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The Relational Organization of Entrepreneurial Ecosystems

Ben Spigel

Entrepreneurial ecosystems have emerged as a popular concept to explain the persistence of high-growth entrepreneurship within regions. However, as a theoretical concept ecosystems remain underdeveloped, making it difficult to understand their structure and influence on the entrepreneurship process. The article argues that ecosystems are composed of 10 cultural, social, and material attributes that provide benefits and resources to entrepreneurs and that the relationships between these attributes reproduce the ecosystem. This model is illustrated with case studies of Waterloo, Ontario, and Calgary, Alberta, Canada. The cases demonstrate the variety of different configurations that ecosystems can take.

Introduction

Entrepreneurial ecosystems have become a popular tool in the study of the geography of high-growth entrepreneurship. Ecosystems are the union of localized cultural outlooks, social networks, investment capital, universities, and active economic policies that create environments supportive of innovation-based ventures. They are seen within the academic (Acs, Autio, & Szerb, 2014; Feldman, Francis, & Bercovitz, 2005), policy (Isenberg, 2010; World Economic Forum, 2013), and popular business literature (Feld, 2012; Hwang & Horowitt, 2012) as a critical tool for creating resilient economies based on entrepreneurial innovation. But research on ecosystems is underdeveloped and undertheorized. Ecosystems represent more of a conceptual umbrella encompassing a variety of different perspectives on the geography of entrepreneurship rather than a coherent theory about the emergence of sustainable communities of technology entrepreneurs. This fosters a tendency among policymakers to import best practices from thriving ecosystems without regard to the underlying local economic and cultural attributes on which their success depends (Harrison & Leitch, 2010). This is in part due to the tendency for research on entrepreneurial ecosystems to focus on individual cultural, economic, and

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policy elements while ignoring how the interdependencies between these elements create and reproduce the overall ecosystem (Motoyama & Watkins, 2014).

This article addresses this gap by examining the attributes constituting entrepreneurial ecosystems, the relationships between them, and how they influence the competitiveness of new ventures. In order to be an effective theoretical construct, entrepreneurial ecosystems need to be more than a label for regions with high rates of entrepreneurship. Rather, ecosystem theory should focus on the internal attributes of ecosystems and how different configurations of these attributes reproduce the overall ecosystem and provide resources to new ventures that they could not otherwise access. This helps differentiate the outcomes of a successful ecosystem—high rates of entrepreneurship—from the internal processes and governance strategies that creates and sustains it. It also emphasizes the fact that there are multiple ways an ecosystem can develop.

Illustrative case studies of Calgary and Waterloo, Canada are used to explore the different possible configurations of entrepreneurial ecosystems and how this affects the types of resources entrepreneurs can draw from to start and grow their firms. Calgary's ecosystem is driven by its strong local oil and gas market, which creates numerous opportunities for new ventures and attracts highly skilled workers and financial capital to the region. Waterloo's ecosystem is driven by an underlying entrepreneurial culture that fosters strong networks of entrepreneurs, advisors, and investors and well-performing public entrepreneurship training and support programs. Despite their different configurations, both confer significant benefits to new ventures, suggesting they are supportive of entrepreneurial ecosystems.

The following section reviews existing theories about entrepreneurial ecosystems and related concepts of clusters, regional innovation systems (RIS), and networks. Ten core cultural, social, and material attributes of entrepreneurial ecosystems are identified. The next section goes on to discuss the relational structure of these attributes within an ecosystem. The article argues that successful ecosystems are not defined by high rates of entrepreneurship but rather how the interaction between these attributes creates a supportive regional environment that increases the competitiveness of new ventures. This is illustrated by case studies of entrepreneurial ecosystems in Waterloo, Ontario and Calgary, Alberta. These case studies demonstrate the different possible configurations of entrepreneurial ecosystems and the implications this has for the entrepreneurship process within them. The article concludes with a discussion of the implications of this new perspective of entrepreneurial ecosystems and suggestions for directions for future research.

The Structure of Entrepreneurial Ecosystems

The Attributes of Entrepreneurial Ecosystems

Entrepreneurial ecosystems are combinations of social, political, economic, and cultural elements within a region that support the development and growth of innovative startups and encourage nascent entrepreneurs and other actors to take the risks of starting, funding, and otherwise assissting high-risk ventures. As originally defined by Dubini (1989) ecosystems (or as she called them, environments) are characterized by the presence of family businesses and role models, a diverse economy, a strong business infrastructure, available investment capital, a supportive entrepreneurial culture, and public policies that incentivize venture creation. Others like Spilling (1996); Neck, Meyer,

Cohen, and Corbett (2004); and Kenney and Patton (2005) highlight features such as skilled workers, lawyers, and accountants specializing in the needs of new ventures, and large local firms or universities to act as talent attractors and spinoff generators. More recent work by Isenberg (2010) and groups such as the World Economic Forum (2013) have argued that accessible local and international markets, available human capital and financing, mentorship and support systems, robust regulatory frameworks, and major universities are the most important pillars of an ecosystem.

Thinking about entrepreneurial ecosystems draws on a heterodox literature that includes work on clusters (Delgado, Porter, & Stern, 2010; Marshall, 1920; Porter, 1998, 2000), innovations systems (Cooke, Gomez Uranga, & Etxebarria, 1997; Fritsch, 2001), economic geography (Feldman, 2001; Malecki, 1997), social capital (Westlund & Bolton, 2003), and networks (Sorenson & Stuart, 2001; Stuart & Sorenson, 2003). While these approaches differ in their methodological and conceptual outlooks, they share a common belief that certain attributes exist outside the boundaries of a firm but within a region that contribute to the competitiveness of a new venture. In general, these perspectives emphasize three main regional resources that contribute to increased entrepreneurship and growth. First, shared cultural understandings and institutional environments that ease interfirm cooperation and normalize practices such as knowledge sharing and firm mobility (Gertler, 2003; Henry & Pinch, 2001), or act as barriers to this kind of activity (Saxenian, 1994; Staber, 2007). Second, social networks within regions create pathways for knowledge spillovers between firms and universities (Owen-Smith & Powell, 2004), help spread information about entrepreneurial opportunities (Arenius & de Clercq, 2005), and connect entrepreneurs with financiers (Powell, Koput, Bowie, & Smith-Doerr, 2002). Finally, government policies and universities can help support these cultures and networks by removing institutional barriers to entrepreneurs, training skilled workers and entrepreneurs, and funding specific support programs such as networking events and incubation facilities (Feldman & Francis, 2004).

There is an obvious harmony among the concepts of entrepreneurial ecosystems, clusters, and RIS. Each argues that a major part of firms' competitive advantage is related to the resources found within the region rather than residing solely within the firm (Asheim, Smith, & Oughton, 2011; Porter, 2000). These regional resources may include access to a shared regional labor pool, local knowledge spillovers, or connections with nearby research universities. However, the precise role of entrepreneurial firms and how they benefit from these externalities differs among the three concepts. Cluster theory has long separated localization economies—the savings due to colocation of firms in the same vertical industry, such as shared infrastructure or lowered transportation costs—and agglomeration economies, the advantages found by being in an environment filled with other firms in the same market with whom they can collaborate and share knowledge (Malmberg and Maskell, 2002). The latter are more important to entrepreneurs, who are given "the advantages of a business environment tailored to their specific needs, even in situations when they might still be unaware of what these needs might be or how they may best be accommodated" (Maskell, 2001, p. 933).

Entrepreneurial ecosystems resemble what Markusen (1996) describes as Neo-Marshallian Industrial Districts: clusters built on the networks between multiple small- and medium-sized firms who simultaneously cooperate and compete within the same industry or supply chain. These clusters benefit firms through the continuous circulation of tacit knowledge and the normalization of particular routines such as cooperation and learning. Entrepreneurial ecosystems are similarly marked by this type of relational governance and lack a clear power hierarchy or formalized enforcement methods that could impede informal interaction between firms (Bell, Tracey, & Heide, 2009; Pitelis, 2012).

However, at the same time, there are clear differences between clusters and entrepreneurial ecosystems. Firms in clusters benefit from being colocated near other firms in the same industry or supply chain because they can cooperate to serve larger clients and learn from each other's production techniques (Piore & Sabel, 1984). This is not necessarily the case for entrepreneurial ecosystems, where entrepreneurs are more likely to share a core technology (such as computer coding) rather than a common client or market. Entrepreneurs can exchange knowledge about the challenges of growing an innovative venture and the presence of many entrepreneurs in a region helps build up a support structure such as networks of investors, advisors, and mentors. The advantages of an entrepreneurial ecosystem are related to *resources specific to the entrepreneurship process* such as startup culture and financing rather than other types of industrial benefits found in clusters that accrue to firms of all sizes and ages.

While cluster and innovation system theories provide important clues to how these resources build up and flow between firms, the underlying mechanisms are not necessarily identical. However, drawing on this work and the extant literature on entrepreneurial ecosystems can help to highlight several key components of regional economic and social systems. These include the presence of entrepreneurs, workers, investors, and mentors; favorable government policies; research universities and other sources of innovative knowledge; availability of local customers; and an entrepreneurial culture that encourages risk taking. These attributes provide resources that new local ventures could not otherwise access such as managerial experience or a skilled workforce. The following sections detail the most commonly cited attributes of entrepreneurial ecosystems and discuss how they provide resources and benefits to entrepreneurs and new ventures. These attributes can be broadly grouped into three categories: cultural, social, and material based on how their benefits are created and governed.

Cultural Attributes

Cultural attributes are the underlying beliefs and outlooks about entrepreneurship within a region. There are two main cultural attributes of entrepreneurial ecosystems: cultural attitudes and histories of entrepreneurship. A number of scholars have examined how localized cultural outlooks affect the larger regional entrepreneurship process (e.g., Stuetzer, Obschonka, Brixy, Sternberg, & Cantner, 2014; Vaillant & Lafuente, 2007). For example, Aoyama (2009, p. 500) argues that regional cultures influence entrepreneurial activities "by shaping acceptable entrepreneurial practices and norms." Saxenian's (1994) comparison of Silicon Valley and Boston famously showed how cultural attitudes toward entrepreneurship and risk taking led to radically divergent economic and entrepreneurial paths. Cultural beliefs normalize outlooks about entrepreneurship, making it seem a standard part of a person's career path or as something to be undertaken only when no other options are available (Kibler, Kautonen, & Fink, 2014). This helps create a milieu surrounding the entrepreneurship that supports firm creation and encourages others to support risky entrepreneurial endeavors (Ritsilä, 1999).

Prominent histories of entrepreneurial success stories are an important part of these cultural outlooks (Feldman et al., 2005). Stories of successful local entrepreneurs who found startups that went on to become large, global market leaders can inspire younger entrepreneurs to undertake similar journeys (Feld, 2012). Just as importantly, local policy makers can mobilize these stories as part of larger entrepreneurship campaigns (Nelles, Bramwell, & Wolfe, 2005). Examples of successful entrepreneurs within the community provide a central focus for discussing the benefits and possibilities of entrepreneurship

and demonstrate that it is a potential career path for students coming out of secondary education. This helps ensure a stable supply of new entrepreneurs and further legitimizes the status of risk taking within the region's culture.

Social Attributes

Social attributes are the resources composed of or acquired through the social networks within a region. The importance of social networks and social capital to the entrepreneurship process is well documented (Nijkamp, 2003; Stuart & Sorenson, 2005). Social networks act as conduits for new knowledge about opportunities and technologies (Owen-Smith & Powell, 2004), help new ventures obtain access to financing (Shane & Cable, 2002), and influence entrepreneurial outlooks and skills (De Carolis & Saparito, 2006). The ability of new ventures to benefit from these networks requires pre-existing connections among entrepreneurs, investors, and other entrepreneurial actors as well as sufficient trust among those parties to encourage the sharing of scarce resources (Kwon, Heflin, & Ruef, 2013). There are four main social attributes of entrepreneurial ecosystems: the networks themselves, investment capital, mentors and dealmakers, and worker talent. Discussions about the importance of dense social networks to entrepreneurship within a region date back nearly three decades (Aldrich & Zimmer, 1986). Networks help entrepreneurs gather market and technological knowledge, acquire resources such as investment capital, and gain access to customers and suppliers (Greve & Salaff, 2003; Hoang & Antoncic, 2003). Networks tend to be locally focused with the densest links forged by frequent face-to-face interactions (Schutjens & Völker, 2010). While connections outside the region are critical for importing novel knowledge, dense social networks within a region create a "buzz" of knowledge flow that helps entrepreneurs tap into knowledge streams they would otherwise not be able to access (Bathelt, Malmberg, & Maskell, 2004).

Investment capital—financing from institutional investors like venture capitalists, high net-worth angel investors, or the entrepreneur's own family and friends—are critical components of an entrepreneurial economy (Malecki, 2011). Investment capital is a necessary catalyst for startup growth, and investors act as advisors to firms, helping them navigate the challenges of growth. As discussed above, almost all risk capital invested in startups is channeled through the social networks of investors (Fritsch & Schilder, 2008). Social networks help investors identify new firms to invest in and reduce the information asymmetry between the firm and the investor (Shane & Cable, 2002) while more informal investors might rely on the trust contained within their social ties to ensure their investment is used properly (Steijvers, Voordeckers, & Vanhoof, 2010). The presence of local investors deeply connected with the local entrepreneurial community is necessary to catalyze the growth of entrepreneurial firms.

The third social attribute of entrepreneurial ecosystems is mentors and dealmakers. Having a mentor increases an entrepreneur's performance (Bosma, Hessels, Schutjens, van Praag, & Verheul, 2012; Ozgen & Baron, 2007) and their presence in a region increases overall firm formation and survival rates (Lafuente, Yancy, & Rialp, 2007). More recently, Feldman and Zoller (2012) have drawn attention to what they call dealmakers: actors with high levels of social capital who proactively build new connections between entrepreneurial actors, helping to improve firm formation and growth within regions. These are people who "live and work in a region and take responsibility for the stewardship of the place" (Feldman, 2014, p. 4). This highlights the importance of individual actors like successful business people or philanthropists in building a sustainable

entrepreneurial ecosystem. Mentors and dealmakers assist entrepreneurs in developing new business skills and help them build their localized social capital.

The final social attribute of ecosystems is worker talent: skilled employees accustomed to the specific demands of working at a small firm. High levels of human capital are a necessary precursor for success in the modern knowledge economy, and skilled workers are a key component of the competitiveness of new ventures (Audretsch, Falck, Feldman, & Heblich, 2011; Qian, Acs, & Stough, 2012). This includes both technical workers as well as experienced managers who can help entrepreneurs as their firms grow and mature. Both entrepreneurs and workers use their social networks to find good matches, adding to the value of dense social networks within a region (van Hoye, van Hooft, & Lievens, 2009). Workers in supportive entrepreneurial ecosystems need more than technical skills; they must also have a similar tolerance for risk as entrepreneurs themselves in order to thrive in the chaotic environment of a startup. The availability of skilled workers who are accustomed to these challenges is a key resource for new ventures.

Material Attributes

The material attributes of an ecosystem are those with a tangible presence in the region. This presence can be a physical location, such as a university, or formalized rules like entrepreneurial policies and well-regulated markets which materialize locally. There are four types of material attributes: universities, support services and facilities, policy and governance, and open markets. Universities provide two main resources to an entrepreneurial ecosystem. First, they develop new technologies that create entrepreneurial opportunities (Lawton Smith, Chapman, Wood, Barnes, & Romeo, 2014). Academic entrepreneurs can take these opportunities to market, or they can spill over into existing startups (Krichhoff, Newbert, Hasan, & Armington, 2007; Shane, 2004). Established firms are able to access the knowledge of universities through hiring graduates, commissioning research, or through more informal knowledge spillover vectors like discussions with faculty or public talks. Universities help develop the human capital of a region while simultaneously fostering entrepreneurial mindsets in its students, encouraging them either to start new ventures or to work within them (Wolfe, 2005).

Support services and facilities provide specialized assistance for early-stage firms. These include services such as accountants, patent lawyers, and human resource advisors who are accustomed to the unique challenges that small firms face and who offer services aimed at early ventures such as equity-for-service arrangements (Kenney & Patton, 2005; Patton & Kenney, 2005). Support firms allow startups to access capabilities they do not possess internally while support firms benefit from a large number of local clients. Incubation, acceleration, and coworking facilities also provide essential services for new ventures by furnishing subsidized office space for startups along with advising and networking support (Totterman & Sten, 2005). Though questions remain about their effectiveness (see Tamasy, 2007), these organizations represent an important facilitator of entrepreneurial activity and are often a key node of an ecosystem.

Policies and governance are less "material" in the sense that they do not have a physical location but instead materialize through government rules and regulations. Policies represent laws and directives that create publicly funded support programs designed to encourage entrepreneurship through tax benefits, investment of public funds, or reductions in bureaucratic regulation (Huggins & Williams, 2011; Mason & Brown, 2013). As such, they are a key part of the economic and political context in which entrepreneurship

occurs. This context may involve reducing legal barriers to firm formation; developing effective tax regimes; or providing public funds to run entrepreneurship support, networking, or incubation programs. While the effectiveness of policies promoting entrepreneurship is debated (e.g., Lerner, 2009), policy remains an important attribute of regional entrepreneurship.

Finally, the availability of strong local markets is a key part of providing opportunities within entrepreneurial ecosystems. The presence of local customers with specialized needs creates opportunities for new ventures and encourages entrepreneurial spinoffs (Spilling, 1996; World Economic Forum, 2013). Entrepreneurs are in a prime position to identify opportunities within the local marketplace because they interact more with local potential customers and can easily test out new offerings with them. This gives young firms a platform to make early sales and build up their capabilities for future expansion (e.g., Feldman, 2001). Such markets often act as the catalyst for the development of an entrepreneurial ecosystem. For example, the U.S. defense industry in California was a major initial customer of microelectronic firms that eventually helped form present-day Silicon Valley (Markusen, 1991).

Table 1 summarizes the attributes of entrepreneurial ecosystems. Not all of these elements are necessary for the development of a thriving ecosystem. There are ready examples of successful entrepreneurial ecosystems that lack one or more of these elements. For example, Boston first developed a thriving biotechnology ecosystem in the absence of a strong local market or histories of successful biotech entrepreneurs. Rather, these attributes should be understood as the major factors that help create supportive environments for entrepreneurial activity and provide external resources that increase the competitiveness of new ventures.

The Relational Configuration of Entrepreneurial Ecosystems

An ecosystem's attributes do not exist in isolation but rather develop in tandem, helping to influence and reproduce one another. For example, a community's underlying beliefs about the wider social status of entrepreneurship affects the desire of entrepreneurial actors to support the entrepreneurial endeavors of others (Liñán, Urbano, & Guerrero, 2011). By normalizing and legitimizing support for entrepreneurship within the larger community, an ecosystem's cultural attributes create a context through which supportive social attributes can emerge. This contributes to the formation of dense networks among entrepreneurs, investors, and advisors. Policies and programs designed to encourage entrepreneurship struggle in the absence of an underlying community of other entrepreneurs, advisors, and workers who provide support above and beyond what the programs supply. These programs would not be successful without supportive social and cultural attributes.

However, the relationships between attributes of an ecosystem are not a simple hierarchy of "lower" elements like culture supporting "higher" ones like policy. The development and success of material attributes can reinforce social attributes, in turn strengthening the underlying cultural attributes (see Figure 1). For example, entrepreneurial support organizations can play an important role in fostering local networks and raising the profile of successful local startups. This encourages new actors to engage in networking activities by exposing them to success stories, increasing the amount of financial, technical, and advisory resources within local social networks. Strong sets of social attributes such as networks, mentors, and investment capital within a region then help to reinforce and reproduce the ecosystem's pre-existing culture by normalizing these

Table 1

Attributes of Entrepreneurial Ecosystems

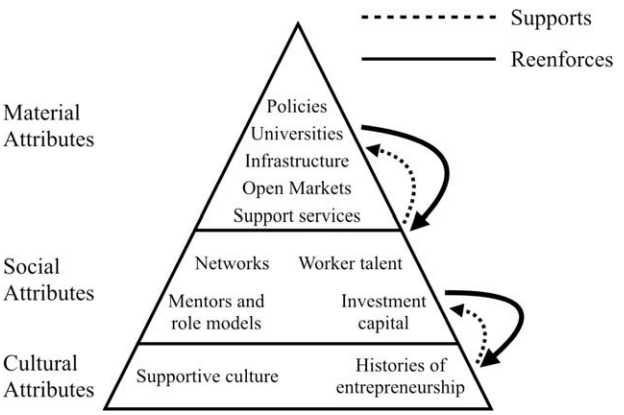
Type of Attribute	Attribute	Description	Examples
Cultural	Supportive culture	Cultural attitudes which support and normalize entrepreneurial activities, risk taking, and innovation.	Aoyama (2009); Feldman (2001); Julien (2007)
	Histories of entrepreneurship	Prominent local example of successful entrepreneurial ventures.	Nelles et al. (2005); Feld (2012)
Social	Worker talent	Presence of skilled workers who are willing to work at startups.	Arruda, Nogueira, and Costa (2014); Audretsch et al. (2011); Bahrami and Evans (1995); Harrison and Leitch (2010)
	Investment capital	Availability of investment capital from family and friends, angel investors, and venture capitalists.	van der Borgh, Cloodt, and Romme (2012); Kenney and Patton (2005); Malecki (2009)
	Networks	Presence of social networks that connect entrepreneurs, advisors, investors, and workers and that allow the free flow of knowledge and skills.	Dubini (1989); Malecki (1997); Neck et al. (2004)
	Mentors and role models	Local successful entrepreneurs and business people who provide advice for younger entrepreneurs	Feld (2012); Kenney and Patton (2005); World Economic Forum (2013)
Material	Policy and governance	State-run programs or regulations that either support entrepreneurship through direct funding or remove barriers to new venture creation.	Desrochers and Saulet (2008); Isenberg (2010)
	Universities	Universities and other higher education institutions which both train new entrepreneurs and produce new knowledge spillovers.	Audretsch et al. (2011); Dubini (1989); Feldman et al. (2005); Wolfe (2005)
	Support services	Firms and organizations that provide ancillary services to new ventures, for example, patent lawyers, incubators, or accountancies.	Kenney and Patton (2005); Patton and Kenney (2005); Startup Genome Project (2012)
	Physical infrastructure	Availability of sufficient office space, telecommunication facilities, and transportation infrastructure to enable venture creation and growth.	Audretsch et al. (2011); Mack and Rey (2014)
	Open markets	Presence of sufficient local opportunities to enable venture creation and unimpeded access to global markets.	Spilling (1996); World Economic Forum (2013)

practices and creating new stories of successful entrepreneurship that enter in the region's history.

This model suggests that entrepreneurial ecosystems can have multiple possible configurations. Ecosystems represent 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 and evolve. An ecosystem's attributes are sustained and reproduced through their relationships with other attributes. In ecosystems with dense relationships between attributes, this reproduction occurs by the interplay between a supportive entrepreneurial culture; networks of entrepreneurs, workers, and investors; and effective public programs and organizations. In sparser ecosystems, one attribute drives the production of the other attributes, such as a large local market that

Figure 1

Relationships Among Ecosystem Attributes



creates multiple opportunities for entrepreneurs to exploit, grow, and profitably exit. The study of ecosystems should focus not only on the outcomes—rates of entrepreneurship—but rather the inputs such as the localized cultural, social, and material attributes that support entrepreneurial activity and the ways in which these attributes interact and reproduce the overall ecosystem.

Entrepreneurial Ecosystems in Waterloo and Calgary, Canada

Case Study Motivation

The different configurations of ecosystems and their influence on entrepreneurial practices and regional economic trajectories can be explored through comparative qualitative case studies. A comparative approach highlights features that are unique to a particular ecosystem and that are standard parts of the entrepreneurship phenomena. Saxenian's (1994) study of technology entrepreneurs in Boston and Silicon Valley is an example of the usefulness of this approach. This work adopts Perren and Ram's (2004) "multiple stories milieu" approach in order to explore how entrepreneurial actors develop their practices within their larger regional contexts and how this affects the structure of the entrepreneurial ecosystem. The purpose is not to privilege one type of ecosystem configuration over another but rather illustrate and explore the different types of relationships between attributes within ecosystems and how this structure affects the ability of entrepreneurs to draw on the localized resources within their community.

Qualitative methods allow for a nuanced understanding of how entrepreneurs interact with their local entrepreneurial ecosystem and are particularly useful in situations where there are yet few standardized metrics to analyze the structure or success of entrepreneurial ecosystems. As argued by Steyaert and Katz (2004) such methods have the potential to examine the socially constructed nature of the entrepreneurship process. The case study method is used as a theory-building tool for the relatively underdeveloped field of entrepreneurial ecosystems (Eriksson & Kovalainen, 2008). The findings should not be

considered generalizable because each region's ecosystem is the product of its unique historical and economic processes. However, the findings do point to two more generalizable points about entrepreneurial ecosystems: the way in which their structure can differ between regions and the importance of understanding how the connections between their internal attributes helps reproduce the overall ecosystem structure and provide benefits to entrepreneurs.

Comparing the cases of Calgary, Alberta and Waterloo, Ontario (part of the larger Kitchener–Waterloo–Cambridge census metropolitan area) is a useful way to understand the differing relationships between ecosystem attributes and their resulting influence on entrepreneurs. As shown in Table 2, both cities perform better than the Canadian average in terms of their human capital, gross domestic product (GDP) per capita, and venture investment activity. The lower rates of self-employment in Waterloo are due to the region's comparatively large industrial sector and belie the high rates of technology startup activity in the region. Both are home to leading research universities (the University of Calgary and the University of Waterloo); headquarters of locally founded global technology firms (SMART Technologies in Calgary, a smart whiteboard company, and smartphone maker Blackberry in Waterloo); public entrepreneurship support programs; and large pools of skilled workers, support services, and investment capital. While each city has a successful entrepreneurial ecosystem, they have very different configurations. Waterloo has a dense ecosystem made up of very strong social, cultural, and material attributes that help reproduce an overall orientation toward high-risk, high-growth entrepreneurship. Calgary's ecosystem is dominated by the oil and gas sector, a large open market that drives high rates of venture creation but with weaker relationships between its cultural and social attributes.

Semistructured interviews were conducted with 71 technology entrepreneurs, investors, and economic development officials in each city between 2011 and 2012 (see Table 3). Interviews focused on respondents' views of their region's entrepreneurial community, and how these views have affected the practices entrepreneurs used to start, run, and grow new ventures. In order to avoid a bias toward the founders of larger and more successful startups, Scotts Business Directory was used to construct a random pool of entrepreneurs who had started firms in six technology sectors.[1] After eliminating firms that did not sell a technological product, subsidiaries of larger firms, and where the founder had left, 83 firms were contacted for interviews in Calgary and 84 in Waterloo, leading to 28 (34% response rate) and 23 (28% response rate) entrepreneur interviews, respectively. Interviews were conducted until data saturation occurred. Comparing the age, year found, and revenue category[2] between the interviewed firms and nonrespondents suggests that interviewees are representative of the overall population in the two communities, though the interviewed firms in Waterloo were slightly younger than nonrespondents (see Table 4). In general, interviewed firms in Calgary tended to be larger than those in Waterloo both in terms of their reported revenues and number of employees (see Table 5).

Market-Driven Ecosystem in Calgary, Alberta

The city of Calgary has undergone a profound economic transformation as a result of the extraction of Alberta's natural gas and petroleum reserves. The discovery of nearby natural gas deposits in the early 1900s and the later development of the Athabasca Tar

1. The selected industries were: computer and peripheral equipment manufacturing; software publishers; data processing, hosting, and related services; computer systems design and related services; other scientific and technical consulting services; engineering services.
2. Scotts Directories classifies firm revenues into five categories: less than 1 million CAD, 1–5 million CAD, 5–10 million CAD, 10–25 million CAD, above 25 million CAD.

Table 2

Demographic and Economic Data for Waterloo and Calgary

	Kitchener-Waterloo	Calgary	Canada
Population	477,160	1,096,833	33,476,688
Self-employment rate (%)	8.55	11.29	11.02
Labor force in natural and applied science occupations (%)	8.87	11.91	7.16
Population with bachelor's degree or higher (%)	21.65	28.82	20.85
Bachelor's degrees or higher in STEM fields (%)	11.60	15.14	9.82
GDP per capita (2007 dollars)	$50,161	$73,151	$45,704
Number of VC investments 2000–2011	93	196	6,004
Average size of VC investment, 2000–2011 (2007 dollars)	$1,979,297	$2,866,391	$239,583
VC investments per 100,000 residents (2000–2011)	19.49	17.87	17.93

Source: Statistics Canada (2012); Conference Board of Canada (2012); Thomson Reuters (2013).

Table 3

Type and Location of Interviews

	Waterloo	Calgary	Total
Entrepreneurs	23	28	51
Investors	5	5	10
Economic development officials	4	6	10
Total	32	39	71

Sands in Northern Alberta in the last two decades helped Calgary grow from a small frontier town to a command and control center for Canada's resource sector and associated finance and support services (Chastko, 2004). One of Canada's largest entrepreneurial communities has developed around this economic engine, with nearly 12% of the population classified as self-employed, the highest rate in Canada (Statistics Canada, 2012). Many of the region's technology startups are oriented toward the energy industry, which interviewees saw as rich in entrepreneurial opportunities and more focused on speed of product development than on price. Seventeen of the 28 (68%) entrepreneurs interviewed served this industry, indicating that a great deal of this region's entrepreneurship is due to this large local market. As the founder of a software firm serving this industry said: "They weren't interested in saving money, they were only interested in getting it done. How much money isn't an issue" (C103). Major oil producers are increasingly outsourcing large portions of their business to reduce risk during downturns, creating numerous entrepreneurial opportunities in areas such as exploration and production management, resource forecasting, logistics, and specialized software development.

Table 4

Response Analysis for Entrepreneur Interviews by City

City		Sample average	Nonrespondent average	*t*
Waterloo	Employees	18.9	27.2	−0.78
	Year founded	2,001.3	1,997.8	−2.51**
	Revenue	1.92	2.11	−0.68
Calgary	Employees	25.3	34.5	−0.96
	Year founded	1,999.8	1,998.6	1.01
	Revenue	1.92	2.23	−1.93

**Significant at $p < .05$

Table 5

Characteristics of Interviewed Firms

	Firm characteristics	Calgary	Waterloo
Size—employees	1–5	6 (21%)	13 (57%)
	6–14	7 (25%)	7 (30%)
	15–29	9 (32%)	0 (0%)
	30–50	3 (11%)	2 (9%)
	51+	4 (14%)	0 (0%)
	Not reported	0 (0%)	1 (4%)
Size—revenues (CAD)	0–499,999	4 (14%)	8 (35%)
	500,000–999,999	6 (21%)	5 (22%)
	1,000,000–2,499,999	6 (21%)	5 (22%)
	2,500,000–4,999,999	5 (18%)	2 (9%)
	5,000,000+	4 (14%)	0 (0%)
	Not reported	2 (7%)	5 (22%)
Industrial classification	Computer equipment manufacturing	2 (7%)	2 (9%)
	Software publishers	4 (14%)	4 (18%)
	Data processing and hosting	2 (7%)	0 (0%)
	Computer systems design	16 (57%)	10 (43%)
	Other scientific and technical services	2 (7%)	2 (9%)
	Engineering services	2 (7%)	2 (9%)
	Not available	0 (0%)	3 (13%)

This market drives an entrepreneurial ecosystem that provides resources for entrepreneurs both inside and outside the resource industry. This is evidenced by the comparative size of the interviewed firms. The mean number of employees of interviewed firms in Calgary was 25.5 compared to 10.3 in Waterloo and mean revenues in Calgary were 3.7 million CAD compared to 1.1 million CAD in Waterloo. This difference can be seen as a result of both the different local markets within the two ecosystems along with the different structures of their cultural and social attributes that encourage this kind of growth. Culturally, Calgary is heavily influenced by the norms of the oil and gas industry. As early as the 1980s, House (1980, p. 2) argued: "oil dominates the economic and social life of

the city." Discourses about cowboys and roughnecks have contributed to a local culture that focuses on wealth creation over other aspects of entrepreneurship such as building an advanced technology. These cultural attitudes create higher social rewards for personal wealth than they do for technological or business achievements such as being featured in a technology magazine or creating an internationally recognized business. One example of this effect is the lower attachment Calgary entrepreneurs felt for their firms than those in Waterloo. Twelve of the 28 (42%) entrepreneurs interviewed in Calgary were categorized as "profit-oriented" because they structured their firm to maximize their short-term personal profit rather than long-term sustainability, compared to 1 of 23 entrepreneurs (4%) in Waterloo. As a result, few Calgary interviewees reported strong connections to their firms or to entrepreneurship in general. One entrepreneur reported that he had "created something that someone wants to buy, [but] I've got no emotional attachment to it. It's just a company. If someone today came and gave me an offer on [my firm], I'd be gone tomorrow. No emotional ties to this stuff whatsoever" (C127).

These cultural outlooks influence the ecosystem's other social and material attributes. The low social value placed on entrepreneurship within Calgary along with the constant demand for workers within larger energy firms have created challenges for developing a large pool of skilled employees willing to work in new ventures. Almost all interviewees reported that they could not compete with the high salaries and other fringe benefits offered by the major oil companies. For example, the founder of an e-learning startup said: "Two days ago we had a new employee who spent one day here and said he got a better offer" (C110). Workers' focus on wages suggests they also shared the perception of the lower social prestige of working at an innovative startup, thus reducing the number of potential employees willing to work in startups. While some interviewees reported that they were able to attract workers tired of the bureaucratic style of the larger oil producers or looking for the increased freedom of working at a smaller firm, they still experienced difficulties hiring and retaining qualified workers.

Calgary's cultural attitude toward entrepreneurship has also affected the propensity of entrepreneurial actors to develop strong social ties within the community, limiting the effectiveness of entrepreneurial social networks. Most respondents expressed little desire to share advice or learn from the experiences of other entrepreneurs. Only 46% of interviewed entrepreneurs in Calgary reported seeking advice about running their business from family and friends, compared to 70% in Waterloo. Entrepreneurs in Calgary typically thought it was more important to spend their time building their networks within the oil and gas industry, which many described as an "old-boys network" (C129) rather than other local entrepreneurs. On the whole, interviewees reported frequently engaging in networking activities to keep abreast of new developments in the marketplace and find new clients, but spent little time meeting with other entrepreneurs to develop their business skills. Calgary's entrepreneurial ecosystem, therefore, has a strong network attribute, but its social networks are more oriented toward the oil and gas industry, reducing their benefits for entrepreneurs outside this sector.

These outlooks toward networking have hampered the effectiveness of the ecosystem's entrepreneurship support programs and policies. While Innovate Calgary (a publicly funded startup incubation facility and entrepreneurial support organization) runs entrepreneurship training and networking programs, none of the interviewed entrepreneurs—even tenants of Innovate Calgary's incubation center—reported participating in them. Nor did interviewees regularly participate in networking events hosted by the city's Chamber of Commerce or the University of Calgary. As one entrepreneur explained: "there's been quite a few different entrepreneurship groups, but what I have found is that most of them are there because they think they're going to get a chance to meet potential

clients. What it ends up being is a bunch of people like themselves" (C104). While the programs themselves are based on best practices from elsewhere to complement the region's energy industry focus, they lack a supportive foundation of complementary cultural and social attributes, and therefore, have struggled to influence the wider ecosystem.

The strength of the local resource industry has created a large pool of potential angel investors and venture capital firms to finance entrepreneurial ventures. As an economic development official put it: "Calgary is awash in money" (C101). This provides an important resource for entrepreneurs looking to quickly expand a firm through outside financing or to support ongoing research and development. However, the backgrounds of many of these investors are in the oil and gas industry, limiting their ability to effectively invest in and advise firms outside this sector. Risk in the oil and gas industry is quantified and limited compared to other high-tech industries where risk is generally unknowable. The large upside risk of investing in a software or life science firm is unfamiliar to energy-based investors. For a local angel investor outside this industry, "[investors] will invest half-a-million dollars to poke a hole in the ground and have no bubbling crude come up way, way, way before they will invest half-a-million dollars in a technology company because they understand it" (C132). While there is substantial investment capital to be found within the ecosystem, not all entrepreneurs have equal access to it.

Calgary's local oil and natural gas market is the most important attribute of its ecosystem. Large energy and natural resources firms are a constant source of new opportunities for startups. As one entrepreneur put it: "If you live in Calgary, and you want to make money, you should be in energy" (C119). The local resource economy reproduces the ecosystem by increasing the supply of entrepreneurs through the easy availability and visibility of entrepreneurial opportunities in the local market. Resource firms attract skilled workers to the region, some of whom eventually leave to form new ventures or work at them, and the industry's high wages help create new potential angel investors. However, the culture of this industry has contributed to an undervaluing of certain entrepreneurial activities within the region's underlying culture, such as building networks with other entrepreneurs, focusing new firms on innovation rather than quick growth, or working for startups rather than large corporations. As a result, the benefits of the ecosystem largely accrue to firms within the oil and gas sector. New ventures outside this industry experience more difficulty accessing the ecosystem's labor pool, investment capital, and social networks.

Dense and Innovative Ecosystem in Waterloo, Ontario

Waterloo, Ontario is commonly seen as a major center of Canadian technology entrepreneurship. The presence of major anchor institutions such as Blackberry and the University of Waterloo, one of the world's leading computer science and engineering universities, has contributed to the development of an entrepreneurial ecosystem characterized by supportive relationships among its cultural, social, and material attributes. The presence of several active entrepreneurial support organizations strengthens local communities of entrepreneurs, mentors, and workers and helps to reproduce the region's underlying entrepreneurial culture. Many observers connect this ecosystem with an entrepreneurial culture that dates back to the region's founding by Mennonite farmers and German immigrants in the nineteenth century (Bramwell & Wolfe, 2008). While the reality of this connection is questionable, waves of German migrants to the region throughout the early twentieth century created a thriving industrial economy that was instrumental in the founding of the University of Waterloo in 1957 as a polytechnic university intended

to supply local firms with skilled engineers (Bathelt & Spigel, 2011). As a result, the university has developed an entrepreneurial culture that contributed to the creation of features such as a favorable intellectual property regime that encourages faculty and students to spin off their developments into new ventures (Kenney and Patton, 2011). A similar culture has developed throughout the entire region that supports entrepreneurial risk taking and provides entrepreneurs and related actors with a great deal of social prestige. Numerous interviewees discussed an entrepreneurial ethos that permeated the community and how, in the words of one entrepreneur: "we're just so lucky that everyone is prepared to share and be involved and that there's a bunch of structured mentoring and networking and there's a ton of informal stuff that just happens that people just take care of each other in the region" (W115).

This culture promotes dense social networks among entrepreneurs, workers, and investors. The importance of entrepreneurship and networking in the region's culture encourages many successful businesspeople to participate in these networks, contributing to their high perceived valued by entrepreneurs. A local venture capitalist explained that: "the CEOs of the large companies . . . will help the next generation of entrepreneurs. [If I] sent a note over to say I met with this company, the CEO has been struggling with this or that, would you be able to help them, I know they're going to get a response" (W115). This ethos allows entrepreneurs within the ecosystem to more easily find mentors and advisors who can guide them through the challenges of the entrepreneurship process. Many respondents believed that sharing their experiences and learning from others was an essential part of being an entrepreneur in Waterloo. As one explained:

> Here, unlike any other community that I've lived or worked [in], there's a strong sense of not just a desire, but a responsibility, to help up and coming companies, especially technology companies. . .. We do a good job of integrating people into the community and that builds strong ties. . . . I'd hazard a guess that we have more individuals in this community that have very broad, expansive networks than other communities. (W114)

The cultural importance of entrepreneurship within Waterloo contributes to strong networks of skilled workers accustomed to the demands and opportunities of working in a startup. None of the entrepreneurs interviewed in Waterloo experienced the same challenges of finding and retaining skilled employees observed in Calgary. Instead, the normalization of working within startups has allowed entrepreneurs the leeway to offer lower salaries in favor of a more relaxed workplace and the possibility of revenue sharing. The social status accorded workers in firms that are seen as particularly innovative can serve as a substitute for more pecuniary interests. For example, one entrepreneur reported that his workers were willing to forgo their pay during periods of low cash flow in exchange for flexible working conditions and a portion of future revenues. The founder believed that: "the model of being able to work from home, be your own boss and get to be a participant in a pretty cool product made up for not getting a pay check" (W130).

The material attributes of Waterloo's ecosystem benefit from this entrepreneurial culture while at the same time reproducing it. Communitech, a nonprofit entrepreneurship support organization, has been very successful in promoting the ethos of technology entrepreneurship. Some of this support is direct, such as its Accelerator Centre and Hyperdive incubator who offer subsidized office space, early-stage funding, and expert advising to selected local startups. Other programs provide less direct support to individual firms but help create a community entrepreneurs can turn to when necessary. Communitech's peer-to-peer groups and networking events give entrepreneurs the opportunity to meet

other firm founders as well as executives from larger firms and prospective investors, advisors, and mentors. Many interviewees said these networking programs helped them learn from other entrepreneurs who had encountered problems similar to theirs as well as introducing them to more senior businesspeople who can provide guidance on long-term strategic decisions. One entrepreneur reported that: "[Communitech] was instrumental for us at the early stage. It gives you access to facilities, access to contacts and the events. Again, that's induced serendipity. You attend events certainly to pick up information, but you also run into the types of people who are maybe interested in investing or who can help out" (W118).

These events do more than simply help entrepreneurs connect with like-minded people: by allowing new entrepreneurs to meet with more successful entrepreneurs, Communitech and other local organizations promote a particular vision of high-growth, technology-led firms. This vision helps reproduce the cultural importance of technology entrepreneurship within the region's ecosystem by celebrating successful entrepreneurs and normalizing particular practices like young university graduates founding growth-oriented companies. Communitech is in a position to influence how entrepreneurship is understood, in effect allowing it to reinforce the ecosystem's social and cultural attributes. However, Communitech could not have become such a successful material attribute of the ecosystem without the support of local business and political leaders fostered by the pre-existing social and cultural attributes that supported technology-based entrepreneurship. The high social status of entrepreneurship encourages successful businesspeople to pledge both time and money to support these organizations.

Waterloo's ecosystem provides numerous resources to new ventures. The region's dense social networks allow entrepreneurs to develop critical business skills and help form connections with local angel investors and venture capitalists. New ventures can access a large pool of skilled workers who are used to the challenges of working at start-ups and are able to reduce their upfront labor costs in exchange for future revenue sharing. The region has several well-developed entrepreneurial organizations such as the University of Waterloo and Communitech that promote entrepreneurship and help strengthen local networks. While Waterloo lacks Calgary's large local market, its strong cultural and material attributes help reproduce the entrepreneurial ecosystem by normalizing entrepreneurial risk taking and network building.

Discussion

There is a strong relationship between the characteristics of each region's ecosystem and the ways in which firms derive resources from their environment. As shown in Table 6, there are small but distinctive trends in how firms grew or exited between 2011 and 2015. Four of the 28 firms (14.3%) interviewed in Calgary were acquired over this period, compared to 2 of 23 (8.7%) in Waterloo. However, 13% of interviewed firms in Waterloo have received venture capital investment, ranging from 125,000 CAD for a microchip design firm to over 65 million CAD for a social messaging app, compared to only one firm in Calgary who received venture capital investments. While a similar number of interviewed firms in each city ceased trading between 2011 and 2015, more entrepreneurs in Waterloo have moved on to start new ventures rather than either retiring or going to work for existing firms as technical or managerial employees.

These differences reflect the structure of each ecosystem's cultural, social, and material attributes. Calgary's underlying entrepreneurial regional culture and economic structure encourages entrepreneurs to try to quickly realize profits from their entrepreneurial

Table 6

Characteristics of Interviewed Firms

Firm Outcomes—2011 through 2015	Calgary	Waterloo
Still in business—No major changes	18 (64%)	12 (52%)
Acquired	4 (14%)	2 (9%)
Received venture capital investment	1 (4%)	3 (13%)
No longer trading—no further entrepreneurial activity	4 (14%)	3 (13%)
No longer trading—continued entrepreneurial activity/serial entrepreneurship	1 (4%)	3 (13%)

endeavor through both fast growth and eventual exits through acquisition. The strength of the local energy industry means that there are a large number of firms capable of acquitting new ventures for their technology and market access. As a result, local venture capitalists are focused on investing in later-stage investments in firms that are likely to be quickly acquired, and the dense networks in the oil and gas industry allow larger firms to monitor the activities of many of the region's energy startups. Entrepreneurs whose firms are not performing as well as they expected can shut down their venture secure in the knowledge that they can quickly find employment elsewhere, reducing rates of serial entrepreneurship.

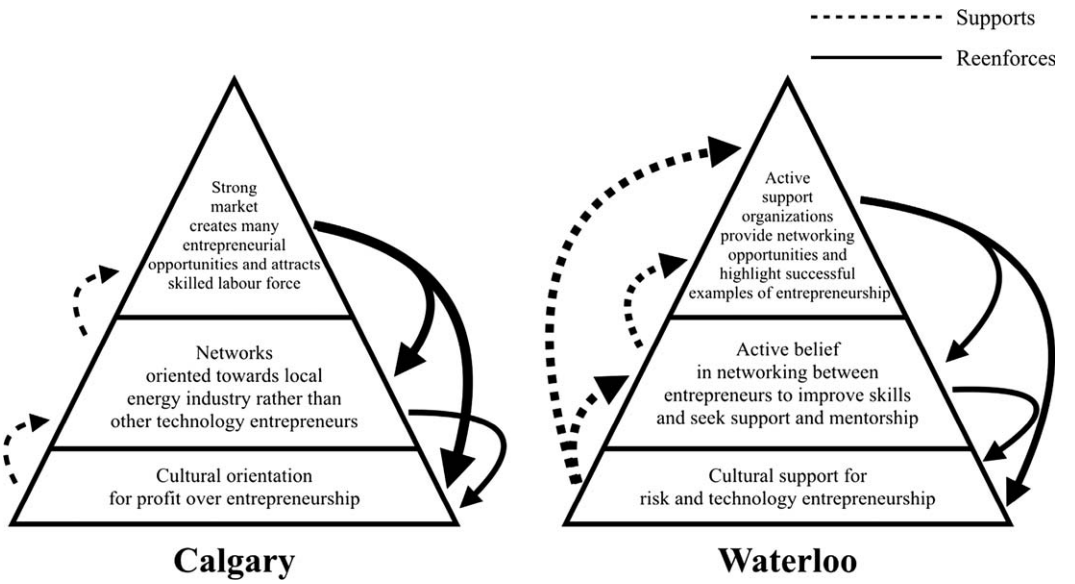
Waterloo's ecosystem is far more focused on catalyzing growth through venture capital, with the goal of making a much larger exit either through an acquisition by a major global technology company or an IPO. This means forgoing early revenues in favor of rapid customer acquisition and long-term R&D activities. This is embedded in the cultural attributes of the ecosystem through a history of technology startups who have experienced this lifecycle and it is reinforced by the efforts of support organizations like Communitech who work to attract venture capital investments to the region along with networks of experienced entrepreneurs and managers who have been through this process before and can advise newer firms. The strong cultural support for entrepreneurship encourages entrepreneurs not to see the closing of a firm as a failure but rather as a lesson on a longer entrepreneurial journey.

Calgary and Waterloo both have ecosystems that provide valuable resources to entrepreneurs and which are reproduced through the relationships between their cultural, social, and material attributes (see Figure 2). In the case of Waterloo, organizations like Communitech and the University of Waterloo promote networking among entrepreneurial actors and highlight local examples of successful technology entrepreneurship, both of which increase the social status of entrepreneurship. This enhanced status encourages actors within the region to participate in these networks, to dedicate their limited time to advising or mentoring entrepreneurs, or to work in a high-risk startup. The high level of entrepreneurial activity created by this activity reproduces and reinforces the region's pre-existing cultural outlooks toward entrepreneurship. The strength of these attributes and their relationships creates a dense ecosystem for technology entrepreneurship.

Calgary's entrepreneurial ecosystem is driven by the strength of its local oil and gas industry, a market that creates a number of niches that entrepreneurs can exploit. This ensures a steady supply of new entrepreneurs and investors and provides a foundation for new firms to develop capabilities and products that can be sold first within the local economy before venturing further afield. This market attracts a number of highly skilled

Figure 2

Relationships Among Ecosystem Attributes in Calgary and Waterloo, Canada



workers to the region, though the higher wages offered by the major resource firms create challenges for entrepreneurs to hire enough workers. However, the economic and cultural structures of this industry have resulted in sparser connections between other ecosystem attributes. For example, the lowered importance of entrepreneurship as a lifestyle has led to fewer network connections between entrepreneurs for the purpose of developing new business skills and to lower participation in entrepreneurship programs.

Studying the interplay among cultural, social, and material attributes is key to understanding the larger role of entrepreneurial ecosystems within regional economies. An entrepreneurial ecosystem is not simply a region with high rates of entrepreneurship; this mistakes the effect for the cause. Instead, ecosystems are defined by the connections between the attributes that produce them and the benefits they provide to entrepreneurs. These benefits and relationships can differ between regions. Calgary's overall ecosystem has weaker ties between its attributes, but the power of its primary material attribute, the local oil and gas market, acts as the central point for the ecosystem's development and reproduction. Waterloo's ecosystem lacks the powerful local market that creates opportunities for new entrepreneurs but instead depends on tight linkages among its cultural, social, and material attributes.

Conclusion

This relational perspective of cultural, social, and material attributes makes three contributions to the study of entrepreneurial ecosystems and the geography of entrepreneurship more broadly. First is the identification of various categories of attributes that

constitute an ecosystem. This provides a framework for future research methodologies that can analyze and compare entrepreneurial ecosystems to reveal the different ways in which they emerge, change over time, and influence the entrepreneurship process. Second, it provides for an expanded view of entrepreneurial ecosystems that acknowledges that there are numerous different ways these attributes can be configured. This creates the need for a more nuanced understanding of entrepreneurial ecosystems that takes into account local specificities. Finally, the importance of relationships between different attributes demonstrates that new material attributes such as entrepreneurial support organizations, state-financed startup investment schemes, or new university technology and knowledge transfer programs are unlikely to succeed if they are not underpinned by complementary social and cultural attributes. Regional entrepreneurial policy, therefore, should focus on building underlying support for these new programs rather than expecting the programs themselves to create entrepreneurial cultures and networks.

As research on entrepreneurial ecosystems continues to develop, there is a need for theoretical frameworks to understand the processes through which ecosystems emerge, change, and influence the activities of entrepreneurial actors. Without this framework, research on ecosystems risks devolving into simple description of successful regions without any claim to more generalizable findings about the ecosystem's internal dynamics or its role in economic development. Identifying the attributes of entrepreneurial ecosystems and their relationships is the first part of a much broader research agenda. There is also a need for a dynamic perspective that seeks to understand how the structure and influence of ecosystems change over time in response to both external economic and social shocks as well to internal changes, such as entrepreneurial successes or the concerted philanthropic or organizational efforts of a few "ecosystem entrepreneurs." At the same time, researchers must develop metrics that can be used to identify the presence of the ecosystem attributes discussed in this article and compare them between different regions. While some metrics, such as startup rates, venture capital investment, and the size of entrepreneurial exits are readily available, gathering comparable data on cultural outlooks or the effectiveness of social networks is much more difficult. These research developments will provide both a more nuanced and rigorous understanding of how entrepreneurial ecosystems affect the entrepreneurship process and will also enable more precise and reliable policy recommendations to strengthen existing ecosystems and develop successful ecosystems in regions without histories of successful entrepreneurial growth.

REFERENCES

Acs, Z.J., Autio, E., & Szerb, L. (2014). National systems of entrepreneurship: Measurement issues and policy implications. *Research Policy*, *43*(3), 476–494.

Aldrich, H., & Zimmer, C. (1986). Entrepreneurship through social networks. In H. Aldrich (Ed.), *Population perspectives on organization* (pp. 13–28). Upsala: Acta Universistaits Upsaliensis.

Aoyama, Y. (2009). Entrepreneurship and regional culture: The case of Hamamtsu and Kyoto, Japan. *Regional Studies*, *43*(3), 495–512.

Arenius, P., & de Clercq, D. (2005). A network-based approach on opportunity recognition. *Small Business Economics*, *24*(3), 249–265.

Arruda, C., Nogueira, V.S., & Costa, V. (2014). The Brazilian entrepreneurial ecosystem of startups: An analysis of entrepreneurship determinants in Brazil as seen from the OECD pillars. *Journal of Entrepreneurship and Innovation Management*, *2*(3), 17–57.

Asheim, B.T., Smith, H.L., & Oughton, C. (2011). Regional innovation systems: Theory, empirics and policy. *Regional Studies*, *45*(7), 875–891.

Audretsch, D.B., Falck, O., Feldman, M.P., & Heblich, S. (2011). Local entrepreneurship in context. *Regional Studies*, *46*(3), 379–389.

Bahrami, H., & Evans, S. (1995). Flexible re-cycling and high-technology entrepreneurship. *California Management Review*, *37*(3), 62–89.

Bathelt, H., Malmberg, A., & Maskell, P. (2004). Clusters and knowledge: Local buzz, global pipelines and the process of knowledge creation. *Progress in Human Geography*, *28*(1), 31–56.

Bathelt, H., & Spigel, B. (2011). University spin-offs and regional policy in comparative perspective: The cases of Columbus (Ohio) and Toronto and Waterloo (Ontario). *International Journal of Knowledge-Based Design*, *3*(3), 202–219.

Bell, S.J., Tracey, P., & Heide, J.B. (2009). The organization of regional clusters. *Academy of Management Review*, *34*(4), 623–642.

Bosma, N., Hessels, J., Schutjens, V., van Praag, M., & Verheul, I. (2012). Entrepreneurship and role models. *Journal of Economic Psychology*, *33*(2), 410–424.

Bramwell, A., & Wolfe, D.A. (2008). Universities and regional economic development: The entrepreneurial University of Waterloo. *Research Policy*, *37*(8), 1175–1187.

Chastko, P. (2004). *Developing Alberta's oil sands: From Karl Clark to Kyoto*. Calgary: University of Calgary Press.

Conference Board of Canada. (2012). *Metropolitan forecast: GDP at basic prices by industry*. Toronto, ON.

Cooke, P., Gomez Uranga, M., & Etxebarria, G. (1997). Regional innovation systems: Institutional and organisational dimensions. *Research Policy*, *26*(4–5), 475–491.

De Carolis, D.M., & Saparito, P. (2006). Social capital, cognition, and entrepreneurial opportunities: A theoretical framework. *Entrepreneurship Theory and Practice*, *30*(1), 41–56.

Delgado, M., Porter, M.E., & Stern, S. (2010). Clusters and entrepreneurship. *Journal of Economic Geography*, *10*(4), 495–518.

Desrochers, P., & Sautet, F. (2008). Entrepreneurial policy: The case of regional specialization vs. spontaneous industrial diversity. *Entrepreneurship Theory and Practice*, *32*(5), 813–832.

Dubini, P. (1989). The influence of motivations and environment on business start-ups: Some hints for public policies. *Journal of Business Venturing*, *4*(1), 11–26.

Eriksson, P., & Kovalainen, A. (2008). *Qualitative methods in business research*. London: SAGE Publications Ltd.

Feld, B. (2012). *Startup communities: Building an entrepreneurial ecosystem in your city*. Hoboken, NJ: Wiley.

Feldman, M. (2001). The entrepreneurial event revisited: Firm formation in a regional context. *Industrial and Corporate Change*, *10*(4), 861–891.

Feldman, M., Francis, J., & Bercovitz, J. (2005). Creating a cluster while building a firm: Entrepreneurs and the formation of industrial clusters. *Regional Studies*, *39*(1), 129–141.

Feldman, M.P. (2014). The character of innovative places: Entrepreneurial strategy, economic development, and prosperity. *Small Business Economics*, *43*(1), 9–20.

Feldman, M.P., & Francis, J.L. (2004). Homegrown solutions: Fostering cluster formation. *Economic Development Quarterly*, *18*(2), 127–137.

Feldman, M., & Zoller, T.D. (2012). Dealmakers in place: Social capital connections in regional entrepreneurial economies. *Regional Studies*, *46*(1), 23–37.

Fritsch, M. (2001). Co-operation in regional innovation systems. *Regional Studies*, *35*(4), 297–307.

Fritsch, M., & Schilder, D. (2008). Does venture capital investment really require spatial proximity? An empirical investigation. *Environment and Planning A*, *40*, 2114–2131.

Gertler, M. (2003). Tact knowledge and the economic geography of context, or the undefinable tacitness of being (there). *Journal of Economic Geography*, *3*, 75–99.

Greve, A., & Salaff, J. (2003). Social networks and entrepreneurship. *Entrepreneurship Theory and Practice*, *28*(1), 1–22.

Harrison, R.T., & Leitch, C. (2010). Voodoo institution or entrepreneurial university? Spin-off companies, the entrepreneurial system and regional development in the UK. *Regional Studies*, *44*(9), 1241–1262.

Henry, N., & Pinch, S. (2001). Neo-Marshallian nodes, institutional thickness, and Britain's "Motor Sport Valley": Thick or thin? *Environment and Planning A*, *33*(7), 1169–1183.

Hoang, H., & Antoncic, B. (2003). Network-based research in entrepreneurship: A critical review. *Journal of Business Venturing*, *18*, 165–187.

House, J.D. (1980). *The last of the free enterprisers: The oilmen of Calgary*. Toronto: Macmillan of Canada.

Huggins, R., & Williams, N. (2011). Entrepreneurship and regional competitiveness: The role and progression of policy. *Entrepreneurship & Regional Development*, *23*(9-10), 907– 932.

Hwang, V.W., & Horowitt, G. (2012). *The rainforest: The secret to building the next Silicon Valley*. Los Altos, CA: Regenwald.

Isenberg, D.J. (2010). The big idea: How to start an entrepreneurial revolution. *Harvard Business Review*, *88*(6), 40–50.

Julien, P.-A. (2007). *A theory of local entrepreneurship in the knowledge economy*. Cheltenham, UK: Edward Elgar.

Kenney, M., & Patton, D. (2005). Entrepreneurial geographies: Support networks in three high-technology industries. *Economic Geography*, *81*(2), 201–228.

Kenney, M., & Patton, D. (2011). Does inventor ownership encourage university research-derived entrepreneurship? A six university comparison. *Research Policy*, *40*(8), 1100–1112.

Kibler, E., Kautonen, T., & Fink, M. (2014). Regional social legitimacy of entrepreneurship: Implications for entrepreneurial intention and start-up behaviour. *Regional Studies*, *48*(6), 995–1015.

Krichhoff, B.A., Newbert, S.L., Hasan, I., & Armington, C. (2007). The influence of university R&D expenditures in new business formations and employment growth. *Entrepreneurship Theory and Practice*, *31*(4), 543–559.

Kwon, S.-W., Heflin, C., & Ruef, M. (2013). Community social capital and entrepreneurship. *American Sociological Review*, *78*(6), 980–1008.

Lafuente, E., Yancy, V., & Rialp, J. (2007). Regional differences in the influence of role models: Comparing the entrepreneurial process of rural Catalonia. *Regional Studies*, *41*(6), 779–795.

Lawton Smith, H., Chapman, D., Wood, P., Barnes, T., & Romeo, S. (2014). Entrepreneurial academics and regional innovation systems: The case of spin-offs from London's universities. *Environment and Planning C*, *32*(2), 341–359.

Lerner, J. (2009). *Boulevard of broken dreams: Why public efforts to boost entrepreneurship and venture capital have failed, and what to do about it*. Princeton, NJ: Princeton University Press.

Liñán, F., Urbano, D., & Guerrero, M. (2011). Regional variations in entrepreneurial cognitions: Start-up intentions of university students in Spain. *Entrepreneurship & Regional Development*, *23*(3–4), 187–215.

Mack, E.A., & Rey, S.J. (2014). An econometric approach for evaluating the linkages between broadband and knowledge intensive firms. *Telecommunications Policy*, *38*(1), 105–118.

Malecki, E.J. (1997). Entrepreneurs, networks, and economic development: A review of recent research. In J. Katz (Ed.), *Advances in entrepreneurship, firm emergence, and growth* (Vol. 3, pp. 57–118). Greenwich, CT: JAI Press.

Malecki, E.J. (2009). Geographical environments for entrepreneurship. *International Journal of Entrepreneurship and Small Business*, *7*(2), 175–190.

Malecki, E.J. (2011). Regional social capital: Why it matters. *Regional Studies*, *46*(8), 1023–1039.

Malmberg, A., & Maskell, P. (2002). The elusive concept of localization economies: Towards a knowledge-based theory of spatial clustering. *Environment and Planning A*, *34*(3), 429–449.

Markusen, A. (1991). *The rise of the gunbelt: The military remapping of industrial America*. New York: Oxford University Press.

Markusen, A. (1996). Sticky places in slippery space: A typology of industrial districts. *Economic Geography*, *72*(3), 293–313.

Marshall, A. (1920). *Principles of economics*. London: Macmillian.

Maskell, P. (2001). Towards a knowledge-based theory of the geographical cluster. *Industrial and Corporate Change*, *10*(4), 921–943.

Mason, C., & Brown, R. (2013). Creating good public policy to support high-growth firms. *Small Business Economics*, *40*(2), 211–225.

Motoyama, Y., & Watkins, K. (2014). *Examining the connections within the startup ecosystem: A case study of St. Louis (Kauffman Foundation Research Series on City, Metro, and Regional Entrepreneurship)*. Kansas City, MO: Kauffman Foundation.

Neck, H.M., Meyer, G.D., Cohen, B., & Corbett, A.C. (2004). An entrepreneurial system view of new venture creation. *Journal of Small Business Management*, *42*(2), 190–208.

Nelles, J., Bramwell, A., & Wolfe, D.A. (2005). History, culture and path dependency: Origins of the Waterloo ICT Cluster. In D.A. Wolfe & M. Lucas (Eds.), *Global networks and local linkages: The paradox of development in an open economy* (pp. 227–252). Montreal: McGill-Queen's University Press.

Nijkamp, P. (2003). Entrepreneurship in a modern network economy. *Regional Studies*, *37*(4), 395–405.

Owen-Smith, J., & Powell, W. (2004). Knowledge networks as channels and conduits: The effects of spillovers in the Boston biotechnology community. *Organization Science*, *15*(1), 5–21.

Ozgen, E., & Baron, R.A. (2008). Social sources of information in opportunity recognition: Effects of mentors, industry networks, and professional forums. *Journal of Business Venturing*, *22*(2), 174–192.

Patton, D., & Kenney, M. (2005). The spatial configuration of the entrepreneurial support network for the semiconductor industry. *R&D Management*, *35*(1), 1–17.

Perren, L., & Ram, M. (2004). Case-study method in small business and entrepreneurial research mapping boundaries and perspectives. *International Small Business Journal*, *22*(1), 83–101.

Piore, M.J., & Sabel, C.F. (1984). *The second industrial divide: Possibilities for prosperity*. New York: Basic Books.

Pitelis, C. (2012). Clusters, entrepreneurial ecosystem co-creation, and appropriability: A conceptual framework. *Industrial and Corporate Change*, *21*(6), 1359–1388.

Porter, M.E. (1998). Clusters and the new economics of competition. *Harvard Business Review*, November-December, 77–90.

Porter, M.E. (2000). Location, competition, and economic development: Local clusters in a global economy. *Economic Development Quarterly*, *14*(1), 15–34.

Powell, W., Koput, K., Bowie, J., & Smith-Doerr, L. (2002). The spatial clustering of science and capital: Accounting for biotech firm-venture capital relations. *Regional Studies*, *36*(3), 291–305.

Qian, H., Acs, Z.J., & Stough, R.R. (2013). Regional systems of entrepreneurship: The nexus of human capital, knowledge and new firm formation. *Journal of Economic Geography*, *13*(4), 559–587.

Ritsilä, J.J. (1999). Regional differences in environments for enterprises. *Entrepreneurship and Regional Development*, *11*(2), 187–202.

Saxenian, A. (1994). *Regional advantage: Culture and competition in Silicon Valley and Route 128*. Cambridge, MA: Harvard University Press.

Schutjens, V., & Völker, B. (2010). Space and social capital: The degree of locality in entrepreneurs' contacts and its consequences for firm success. *European Planning Studies*, *18*(6), 941–963.

Shane, S. (2004). Academic entrepreneurship: University spinoffs and wealth creation. Cheltenham, UK: Edward Elgar Publishing.

Shane, S., & Cable, D. (2002). Network ties, reputation, and the financing of new ventures. *Management Science*, *48*(3), 364–381.

Sorenson, O., & Stuart, T. (2001). Syndication networks and the spatial distribution of venture capital investments. *The American Journal of Sociology*, *106*(6), 1546–1588.

Spilling, O.R. (1996). The entrepreneurial system: On entrepreneurship in the context of a mega-event. *Journal of Business Research*, *36*(1), 91–103.

Staber, U. (2007). A matter of distrust: Explaining the persistence of dysfunctional beliefs in regional clusters. *Growth and Change*, *38*(3), 341–363.

Startup Genome Project. (2012). *Startup Ecosystem Report 2012*. https://goo.gl/F3Ta7P, accessed 14 June 2015.

Statistics Canada. (2012). Census of Canada, 2011: Labour [computer file].

Steijvers, T., Voordeckers, W., & Vanhoof, K. (2010). Collateral, relationship lending and family firms. *Small Business Economics*, *34*, 243–259.

Steyaert, C., & Katz, J. (2004). Reclaiming the space of entrepreneurship in society: Geographical, discursive and social dimensions. *Entrepreneurship and Regional Development*, *16*, 179–196.

Stuart, T., & Sorenson, O. (2003). The geography of opportunity: Spatial heterogeneity in founding rates and the performance of biotechnology firms. *Research Policy*, *32*, 229–253.

Stuart, T.E., & Sorenson, O. (2005). Social networks and entrepreneurship. In S.A. Alvarez, R. Agarwal, & O. Sorenson (Eds.), *Handbook of entrepreneurship research* (pp. 233–252). New York: Springer.

Stuetzer, M., Obschonka, M., Brixy, U., Sternberg, R., & Cantner, U. (2014). Regional characteristics, opportunity perception and entrepreneurial activities. *Small Business Economics*, *42*(2), 221–244.

Tamasy, C. (2007). Rethinking technology-oriented business incubators: Developing a robust policy instrument for entrepreneurship, innovation, and regional development. *Growth and Change*, *38*(3), 460–473.

Thomson Reuters. (2013). *Special tabulation: Private equity and venture capital*. Toronto: Author.

Totterman, H., & Sten, J. (2005). Start-ups: Business incubation and social capital. *International Small Business Journal*, *23*(5), 487–511.

Vaillant, Y., & Lafuente, E. (2007). Do different institutional frameworks condition the influence of local fear of failure and entrepreneurial examples over entrepreneurial activity? *Entrepreneurship and Regional Development*, *19*, 313–337.

van der Borgh, M., Cloodt, M., & Romme, A.G.L. (2012). Value creation by knowledge-based ecosystems: Evidence from a field study. *R&D Management*, *42*(2), 150–169.

van Hoye, G., van Hooft, E.A.J., & Lievens, F. (2009). Networking as a job search behaviour: A social network perspective. *Journal of Occupational and Organizational Psychology*, *82*(3), 661–682.

Westlund, H., & Bolton, R. (2003). Local social capital and entrepreneurship. *Small Business Economics*, *21*(1), 77–113.

Wolfe, D. (2005). The role of universities in regional development and cluster formation. In G. Jones, P. McCarney, & M. Skolnik (Eds.), *Creating knowledge, strengthening nations* (pp. 167–194). Toronto: University of Toronto Press.

World Economic Forum. (2013). *Entrepreneurial ecosystems around the globe and company growth dynamics (industry agenda)*. Geneva: World Economic Forum.

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