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RESEARCH

A knowledge spillover narrative theory of entrepreneurship

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Abstract
This paper complements the knowledge spillover theory of entrepreneurship (KSTE) by introducing narratives as a vehicle to match people and places. While the KSTE explains that places differ in their economic activity by the key role played by new ventures in absorbing knowledge spillovers, the theory does not sufficiently address 'how' this leads to sustainable agglomeration effects. This paper complements the KSTE by introducing the spillover process of stories and narratives to attract people from outside, best described by a matching function of agents involved in all kinds of entrepreneurial activities—the knowledge spillover narrative theory of entrepreneurship (KSNTE). This refinement then explains agglomerations effects like entrepreneurial ecosystems induced by the stories and narratives told to match important people, solidifying the reputation of the location as 'the-place-to-be' for entrepreneurship.

Keywords Narratives · Knowledge spillover theory · Entrepreneurship · Entrepreneurial ecosystems

JEL Classification A13 · M16 · L26 · O30

1 Introduction: the spiritus loci

'To find out what the future holds, you have to come to Silicon Valley!' This narrative prevailed decades ago, peppered with a myth about new ventures created in garages, like Hewlett Packard and Apple, complemented with slogans like 'fail fast—try again' or 'move

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fast and break things' has made an apple orchard close to San Francisco[1] the world's hottest hot spot in entrepreneurship, the place to be for successful entrepreneurs—and a role model for all entrepreneurial ecosystems. Often copied but never achieved. Why? Because the narrative and the myth disseminated and its enduring success assured by a reinforcement mechanism, could not easily be replicated, and told for other places (Eliaz & Spiegler, 2020; Hubner et al., 2022; Roundy, 2016). Narratives generate beliefs by interpreting long-run correlations between these variables. What defines a narrative is the variables it incorporates and the way these are arranged in the causal mapping from actions to consequences. Places thus differ according their 'myth', the specific stories told. As Eliaz and Spiegler (2020) theorize, such a myth may enter a competition of competing narratives, a competition for the best minds to produce knowledge spillovers, the best talents to exploit these spillovers by new venture creation and the best agents to support them.

A narrative theory of the entrepreneurial ecosystem, the myth in the air, the story behind the story, the success of places over others is not only in economic terms. What lies behind the myth of a particular place, such as "a generosity of spirit" (Link, 1995), has led to an unequal spatial distribution of innovations, new firm creation, social and economic welfare? Transforming a place towards *the* genius or spiritus loc? In this paper we wrench open the black box of Alfred Marshalls (1920) 'myth in the air' by introducing narratives as a further variable explaining the white noise, the 'residual' in regressions estimating the endogeneity of place-based economic growth. There has been a long tradition explaining the economic growth and welfare of places since Marshall by variables based on new ideas and innovation as drivers of economic growth, along with other measures of economic and social performance (see Shakiba & Belitski, 2024), leading to agglomeration effects. Urban economists argue that such agglomeration effects are the result of the co-location between firms and people, enabling them to accrue benefits that ultimately emanate from transport costs savings since it is easier to connect with a neighbour, like supplier, consumer or access to a dense labour pool (Glaeser and Gottlieb, 2009, Glaeser, 2008; Audretsch, 2015). Such transportation costs must be interpreted very broadly, not only including the infrastructure of transporting physical goods and people, but more importantly the exchange of ideas, the transmission of information and disseminating of knowledge (Audretsch, 2015). Agglomeration effects then exist when productivity rises with density caused by lower transportation costs, inducing clustering effects by attracting additional firms and people to benefit from the agglomeration effects, which further reduces the costs that density can play in facilitating the flow of goods, people, knowledge, and ideas, and particularly the finance enabling these flows (see Colombo et al., 2023).

Taking such agglomeration effects as endogenous spurred the development of a fruitful theory in macroeconomics, the 'endogenous growth theory', including the seminal work of, Lucas (1988), Romer (1990), Krugman (1991) and Aghion and Howitt (1992). According

[1] The story about the apple orchard in the San Francisco Bay is part of the narrative told. It was in 1951 when *Frederick Terman*, dean of the school of engineering at Stanford University at that time, proposed leasing Stanford's lands for use as an office park to provide local employment-opportunities for graduating students to address the financial demands of Stanford's growth requirements. Terman invited only high-technology companies and also found venture capital for civilian-technology start-ups. The first tenant was *Varian Associates*, founded by two brothers and Stanford alumni in the 1930s to build military-radar components. *Hewlett-Packard,* founded by Stanford graduates Bill Hewlett and David Packard in 1939 in Packard's garage, became one of the major success-stories, when moved its offices into the Stanford Research Park shortly after 1953, General Electric, Eastman Kodak, or Lockheed Corporations followed.

to the endogenous growth theory, economic performance is mainly driven by investments in R&D to generate innovations that could then be commercialized by established firms. However, while including investments on R&D, either by the private or public sector, further explains some of the white noise, a remarkable share of the statistical variation of the endogenous growth variable remains unexplained. This has led some scholars to wonder about the theoretical assumptions underlying the regression models. Audretsch (1995) was among the first challenging the assumption that only large and established companies are the main drivers of innovations. He instead posited that innovations are also endogenously shaped by the knowledge commercialized outside established companies. This provoking hypothesis has been tested empirically in several studies, in particular by Acs and Audretsch (1987, 1988). Moving beyond their findings, Acs and Audretsch tried to explain the underlying logic of why and how the dynamics of entrepreneurial ventures, particularly in the knowledge-based sectors, increased so rapidly, resulting in a fundamental change in the industrial structure and dynamics. They argue that the creation of a new venture is a response to opportunities stemming from knowledge generated but not commercially exploited by incumbent firms or academic research institutions (Acs et al., 2012, 2013; Ghio et al., 2015). While incumbent firms are often unable or unwilling to recognize the potential value of these opportunities (e.g., they are unwilling to implement new products or processes that are not consistent with their core competencies and technological trajectories), this knowledge spills over from its source by the conduit of prospective entrepreneurs creating a new venture. This has led to the development of the knowledge spillover theory of entrepreneurship, KSTE, and has since then become a standard framework analysing why places differ in their growth rates and related performance measurers (see Audretsch & Lehmann, 2005, 2017, 2022; Audretsch et al., 2006; Morris et al., 2024). A subsequent plethora of empirical studies confirm the KSTE. Still there remains unexplained variation in the data, along with remaining open questions. One important question that must be solved is the 'why'. Why are some places, like the Silicon Valley, or the Research Triangle Park (Link & Scott, 2003) such hot spots in producing knowledge spillovers by their outstanding research institutions. Similarly, why is there such a vibrant entrepreneurial scene? Why are other places also outstanding in their scientific output but less dynamic in terms of innovation and economic growth? But when the myth lies in the local air, why and how does this air not only shape locals but also out-of-towners to create new ventures? How are people aware of the atmosphere, the existence of local agglomeration effects, beyond the ones which are easy to measure? The answer is—the narrative, the stories told. Narratives are an adaptation to the circumstances driving agglomeration effects, making places 'the place to be'. The pattern of circumstances are patterns of technological and institutional rules (Hodgeson, 2015, p. 16). Technological rules heavily depend on the laws of physics and chemistry, and much of technological knowledge often consists of rules. Specific pattern of knowing such rules, exploiting, and applying them are part of the circumstances of a place, as well as the related institutions, such as universities and science and technology centres. Institutional rules, however, are often more malleable, constrained by culture, nature, and social practicalities. Just as places differ according to their technological rules, they also differ in their institutional rules, not only legislated laws, but also and more importantly in the contemporary economy, rules of communication, rules of governing behaviour in organizations and places, cultural rules, and different degrees establishing or changing them (Hodgeson, 2015, p. 17). Places differ

according to the rules of producing, absorbing, and exploiting knowledge spillovers and thus agglomeration effects.

We posit that knowledge spillovers emanating from knowledge sources, such as research universities, laboratories or R&D intensive companies are only one side of the coin, even assuming that much of this knowledge is tacit, requiring in person interactions and thus close geographic proximity. 'Knowing how' and 'knowing that', the knowledge rules (Gibbons & Prusak, 2020, p. 187), are perhaps necessary but not sufficient in explaining the spatial agglomeration effects of economic activities in general and, in particular, entrepreneurship (Glaeser, 2008). But knowing the knowledge rules of places may favour advantaged places when competing for firms and people to locate and further enhance the agglomeration effects. Narratives are then the adaptation of the technological and institutional rules, centred in a story, a myth, that spreads over. Narratives are a type of knowledge, tacit knowledge, according to Polanyi, who popularized the idea of 'tacit' knowledge, arguing that '*we know more than we can tell*' (Polanyi, 1966, p. 4, italics in original). We follow Link et al. (2007) and Michelacci (2003) by positing that matching increases the propensity of academics and scientists to engage in the knowledge spillover process because 'knowing how' and 'knowing that' must be matched together and that the matching mechanism matters (Hayter et al., 2023). Knowledge spillovers are neither generated by chance nor are they absorbed or commercialized by chance. It is also important to match people generating knowledge spillovers by combining different skills and talents congruent with Griliches's knowledge production function (1979), and to attract people to absorb and commercialize unutilized knowledge. The matching mechanism between inventors and economic agents who commercialize the inventions is most effective when both parties have access to R&D and entrepreneurial skills (Michelacchi, 2003). The matching process, we argue, is shaped by the narrative.

The paucity of research in the entrepreneurship literature concerns us not only because stories are prevalent in economies and places, but we also are convinced that stories play an important role in entrepreneurship that shed light on why local and spatial entrepreneurship exist and prosper in certain locations, while other places suffer. In brief, we suggest that storytelling and stories may induce a kind of entrepreneurial capital and entrepreneurial knowledge, of which entrepreneurial culture is a leading example, only partly captured by what has been characterized as the knowledge spillover theory. Thus, we believe that the knowledge spillover theory made popular by giants in the field of endogenous growth theory, just as Lucas, Romer and even Alfred Marshall, needed a refinement. Not only does knowledge spill over but also narratives as well.

In the next section we briefly introduce the pillars of the narrative knowledge spillover of entrepreneurship, namely the narrative itself, then types of narratives for places and the spillover mechanisms of narratives. We then conclude by speculating on how such a refined knowledge spillover theory inspires future research in analysing and explaining entrepreneurial agglomeration activities in places and the use and misuse of the narrative knowledge spillover theory of entrepreneurship.

2 The knowledge spillover narrative theory of entrepreneurship

The knowledge spillover narrative theory of entrepreneurship (KSNTE) aims to explain why places exhibit considerable variance in their economic performance and social welfare, and that this spatial inequality is long-lasting. At least four components are responsible for the variation of economic performance measures. First, the production of knowledge in incumbent organization (Audretsch & Stephan, 1996; Audretsch et al., 2022; Link & van Hasselt, 2023). Second, the existence of a knowledge filter that impedes the commercialization by the incumbent organization creating that knowledge (Acs et al., 2012; Audretsch, 1995; Audretsch et al., 2004). The third is a base of talents to absorb, exploit and then commercialize the spillovers by the creation of new ventures, i.e. entrepreneurship (see Audretsch, 1995; Audretsch & Lehmann, 2005; Audretsch & Belitski, 2013). Finally, the fourth is a matching mechanism to select, motivate and coordinate individuals within this production process, the narrative that forms the entrepreneurial ecosystem (see Audretsch & Lehmann, 2023). The first three strands of the literature are the basic pillars of the well know KSTE, namely the production of knowledge, along with its spillover, absorption, and exploitation by newly created third-party ventures. The fourth strand of the literature is the narrative theory of entrepreneurship (Audretsch & Lehmann, 2023). All four strands revolve around the concept of knowledge: the production of knowledge, the spillover and absorption of knowledge, and finally narratives as tacit knowledge. We therefore introduce how the concepts of knowing, knowledge and information are integral to how narrative and stories fit into these subjects but first start with a brief definition of narratives and stories.

2.1 Narratives and stories

The scholarly literature has recently focused on the importance of narratives and stories in trying to explain how entrepreneurs discover opportunities. While opportunities are, on the one hand, exogenous, enabling entrepreneurs to tap into them given a certain context, on the other hand, the creation perspective mandates that opportunities are 'endogenously generated through processes such as creative imagination' (Lachmann, 1986) and effectuation (Sarasvathy, 2001). Garud and Giuliani (2013) were among the first who use the term narrative perspective to suggest a certain stance toward entrepreneurial agency germane to the issue of discovery and creation, 'specifically, a narrative perspective considers agency as an emergent property of relational processes involving ongoing associations between humans and artifacts.' (p. 158). Brattström and Wennberg (2022, p.559) argue that entrepreneurs must 'learn to become skilled cultural operatives who can develop stories about who they are and how their resources or ideas will lead to future benefits for consumers and society'. Lounsbury and Glynn (2002) and van Werven et al. (2019) document that new ventures use stories as structured accounts enabling them to gain legitimacy from relevant stakeholders such as investors, competitors, and consumers.

Gartner (2007) provides a simple definition for narrative approaches, namely an analysis of 'the stories that people tell' (p. 615). Shiller (2017, p. 986) similarly describes the narrative as 'a simple story or easily expressed explanation of events that many people want to bring up in conversation or on news or social media because it can be used to stimulate the concerns or emotions of others, and/ or because it appears to advance self-interest' and as 'a gem for conversation' that 'may take the form of an extraordinary or heroic tale or even a

joke. It is not generally a researched story, and may have glaring holes, as in urban legends. The form of the narrative varies through time and across telling, but maintains a core contagious element, in the forms that are successful in spreading.' Narratives create their own little sequence of a film in our minds, into which we can place ourselves. These associative links help us to make connections with others, an important ingredient for successful places like those bestowed with vibrant entrepreneurial ecosystems. It is the immediate relative character of narratives, which enables individuals to establish a relational connection to other individuals in a given place or location through impressions, feelings and cognition, and to empathize with them. Thus, through narratives, different actors obtain a mutual relational bond that is manifested through a shared experience and this shared understanding of narratives is fostered by a common ground of norms, values, and experiences that find expression in the narrative, and enhances the spillover mechanism.

As a medium, various possibilities come into consideration for the narrative: Narratives can be simply told, or they can be transported in the form of symbolism, film, music, or other forms of artistic expression. Here it is not necessarily central how the narrative is told word-for-word. Rather what is crucial is that the imagery of the recipient be addressed. The own imagination decorates narrative and allows each recipient to create his own connections from place and time with the narrative. Thus, each recipient gives the narrative his or her own meaning through his or her individual connections. However, the awareness of the collective meaning of the narrative is always present, since narratives are processed under the assumption of how the peer group understands and interprets the narrative.

2.2 Knowledge, what knowledge?

When referring to knowledge and how and why it matters for outcomes, studies typically refer to Arrow (1962) and argue that knowledge may have an economic value which presents opportunities for exploitation and commercialization, particularly for entrepreneurship (Audretsch & Link, 2012). However, what Arrow discussed is information, and what entrepreneurship scholars have in mind is knowledge. While knowledge is a widely understood and used concept in the field of entrepreneurship, it remains 'too slippery to handle', as Edith Penrose (1959, p. 77) pointed out, in contrast to information (see Audretsch & Lehmann, 2023).

Figure 1 depicts the concept of knowledge. A first categorization of knowledge dates back to Ryle (1945), a British philosopher, who distinguished between what people know (knowing how) and how knowing could be used and transmitted (knowing that). The first is called 'knowledge' and the latter is the widely used text-book concept of 'information', either private or public and accordingly asymmetrically or symmetrically distributed (Gibbons & Prusak, 2020, p. 187). Polanyi (1966) then popularized Ryle's thoughts on 'knowing how' and 'knowing that', distinguishing further between tacit from codified knowledge, arguing that we know more than we can tell. Since Polanyi (1966), tacit knowledge is a widely used concept in the field of entrepreneurship and has emerged as the basis for a broad spectrum of spillover and agglomeration effects. Tacit knowledge refers to ideas implicitly understood as embodied in individual skills and abilities, which typically are difficult and costly to communicate,, even on a personal level. Codifying tacit knowledge adds value to the content of explicit knowledge and stories and narrative are an important way to codify tacit knowledge for communication and transmission. Tacit knowledge becomes useful and

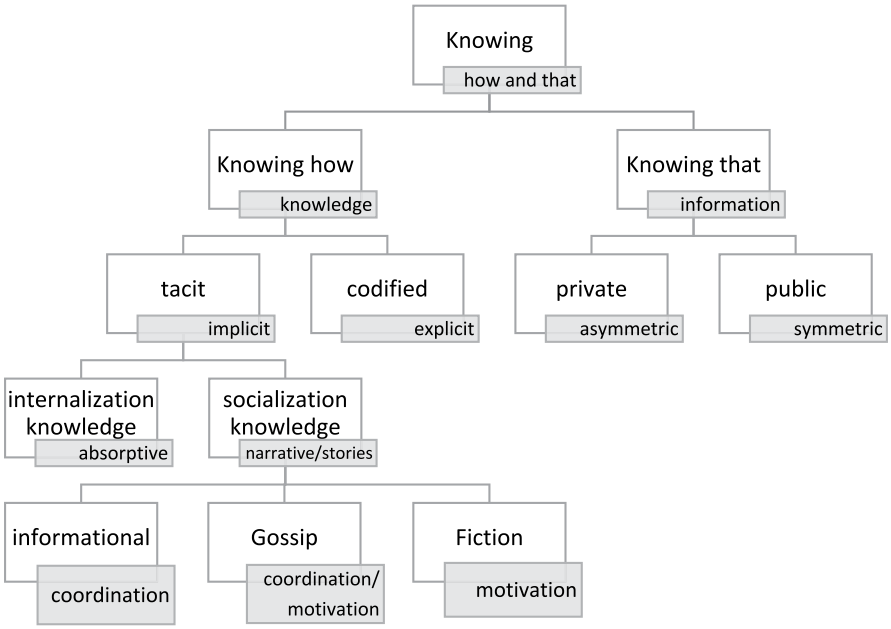

Fig. 1 The concept of knowing. *Source*: Audretsch and Lehmann (2023, p. 1608)

valuable to others only when it's shared by those who possess it. By communicating tacit knowledge in a compelling and understandable manner, such as stories and narratives, the value of the tacit knowledge is leveraged and multiplied considerably, albeit to team members internally within the organization or externally to partners in other organizations.

The narrative, as emphasized by Davenport and Prusak (1998) is such a method for communicating meaningful knowledge. A narrative, a story or a tale is any account of a series of related events or experiences, presented through a sequence of written or spoken words, still or moving images, or any combination of these. In most people's childhoods, narratives are used to guide them on proper behavior, cultural history or formation of a communal identity and values (as especially studied in anthropology today among traditional indigenous peoples), simply because 'narrative comprehension is among the earliest powers of mind to appear in the young child' (Bruner, 1991, p. 9). In the fields of ethnology, history, and literature, among others, narratives and stories are organized into several thematic or formal categories, such as overcoming the monster, voyage and return, rags to riches, or from the dish washer to the millionaire (see Audretsch & Lehmann, 2023). In the following, we introduce narratives and stories as a vehicle to match people with place as the focal point of the matching process. Taking the narrative 'from the dish washer to the millionaire', the dish washer is searching for the perfect place with the best resources for them to absorb and exploit to become a millionaire (or to have at least the chance to become one). The narrative then leads to a selection of people towards a particular place, either an unbound ecosystem (Audretsch et al., 2024) or a cluster or a city (see Audretsch & Belitski, 2017) In economic theory, matching is a mathematical framework to describe the formation of mutually beneficial relationships over time—the so-called matches (see Petrongolo &

Pissarides, 2001). A matching function is, in general, analogous to the well-known knowledge production function introduced by Griliches (1979), representing the formation of new relationships from the pools of available unmatched individuals. In our setting, the matching function then describes the beneficial mutually relationships across scientists, talented entrepreneurs, talented employees, specialized investors, and the place-based infrastructure. The spatial dimension of the knowledge production function (Griliches, 1979) is dictated by the localization of the matching function, or where the 'place of interest' is the geographic context where the narrative is told and spills over. In the following, we will introduce three categories of narrative and stories, along with why and how they serve as a vehicle to match people within the narrative knowledge spillover theory of entrepreneurship.

2.3 Categorizing narratives for as a matching mechanism of places

Narratives and the strategic management of place (Audretsch, 2015; Audretsch et al., 2023) has become popular in the last years with the emergence of the 'ecosystems' literature, including research analyzing entrepreneurial ecosystems (Audretsch & Lehmann, 2023). As Gill and Larson (2014) put it, places, like ecosystems differ, because their narratives differ, and different places may shape different narratives for different recipients, according to the place-specific factor constellation. Place-specific factor constellations, as Hubner et al., (2022, p. 215) argue, drive place-specific narratives, which create and reinforce tendencies towards specific entrepreneurial approaches. Roundy (2016) was among the first suggesting three typical narratives in the emergence and development of entrepreneurial ecosystems: success stories, historical accounts, and future-oriented narratives. Similarly, Roundy posited the existence of a six outcomes: transmitting place culture; making sense of the place; constructing place identity, legitimating places; garnering attention for places; charting the ecosystem's future.

In a more recent study, Hubner et al. (2022) provide compelling examples, based on interviews, of how narratives shape specific strategies, i.e. they either encourage 'effectuation' when focusing on building partnerships and utilizing the networks and encouraging confidence and speed, or 'causation', when they focus on developing systematics and structured plans. They show that narratives in Silicon Valley seem to facilitate effectuation, while in Munich causation, and in Singapore both. Burnell et al. (2023) identify six types of entrepreneurial narratives—an identity narrative, an opportunity narrative, a projective narrative, a failure narrative, a pivot narrative, and a resourcefulness narrative. They identify specific strategies to shape each of these narrative types.

While these categories and outcomes are undisputedly important, we instead rely on the categories of stories developed by Audretsch and Lehmann (2023) (see Table 1), which complements the effectuation-causation literature. Causation has been suggested as a decision-making logic with a predefined goal, like to develop a vaccine against Covid-19, while effectuation has been suggested as a logic when the goal cannot pre-defined in advance. Causation thus occurs in industries like biochemistry, or in the development of more powerful computer chips, while the development of a new generation, like quantum chips, falls in the category of effectuation. And, of course, there exists also a mixture of both, when the goal can be predefined, but very vague, and uncertainty still dominates the development and market process.

Table 1 Categorizing stories and narratives for places

Type of story/narrative	Ability of the storyteller	Spillover and matching mechansism	Examples
Infotainment	To communicate and transmit information about the place (university, science labs, entrepreneurship scene) to a few and specific people to match them: scientists in specific fields (engineers, scientists in biochemistry), with specialiced VC and financiers and founders	narratives and success stories of the place (the home of the inventor of Aspirin, the place where star scientists work together, the 'place-to-be' Presentations and talks at conferences and events, reports in selected magazines and field journals, mouth-to-mouth propaganda, social media channels for selected group members	Narrow niche clusters and ecosystems based on specific fields in science, technology or engineering Biotechclusters, the MIT engineering cluster, small but highly concentrated cluster[a]
Gossip	Stories and narratives to bring together and match a larger group of different people	Narratives about 'the place to be' ('If you can make it here, you can make it everywhere'). Stories about the history of the place (long tradition of new firm creation, where entrepreneurs are born and made). Media campaigns in events, use of social media and influencers	Clusters or entrepreneurial ecosystems focused on almost existing industries, like gaming, App developpment, delivery services
Fiction	Stories and narratives to match a huge group of people	Future oriented narratives of places (where the next generation of computing will be born, where the problems of the future are solved, where the next Apple, Microsoft, etc.… is born), massive use of social media and influencers	Entrepreneurial ecosystems for scalable and future oriented solutions in a 'winner-takes-it-all' contest, like AI applications, requesting a heterogeneity of specialists in different fields to realize economies of scale and scope

[a]Examples for Germany are provided in Audretsch and Lehmann (2015), like the world's largest cluster for medicine and live sciences measured by the number of firms around the city of Tuttlingen (about 60,000 inhabitants)

The first category of narratives and stories is about infotainment, in that they are narratives and stories told to transmit information about a place to coordinate and match a pre-defined group of people, such as scientists in a specific scientific field, such as biochemistry or genetics. Places may create stories and narratives about the excellence of research institutes and science parks to attract scientists, specialised venture capital firms and other types of financiers, along with students and graduates and other talented people and potential founders of new firms in specific fields. In this sense, knowledge means knowing the right words to use to attract the right people to the right place. This falls in the causation process category, where goals can be predefined, such as in biochemistry. Vehicles are success stories of renowned universities and companies to legitimate the palace as 'the place to be' for a specific group of people. Such places are often advertised as a specific cluster, such as a biotech cluster, an engineering cluster, or the contemporary example of a specialized

entrepreneurial ecosystem. An example is the biotech cluster in Sophia Antipolis, France, with narratives about the historical success of the place and the myth and narrative of the founding process, which occurred half a century ago.

The second kind of story, like gossip, is used to attract and match a larger group of individuals. Examples include scientists to produce knowledge spillovers in different scientific fields and founders to absorb and exploit these spillovers, financiers to provide the necessary financial resources and, of course, people willing to work in these companies. Narratives contain a mixture of recent success stories, historical account, and some future oriented narratives. Narratives created and told transmit the culture of the place, like the creativity of the people and a vibrant creative scene, or what Roundy (2016) describes for ecosystems as 'making sense of the place'. Spillover mechanisms are conventions, like the 'Bits and Brezels' in Munich, where famous entrepreneurs give talks and thus advertise Munich as 'the place to be' for entrepreneurs. Such narratives are often told by politicians to champion their region and they spill over via various channels, like TV, YouTube videos, reports in magazines and newspapers but also diverse social media channels. Industries could be characterized by both causation and effectuation, when goals could be predefined, even very vague, but the contextual factors are rather uncertain. Cappa et al. (2021) show for crowdfunding that projecting potential futures for given projects, it is important to provide a compelling case tailored for specific stakeholders.

Finally, fictional stories play a key role for places. Fictional stories about places require the ability to transmit and communicate a large set of information over things which did not (yet) exist or are rather just constructs like the building of new research labs, investment in future oriented infrastructure like green energy, quantum computing or laboratories. Narratives are therefore visions about the future framed around a specific place as the 'it' place—this is the place to match the generation of people trying to solve the problems of the future and to find solutions for problems which are not yet known. These are 'the big stories', the narrative, like saving the planet, cleaning the oceans, interlinking the world, beating the pandemic, or just making the world smarter. Fictional stories and narratives are predominant in situations of effectuation when contingencies are seen as opportunities that should be leveraged rather than avoided (Hubner et al. 2022).

3 The spillover mechanism

What do the Californian gold rush, narratives, knowledge spillovers and the recent Covid-19 epidemic have in common? They all started with one individual and then spread to others. Such effects, characterized as infectious or contagious effects, all follow the same logic. A logic, first expressed by Anderson Gray McKendrick, a Scottish military physician and epidemiologist, and William Ogilvy Kermack, a Scottish biochemist, which became known as the Kermack–McKendrick theory of epidemics and was published in 1927. Their theory predicts the number and distribution of cases of an infectious disease as it is transmitted through a population over time. During the Covid-19 pandemic, this theory re-gained worldwide attraction in the mass media, each day presenting the contagion rate c, i.e. whether c is increasing ($c>1$), i.e. the pandemic is spreading more and more, or is declining, when $c<1$ (see "Appendix 1").

However, even before the pandemic, Nobel laureate Shiller (2017) introduced the Kermack–McKendrick or ISR-Modell, which he popularized in his bestselling book *Narrative economics: how stories go viral and drive major economic events* (2019). Shiller (2017) applies this model to describe the word-of-mouth transmission of a story or narrative. The contagion rate is the fraction of the time in an encounter in which someone becomes infected, in that, a person interested in and accepting of a story or narrative, effectively convinces the susceptible enough of the story to spread it further. Many encounters may be needed before a particular person is infected. The removal rate might be described as the rate of forgetting, of simple decay of memories, but there is also cue-dependent forgetting. This removal also occurs as the repository of other current stories evolving from this story, so that there are declining cues for the memory; this story seems less connected, less apt, or even superficially contrary to current theories and prejudices. It might be plausible to suppose, as the model does, that contagion rates and removal rates are both constant through time, if they are intrinsic to the narrative. Inaccurate retellings of the narrative that leave out its essential interest value, because of transmission error, do not survive; the parameter c refers to successful spread of the core interest value of a story or narrative. The core model may apply no matter how people connect. Airports, railway stations and classrooms drastically spur the infection rate, resulting in a type of super spreader. This holds for conventions, social media contacts and other means of mass communication. This model implies that from a small number of initial infected, or people convinced by the story or narrative, the number infected and contagious itself follows a bell-shaped curve, rising at first, before subsequently falling. At the end, when successful, the place becomes what is characterized as an agglomeration effect, namely path dependences—like the Silicon Valley. The narrative still holds and diffuses to people outside the place. A self-enforcing process, starting with a mouth-to-mouth process, like the 'traitorous full eight', who founded Fairchild Semiconductor, or the company founded by Hewlett and Packard in a garage (see Audretsch & Lehmann, 2023).

4 Conclusion and future research

This paper complements the knowledge spillover theory of entrepreneurship by introducing narratives as a vehicle to match people and places. While the KSTE explains why places differ in their economic activity, and in particular the key role placed by new ventures that absorb and exploit unused knowledge by serving as a conduct for the spillover of that knowledge, the theory does not sufficiently address the 'how'. How does knowledge spill over? How are knowledge spillovers generated? How are spillovers absorbed and commercialized? The answer is, at least in some cases, by people outside the place. Previously low-population places, like the fields around San Francisco, became hot spots with a high dense population. When places change their norms, culture, economic activities, and social life, this could be either because the inhabitants living there are changing their minds, their way of life, or their values, perhaps from generation to generation, or by migration flows, attracting people from outside the place. People with specific skills and abilities, but also different values, norms, and attitudes. How can this migration be shaped? One way is through stories told about the place, by narratives. Just as the USA became the dreamland for migrants from Europe a few hundred years ago, driven by the narrative of the Land of unimagined

possibilities, places today tell stories about their unimagined possibilities to attract people and companies. Narratives told about the unimagined possibilities to work in their research laboratories and universities—to produce knowledge spillovers—which are then detected, absorbed, and commercialized by talented entrepreneurs, financed by special interest investors, venture capitalists and business angels, as well as a minor army of other people supporting the entrepreneurship scene. Places differ not only by their initial place-specific factor constellation, but also by the stories told and the narratives developed to select and attract people. We describe these mechanisms as an analogy to the knowledge production function introduced by Griliches (1979) as a matching production function, with narratives as the matching mechanism. Places thus not only develop over time and by chance, but also by the narratives told which spill over, transforming a place toward a genius and spirit loci, the 'place to be'. The spillover mechanisms, either narratives or knowledge, by mouth-to-mouth or other mechanisms, follow the logic of an epidemic, as introduced by Shiller (2017). The more people are infected by the narrative, the higher is the probability that they select themselves for the place with the most compelling story told. People similarly leave from or avoid a place with a narrative that repels them. The narrative increases the matching probability of people in a particular place, thus enhancing agglomeration and can show long-lasting, since path-depending and self-enforcing effects. Not without reason, as Audretsch and Lehmann (2015) show for Germany, do some outstanding industry clusters exist since over a century in the same industry sectors. We conclude that narratives should be included in the KSTE to explain how places could be transformed to a successful place. Applications of the Narrative KSTE could be ecosystems, either real or digital (Audretsch et al., 2024). Implications for policy makers are then at hand, as Wapshott and Mallett (2024) claim: Policymakers should also serve as pitch makers, since stories and narratives shape the context in which entrepreneurs operate. But also, as Gartner (2007) put it out, the stories of entrepreneurs, small businesses and other relevant stakeholders may not only shape the way scientists think about entrepreneurship but also influence the enterprise policy formulation process (Wapshott & Mallett, 2024).

However, while the importance of narrative and stories in coordinating and motivating people in general is undisputed, the effects should not be overestimated. In particular, the 'ex post' effect must be considered—ex post ergo propter hoc, or we are always smarter with hindsight. Successful stories are almost always told after the success, after the combination of necessary inputs, such as supporting institutions, finance and investors, infrastructure, public policies among others to spur or promote a place by new venture creation. Even policymakers promote their place as becoming 'the new artificial ecosystem', the 'high-tech cluster of the future', or 'the place where entrepreneurs are born'. Such stories are often nothing else than cheap talk.

To sum up, the topic of 'narrative entrepreneurship' holds considerable promise because it analyzes why some places, *ceteris paribus*, outperform others. We hope that this paper may add to stimulate future research, both empirically and theoretically. Besides empirical tests about the causation of narratives (Hubner et al., 2022), which kind of narratives are told in different places, what constitutes successful narratives (see Kyprianou et al., 2024) and which ones not. Perhaps the most important issue and ingredient in a narrative about an entrepreneurial place in the context of the KSTE is the role of finance and in particular 'entrepreneurial finance' (Colombo et al., 2023; Meoli et al., 2024; Vismara, 2022). Future research should include the role of financial institutions both as an exogenous variable: how

entrepreneurial finance shapes the narratives of places, and endogenous variable– how narratives shape the clustering of financial institutions (see Audretsch & Lehmann, 2023). A second empirical question to be answered is whether future entrepreneurs move to a place to commercialize an unutilized opportunity, and if the answer is affirmative, whether they are attracted by the narrative told or by other kinds of communication.[2]

Besides a more elaborated empirical analysis, future research should also strengthen the theoretical background. First, by including entrepreneurial finance into the production function, testable hypotheses on the impact and complementary function of narratives can be subjected to empirical scrutiny. Access to finance is a necessary condition for a functioning entrepreneurial ecosystem, and narratives could be an important compliment. Theoretical modelling could then quantify the effect of narratives as an elasticity that strengthens or weakens the availability and access of entrepreneurial finance, along with other important resources of a place.

A second theoretical contribution would be to model the effect of narratives as a signaling mechanism to coordinate agents in producing and absorbing knowledge spillovers–entrepreneurs (like in Spence, 1974). It is of great interest for all agents, whether narratives provide a signaling-equilibrium, where the desired agents are coordinated or as a pooling-equilibrium, where also undesired individuals are attracted in a place by a 'true story' or desired individuals are attracted by a 'false story' (like in Becker & Murphy, 1993; Milgrom & Roberts, 1986). Finally, future research needs to analyze competing narratives and whether some narratives told are cheap talk, gossip or reflect reality, and whether they fulfill a function to coordinate and motivate economic agents as a focal point (Schelling, 1960). To conclude, as McCloskey (2016) suggests, ideas and thoughts to motivate individuals for economic actions like new venture creation are crucial, and ideas and thoughts may be stimulated by narratives told, and exploited by the place-to-be.

Appendix

The narrative matching production function

For example, in the context of job formation, matching functions are sometimes assumed to have the following 'Cobb–Douglas' form:

$$mt = M\left(u_{t,}v_t\right) = nu_t^a v_t^b$$

In this equation, u represents the number of talented entrepreneurs, in the place at a given time *t* seeking for ideas and spillovers to create a new venture and *v* reflects the number of investors, scientists or other agents to fill their demand. The number of new relationships (matches) created (per unit of time) is given by *mt*. *n, a, b* are positive constants. *n* is in analogy to the total-factor productivity (TFP) in Cobb–Douglas functions and expresses the multi-factor productivity of a place, say the infrastructure or what makes the place 'the place to be'—the core of the narrative or story. While under most simplifying assumptions about the production technology, growth in *n* becomes the portion of growth in output not

[2] We are grateful for this and the following comments by an anonymous referee.

explained by growth in traditionally measured inputs of labor and capital used in production, here, the growth in n is explained by the myth in the air, the story told, the narrative. Finally, a,b, are scale parameters, with $a+b\sim 1$ suggesting constant returns of scale.

The narrative spillover mechanism

Shiller (2017, pp. 974–975) applies the Kermack and McKendrick (1927) mathematical theory of disease epidemics to model the spillover mechanisms of narratives. In this framework, the total population $N=S+I+R$ is assumed constant. Where S represents the number of susceptible, I the number of infectives and R the number of recovered individuals. The key idea of the model is that in a thoroughly mixing population the rate of increase of infectives in a disease epidemic is equal to a constant contagion rate $c>0$ times the product of the number of susceptible S and the number of infectives I minus a constant recovery rate $r>0$ times the number of infectives. The three-equation Kermack–McKendrick SIR model is:

(1) $\frac{dS}{dt} = -cSI$

(2) $\frac{dI}{dt} = cSI - rI$

(3) $\frac{dR}{dt} = rI$

Each time a susceptible meets an infective there is a chance of infection. The number of such meetings per unit of time depends on the number of susceptible-infective pairs in the population. The recovery from the disease is assumed for simplicity to occur in an exponential decay fashion, instead of the more usual notion of a relatively fixed timetable for the course of the disease. However, a more elaborated theoretical modelling of the disseminating of narratives should take into account that while a 'recipient' of a virus cannot choose whether to get it or not once exposed, a 'recipient' of information can choose whether to act on it or not. This leads to different kinds of nonlinearities in the ways narratives spread depending on many factors like educational backgrounds, social relationships and social networks, individual political views, and individual preferences. A comparison of a viral spread with a partially inoculated population, as in the previous Covid-19 pandemic, would be a better analogy for the Narrative KSTE.[3]

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Declarations

Competing interests The authors declare no competing interests.

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