



Entrepreneurial innovation: The importance of context



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ABSTRACT

The purpose of this article and the special issue is to improve our understanding of the theoretical, managerial, and policy implications of entrepreneurial innovation. We accomplish this objective by examining the role of context in stimulating such activity, as well as its impact on the outcomes of entrepreneurial innovation. Our analysis begins by outlining an overarching framework for entrepreneurial innovation and context. With reference to this framework we then compare the attributes of national innovation systems, entrepreneurship and entrepreneurial innovation, and categorize contextual influences on entrepreneurial innovation. We then situate the papers presented in this special issue within this framework. We conclude by outlining an agenda for additional research on this topic, focusing on the relationships between contexts and entrepreneurial innovation and then discuss policy implications, focusing on how public and private actors can meet these challenges.

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1. Introduction

Ever since the early work of Schumpeter,² the concepts of ‘entrepreneurship’ and ‘innovation’ have been strongly related. Schumpeter famously talked about ‘gales of creative destruction,’ which entrepreneurs unleash by introducing new, radically different products, services, and processes to the marketplace, thereby challenging status quo-preserving industry incumbents. Due to Schumpeter’s ideas, entrepreneurship and innovation have been closely linked in the popular mindset. William Baumol (2002) argued that entrepreneurial innovation was the true source of national competitive advantage. In Baumol’s thinking, entrepreneurs³ were required for the introduction of novel

ventures that broke with established development paths and undermined established competencies. Consistent with this, Scherer (1980) identified numerous disruptive innovations that were introduced by entrepreneurial firms, such as the electronic calculator, alternating electric current, sound motion pictures, and the turbojet engine. Recent examples of entrepreneurial innovation include biotechnology, the personal computer, and Internet search engines.

Associating entrepreneurship with innovation, many nations, regions, states, and universities have adopted policies to stimulate innovation by entrepreneurial firms, in the hope of facilitating economic growth. Examples of such policies include local, regional, and national initiatives to promote university-based start-ups (Grimaldi et al., 2011). These initiatives include technology-based economic development (e.g., incubators/accelerators), as well as formal government programs, such as the Small Business Innovation Research (SBIR)/Small Business Technology Transfer (STTR) program in the U.S, the Science Enterprise Challenge in the U.K., the “Law on Innovation and Research to Promote the Creation of Innovative Technology Companies” in France (Mustar and Wright, 2010), and ProTon Europe, the European Knowledge Transfer Association, created by the European Commission.

However, although the general public and policy-makers often use the terms interchangeably and even facilitate one in the hope of getting more of the other, innovation is not the same as entrepreneurship. We know that not all entrepreneurs innovate.

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² Schumpeter published his ideas originally in German: Schumpeter, J.A. (1912). *Theorie der wirtschaftlichen Entwicklung*, München und Leipzig: Duncker und Humblot. A version of this book was published in English in 1934.

³ We will use the term “entrepreneur” throughout, but we recognize that entrepreneurship is often a collective action by a team, such as Gates and Allen, Hewlett and Packard, Jobs and Wozniak, Noyce and Moore, Page and Brin etc.

In fact, the majority of new, independent ventures are not innovative at all. The Global Entrepreneurship Monitor survey, which reports primary data from some 80 countries, shows that, on average, only less than 30% of all new ventures reported that their products were new to customers and most of their competitors (Reynolds et al., 2005; Bosma et al., 2009) – and a stricter criterion emphasizing radical novelty would likely result in an even lower percentage. Importantly, the data also indicates that the share of product-innovating and technology-based new ventures varies considerably across countries and, in fact, within nations, from less than 10% to a high of nearly 50%. The real question, then, seems to be not *whether* entrepreneurs innovate, but rather, *when and where* they do so. This question calls attention to the regulating influence of context on innovative activity by entrepreneurs, which is the focus of the current Special Issue.

Given the long-standing theoretical association between entrepreneurship and innovation, the question of contextual influences on entrepreneurial innovation has received surprisingly little attention. The arguably most influential tradition on country-level innovation – the National Systems of Innovation literature – has hardly touched upon the topic. Acs et al. (2014) observed that the core writings of the NSI literature hardly even mention entrepreneurship, and even then, mostly as anecdotal examples or passing references to Schumpeter's 'Mark I' and 'Mark II' models (Dosi et al., 1988; Freeman, 1988; Lundvall, 1992). This is because Schumpeter subsequently changed his mind and started to emphasize the importance of institutionalized structures – such as corporate R&D departments – on innovation over the chaotic and haphazard process managed by entrepreneurs. It was this, Schumpeter's "Mark II" model that came to influence much of the NSI literature, with the consequence that the entrepreneur, and the role (s)he plays in innovation, was largely ignored.⁴ Acs et al. (2014) conclude that "... in the institutional tradition of the NSI literature, institutions engender, homogenize, and reinforce individual action: it is a country's institutions that create and disseminate new knowledge and channel it to efficient uses." Thus, individual-level agency and the micro processes of entrepreneurial innovation – and how these are regulated by context – have not been the focus of this literature and thus have been less explored by these authors.

Whereas the innovation literature, and especially, the NSI literature was mostly about structure and institutions, the entrepreneurship literature has been mostly about the individual or the firm (Zahra and Wright, 2011). Yet, as noted above, there is increasing evidence that in entrepreneurship, quality matters. The GEM data suggests that on the basis of self-employment rates, the most entrepreneurial economies in the world would be poor developing nations. In high-income economies, with better supply of high-quality jobs, self-employment rates tend to be lower, yet the aggregate contribution of entrepreneurs to innovation tends to be higher. This contrast again calls attention to how context regulates the micro processes of entrepreneurship innovation. Still, the gap remains: although increased availability of data has spurred comparative entrepreneurship research exploring the effect of country context on the entrepreneurial dynamic, this research stream remains very much in its infancy (Autio and Acs, 2010; Autio et al., 2013b; Bowen and De Clercq, 2008; Levie and Autio, 2011). It is also important to note that entrepreneurial innovation can vary by region within a country (e.g., the San Francisco Bay Area versus Alabama, Beijing versus rural China) and across

industries. That is, both region and industry are important contexts to consider.

This Special Issue addresses the above gap. Its purpose is to improve our understanding of the theoretical, managerial, and policy implications of entrepreneurial innovation by examining the role of context in stimulating the extent and variety of such activity, as well as its impact on outcomes in terms of the types of entrepreneurial innovation and subsequent venture performance (Zahra and Wright, 2011). Although contextual influences on entrepreneurial action have long been acknowledged (Aldrich, 1999; Aldrich and Fiol, 1994; Thornton, 1999; Welter, 2011), research on entrepreneurial action has been dominated by individual-level and dispositional approaches (Shane, 2003; Shane and Venkataraman, 2000; Sorensen, 2007). That is, the primary focus of the academic literature on entrepreneurship has been on the individual.

The associated neglect of contextual influences constitutes a major gap (Zahra and Wright, 2011), since policy action seeks to influence entrepreneurial activity by manipulating the contexts in which individuals choose to act or not (Audretsch et al., 2007). Fig. 1 presents our organizing framework, portraying the interrelationships between contexts, entrepreneurs and entrepreneurial behavior, types of entrepreneurial innovation and performance, which we elaborate. The remainder of this paper is organized as follows. Section 2 elaborates on our comparison of national systems of innovation, entrepreneurship and entrepreneurial innovation. Section 3 introduces a high-level organizing framework to categorize contextual influences on entrepreneurial innovation. Section 4 provides focused summaries of the papers and lessons learned. In Section 5, we outline an agenda for additional research on this topic. In the final section, we conclude by outlining policy implications.

2. NSIs, entrepreneurship, and entrepreneurial innovation

Table 1 provides a comparison of national systems of innovation (NSI), entrepreneurship, and entrepreneurial innovation.

The notion of a NSI is one of the most important and most cited concepts in innovation studies (Martin, 2012). Building on several seminal works (e.g., Freeman, 1987, 1995; Lundvall, 1988, 1992; Nelson, 1993), a growing body of literature uses it as a framework to understand both the process of innovation and the differences in innovative performance across countries. In response to the criticism that the national level is heterogeneous both in terms of geography and sectors, the concept has also been extended

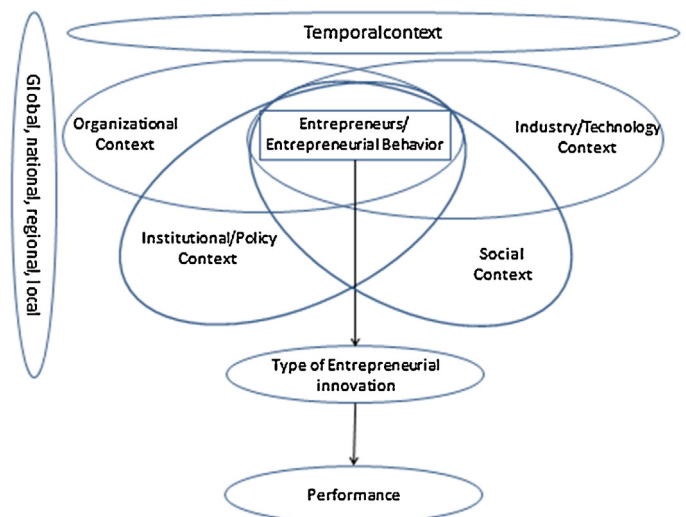


Fig. 1. Framework of entrepreneurial innovation and context.

⁴ There were salient exceptions. For example, Kenney (1986) explicitly analyzed the entrepreneurial foundation of the U.S. biotechnology industry in terms of Schumpeter's Mark I and II models. This was then extended in relationship to the operations of the U.S. venture capital industry, see Florida and Kenney (1988).

to regions and sectors in order to add granularity (Malerba and Breschi, 1997).

The NSI approach emphasizes the complex relationships of cooperation, communication, and feedback among various institutional actors (Carlsson et al., 2002). One of the strengths of the concept has been to highlight the non-linear character and the contextually embedded nature of innovation processes (Samara et al., 2012). But one of its main weaknesses is its focus on structure at the cost of ignoring agency, and consequently, its insufficient understanding of the micro-foundations of innovation dynamics (Gustafsson and Autio, 2011). The concept has been criticized because the existing literature provides only limited insights into the drivers of change in NSIs and on the mechanisms that can explain their evolution and growth over time (Castellacci and Natera, 2013; Hung and Whittington, 2011). Another weakness of the concept is that the majority of the literature is based on a relatively narrow conception of innovation, with the main focus being on patentable technological innovation. Innovation is associated with activities taking place at technological frontiers, leading to equating innovation narrowly with invention (Metcalf and Ramlogan, 2008). Less focus has been given on 'softer' forms of innovation, such as organizational and business model innovation. Finally, a further weakness of the concept is that entrepreneurship has been the overlooked element in the innovation system story (Metcalf and Ramlogan, 2008). As noted earlier, the core works of the NSI literature hardly ever evoke the term 'entrepreneurship'—and even then, usually as anecdotal examples or in reference to Schumpeter's Mark I and Mark II models (Acs et al., 2014).

In contrast to the NSI literature, entrepreneurship takes a broad view of innovation to include formal and informal IP, services, and processes. In entrepreneurship literature, individual agency is of core interest, and individuals and entrepreneurial teams are portrayed as playing a key role in identifying, selecting, and exploiting opportunities for entrepreneurial action. Hence, in contrast to the largely top-down emphasis of the NSI literature, the entrepreneurship literature tends to portray a non-linear bottom-up approach by the entrepreneurial individual and teams. Consequently, a vast literature has been devoted to analyzing what kinds of actions constitute entrepreneurial behavior. Over time, this literature has

developed from the subsequently heavily criticized focus on identifying the psychological traits that were believed to characterize entrepreneurial individuals toward a broader focus on the determinants of entrepreneurial action and the cognitive processes that regulate such action (McMullen and Shepherd, 2006; Autio et al., 2013a).

The entrepreneurship literature traditionally focused on independent start-ups as the organizational mode within which entrepreneurial action took place. Again, while there remains some debate, it is increasingly recognized that the variety of forms that opportunities for entrepreneurial action take can emerge in a range of organizational arrangements including established corporations (Phan et al., 2005), spin-offs from corporations and universities (Siegel and Wright, 2014), family firms (Chrisman et al., 2014), management buyouts (Ughetto, 2010), social movements (Rao et al., 2000), and social entrepreneurial ventures (Zahra and Wright, 2011).

An acknowledged gap in the entrepreneurship literature is an almost myopic focus on the individual, the team, and the resulting venture while not paying much attention to how context regulates the behavior, choices, and performance of each (Phan, 2004; Davidsson, 2006; Autio and Acs, 2010). This is a non-trivial omission, since we know that all human action occurs in contexts: it is the context that regulates what individuals and teams get to see, what choices they are likely to make, and what the outcomes of those choices are likely to be. For this reason, context must play a central role in our understanding of the origins, forms, micro-processes, functioning, and diverse outcomes of entrepreneurial activities. While some early studies gave consideration to the context in which entrepreneurship occurs, research attention to contextual influences on entrepreneurial behaviors has been typically ad hoc if considered at all (see Zahra et al., 2014 for a review). More recently, attempts have been made to elaborate a more systematic framework of the dimensions of context in entrepreneurship (Levie et al., 2014). Dimensions influencing entrepreneurial action have been identified as comprising institutional, temporal, industry, market, spatial, social/organizational, ownership and governance aspects (see Table 1).

In contrast to NSI and entrepreneurship, the dimensions portrayed in Table 1 view entrepreneurial innovation as involving the

Table 1
National innovation systems, entrepreneurship and entrepreneurial innovation compared.

	National innovation system	Entrepreneurship	Entrepreneurial innovation
Definition of innovation	Narrow view: focus on technological and science based innovation	All actions that lead to the formation of a new organization?	Focus on radical innovation
Innovation driver	R&D and technology, invention	Entrepreneurial cognition and learning, opportunity recognition and creation	Co-creation and evolution with ecosystem
Role of the Individual agent	Not considered or expected to appear automatically	Central, but analysis usual in vacuum and focuses usually on individuals (often does not recognize team character of much entrepreneurship)	Individuals/teams operating within a context that includes social, institutional, industrial, organizational, temporal and spatial networks
Context Mechanisms	Institution as actors Top down (i.e. Government policy) and complex set of interaction	Generally ignored but emerging agenda Bottom up (i.e. individual entrepreneurs), decentralized, non-linear processes; social networks; resource orchestration	Agency within a multi-dimensional context Multi-level and multi-actor processes
Mode, organizational forms	University, research labs, tech transfer, large corp.	Start-ups, corporate entrepreneurship	Entrepreneurial firms embedded in networks
Perspective	Actions of macro-level actors	Opportunities and motivation	Interaction between entrepreneur and ecosystem
Unit of analysis	Institutional context	The individual; the firm	Multiple units of analysis: Context and individual
Policy emphasis	To foster R&D, provide subsidy programs, transfer/bridging policies	Fostering firm creation and growth	To foster development of entrepreneurial ecosystems
Financing	Emphasis public support for knowledge production and technology transfer?	Government entrepreneurship programs, incubators, subsidies to BA and VC sector	Multilevel, multi-dimensional and public-private funds and funds of funds

disruption of existing industries and creation of new ones through multi-level processes and stakeholders, multiple actors and multiple contexts that constitute different entrepreneurial ecosystems (Isenberg, 2010). Entrepreneurial ecosystems regulate the direction and quality of entrepreneurial innovation by shaping the direction and potential rewards of alternative courses of technological development and even the types of organizational forms that will be accepted as legitimate.⁵ Consequently, we envision the main purpose of policy as strategies to foster the development of entrepreneurial ecosystems in different contexts. We return to discussion of the dimensions of such a policy stance in the final section.

3. Contexts for entrepreneurial innovation

But how do contexts regulate entrepreneurial innovation? Although there have been studies exploring contextual influences on entrepreneurial behaviors (including innovation), overarching frameworks have been missing. At a general level, one may distinguish between effects on 'entry' behaviors and effects on 'post-entry' behaviors (Autio et al., 2013a). Correspondingly, we distinguish between two types of effects through which context can influence entrepreneurial innovation: selection effects and strategic choice effects.

In the terminology adopted here, 'entry behaviors' refer to situations where individuals initiate entrepreneurial pursuits, either through new ventures ('entrepreneurship') or in the context of established organizations ('intrapreneurship'). 'Post-entry' behaviors refer to the goal setting of those behaviors. In the context of entrepreneurship, post-entry choices will influence goal setting in terms of, e.g., growth orientation or innovative activities affected through the new venture. In the context of intrapreneurship, post-entry choices may set the ambition level of the entrepreneurial action pursued.

Influences on entry manifest themselves as selection effects: by regulating who engages in entrepreneurial behaviors, influences on entry will indirectly shape the form those behaviors take (Cassar, 2006). These are also sometimes referred to as 'demand-side influences' (Sorensen, 2007). The influence of selection effects on entrepreneurial behaviors may operate through opportunity costs created by the entry choice. For example, highly educated entrepreneurs might experience opportunity costs accruing to the allocation of their human capital. These would push such individuals to pursue faster growth in new ventures to compensate for the cost of abandoning alternative occupational pursuits (Autio and Acs, 2010). Or, selection effects might operate through social legitimacy costs that individuals belonging to a given social, cultural, or ethnic group or organizational culture might associate between alternative courses of action. Thus, selection effects can be traced back directly to the characteristics of the individual that self-selects to the entrepreneurial behavior.

Post-entry influences operate through strategic choices made in post-entry situations, once the selection is complete. While selection effects continue to influence entrepreneurial innovation in post-entry situations, another set of contextual influences also kicks in. These would operate through the perceived desirability or feasibility associated with alternative entrepreneurial actions – e.g., the choice between pursuing radical vs incremental innovation. In the case of strategic choice, perceptions of feasibility and desirability would ultimately reflect contextual factors rather than individual-specific characteristics. For example, the form

of innovation pursued by post-entry entrepreneurs might be regulated by, e.g., resource availability, cultural and social norms, or perhaps by formal institutions such as intellectual property protection (Autio and Acs, 2010). We propose that it is important to pay attention to both selection and strategic choice effects when theorizing about contextual influences on entrepreneurial innovation. Combined, we label these 'contextual influences'.

We also propose that it is useful to distinguish between types of contexts when considering contextual influences on entrepreneurial innovation. While no widely cited categorization of such influences is available in the literature, there is sufficient previous research to propose one. In our organizing framework, we distinguish between: (1) industry and technological contexts; (2) organizational contexts; (3) institutional and policy contexts (further distinguishing between formal and informal institutions); and (4) social contexts, overlain by (5) temporal and (6) spatial contexts. These contexts are interrelated, as portrayed in Fig. 1. We see the interplay between variations in these contextual elements and entrepreneurs as constituting different entrepreneurial innovation ecosystems that generate different types of entrepreneurial innovation.

Industry and technological context is the most widely studied context for entrepreneurial innovation. For example, industry life cycle models typically maintain that entrepreneurial activity is most likely encountered during the early stages of an industry life cycle, where the emphasis of innovation is on product features and alternative product designs (Abernathy and Utterback, 1978; Anderson and Tushman, 1990; Kenney and von Burg, 1999). Early stages of industry life cycle might witness high rates of entry due to imitation and bandwagon effects, which we could expect to operate primarily through selection (Aldrich and Fiol, 1994; Klepper, 1996; Klepper and Simmons 2000; Wade, 1995). In later stages, industry structural conditions and resource munificence may exercise salient influences on entrepreneurial innovation (Acs and Audretsch, 1988; Castrogiovanni, 1991).

Besides structural aspects, industrial contexts also vary in terms of technology. Technological aspects of context are defined by the architectural attributes of the technology around which the entrepreneurial action takes place (Obschonka et al., 2012; Thomas and Autio, 2012). Important here is how the architectural attributes of the underlying technology shapes the innovative activities of the various stakeholders in the networks attached to it. Many authors claim that technology platforms are growing to exercise an increasingly important influence on firm-level innovative activity (Garud et al., 2008).

Organizational context captures the influences of, for example, organizational culture, practices, experience, knowledge and skill effects (Nanda and Sorensen, 2010). This is another relatively widely explored contextual influence on entrepreneurial innovation. Drawing on employment statistics it has been demonstrated, for example, that the characteristics of previous employment exercise a salient influence on entrepreneurial entry (Buenstorf and Klepper, 2009; Sorensen, 2007). In this issue, Stuart and Liu (2014) examine the effect of organizational incentives on entrepreneurial innovation by employees, while Agarwal and Shah (2014) discuss the different types of knowledge relating to entrepreneurs emanating from different organizational contexts. This is consistent with previous research regarding entrepreneurial innovation in other organizational contexts, such as the aftermath of private equity and leveraged buyout transactions (Lichtenberg and Siegel, 1990; Lerner et al., 2008; Ughetto, 2010).

Institutional and policy contexts have attracted some attention in the entrepreneurship literature (Autio et al., 2013b; Hart, 2003; Hayton et al., 2002; Uhlaner and Thurik, 2007; Welter, 2011). Regarding institutional context, it is useful to distinguish between formal and informal institutions. Whereas formal

⁵ There is a large sociological literature on the role of legitimacy in the acceptance or rejection of certain types of entrepreneurship, see for example, DiMaggio and Powell (1983), Suchman (1995).

institutions mostly influence economic outcomes and opportunity costs, informal institutions tend to operate through established social norms and perceptions of legitimacy and social desirability. Salient formal institutional influences include, for example, property protection (Autio and Acs, 2010); regulation of entry (Djankov et al., 2002), the rule of law (Djankov et al., 2002; Levie and Autio, 2011), rules regarding competition with former employers (e.g., Marx et al., 2009). Certain regions or nations may also have a set of formal institutions, such as venture capitalists, lawyers, accountants, etc. specialized in assisting entrepreneurial firm formation and growth, or what Kenney and Patton (2005) termed “entrepreneurial support networks.” Informal institutions extend from culture (Stephan and Uhlaner, 2010) to social norms (Webb et al., 2009) to peer influences (Obschonka et al., 2012).

Social context: Substantial attention has focused on how the networks between entrepreneurs, trading partners, financiers, and incumbent firms influence the nature of entrepreneurship (Hoang and Antoncic, 2003; Dubini and Aldrich, 1991). Evolutionary scholars have shown that knowledge is widely dispersed among many heterogeneous agents and that the interactions and exchanges between them are crucial for new knowledge production (Amin and Cohendet, 2000), and hence entrepreneurial innovation. These agents include entrepreneurs who create and discover new ideas, actors who develop complementary assets, actors in institutional forums, and customers (Garud et al., 2003).

Overlaying each of these contexts are temporal and spatial dimensions of context.

Temporal context: Studies have recognized a temporal dimension as industries evolve from new to growth, maturity and decline. Organizational contexts may also change over time as firms evolve through similar life-cycle stages which may also involve ownership and governance change (Wright et al., 2013). Institutional contexts have temporal aspects as various dimensions of laws and regulations change over time. For example, emerging economy contexts are not static but evolve over time and at different rates across countries (Hoskisson et al., 2013). Entrepreneurial ecosystems are also evolving as Feldman et al. (2005) argue in the case of the development of new industrial clusters. These evolutionary processes initiated by successful entrepreneurship drive changes in the local institutions and cultures. As the case of Silicon Valley shows most dramatically, the actions of entrepreneurs contributes to the creation of an environment that encourages yet more entrepreneurship and even form a positive feedback loop.⁶

Spatial context: A spatial dimension to entrepreneurship concerns the geographical locus of entrepreneurial firms in terms of their global, national, regional and local distribution (Welter, 2011). Similarly, the spatial dimension also includes the spatial concentration of institutions, policies, and even social norms supporting or even encouraging entrepreneurial behavior. This dimension can include the mobility of innovative entrepreneurs to different geographical areas with different regulations, laws, networks, etc. that affect their ability to innovate (Drori et al., 2009).

4. Summaries of contributions in the special issue

In this section, we situate the papers in the special issue within the over-arching framework of Fig. 1. Table 2 presents the salient aspects of each study. The papers address different aspects of context and the nature of entrepreneurial innovation.

Drawing upon the observation that entrepreneurs build firms based upon knowledge they wish to commercialize, Rajshree Agarwal and Sonali Shah consider three organizational

contexts – previous employment in a firm in the particular industry, university or at a user of the technology – and their impact on the type of entrepreneurial innovation. The model they construct suggests that the nature of entrepreneurial action will differ based on each of these sources.

The authors theorize that the knowledge sources of entrepreneurship are critical in determining who profits from innovation, how they do so, and the manner in which industries evolve due to type and source of their knowledge. Effectively, the different organizational contexts endow entrepreneurs with systematically different types of knowledge. They suggest that academic- and user-founded are more likely introduce product innovations, while employee-founded firms would introduce both product and process innovations. The results also suggest that knowledge contexts have differential effects on new firm formation for employee, academic and user innovators, their relationships with existing firms, and their resultant performance. These systematic differences would extend to access to complementary assets, appropriability, when in an industry life-cycle firm formation is likely to occur, relationships to existing firms, and ultimate performance. This theory-building exercise provides a number of testable hypotheses.

Focusing on the role of the organizational context, Toby Stuart and Chris Liu empirically examine the extent to which internal rewards and resources in a science-based entrepreneurial firm accrue to scientists for publishing. There are costs in that open publication is tantamount to a revelation of a firm's strategic intent and identifying individuals who contributed to knowledge development can make them attractive targets for competing employer. However, by being more embedded in the external ecosystem, publishers become active participants in the invisible colleges of the scientific community and acquire access to unpublished results that can help the organization to accelerate profitable entrepreneurial innovation. Stuart and Liu assess how within a single firm the rewards process varies with respect to the hierarchical positions the scientists occupy. Their data consist of almost 2000 person-year observations during the period 2001–2008. The authors report that there was a positive link between an employee's publication success and rewards. However, when they controlled for hierarchical position, they found that it was, in fact, employees holding scientific leadership roles within the organization that were rewarded for publication success, and not rank-and-file members. This reinforces the sociological observation that location within a particular context has a significant impact on rewards. These results contribute to our understanding of resource allocation processes and reward structures in science-based firms, and of how an aspect of organizational context can facilitate entrepreneurial innovation.

Linking to the role of the university context explored by Agarwal and Shah, Andrew Nelson analyzes how a change between institutional contexts shapes entrepreneurial activity. Based on a unique case study of the commercialization of a university-developed technology, in which a largely overlapping team first attempted to commercialize the technology in a university setting and then later in a startup firm, he demonstrates the importance of context for success. Remarkably, the same individuals adopted different behaviors and perspectives in the different institutional contexts of a university and a firm. These two different contexts were optimized to facilitate and encourage different goals. Since in both cases, the ultimate goal was the development of a commercial technology, the university context driven largely by an exploration motivation created a misalignment between the necessity for a firm to exploit its technologies and the overarching university goal of creating new knowledge. As a coherent institution and, in this case, very successful university, Stanford exhibited multiple mutually reinforcing contextual features that made it difficult to change. In contrast, when the technology and many of the individuals were

⁶ For a general discussion of this process in Silicon Valley, see Kenney and Florida (2000).

Table 2
Papers in the special issue.

Authors	Research question	Theory/framework	Data and method	Findings and conclusions
Agarwal & Shah	What advantages and disadvantages are conferred by employee (within industry), academic, and user entrepreneurship knowledge contexts on new firm formation and performance? How does the heterogeneity of innovation affect these relationships?	Employee, academic and user entrepreneurship	Theory paper, literature review and synthesis	The knowledge source of entrepreneurship is critical in determining who profits from innovation, how, and the manner in which industries evolve due to the role of heterogeneity in the knowledge source; strengthening of the importance of complementary assets and the appropriability regime over time differentially affects new firm formation by employee, academic and user innovators, their relationships with existing firms, and their performance.
Stuart & Liu	To what extent do internal rewards and resources accrue to scientists who are prolific publishers in a science-based entrepreneurial firm? How does this process vary across the positions that scientists hold within the firm? What lessons can be learnt about creating an entrepreneurial context within a science-based firm?	Incentive mechanisms, authority structures	Case study of an established entrepreneurial firm. Longitudinal dataset of almost 2000 person-year observations covering 2001–2008. Fixed effects panel linear modeling and OLS	Publishing creates an ecosystem that helps recruitment and retention. Disclosing some knowledge to competitors also enables privileged access to new unpublished knowledge that can accelerate future for-profit endeavors. Prolific publishers receive greater year-end bonuses and are allocated additional direct reports, but only for individuals in scientific leadership roles.
Nelson	How does context shape entrepreneurial processes beyond “entry”? How do the roles of individuals and contextual factors interact in shaping entrepreneurship over time? What are the challenges and opportunities associated with attempts to change organization contexts?	Organizational context; process of entrepreneurial behavior	Case study of commercialization of waveguide physical modeling (PM) technology at Stanford University and subsequently in a start-up; 17 interviews and archival data covering 20 years	The same individuals adopted different behaviors and perspectives in the different organizational contexts; the university and firm contexts were optimized to different goals, creating a tension arising from misalignment between different contextual factors in the university that reinforced one another making for a system that is difficult to change; attempts to change the organizational context can have adverse consequences for the underlying main purpose of an organization and for key relationships. Social networks play an important role in promoting innovation and reducing uncertainty. This “social” aspect of entrepreneurship increases the likelihood of entrepreneurial success. The findings lend credence to theories of entrepreneurship that suggest that entrepreneurial opportunities are formed endogenously by the entrepreneurs who create them.
Leyden, Link, & Siegel	What is the importance of social networks on entrepreneurial performance?	Knightian uncertainty; entrepreneurial search; social networks	Theory paper	Disconnections between knowledge, business and financial systems has a negative impact on the innovative output and survival of entrepreneurially innovative firms.
Clarysse, Bruneel, Wright, & Mahajan	To what extent are innovation and business ecosystems related? How do innovation and business ecosystems impact innovative output and survival?	Innovation and business ecosystems	Archival data on innovation ecosystem, business and financing networks of 138 innovative start-ups in Flanders, Belgium from 2005–11.	
Garud, Gehman, & Giuliani	How do entrepreneurs use narration to create and pursue opportunities?	Narrative theory	Theory paper, literature review and synthesis	A narrative perspective that considers relational, temporal, and performative facets is insightful to understanding entrepreneurial innovation;
newline ‘anchor events’, such as regional conferences and state-sponsored entrepreneurial expositions, are important platforms for different constituencies of an ecosystem to coordinate their activities				

shifted to a start-up firm, this context was aligned to encourage exploitation. This suggests that institutional contexts can have profound influence on individual entrepreneurial action. Moreover, contexts optimized for a certain set of actions will have difficulty supporting others that conflict with the dominant logic, institutions, and values of another context.

Dennis Leyden, Al Link, and Don Siegel focus on the interaction between entrepreneurial behavior and social context. They develop a theoretical model of the entrepreneur as an agent taking innovative action in an environment of uncertainty, while recognizing that the process occurs in a social environment within which the entrepreneur can reduce uncertainty. Leyden et al.'s formal model suggests that this "social" aspect of entrepreneurship increases the likelihood of entrepreneurial success. The results also lend credence to theories of entrepreneurship that suggest that entrepreneurial opportunities are formed endogenously by the entrepreneurs who create them.

Linking to this paper, Bart Clarysse, Johan Bruneel, Mike Wright and Aarti Mahajan provide empirical evidence on the role of the social context. Exploring the interaction between social, spatial, and institutional and policy contexts, their paper examines the R&D alliances, key customers, and sources of financial support for 138 innovative start-ups in Flanders, Belgium during the period 2005–2011. Using research alliances these firms had established with other organizations as representing their knowledge ecosystem, main customers as their business network, and their financial backers as their financial network. Using a network density analysis and negative binomial estimation technique they test their hypotheses regarding the network structure for these start-ups. Their analysis concludes that the knowledge ecosystem is present and concentrated around a few central actors. In contrast, they find that the business ecosystem, i.e., a group of companies, which simultaneously create value by combining their skills and assets, is almost non-existent. Finally, they find that the almost entirely publicly-backed financial support network is disconnected with the knowledge ecosystem and business network. They argue that the disconnection of these three systems has a negative impact on the innovative output and survival of these firms. From this, they conclude that Flanders should consider reconfiguring its policies to improve the linkage between the knowledge and business ecosystem elements.

Finally, Raghu Garud, Joel Gehman, and Antonio Giuliani address the links between context and types of entrepreneurial innovation. They note that interest in entrepreneurial innovation is growing. Some scholars have taken a micro perspective emphasizing the importance of agency, while others have taken a macro perspective emphasizing the importance of contexts. Further scholars have proposed multilevel perspectives, arguing that opportunities are discovered or created by entrepreneurs whose efforts are moderated by contexts. The authors note that more recent studies, informed by theories of structuration, complexity and disequilibrium, have explored perspectives wherein the micro and macro are mutually constituted. Garud et al. argue that one can better understand entrepreneurial innovation by using a narrative perspective that considers the relational, temporal, and performative facets of entrepreneurial innovation. Each facet offers entrepreneurs a toolkit for constituting their innovations. As entrepreneurs narrate and constitute their innovations over time, these different narrative elements allow them to contextualize their innovations. Entrepreneurial innovation is thus conceptualized as a continuing process involving embedded actors who attempt to shape emergent contexts through their performative efforts. The authors also note that the narrative perspective has several important implications for policy, practice, and research. In particular, they highlight the importance of 'anchor events', such as regional conferences and state-sponsored entrepreneurial

expositions, as platforms for different constituencies of an ecosystem to coordinate their activities. Anchor events provide venues for the creation, maintenance, and rejuvenation of the relationships fundamental to the development of ecosystems, serve as important venues for the temporal coordination of activities during the emergence of ecosystems and thereafter, and from a performative perspective serve as venues for turning ideas into reality, and talk into action. For research they suggest, for example, that there is a need to understand how entrepreneurs craft narratives that will generate legitimacy for their ventures, and yet change their narratives to deal with emergent situations.

5. Contextual influences on entrepreneurship: a research agenda

In this section, we outline an agenda for future research based on the framework developed in Fig. 1. Specifically, we highlight the relationships between different contexts and entrepreneurial innovation in relation to: contextual interactions, entrepreneurial behavior, type of entrepreneurial innovation and performance. The main research questions are summarized in Table 3.

5.1. Contextual interactions

A first aspect of contextual interactions concerns the link between ownership and governance and different contexts. To the extent that research has compared ownership structures in entrepreneurial firms the focus has tended to be on VC backed and family firms. Some work is emerging on the heterogeneity of firms within these categories (see Manigart and Wright, 2013). However, comparative analyses in different institutional contexts and over time remain limited. Relatedly, work on the role of board structures and processes in facilitating entrepreneurial innovation in different contexts is limited. We noted earlier the temporal dimension of organizational contexts as entrepreneurial firms develop over time. Zahra et al. (2009) developed a framework for the nature of boards in firms engaged in entrepreneurial innovation that addressed a temporal aspect of context concerning the threshold between start-up and professionalization.

A second aspect of contextual interactions relates to understanding of how contexts influence different configurations of entrepreneurial ecosystems. The literature on national systems of entrepreneurship has highlighted the macro-conditions for the development of entrepreneurship (Acs et al., 2014). While there is an extensive literature on entrepreneurs' social networks (Davidsson and Honig, 2003; Greve and Salaff, 2003), an emerging business ecosystems literature has focused on customer, supplier, and service networks for the entrepreneurship process in high-tech firms (e.g., Buhr and Owen-Smith, 2010; Kenney and Patton, 2005). There is a continuing need for analysis of the institutional characteristics and dynamics of differing entrepreneurial ecosystems. Chronological analysis of how such ecosystems evolve would likely yield interesting insights. For example, analysis is warranted of the extent to which and how these emerge on the basis of dominant firms that spawn superior spin-offs that remain locally or regionally or whether such firms are attracted to move to a particular cluster (Agarwal and Breguinsky, 2014). Further, the determinants of why, in some cases, entrepreneurial innovation declines and even disappears, while in other ecosystems there are new waves of entrepreneurial innovation. How this evolution is shaped by and shapes institutional, organizational and sectoral changes also warrants attention.

A third aspect concerns the development and operationalization of policies aimed at stimulating entrepreneurial innovation and how these should be informed by the wide variety of

Table 3
Further research agenda.

	Type of context
Contextual interactions	
Organization and ownership	How does the nature and characteristics of entrepreneurial firms vary by context?
newline How does the nature and characteristics of entrepreneurial firms vary by source of the entrepreneurs and innovation? (e.g., university, user, or corporate spinoff)	
newline How do the characteristics of the entrepreneur or entrepreneurial team affect ownership and organization	
Ecosystem	What are the mechanisms by which ecosystems become structured, mature, decline, or become renewed Do different macro-contexts matter for entrepreneurial innovation and if they do, how?
Policy	How does context impinge upon the effectiveness of regional and national programs designed to stimulate entrepreneurial innovation?
Entrepreneurial behavior	
Entrepreneurial objectives, learning, etc.	How do different levels of context influence entrepreneurial behavior, its quality, and its outcomes?
newline What are the salient levels of context (e.g., social, network, cultural, institutional, spatial) in terms of how they regulate and/or channel innovatory entrepreneurial behavior?	
Entrepreneurial processes and resource orchestration	How do institutional contexts affect diffusion and commercialization of new technologies by entrepreneurs?
newline What are the salient mechanisms through which context influences entrepreneurial behavior? Do these mechanisms differ between different dimensions of contexts?	
newline What is the relationship between context and resource availability and configuration?	
Type of Entrepreneurial Innovation	What are the dimensions of entrepreneurial innovation and how do these vary with context?
newline How does location in entrepreneurial ecosystems affect entrepreneurial innovation?	
Performance	What contexts for entrepreneurial innovation and have the greatest impact on firm growth?

existing contexts. For example, from a spatial perspective, an important question is scalar and interrogates the relationships between “national” systems of entrepreneurship and “region-based” or “industry-specific” systems. Further, there are questions regarding what might be effective policies and who is the appropriate actor for implementing them.

5.2. Entrepreneurial behavior

The cognitive aspects of entrepreneurial behavior and entrepreneurial learning have attracted substantial attention, while the contextual influences have received less explicit attention. The aspects of the context influence entrepreneurial behavior and innovation are still not so well understood.

In this issue, Agarwal and Shah, Clarysse et al., and Nelson examine different aspects of the ways in which context influence and even frame entrepreneurial action. Of course, one fundamental challenge to understanding entrepreneurial innovation is grappling with the fact that the entrepreneurs we are most interested in, those introducing innovations face pervasive uncertainty regarding market acceptance, the ability to mobilize resources in terms of capital, employees, etc., and in the case of many technologies whether they will actually work. Ultimately, entrepreneurs must make judgments and take action based on their perception of the opportunity which may differ from judgments made by others. As Garud et al. note in their essay, an important aspect of this process is to create narratives for themselves and other social actors to justify their actions and mobilize resources. Entrepreneurs typically use heuristics to make such judgments. There is a need for further understanding of how different contexts affect the heuristics that entrepreneurs employ to understand and cope with this uncertainty. By extension, one would also expect context to influence entrepreneurial judgment about whether and how to exploit an opportunity (Alvarez et al., 2014).

As organizational ecologists have observed, entrepreneurial behavior is about mobilizing and coordinating the resources and capabilities within the environment to build organizations. Clearly, different contexts may be more or less munificent in terms of resources and amenable to their mobilization. Further, specific contexts may have highly specialized resources. To illustrate this prosaically, the City of London or Wall Street may be superior locations for establishing a finance-related new venture, while Silicon Valley is more conducive to starting a semiconductor firm. While we understand this intuitively, deeper analysis would be welcome.

5.3. Types of entrepreneurial innovation

As Agarwal and Shah (in this volume) suggest, there are many further opportunities to explore the nature of entrepreneurial innovation in different contexts. Such analysis needs to consider the different dimensions of entrepreneurial innovation and how they vary with context. Different ecosystems with their concomitant resources may be required to effect different types of entrepreneurial innovation. Almost certainly, entrepreneurial innovation may differ between ICT, clean technology, biotechnology, health, scientific instruments, and sports equipment sectors. The required ecosystem in terms of access to types of finance, networks and alliances with incumbents, public support schemes, etc. may need to vary accordingly.⁷

The extent to which entrepreneurs are experienced, for example as a result of the number and success of earlier ventures, may introduce a temporal influence on the type of entrepreneurial innovation undertaken. More successful experienced entrepreneurs may believe that they have learnt which aspects of the ecosystem

⁷ For an illustration of this idea, see the discussion of the problems venture capitalist financiers have with clean technology (Hargadon and Kenney, 2012).

are particularly relevant to them and find it easier to identify novel innovative opportunities and to mobilize resources.

5.4. Performance

Although our principal focus is on the link between context and entrepreneurial innovation, the impact on performance is of ultimate interest. In the current difficult economic environment, entrepreneurial innovation holds promise for generating growth. However, creating the appropriate macro environments for entrepreneurship that generates such outcomes – such as ‘National Systems of Entrepreneurship’ remains a major policy challenge that warrants further attention (Acs et al., 2014; Adams, 2011; Radosevic, 2007). The configurations of entrepreneurial innovation and different contexts that generate innovatory entrepreneurial performance in the economy; both in terms of new products and services and organizational forms are not well understood.

6. Policy

The articles in this special issue provide further evidence that entrepreneurial innovation is profoundly affected by its context. For twenty years, policy-makers have understood this point and have engaged policies and tools to create a more hospitable environment for entrepreneurial innovation. Reflecting our earlier discussion, policies have paid attention both to entry and post-entry behavior of entrepreneurs (Audretsch et al., 2007; Stevenson and Lundström, 2007; Storey, 2005). Public authorities have sought to influence the quantity of entry behavior through general (the development of entrepreneurial education or an easier new firm registration) or targeted policies (e.g. policies for specific populations: women, immigrants, unemployed people, youths, students, academics). Policy-makers have also tried to foster the creation of growth oriented new ventures using specific support for innovative or ambitious projects (e.g. support to new venture R&D, support for NTBFs exportation, support to recruit high or experienced level managers and engineers) (NESTA, 2009; OECD, 2002). This section links examples of these tools to our framework with its six different contexts that influence entrepreneurial innovation.

6.1. Industry and technological contexts

Policy actions have tried to foster the development of new technological sectors. Public support has taken several forms: development of academic research, competitions, development of frameworks governing skill formation systems and labor market, creation of technological platforms or creation of specific venture funds dedicated to biotechnology ventures (Casper and Whitley, 2004). For example, during the last 30 years the German government has pursued policies to foster the development of a biotechnology industry and technological context (Jasanoff, 1985; Giesecke, 2000; Dohse, 2000). The majority of these policy stimulants are oriented toward the creation of start-up firms (e.g., BioRegio, BioChance, BioChancePlus, ExostGO-Bio, Biofuture) (Wright et al., 2007). This sectoral policy approach has also been adopted elsewhere. Recently, the U.S. federal government has dedicated large subsidy programs to entrepreneurial clean technology sector (Hargadon and Kenney, 2012).

6.2. Organizational contexts

Support for the creation of academic spin-offs from university and public research organizations (PROs) is way that policy makers have attempted to modify organizational contexts (Wright et al., 2007). In Europe, to foster the creation of academic spin-offs, public policies have tried to emulate the US organizational context with

different schemes both to provide direct support for entrepreneurs and to develop cultures, practices, and skills in universities and PROs in traditionally under-developed high tech entrepreneurship environments. The French ‘Law on Innovation and Research to Promote the Creation of Innovative Technology Companies’ adopted in July 1999 is one example of a policy trying to build an organizational context able to foster entrepreneurial innovation (Mustar and Wright, 2010). The Law changed the status of academics and researchers to allow them to participate in the creation of a private company, allowed Universities and PROs to set-up incubators to encourage spin-off creation (30 university incubators have been created), created a national competition for the creation of technological innovative firms, and established public seed money funds. Although these actions have helped change the organizational culture and have led to more spin-offs being created, the results fall far below expectations (Mustar et al., 2008).

6.3. Institutional and policy contexts

Public authorities in different countries have changed the formal context, i.e. rules and laws, to influence economic outcomes and opportunity costs. For example, in France the law has been changed to enable entrepreneurs who have failed to be allowed to borrow money from a bank to pursue a subsequent venture. Reduction of regulatory and administrative barriers has also involved making it easier for employees to quit their job to start a business which may be competitor for the one they have left. Public authorities have also intervened in informal institutions. For example, programs have been developed to promote and legitimize the role of entrepreneurs through competitions, prizes and awards (Westhead and Wright, 2013).

6.4. Social contexts

Policy makers have long recognized that entrepreneurs are embedded in a social context and have tried to facilitate the establishment of connections between them and various actors able to bring them resources. The creation of networks is a central plank of entrepreneurship policy, taking a variety of forms including university research parks, university-industry collaborative research program, and public-private partnerships (Phan et al., 2005). For example, in Taiwan, the Industrial Technology Research Institute (ITRI) has developed public-private partnerships to become a world leader in semiconductor manufacturing, digital displays and notebook computers (Amsden, 2006). Similarly, the main focus of European Framework Programs has been to produce networks of the diverse participants in a particular sector (Larédo, 1998).

6.5. Temporal contexts

Industrial/technical, organizational, institutional and social contexts change over time. Scholars and practitioners recognize that there are different phases in the process of entrepreneurial innovation. At the venture level, a huge academic literature analyzes stage-based models of new firm development (e.g. Vohora et al., 2004). It has long been known that VCs distinguish between different investment stages with financing provided for different purposes. Yet, few policy instruments have tried to take into account this temporal aspect of entrepreneurial innovation. One exception is the US-SBIR (small business innovation research) program. This program reserves a percentage of federal agencies’ R&D budgets for research projects conducted by small businesses covering three phases over time from financing exploration of the technical feasibility of an idea or technology, the proof of concept, through financing the pre-prototype and the evaluation of the potential for commercialization, to support to move from the

laboratory into the marketplace. A large number of evaluation studies have generally identified positive effects of this program (e.g., [Link and Scott, 2010](#)) but some have identified distortions and limitations (e.g., [Lerner, 1999, 2009](#)). Since the beginning of the 2000s and on the basis of the perceived success of the SBIR program, several countries (e.g., Japan, The UK, The Netherlands, and Australia) have launched similar initiatives. In 2014, the EU has developed a similar instrument in its Horizon 2020 Program.

6.6. Spatial context

Entrepreneurship policies may be initiated by federal or state governments but implemented at the regional level ([Audretsch et al., 2007](#)). Over the past quarter century Regional innovation systems in the form of high technology clusters have received significant public intervention to foster regional innovation and creation of new ventures through partnership and spillover among various actors ([Powell et al., 1996](#)). For example, in Japan, the Ministry of Economy, Trade and Industry initiated in 2001 the Industrial Cluster Project (ICP) ([Nishimura and Okamuro, 2011](#)). In France, the government created “pole de compétitivité” to develop collaboration at the local and regional levels between universities, research institutions, large private firms, SMEs and start-ups to foster technological collaboration and entrepreneurial innovation. Another policy intervention in this field concerns immigration policy because the mobility of innovative entrepreneurs to different geographical areas can affect their ability to innovate. In the US, immigrants have made a strong contribution to innovative entrepreneurship. The recent bipartisan Senate Immigration Reform Bill, proposes improvements to the existing employment-based green card system and creates a new “startup visa” for immigrant entrepreneurs ([SBA, 2013](#)). Further, public authorities in Taiwan and China fostered the return of highly trained individuals (in China, “sea turtles”) to establish new businesses in the hopes of encouraging entrepreneurial innovation ([Saxenian, 2006; Filatotchev et al., 2011; Kenney et al., 2013](#)), although the benefits of this policy may have passed its peak ([Economist, 2013](#)).

6.7. Further policy directions?

While the previous examples illustrate specific aspects of context, our framework highlights its multidimensional nature. The connections and ties across these contexts are also crucial for entrepreneurial innovation and future policy development needs to recognize these inter-dependencies and the possible synergies and conflicts between them. Recognizing these inter-dependencies also suggests that a policy to foster a particular aspect of entrepreneurial innovation requires a specific mix of policy instruments for a particular combination of contexts. In other words, a “context mix” requires a “policy mix”. Such an approach calls for more fine-grained evaluation of the effectiveness of policy instruments. Clearly, this view makes the policy-makers task more difficult but may ultimately contribute to more effective policy.

7. Conclusion

This special issue focused on contextual influences on entrepreneurial innovation. Entrepreneurial innovation involves the disruption of existing industries and the creation of new ones. In this Introduction, we have argued that integrating the NSI literature, which has been focused upon structures and institutions, and the entrepreneurship literature, that has been mostly about the individual or the firm, through understanding the contexts within which entrepreneurial innovation occurs will be an important academic advance. We proposed to distinguish between different types of contexts influencing entrepreneurial innovation: industry

and technological, organizational, institutional and policy, social, temporal and spatial contexts which are strongly interrelated.

The variety of papers of this special issue addresses different aspects of context and the nature of entrepreneurial innovation. These papers assist in understanding the question: how does context regulate the micro processes of entrepreneurship innovation? The agenda we outlined for future research on the relationships between contexts and entrepreneurial innovation proposes to fill some gaps in contextual interactions, entrepreneurial behavior, type of entrepreneurial innovation, and, performance. The wide variety of these themes and of the questions asked show that this topic is a promising area of research.

To answer these questions we would need more systematic data on all dimensions of context (e.g. data on the effects of country or region or industry context on entrepreneurial behavior). We will also need a shift in the content and methods of entrepreneurship research to understand the multiple dimensions of entrepreneurial innovation processes and activities. This will, without doubt, improve our appreciation of the huge variety of entrepreneurial activities and their contexts. Academics but also policy makers will have to constantly adapt to deal with such important challenges. Public policies have long recognized that entrepreneurial innovation is profoundly affected by its context. They have tried to create a more hospitable environment for entrepreneurial innovation. Today, they will need to recognize the inter-dependencies between the different types of context we have drawn.

We hope that the directions proposed in this special issue, will inspire many colleagues to enrich our understanding of the role of context in stimulating entrepreneurial innovation and our knowledge of the outcomes of these processes.

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