3 Conceptual framework: Seed accelerators as network brokers and facilitators of knowledge sharing

Accelerators have been described as “key intermediaries” (Goswami et al. 2018). As venture capital investors, they operate large networks of partners to source knowledge from different fields (Zook 2004; Klagge/Peter 2009). Knowledge brokering combines two distinct yet related social dynamics: network brokerage and shared practices.

First, in the terminology of structural networks analysis, brokers occupy strategically crucial positions in networks in which they are the only node that connects otherwise separated sub-networks (‘structural holes’; Burt 2004). This position offers ripe opportunities for a strategic agency which can be used in two ways (Simmel 1908). First, as a *tertius gaudens*, brokers can take advantage of the mutual ignorance of network partners and manipulate the respective parties for their own benefit (Obstfeld 2005). Second, as *tertius iungens* brokers show a more cooperative orientation toward connecting previously separated people within their social network. By “either introducing disconnected individuals or facilitating new coordination between connected individuals” (Obstfeld 2005: 102), the *tertius iungens* further benefits the whole network by enabling the recombination of otherwise disconnected resources.

In the case of seed accelerators, the cooperative attitude towards brokerage prevails. Seed accelerators maintain contacts with startups, serial entrepreneurs, venture capitalists, strategic investors, technology experts, entrepreneurship “gurus” and consultants, as well as leading representatives of firms and sectoral organizations. Analogous to the *tertius iungens* seed accelerator organizations create shared benefits by introducing promising startup enterprises to strategically important partners. As seed accelerators usually acquire equity in the startup ventures they support, the organization retains parts of the created benefits.

In terms of network structure, a seed accelerator organization forms the core node of many open triads consisting of two direct contacts. The seed accelerator introduces startups to other startups, startups to mentors/coaches and to industry partners. Through brokerage, the accelerator creates spaces of overlapping practices, thereby inducing knowledge dynamics along the horizontal and vertical dimensions (see figure 1).

Secondly, seed accelerators also initiate inter-personal “conversations” (Rutten 2016) by providing an organizational, social and material context for sharing practices and knowledge. As such, seed accelerator can be

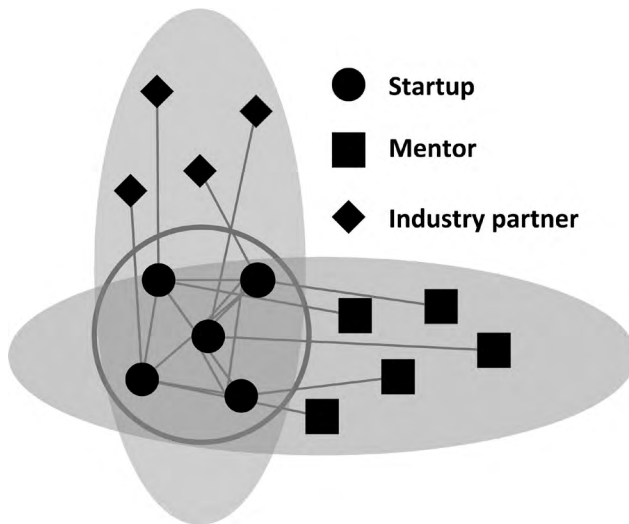


Figure 1: Brokerage during a seed accelerator program

interpreted as places that host different, overlapping communities of practice in which the knowledge and expertise required to establish a startup venture reside. Communities of practice denote groups of individuals who share the same set of practices or a similar concern and who voluntarily adhere to commonly cultivate rules that structure collaboration and interaction.

In their original conceptualization, Lave and Wenger (1991) describe communities as collectives of people who share practices in a locally situated setting and in physical copresence. Yet, participating in practice involves more than the actual engagement with a practice in a particular situation. It also encompasses more generalized forms of building up a shared professional identity. Newer conceptualizations (Amin/Cohendet 2004; Amin/Roberts 2008; Müller/Ibert 2015) acknowledge that communities are not restricted to single localities, but rather that community members perform the respective practices in similar settings at different places. Moreover, practitioners use various techniques to share practices across distance, including by traveling, visiting emblematic places, sharing documents, interacting on online forums – thereby enacting a complex geography of interrelated practices that unfold in many places at the same time (“constellations of practice”; Wenger 1998; Faulconbridge 2010 or “networks of practice”; Brown/Duguid 2001).

Following this, seed accelerators provide an important “infrastructure” (Bliemel et al. 2018) for startups, in that they host different, overlapping communities of practice. For instance, they often provide coworking areas in which the participating startup teams can collaborate on their projects and find opportunities to look at the other teams’ efforts. This socio-spatial setting supports the sharing of

knowledge on the horizontal dimension (see figure 1), as crucial experiences made during the process of firm formation are not only shared within but also across entrepreneurial teams (“startup communities”; Van Weele et al. 2018).

When introducing startups to business representatives, the seed accelerator organization initiates an interaction that might transform into a sustained vertical customer-provider relationship, in which entrepreneurial and sectoral practices can be recombined (figure 1). Such vertical interaction oversteps the boundaries of existing communities (“boundary practice”; Wenger 1998). Seed accelerators provide unique opportunities for previously unrelated practitioners to collaborate and for boundary practices to emerge (Kuebart/Ibert 2019). Thus, seed accelerators offer local access to trans-locally shared practices and unfold complex geographies of knowledge sharing, which we scrutinize empirically in the next sections.

3 Research design

As pointed out in section 2.2, seed accelerators are strategic entry points to explore the complex and dynamic geographies of EEs. We traced entrepreneurial processes in seed accelerators in time and space and studied the layout of their entrepreneurial programs to untangle these complex geographies. Our cases are thus not regions, but single seed accelerators.

In multi-site research, due to the difficulty of studying all accessible cases in great detail, it became necessary to balance the trade-offs between the width and depth of multiple cases (Elger 2010). We dealt with the related challenges by subdividing our study into two steps. First, we explored the width of the field by conducting “limited-depth case studies” (ibid.) on ten different seed accelerators in four regions. We then gained insight into the variety of the field and were able to replicate key findings across different cases (Yin 2014). The main impression after this initial step of “cross-case comparison” (Burns 2010), was that the organizational models and programs are fairly similar across cases and regions, despite the considerable scope of the contextual conditions. Second, to delve deeper into the respective practices and knowledge dynamics, three of the ten cases were further developed into “in-depth cases” (Elger 2010). For in-depth cases, we conducted additional interviews with a broader spectrum of different actor groups and intensified field observations.

Our cases are located in regions that differ in their level of startup activity and regional economic conditions. These differences are helpful to replicate findings regarding processes of knowledge mobilization under different local circumstances (Herbert 2010).

We accessed our cases in Berlin, Hamburg, Detroit, and Amsterdam. Berlin is one of the global centers of the startup scene, with many high-growth startups originating there (Acs et al. 2017; Brown/Mason 2017; Schmidt et al. 2014). Amsterdam occupies a less prominent position, but still witnesses a significant amount of entrepreneurial activity (Gauthier et al. 2017). Hamburg and Detroit, in contrast, occupy less prominent positions in the global system of startup centers. While Hamburg, the second biggest city in Germany, performs well in terms of economic development and shows strong concentration measures for knowledge-based sectors (Kujath/Zillmer 2010), the city of Detroit has been in a major structural crisis for decades (Peck/Whiteside 2016). The wider metropolitan area of Detroit however, still has a significant agglomeration of economic activity, and both Hamburg and Detroit have significant clusters of traditional industries (Detroit: automotive; Hamburg: media and logistics) that seek to renew their industrial base by introducing digital business models. Our sample includes both single and multi-site organizations (see table 1). All in-depth cases are multi-site accelerators and we collected data on them in two regions (DC1 – Berlin, and Detroit; DC 2 – Berlin and Amsterdam; DC 3 – Berlin and Hamburg). This ensured that our sample encompasses both horizontal and vertical dynamics of knowledge sharing.

Fieldwork took place between 2015 and 2017. To access accelerators in Amsterdam and Detroit, we conducted fieldwork during two trips to each city. In some cases, complementary interview data was collected through Skype interviews after leaving the field. In Berlin and Hamburg, interviews and observations were arranged more spontaneously. Our case studies are reconstructed from different types of data: First, we conducted 29 semi-structured expert interviews. Experts were defined as social actors who have privileged access to first-hand information on the aspects we are interested in due to their qualifications, professional experiences and/or organizational roles (Meuser/Nagel 1991). We conducted nine interviews with management staff of seed accelerators, eleven with startup executives and nine with mentors, venture capital investors, and regional policymakers. The interviews were all conducted in English or German, audio recorded and transcribed verbatim. Direct quotations from the German case studies have been translated. Second, participatory observation at 17 events, including eight demo days, was

Case	Interviews	Observations	Ethn. interviews	Region
DC_1	4	6	8	Detroit/ Berlin
DC_2	5	3	3	Amsterdam/ Berlin
DC_3	3	2	4	Hamburg/ Berlin
C_4	1	1	2	Berlin
C_5	3	0	0	Amsterdam
C_6	1	0	0	Detroit
C_7	1	1	0	Berlin
C_8	0	4	2	Berlin
C_9	1	0	0	Berlin
C_10	1	0	0	Berlin

Table 1: Research Design – cases and locations

used to “enrich” the interview data (Dowling et al. 2016). The events included public meetings (meet-ups or information evenings), semi-public events (like demo days) and some private events (like workshops or even parties). Access to the latter was made possible by invitations from our interviewees. At all of these events, field notes were taken during or shortly after the participation. During the observations, opportunities arose to conduct 19 additional spontaneous “ethnographic interviews” (Spradley 1979). This produced particularly valuable data as they provided us with access to less approachable actors like investors or mentors. As these interviews took place during the events, they could not be audio-recorded. Instead, summaries were included in the field notes (see table 1).

The resulting data set was analyzed in three steps. First, the data were coded in order to contrast organizational structures and program designs of the cases. Secondly, a process model for seed accelerators was established (described in section four). This model is mostly derived inductively from a cross-case analysis (Burns 2010) of the three in-depth cases, further strengthened by replicating findings in the remaining cases. The process model of accelerators provides a heuristic framework to foreground the relational dynamics unfolding in seed accelerators. Thirdly the data was coded once more to identify the specific aspects of how knowledge is mobilized during the different stages.

4 Spatio-temporal dynamics in seed accelerators

Like project-based organizations, seed accelerators enact a dialectic tension between linear and circular temporal logics (Ibert 2004). On the one hand, as permanent organizations, seed accelerators reiterate the same program, maintain networks to crucial actors and continuously observe new trends in the tech-scenes and startup communities. On the other hand, the programs themselves have a clear starting point and an “institutionalized ending” (Lundin/Söderholm 1995) and thus feature a linear understanding of time, a characteristic of temporary organizations. Accelerator programs subdivide the otherwise rather organic entrepreneurial process into three clearly demarcated phases: a pre-program, program, and post-program phase. The program starts with a kick-off event and it terminates with a final presentation of the firms’ achievements (demo day).

Seed accelerators bring together a complex set of actors: The *seed accelerator organization* itself consists of a small management team responsible for running the programs, providing services to startup firms and for (re) developing the program. Venture capital investors or corporate partners are also involved in both the long-term strategic development of the seed accelerator and the running of the programs. *Startup firms* usually consist of a team of founders around the CEO, responsible for business development, and the CTO, who is responsible for the firm’s core technology. Finally, seed accelerators cultivate extensive *networks to all kinds of third parties*. While many of these contacts remain latent, some are mobilized during programs. These third parties include mentors and coaches, potential client firms or service providers (see also figure 1). With each iteration the network of external business partners and alumni firms grows.

To assess the dynamic geographies of the entrepreneurial processes that run through accelerators, we followed the logic of the program by subdividing our analysis into three distinct phases: the pre-program, program, and post-program phase. For each phase, we identified different practices of horizontal and vertical forms of knowledge sharing, as well as the geographical origins of the involved actors and the spatiality of their interaction.

4.1 Pre-program phase: curating

A Attracting and applying

To establish “deal flow”, seed accelerators issue an open call. In terms of content, vertical knowledge dynamics predominate in the call, as the thematic focus of the program and the technological areas specified there largely reflect the interests of the seed accelerators corporate partners and strategic investors. The seed accelerator organization distributes such calls widely in global startup communities. Startup firms, in turn, react on open calls, addressing the profile of the program by handing in business plans. Based on this, both sides select or accept offers based on their actual interests. In our analytical terms, during the application phase, vertical knowledge dynamics prevail as entrepreneurial practices are combined with the sectoral logic incorporated in the call.

“We applied for different [seed accelerators], also were accepted several times and chose this accelerator because they took the lowest equity stake” (startup CEO_1, DC_3, Hamburg)

“We have an [online] application tool and each investor can view the application deal flow on demand. The structure is that the four persons of our management team do make the decisions whom to accept. The investors cannot decide on that, but they can vote on the applications, they can give judgments and they can signal ‘this is a team we consider extremely important’ (program manager, DC_3, Hamburg).

The sketched interrelated practices of advertising and applying reveal rather complex geographies. The circulation of calls is facilitated by digital media and has a global reach. As the second quote above suggests, interested entrepreneurs apply by filling out online forms and submitting the respective documents online. Physical copresence is thus not necessary, however, when advertising the program, elaborate measures of temporary physical copresence may be included. For instance, open calls are often also advertised during international “roadshows” (*field observations, DC_1, and DC_2 Berlin*) in certain regions from where the seed accelerator wishes to attract startups. Thus, a personal consultation might precede the formal application. Attracting and applying terminates with the selection of short-listed startups that are then invited to pitch in person. In this early phase of the process, the content of the call is derived from regional resources, while the global circulation of the call is done to mobilize extra-regional resources.

B Pitching and investing

Selection criteria for participants in the seed accelerator programs include the venture's fit to the strategic interests of corporate partners, market potential or scalability and, not least, avoidance of direct competition within the cohort. Although the criteria mostly represent the vertical logic of strategic investors or industry partners, the horizontal logic of knowledge sharing also is prevalent.

While some of the selection criteria can be determined from the submitted material, selection committees also apply intangible evaluation criteria, such as the internal team dynamics or the 'coachability' of the team.

"Being coachable, that is something that [name of seed accelerator] really believes in: 'Is the team coachable? Can they learn, listen, can they absorb information? And can they, sort of, pivot their model at need?' And we [...] did pivot." (Startup CEO_1, DC_1, Detroit)

To assess these softer criteria, representatives from the seed accelerator and the short-listed startups interact more intensively and in physical copresence to come to a final decision. For this, seed accelerators organize pitching-sessions during which the short-listed startup teams present their ideas and partners and/or investors interrogate them directly.

So, every startup, a few hundred, will put their idea on paper and apply. And the [accelerator] will select a few talks, the 20 best. And from that moment you will go into an event. And during that event, you will pitch all day. [...] Very competitive, yeah, but it does not really have a very competitive feeling about ... because they want to help every startup. (program manager, DC_2, Amsterdam)

The startups attracted by seed accelerator programs are both of regional and extra-regional origin. For the latter case, we observed national and international non-local firms. Between 2014 and 2018, a total of 179 startup firms ran through the programs organized in DC1-3. Only about 22 percent of the startups in these cohorts came from the same region, while on average about 65 percent were sourced internationally. This implies subordinate importance of regional origin for the curation of cohorts.

"Our startups are 60% coming from another country. So, from Germany, from Denmark, from Czech, from Poland, from Spain, from the UK." (program manager, DC_2, Amsterdam)

Again, the pitching of venture ideas and the recruiting of a cohort requires regional and extra-regional resources.

After the final decision about the composition of a cohort of startups, the accelerator invests an equity stake of five to ten percent in all participants. For the startups, this investment secures the operations during the program and ensures the teams' commitment to the program. For the seed accelerator, placing an investment establishes a lasting interest in the performance of the startup and provides a certain influence on future strategic decisions. Based on this enhanced mutual commitment, the startups relocate their team into the office space provided by the accelerator.

4.2 Program phase: fostering collaboration

The program phase starts with the relocation of a cohort of startups to a shared office space and lasts for a fixed timeframe, usually three to six months. During that time, the startup teams participate in manifold events organized by the seed accelerators' management.

"These 10 companies are working on a 24-hour base for 3 months potentially with each other. We have around 86 workshops." (program manager, DC_2, Amsterdam; similarly: program manager, DC_1, Detroit).

Participation in the program creates an atmosphere of exceptionality and transformation. Aesthetically designed work environments located in prestigious locations reinforce this sense of exceptionality. The aim is to motivate founders to leave the everyday business behind and to focus on transformative activities. Deadlines and milestones evoke a permanent time pressure for participants from day one, contributing to the atmosphere of exceptionality. Some participants report that these extraordinary conditions lead to a temporary boost in work intensity, with some reporting feelings like *"being in a tunnel"* (ethnographic interview startup CEO_2, DC_3, Berlin).

"Well, probably one of the hardest experiences we have ever been through. They ..., it is no joke when they state that they accelerate your business of a year and a half – in three months." (Startup CEO_1, DC_1, Detroit).

The temporary co-location leads to different forms of collaboration which are crucial to the entrepreneurial process. It enables horizontal knowledge exchange such as the exchange between startup teams (C. mutual engagement), startups and mentors (D. mentoring), or between startups and coaches (E. coaching). Moreover, the relocation into the region also affords vertical knowledge dynamics between startups and corporate partners (E. partnering).

C Mutual engagement: Co-working with other startup teams

The temporal relocation of several teams of founders into a shared office space helps to achieve horizontal knowledge dynamics. Firms learn by reciprocally engaging in each other's practices. These practices focus on rather generic entrepreneurial topics that all firms face, and less on the actual core technologies or industry-specific topics. This predominance of horizontal knowledge flows within the temporal startup community is well in line with Autio et al.'s (2018) perspective on EEs. By enabling the startups to pool their business knowledge within the group, the accelerator is fostering the competitiveness of the participants against outside incumbents. The selection rationale to avoid direct competition within the cohort as applied in the previous phase (see above), ensures that based on similar degrees of maturity and a shared interest in digital business models applied to dissimilar target markets, startups share knowledge voluntarily on the horizontal dimension.

Due to the temporary relocation, teams from different regions inhabit the same office space for a couple of months and become easily accessible to each other. This accessibility on a daily basis supports the voluntary horizontal knowledge dynamic described above. Depending on the accelerator model and team size, it's not always that the whole team has to relocate:

"The CEO has to join, CTO can join." (Ethnographic interview startup CEO_3, DC_3, Berlin)

This quote illustrates that the voluntary exchange of knowledge on a horizontal dimension crucially depends rather on the presence of management skills than technical expertise.

With all participating startups sharing a joint working space, accelerators aim to facilitate mutual collaboration by drawing on the mechanisms of workplace "startup communities" (Van Weele et al. 2018). The physical layouts of shared office and coworking spaces create situations of mutual visibility and opportunities to literally look over each other's shoulders.

Interviewer: Your relation to the other startups is it more on an informal base like you have lunch together or do you really talk about your business ideas? Person 1: Both I would say both and even in informal we would talk about our and their business but we also have some sessions almost, most of them self-organized [...] Interviewer: In this shared office-spaces do you also share any detail of your business with others or are there also things that you keep secret? Person 1: No, no don't believe in keeping secrets, no if they're interested or if we need help, we share everything to everyone (startup CEO_1, DC_2, Amsterdam).

D Mentoring: Guidance and advice

One of the main goals for the participating startups is to establish new and valuable ties with mentors. Mentors are mostly successful entrepreneurs or experts in a relevant field, such as legal or financial matters. Mentors, in other words, provide organizational expertise and act as role models. Mentor-mentee interaction largely unfolds horizontal knowledge dynamics, as these advisors' main qualification is their embodied expertise in entrepreneurship topics.

If locally available, mentors come from within the same region. However if necessary, seed accelerators mobilize expertise from around the world. In the latter case, the respective individuals usually travel to interact with startup firms directly. In some less typical cases, collaboration across distance is supported by digital media devices:

"A majority [of mentors is from] around here but it's also world-wide. So, we've had some mentors in China that would just do a Skype video. [...] We definitely have mentors across the world... Now the majority of them are definitely local so they can just come [...] in person. But some do just travel in, like mentors from New York or the West Coast and just stay for the day. That's pretty common." (program manager, DC_1, Detroit).

Seed accelerators facilitate the mentoring process with two interrelated practices. First, they arrange the match-making by offering an abundance of potential mentors from their network. Match-making is achieved through networking events, such as "mentor madness" (field notes, DC_1, Detroit and Berlin), during which mentors and startup teams can get in touch for the first time and test how well they fit each other. Sometimes the management team facilitates the contact through direct intermediation.

Once a contact has been established, mentors and mentees collaborate intensively. To be successful, mentors must become personally acquainted with the founders and access business processes to inspect them closely. This leads to a sequence of face-to-face meetings, usually inside the accelerator. Once mentors know the startup firm well, personal meetings can partly be replaced by mediated interaction across distance:

"Oh, yeah. We wake up to text messages from them. We fall asleep to e-mails with them. We have weekly calls with them. They [the mentors] are very hands-on. They are very hands-on." (Startup CEO_1, DC_1, Detroit)

Obviously, mentoring does require immediate encounters and frequent face-to-face conversations. Yet despite the necessity for frequent temporary copresence, mentoring cannot rely on regional resources alone. The personalized

entrepreneurial expertise of mentors is partly mobilized from all over the world and a lot of traveling is necessary to ensure the sharing of knowledge.

E Coaching: forming organizations

During a program, the participating startups undergo a transformation of their business model and the related organizational structures and routines. The degree of change can range from minor twists to a full “pivot” (changing the business model).

“We pivoted the product, the tool. We are going to create to solve a problem because it’s a huge thing. How do you enter the market the right way? That is a difficult question for us. [...] we need the win-win, which is difficult to find. [Seed accelerator] helped us to get a real concrete idea about that, yeah” (startup CEO_2, DC_2, Amsterdam)

No matter how radical the respective shift is, the underlying knowledge dynamics are mostly of a horizontal nature. What is perceived as a once-in-a-lifetime achievement from the founders’ point of view, is a rather standardized practice of forming organizations for the accelerator’s team. The shared knowledge itself is all but entirely new. Coaches adapt packages of consultancy from a wider set of predefined and standardized modules to the startups’ situation. Accelerator programs decompose entrepreneurial processes into manageable steps and re-arrange these sequences in various ways.

“It’s just a vision, a car wash. [...] They come in, and they go out. And during their period, you are in there for 3 months you are in there with 10 companies all smart city-related” (program manager, C_5, Amsterdam).

This “post-heroic” (Braun et al. 2018) approach to entrepreneurship largely relies on horizontal knowledge dynamics. Seed accelerators hire coaches to convey this rather generic knowledge to participating firms. Sometimes these coaches just give single workshops, in other cases, they participate in the whole program as entrepreneurs or technicians-in-residence. One interview partner described how he was working for DC_1 as an “associate, which means, I am working with the startups on hands-on developing tasks” (ethnographical interview, program employee, DC_1, Berlin).

The same interviewee has been involved with different accelerator programs in London and Berlin. This illustrates that it does not make a significant qualitative difference whether the coachable knowledge is sourced regionally or internationally.

The practice of sharing rather generic knowledge about the entrepreneurial process relies on both face-to-face encounters and the use of online tools. Generic concepts of entrepreneurship, like the “lean startup”, are combined with generally shared attitudes like “pivoting” and “fail fast,” frequently referred to in all our cases. These generic concepts are presented to the startups in workshops or adapted to the particularities of the startups’ situations in coaching sessions. Further, pertinent entrepreneurship “gurus” like Brad Feld, one of the co-founders of the prominent accelerator company Techstars, share knowledge in the form of best practices via a multitude of channels, including far-reaching blogs, webinars, and books (e.g. Feld 2012). Finally, all of the startups in our cases relied on cloud-based software tools for their organizational routines such as team communication, project management or marketing tasks. The software tools used were more or less the same among all of the cases, which also implies shared practices in using them. This organizational approach is also actively fostered by the accelerators, who provide free subscriptions for cloud computing platforms such as AWS or Microsoft Azure, on which many of the startups’ run, their backend. The knowledge about creating and running the underlying software architectures for cloud-based businesses is thus shared trans-locally as well.

In general, coaching is mobilized from wider, international startup communities through inviting internationally respected experts to the program. Yet the necessity to provide highly customized advice in face-to-face conversations and the generic quality of the taught knowledge requires regional sourcing to some degree. As the attractiveness of these practices increase with the celebrity-factor of the coaches, at least some of them are usually recruited internationally.

F Partnering: Making the business case

The corporate network of the accelerator helps to establish the supported firms on their respective markets by brokering contacts to “companies that are ready to work with startups” (case B, startup, Amsterdam). In the case of B2B services, seed accelerators introduce the startups to lead customers. In the case of B2C businesses, they are brought together with business partners such as marketing firms or platform providers.

“You’re bombarded with introductions and, and people. We liked the joke that now that we have gone through [seed accelerator], like our company will never fail because we were not able to get

introduced or meet person or company X. Like even if you told [seed accelerator] 'I need to sit down and talk with ... Obama and Elon Musk'. Like somebody in [seed accelerator] will get you that introduction". (Startup CEO_1, DC_1, Detroit)

Unlike the aforementioned practices, partnering unfolds clearly vertical knowledge dynamics. Throughout the program, startup firms get access to top-level executives from the targeted industries. Seed accelerators thus open doors to otherwise exclusive circles, allowing the startups to familiarize themselves with the logic of their potential future customers, suppliers or service providers. The focus is on specific industries:

"They have access to anyone at any organization. So, most of our customers have been inbound requests for word-of-mouth through [seed accelerator]. We have not had to do a lot of outreach on our own." (Startup CEO_1, DC_1, Detroit)

These vertical knowledge dynamics have a stronger local or regional orientation. Some of the respective firms from these focal industries invest financial capital in the accelerator program and thus act as strategic investors. As such, they have already influenced the design of the program and were included in the process of selecting participating firms (see above). Other firms are just part of regional industry clusters.

Regarding the locations of seed accelerator programs, a fit between the regionally accessible opportunities and the program's aims and scopes is pursued. They thereby refer to branded imaginaries of the respective metro-regions:

"That is what I call the 'Hamburg Way', that in Hamburg, we don't want to be like Berlin. We can't. [...] But our topic is 'from startup to grown up'" (program manager, DC_3, Hamburg).

"You know, where better else for automotive than in Detroit. [...] And I feel like in Detroit they understand automotive" (Startup CEO_1, DC_1, Detroit)

Apart from reenacting local or regional brands, the location of the program also has pragmatic consequences when it comes to collaboration with related sectors and industries. While Berlin and Amsterdam have particularly rich clusters of entrepreneurial support, business advice, and venture capital and thus support horizontal knowledge dynamics at the regional level, Detroit and Hamburg offer a large range of potential ties to customer industries and are thus more attractive for startups due to the regional opportunities they provide for vertical knowledge dynamics. While in Berlin customer firms often send their representatives to the region in order to attend the seed

accelerator programs, Hamburg and Detroit are valued for offering local access to customer sectors (automotive and media sectors).

"To build these net-relations and network with the industry usually takes time and [through the accelerator] we became a part of the, you know, the 'old boys' club' [...] It does not matter how much money you have, you know, you cannot just jump in and like start selling to them" (Startup CEO_2, DC_1, Detroit).

"We needed to get in touch with media executives and with publishers, you do not get in touch without knowing anybody. The media industry is a people business. They all know each other [...] and follow each other on Twitter. Without an introduction, you start talking with the caretaker, as silly as it sounds. [...] Because of this, we had to participate in the accelerator that offered us the largest network." (Startup CEO_1, DC_3, Hamburg).

Seed accelerators facilitate recombinant practices by arranging constellations of temporary copresence between startup teams and representatives from the addressed focal industries, and by translating between otherwise unrelated mindsets. However, an even stronger benefit of partnering is to not just get in touch with customers, but rather to co-create something together. Therefore, some accelerators offer the opportunity to develop a corporate use-case or prototype together with representatives of a client firm during their program (*program manager, C_10, Berlin*). These particularly rich vertical knowledge dynamics require frequent face-to-face meetings and on-site visits and thus require permanent colocation with customer firms. Partnering, in other words, is a rather regional affair.

4.3 Post-program phase: going the next steps

The end of the accelerator program is clearly marked with a "demo day". On this occasion, each startup in the cohort presents their results from the intensive period of firm formation to a larger audience of up to several hundred participants, including mentors, journalists, corporate partners, industry experts and, crucially venture capital investors. This extravagant event marks a point of culmination for the whole program. It terminates the efforts to transform the firm and marks the transition into the post-program phase. Short-term excitement shifts into long-term concerns.

G Maintaining: Nurturing a trans-local community

Once the program has terminated, the close contact between the accelerator and startup firms transforms into a latent long-term relationship. As the accelerator organization still holds equity shares, it retains some influence over their investees' future development and incidentally offers support:

"It's kind of like alumnae. So, they're always part of our network, we support them. We kind of have a saying "[Name of seed accelerator] is for life" [...] I'll talk to a lot of our companies on a bi-weekly basis... It's just not at force like the program is over but they are still building businesses, we're still helping them, it's just not constrained to 90 days." (program manager, DC_1, Detroit)

Once the demo day buzz ends, the participating startups move out of the shared office space and return to everyday business. The post-program practices clearly unfold horizontal knowledge dynamics. The startups transfer the shared entrepreneurial practices they learned alongside other cohort firms, and the business models they developed with mentors and coaches, into their everyday business. Although the ties between them become more selective and the collaboration becomes less intensive, due to the absence of copresence, many participants stay in contact after the program.

Even if the financial relationship between accelerators and startups terminates at some point, once the accelerator sells the shares in exit trade sale, IPO or management buy-out, the firm's expertise can still be mobilized in subsequent programs. Former participants might become part of the accelerator's network of industry contacts. "Alumni" events are integral parts of many accelerator programs.

"Being in the accelerator we did these weekly [mistake analysis]. We still do that internally. And then, sending update-e-mails to investors at some sort of frequency. It is a lot of things that they taught us, so it was like kind of going through a curriculum. So, I mean it is hard to pinpoint what we still use, but I think you, you know like once you go through school you are changed as a person because you now know all these things." (Startup CEO_3, DC_1, Detroit)

Moreover, many of these firms return to their regions of origin or to other regions. This implies that most of the ties to former collaborators and the seed accelerator organization have to be maintained over distance. From the accelerator's point of view, the startup transforms from a regional to an extra-regional resource. However, in some cases, the changes achieved during the program have been so fundamental that the startup firms choose to relocate to the region where they participated in the accelerator program.

"Two of the companies moved here permanently. 3 have plans to open offices here and one was already from here. So, 60% have some presence locally, the other ones, they're basically going back to where they came from. They haven't relocated somewhere different yet" (program manager, DC_1, Detroit).

With each iteration of the program, the accelerator creates an increasingly complex, spatially dispersed startup community that unfolds trans-local and horizontal knowledge dynamics. Ties that were formed in temporary copresence are now transformed into more superficial contacts that can be maintained across physical distance. However, these ties may be vital for the startup's further development, as they can develop into future client, advisory, service or investor relations.

5 Conclusions

In this paper, we oppose the widely shared assumption that EEs are primarily a territorial phenomenon. We focus our empirical analysis on seed accelerator programs located in the metro-regions of Amsterdam, Berlin, Detroit, and Hamburg.

We argue that seed accelerators provide strategically important points of access for an empirical analysis of EEs. Due to their strong focus on the resources and interactions required during entrepreneurial processes, we regard seed accelerators as core layers of EEs. According to Autio et al. (2018), voluntary horizontal knowledge dynamics among firms with digital business models are *the* distinctive characteristic of EEs. Seed accelerators do not only host many interaction formats that afford such knowledge dynamics, but also arrange them into complex sequences and seek to combine them purposefully (Kuebart/Ibert 2019). Moreover, the clearly distinguishable pre-/program and post-program phases facilitate a process-oriented analysis, something that most geographic studies on EEs have lacked so far.

Our findings show that seed accelerators broker collaboration to facilitate the sharing and co-creation of business-related knowledge. Some of the identified practices, like mentorship, coworking or coaching, afford the sharing of knowledge along the horizontal dimension. This knowledge mainly relates to digital business models and startup development in general. Other practices, like partnering, selecting and investing, also allow the sharing and co-creation of knowledge along the vertical dimension (see figure 2).

All identified entrepreneurial practices combined regional and extra-regional resources. They are thus

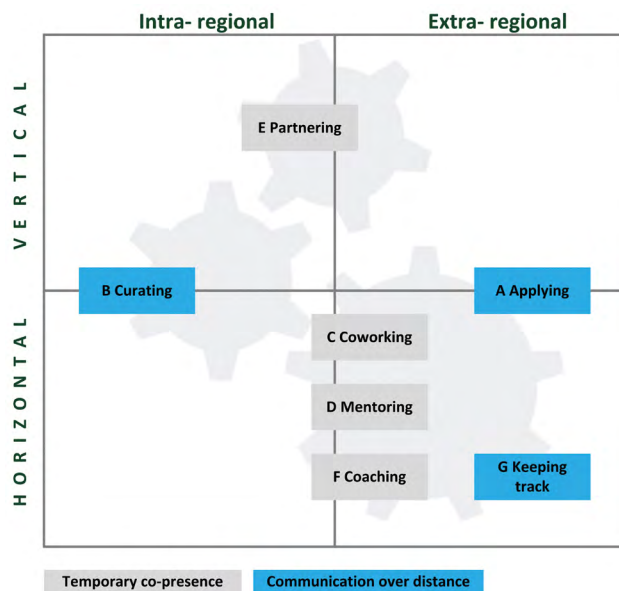


Figure 2: Relational dynamics during a seed accelerator program

incompletely embedded in the respective regions. For instance, most participating startups join from other, often international locations. Some of these ventures stay in the region after completing the program or even look for opportunities elsewhere, while most return to their original locations. Professional coaches are hired from around the globe to give workshops or to attend the entire program. Contrastingly, industry partners, typically stem from the same region.

The degree of territorial embeddedness of seed accelerators thus depends on whether horizontal or vertical knowledge dynamics prevail in the program. While practices to afford horizontal knowledge sharing (among startups or between startup and coaches/mentors) seem to be extra-regionally oriented, the formats of vertical knowledge exchange (startup–Industry partner) follow the agglomeration of target industries in sectoral clusters (like media in Hamburg or automotive in Detroit). In the pre- and post-program phase, seed accelerators interact over distance through mediated forms of interaction. During the program phase, they utilize temporary copresence created through mobility and relocation to offer new opportunities for sharing knowledge.

Taken together, these findings suggest that EEs unfold a complex and dynamic geography that stretches beyond the boundaries of single territories. Our analysis of entrepreneurial practices in seed accelerator programs suggests that the territorial view on EEs should be complemented with a topological view that highlights the boundary crossing and trans-local character of EEs.

The overall impression is that entrepreneurial knowledge on digital business models is based on rather generic approaches used in similar ways in different regions. By providing a physical setting and stable organizational framework for entrepreneurial practices, seed accelerators virtually “anchor” (Crevoisier/Jeanerat 2009) these practices in regions. Comparable to a church that provides a physical site for religious practices, seed accelerators offer a socio-material setting for diverse practices related to the entrepreneurial process to “touch down” somewhere. In a church, religious rituals can be observed in a highly situated and localized way. This, however, does not mean that the religion itself is primarily local. Similarly, the entrepreneurial practices that are cultivated in seed accelerators are performed locally and at the same time shared trans-locally in different regions around the globe.

Furthermore, and unlike churches, seed accelerators do not only host these practices, but also offer opportunities for participants to participate in related practices. This simultaneous participation in practices that habitually belong to separate spheres (e.g. sectoral practices of customers, practices of advancing digital technologies, and practices of venture capital investing) creates opportunities for recombination that fuel the entrepreneurial process.

Finally, seed accelerators foster trans-locally shared entrepreneurial practices which, during the temporary relocation, exist on the level of a local startup community based on a shared workspace (Van Weele et al. 2018). However, after the program, the shared practices are transferred to other regions and thus shared over distance (Grabher/Ibert 2014).

Of course, we do not suggest that regional differences or effects no longer exist. Seed accelerators mobilize territorial imaginations at different stages of the entrepreneurial process, yet they do so in different ways (the regions as brands, as a cluster of industries, as a pool of valuable contacts) and with different boundaries. Yet, from a topological perspective, we identify an archipelago-like pattern of trans-locally shared practices that tap into different territories. The respective regions differ in functional terms (e.g. Berlin and Amsterdam as startup centers vs. Hamburg and Detroit as sectoral clusters) and feature higher or lower concentrations of entrepreneurial activity. Rather than providing stable arenas within which entrepreneurship happens, territories can be either points of departure, transit stations or final destinations of entrepreneurial processes (Schmidt et al. 2018).

These findings open avenues for future research. First, we mainly focused our analysis on horizontal knowledge dynamics in entrepreneurial practices, and vertical knowl-

edge dynamics that integrate digital entrepreneurship into target industries. Our focus did not incorporate financial practices, technological expertise or political actions. While this was necessary to maintain the focus of this analysis, it provides opportunities for follow up studies focusing on the interrelations between several layers within EEs in a procedural and systemic way. Second, we traced entrepreneurial processes only in the specific field of startup firms participating in accelerator programs. It is up to future research to establish a more comprehensive procedural approach that covers wider entrepreneurial biographies.

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