

Public-sector entrepreneurship and the creation of a sustainable innovative economy

Dennis Patrick Leyden

Accepted: 20 January 2016 / Published online: 17 February 2016
© Springer Science+Business Media New York 2016

Abstract Economic growth requires innovation that can only occur through entrepreneurial action. Attempts to stimulate such action through central direction and explicit planning such as embodied in a National Systems of Innovation approach are inherently limiting because of an inability to anticipate future actions and consequences. A more fruitful approach is the one embodied in a National Systems of Entrepreneurship (NSE) approach, one that recognizes the uncertainty of the entrepreneurial process and focuses instead on the promulgation of policies through public-sector entrepreneurship to create a more nurturing environment within which entrepreneurial action can spontaneously arise in both the private and the public sectors. This paper develops an NSE-based theoretical model of the entrepreneurial environment that integrates into a functional whole the various subsets of that environment that others have studied and explores the role that NSE-guided public policy can play in improving the entrepreneurial environment for both private-sector and public-sector entrepreneurs. In the private sector, such public policies would focus on enhancing the creative

environment, the exchange environment, the incentive and feedback structures, and the access to resources. It is also possible to enhance the entrepreneurial environment in the public sector, though the competing demands of democratic norms make that enhancement more difficult.

Keywords Entrepreneurship · Innovation · Policy · Uncertainty · Sustainability

JEL Classifications D73 · L26 · O3

National Systems of Entrepreneurship (NSE) are fundamental resource allocation systems driven by opportunity pursuit of individuals through the creation of new ventures. Opportunities for venture creation and its outcomes are regulated by country-specific institutions. In contrast to the institutional emphasis of the National Systems of Innovation (NSI) frameworks, where institutions engender and regulate action, National Systems of Entrepreneurship (NSE) are driven by individuals who act within and interact with an institutional frame. This approach differs from the traditional entrepreneurship literature, where institutions are largely silent.

—Conference on National Systems of Entrepreneurship

1 Introduction

Assuring economic growth requires innovation, and innovation can only occur through entrepreneurial action. Despite perhaps the best of intentions, central direction and explicit planning that characterize a National Systems of Innovation (NSI) approach to

D. P. Leyden (✉)
Department of Economics, University of North Carolina
at Greensboro, P.O. Box 26165, Greensboro,
NC 27402-6165, USA
e-mail: dpleyden@uncg.edu

public policy are inherently limiting.¹ Entrepreneurial action occurs in an uncertain environment and therefore cannot be sustained through centralized direction and explicit planning. Because it arises from the spontaneity and creativity of the human imagination and the diverse human ties that engender such imagination, the focused effort of individuals in organizations, and the rewards and penalties that come from those whom the entrepreneur would make better off, entrepreneurial action requires a complex environment of social networks, incentives, material support, and feedback that are better engendered through a National Systems of Entrepreneurship (NSE) approach to public policy.²

Commensurate with these two approaches to public policy, efforts have been made to develop empirical measures of the entrepreneurial environment to guide policy development. The best known of these empirical efforts are the Global Entrepreneurship Monitor (GEM) Project (<http://www.gemconsortium.org>) and the Global Entrepreneurship and Development Institute (GEDI) Index (<http://thegedi.org>). While both efforts have much to offer, the GEDI Index approach is particularly useful, explicitly employing an NSE approach and defining measures to assess the degree to which individual countries' economic environments are supportive of entrepreneurial activity that is the source of innovation and economic growth (Ács et al. 2014).³

¹ The idea of an NSI framework, as Freeman (1995) shows in his historical analysis, is quite old and goes back to Friedrich List's National System of Political Economy in 1841. For an example analysis from an NSI perspective with its emphasis on central direction and explicit planning, see Shapira et al. (2011). While an NSI approach may have some value, Mroczkowski (2014) argues that the approach is ultimately limiting and that a broader, more open approach is needed if innovation is to be more than simply incremental.

² The NSE approach with its view of the critical role of the entrepreneur is similar to the entrepreneurial ecosystem approach with its emphasis on the critical role of the individual entrepreneur in operating within a social/institutional context while helping to define that nature of that same context. Stam (2014) provides an overview of the entrepreneurial ecosystem literature.

³ Szerb et al. (2012) provides a comparison of the two approaches.

While there is a large literature on the nature of the entrepreneurial environment, such efforts have almost entirely focused on subsets of the entire entrepreneurial environment. Thus, to provide a few examples, some, following the seminal work of Kirzner (1973), have focused on the entrepreneurial act of (often incremental) discovery. Others, building on work by authors such as Granovetter (1973) and Burt (2005), have focused on the role of networks in the entrepreneurial process. And still others (Renucci (2014) is a recent example) have focused on the entrepreneurial funding process. To be sure, some have attempted to provide a more comprehensive approach. However, as Stam (2014) notes, such efforts have taken the form of a simple list of attributes associated with entrepreneurial activity without the formal delineation of the connections (causal or otherwise) between such attributes. In his analysis of the entrepreneurial ecosystem approach, Stam (2014, p. 3) points to what is still lacking:

What needs to be unraveled is: what are the proximate and fundamental causes of entrepreneurial ecosystems, and what are the proximate and final consequences of these entrepreneurial ecosystems?

This paper constructs an NSE-based theoretical model of the entrepreneurial environment that integrates into a functional whole the various subsets of that environment that others have studied. Using that integrated structure, this paper then explores the role that NSE-guided public policy can play in improving that environment for both private-sector and public-sector entrepreneurs, thus promulgating a more sustainable innovative economy.

2 The entrepreneurial environment

As Table 1 gives, the entrepreneur has been viewed quite differently by various scholars. Beginning with Cantillon (1755/1931), the first to use the term entrepreneur in its modern sense, the entrepreneur has been viewed alternatively as a risk taker, a capitalist, an innovator, a decision maker, an industrial leader, a manager, a coordinator of resources, an owner, a contractor, or an arbitrageur. In any given circumstance, the entrepreneur may play any of these roles. However, most of these roles are not essentially entrepreneurial; they are often associated with general

Table 1 Different views of the entrepreneur (Leyden and Link 2015)

The entrepreneur is a ...	Associated scholar (s)
Person who assumes the risk associated with uncertainty	Richard Cantillon Frank Knight Johann Heinrich von Thünen
Person who supplies financial capital	Adam Smith
Innovator	Richard Cantillon Nicholas Baudeau Joseph Schumpeter Johann Heinrich von Thünen
Decision maker	Carl Menger
Industrial leader	Jean Baptiste Say
Manager or superintendent	John Stuart Mill
Organizer and coordinator of economic resources	Léon Walras
Owner of an enterprise	François Quesnay
Employer of factors of production	Amasa Walker
Contractor	Jeremy Bentham
Arbitrageur	Israel Kirzner
Allocator of resources among alternative uses	T. W. Schultz

business activity and can be delegated to others. But what is essential is the role of innovator who bears the special type of risk associated with Knightian uncertainty (Leyden and Link 2015).

Risk, Knight (1921, 1951) argued, manifests itself in two forms. One form occurs when the future is not certain, but the possible outcomes as well as their associated probabilities are known with reasonable certainty. Such risk, because it is measurable, can be insured against and is therefore easily dealt with by markets. It is, therefore, a known entity in terms of cost. The other form of risk occurs when the complete list of outcomes and/or the probabilities of those outcomes are not known. This type of risk is inherently unmeasurable, uninsurable and therefore not able to be dealt with by markets. Knight labels the first form of risk simply “risk” and reserves the word “uncertainty” for the second form of risk. As luminaries such as Cantillon (1755/1931), Baudeau (1767/1910), Thünen (1826/1960), and Schumpeter (1926/1934) have noted, what distinguishes the entrepreneur from other business people is their innovative activity. But innovation by its nature is about creating which has not been created before, that is, engaging in an uncertain process. Thus, Knight argued that what essentially distinguishes the entrepreneur is the willingness to take on the special risks associated with uncertainty; it is about perceiving an opportunity heretofore

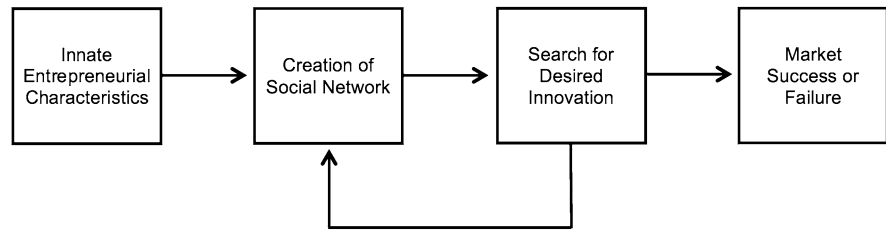
unexploited and acting on that opportunity.⁴ It should be noted that while profits play an important extrinsic role in motivating the entrepreneur, Leyden and Link (2015) argue that at least as important is an intrinsic drive to create. This intrinsic drive sustains the entrepreneur when possible future profits, by the nature of uncertainty, cannot be rationally calculated.

The heart of the entrepreneurial process (shown in Fig. 1) can be thought of an iterative two-step process of creation and discovery in which the entrepreneur creates social networks⁵ based on subjective expectations about the future effectiveness of those networks,

⁴ J. H. von Thünen provides the earliest characterization of the nature of entrepreneurial profits and their motivating role (Thünen 1826/1960). In that characterization, Thünen was quite explicit that entrepreneurial return is not the return from capital but rather the return from ingenuity and the willingness to confront the risks associated with uncertainty. In many ways, Thünen presages the work of Knight nearly a century later. Oddly, Schumpeter was quite explicit in his belief that risk bearing was not an essential characteristic of the entrepreneur (Schumpeter 1926/1934). It is not clear whether this rejection of the entrepreneur as risk bearer was due to his misunderstanding of Knight’s distinction between risk and uncertainty or to a more fundamental disagreement.

⁵ Social networks are also referred to as the social dimension of context in the entrepreneurial literature (Hoang and Antoncic 2003; Welter 2011; Zahra and Wright 2011) and as creative cognition in the psychology literature (Ward et al. 1999; Shalley and Perry-Smith 2008).

Fig. 1 Heart of the entrepreneurial process (Leyden and Link 2014)



chooses an innovation to pursue, and then maps out a search process to discover how to bring that innovation to fruition (Leyden and Link 2014). Key to a productive social network is the presence of what Granovetter (1973) and Burt (2005) refer to as strong ties (i.e., a focused organization under the control of the entrepreneur) and weak ties (i.e., a diffused range of contacts that have a heterogeneous set of knowledge and perspectives). These ties, which make up the private-sector entrepreneur's social network, allow the entrepreneur to generate the social capital (i.e., knowledge) that is used to identify and bring to fruition an innovation.

Of course, entrepreneurial success depends on more than the will of the entrepreneur. It also depends on the entrepreneur being able to operate in an economic environment that provides the entrepreneur with the ability to act on that will to create social networks, gain access to the resources, deliver innovations to customers, get feedback on the value of those innovations, and have the opportunity to earn (uncertain) entrepreneurial returns. For entrepreneurs in the private sector, this economic environment is typically associated with access to competitive markets. Through engagement in such markets, the entrepreneur receives feedback about the value (or lack thereof) that society places on the innovation through the generation of entrepreneurial profits (or losses). Important in this regard, of course, is a system of well-defined property rights and access to capital.

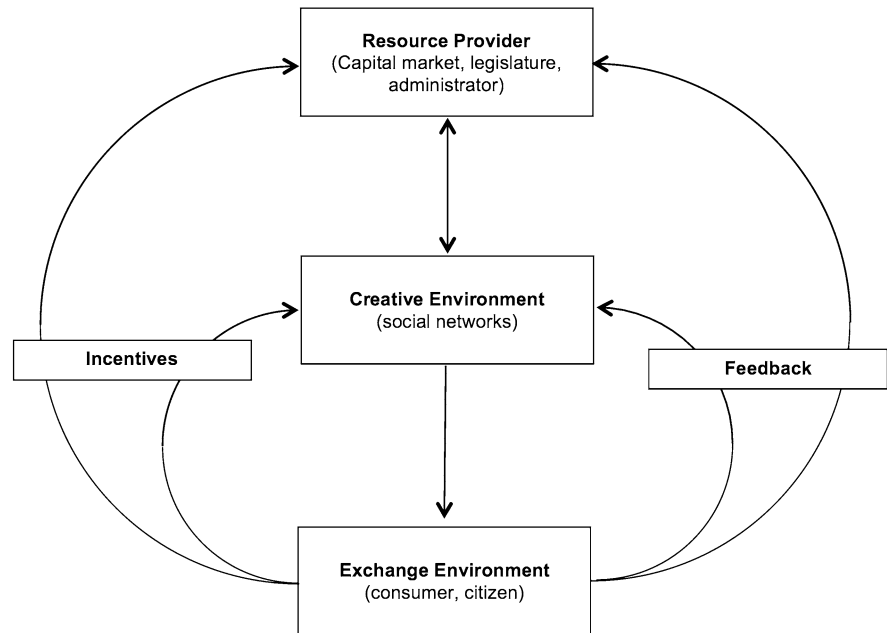
An NSE environment is thus one in which entrepreneurial activity, be it in the private or public sector, will flourish in a complex economic environment of social networks, incentives, material support, and feedback that is necessary for entrepreneurial activity to arise and be nurtured. In contrast to an NSI approach that is structured around institutions that attempt to engage directly in entrepreneurial action or direct the entrepreneurial actions of others, an NSE approach focuses on creating an environment in which

the natural entrepreneurial proclivities of individuals can arise and be nurtured. Given the essential uncertainty that characterizes the entrepreneurial process, an NSI approach is inherently limiting because of its inability to anticipate future actions and their consequences. An NSE approach, by contrast, recognizes the inherent limits of relying solely on planning and therefore focuses on creating an environment that is better designed to cope with such inherent uncertainty. Ács et al. (2014, p. 479) in particular argues that the NSE approach focuses on assuring that:

the right individuals ... form conjectures that entrepreneurial action is desirable and feasible; ...[that] the right individuals... act and initiate new firm attempts that are likely to channel resources to productive uses; and ... that the new firm attempts are allowed to realize their full potential.

To assure such outcomes, an NSE environment can therefore be modeled as a structure consisting of five parts (Fig. 2 shows a schematic overview of this model):

- *A creative environment*—A creative environment is one in which entrepreneurs are able to create and exploit social networks composed of weak and strong ties to generate proposed innovations, and engage in a discovery process by which the entrepreneur attempts to bring the innovation to fruition using the intellectual and resource foundation provided by social networks and the resource support of others.
- *An exchange environment*—An exchange environment (the marketplace in a private-sector context, a more nebulous delivery system in a public-sector context) is where the entrepreneur delivers the innovation. Significant here is the end user (the consumer in a private-sector context; the citizen in a public-sector context) who ultimately

Fig. 2 Entrepreneurial environment

passes judgment on the value of the entrepreneur's innovation.

- *Incentives*—Incentives take the form of reward or loss and provide the extrinsic motivation necessary to sustain entrepreneurial action. In the private sector, incentives come primarily from consumers and are manifest in the form of profit or loss, though government policies may also play a role. In the public sector, incentives come primarily from citizens, but may also come from others such as those who also provide the resources needed to engage in the entrepreneurial process.
- *Feedback*—Information about the value that end users place on the innovation is important to the entrepreneur because it provides guidance as to what innovations to pursue and how to craft and deliver them. In the private sector, feedback comes primarily through the market in the form of profits or losses. In the public sector, the feedback mechanism may take a variety of forms, perhaps directly from citizens, but also indirectly through those who provide resources.
- *Resources*—Finally, the entrepreneurial process requires resources. Particularly important, though not exclusively so, is access to capital. In the private sector, this may initially be the result of self-funding on the part of the entrepreneur

(perhaps with the help of friends, family, and partners) but ultimately requires interaction with capital markets. In the public sector, this typically requires interactions with higher-level administrators and legislatures, though there is the possibility of interactions with capital markets as well.

3 Sustaining entrepreneurship through public-sector entrepreneurship

Leyden and Link (2015) define public-sector entrepreneurship as the process by those in the public sector of identifying and exploiting heretofore unexploited opportunities, that is, by engaging in the uncertain process of public-sector innovation. Unlike private-sector entrepreneurship, this innovation process focuses on government policies. Those policies can take either a direct form that is manifest in the institutional reform of government to make it more economically productive, or an indirect form that attempts to make the private-sector environment more conducive to entrepreneurial action through changes in private-sector rules of the game. Thus, public-sector entrepreneurship refers to innovative public-policy initiatives that generate greater economic prosperity

by transforming a *status quo* economic environment into one that is more conducive to individuals in either the public sector or the private sector engaging in greater innovative activities in the face of uncertainty.

3.1 Indirect public-sector entrepreneurship

Indirect public-sector entrepreneurship is manifest through changes in laws, regulations, etc. in order to foster private-sector entrepreneurial action and hence innovation and economic growth. Following the model described above, this implies action directed at enhancing five aspects of the private-sector entrepreneurial environment:

- *The creative environment*—As noted above, the heart of the entrepreneurial process involves the creation and exploitation of social networks that generates the desired innovation and gives rise to a discovery process by which the entrepreneur attempts to bring the desired innovation to fruition. Key in that regard is the ability of the entrepreneur to create the strong and weak ties that make up the entrepreneur's social network. Public-sector entrepreneurship can affect this process by increasing the effectiveness of these social networks, that is, by increasing the heterogeneity of experiential ties among economic units (i.e., enhancing the number and effectiveness of a social network's weak ties) and by strengthening the ability of entrepreneurs to create and maintain effective organizations (i.e., enhancing social network strong ties) in order to bring desired innovations to fruition. Indeed, given the current state of institutions in developed economies and the difficulties associated with direct public-sector entrepreneurship, the dominant method by which public-sector entrepreneurship can improve the entrepreneurial environment today is precisely by increasing the effectiveness of social networks (Leyden and Link 2015). Perhaps the best example of such an approach is the 1980 Bayh–Dole Act in the USA that fundamentally enhanced the ability to expand and exploit social networks of private-sector entrepreneurs by redefining and clarifying the property rights associated with governmentally funded university research. While the innovation process that entrepreneurs engage in is inherently and unavoidably uncertain, this law reduced what

might be called the transactional uncertainty (as well as the transactional costs) associated with the transfer of knowledge from universities to firms. The result was a dramatic increase in the transfer of technological knowledge from universities to the private sector (be they existing firms, startups or spinoffs) for commercial exploitation (Schacht 2009).

- *The exchange environment*—Private-sector entrepreneurs deliver innovations in the marketplace. Particularly important in that regard are the informal and formal institutions that govern the exchange process and that affect the ability to enter or exit a market. Among the public policies that are relevant here are laws and regulations associated with:
 - property rights and contract law (including those regarding such issues as product liability, patents and copyrights, environmental issues, and various market structure and behavior rules such as antitrust law and other forms of market regulation),
 - market prices (including sales taxes, excise taxes, and laws governing corruption and bribery),
 - the formation of new firms (including those regarding incorporation and business taxation), and
 - exit from markets (including those regarding bankruptcy and obligations after exit).
 Public-sector entrepreneurship in this regard focuses on the innovative changes in such policies with the intent of reducing the restrictions, costs, and uncertainty associated with entrepreneurial action. Like the Bayh–Dole Act with regard to the transfer of knowledge on the creative side of the entrepreneurial process, actions that make such changes in the exchange environment contribute to a more receptive entrepreneurial environment.
- *Incentives*—For the private-sector entrepreneur, extrinsic incentives ultimately come primarily from consumers and are manifest in the form of profit or loss. Because this is inseparable from the market process, many of the exchange environment policies described above (and their impact on transactional costs and uncertainty) are relevant here as well. Particularly important, in that regard, is

business tax structure as well as patent and copyright laws that directly affect the entrepreneur's profit.

- *Feedback*—Feedback for the private-sector entrepreneur also comes primarily through the marketplace. Hence, once again much of the exchange environment material discussed above is relevant here. Particularly important, in this regard, are policies such as sales and excise taxes that directly impact net market prices and hence alter the entrepreneur's perception of consumer valuation of their output. In addition, public policies regarding product quality (for example, product safety or efficacy) are also relevant policies from a public-sector entrepreneurship perspective.
- *Resources*—Private-sector entrepreneurs typically emphasize access to capital markets as the primary resource need. But access to skilled labor and to high-quality services and physical inputs may also be important. From a public-policy perspective, such access is affected by a variety of laws and regulations that affect both cost and availability, the latter being especially important in affecting uncertainty associated with gaining access to resources. Moreover, for the case of skilled labor, a country's education system can play a significant role. Public-sector entrepreneurship here would focus on improving the supply of such inputs through innovative changes in such laws, regulations, and institutions that are affected by public policy.

In developed economies, many of the above-mentioned indirect public-sector entrepreneurship policies except for those that affect the effectiveness of social networks may have relatively small effects on the level of private-sector entrepreneurial action (Leyden and Link 2015). However, the result of a given policy change is ultimately an empirical question that is likely to vary by country and the particulars of its overall NSE structure.⁶ This is especially true for underdeveloped countries where other issues such as the need for competitive markets, well-defined property rights, and access to capital may be of more fundamental

concern.⁷ The problem, then, of identifying what policy changes would be the most fruitful in a given country is not a trivial matter. It is for that reason that empirical assessments of the entrepreneurial environment through such NSE approaches as the GEM project or the GEDI Index are so important. Interestingly, the GEDI Index approach includes within it an emphasis on identifying bottlenecks in the entrepreneurial process, that is, where the marginal benefit of changes is likely to be the most beneficial (Ács et al. 2014).

3.2 Direct public-sector entrepreneurship

While private-sector entrepreneurial action rightly receives most of the focus in discussions of improving the entrepreneurial environment, the public sector in most countries commands a significant portion of the country's output and suggests that innovation in the public sector itself has the potential for contributing significantly to a country's economic growth and prosperity by reducing the cost of delivering public services, by increasing the quality and array of those same services, and by improving private-sector productivity through expansion and improvement of publicly provided infrastructure on which the private sector depends.

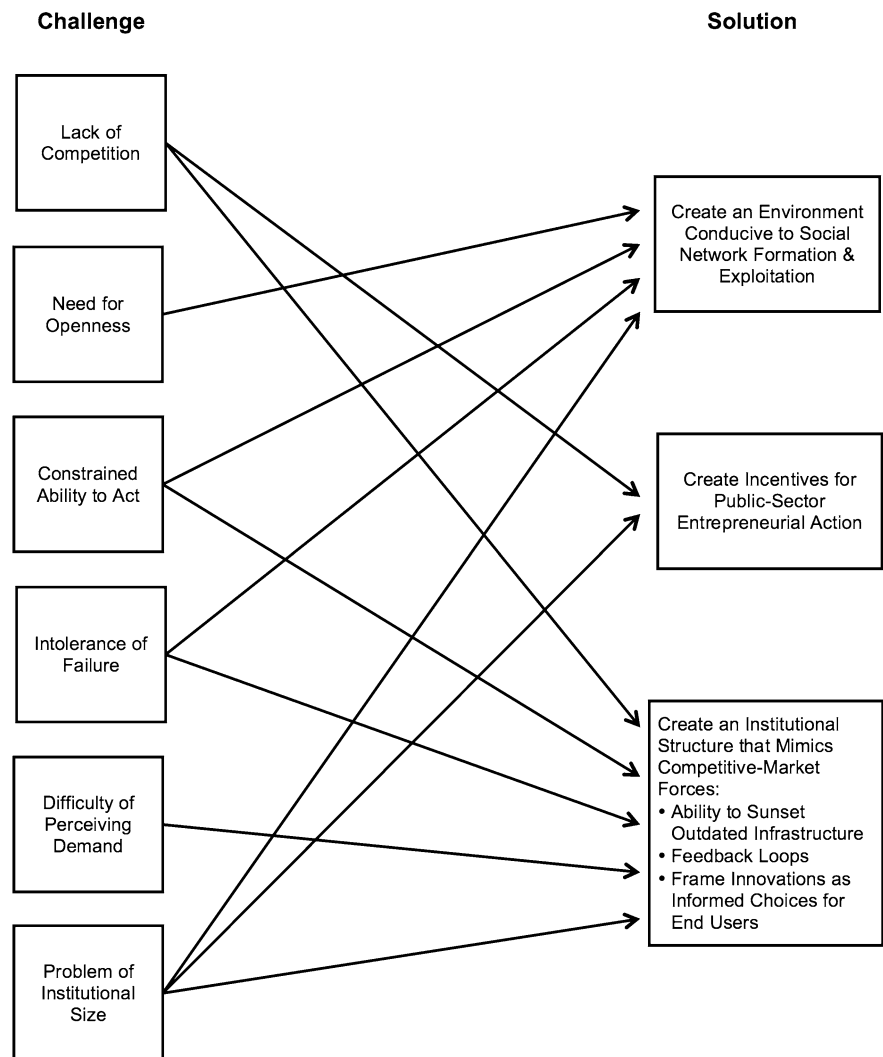
Innovation in the public sector, like that which occurs in the private sector, is the result of entrepreneurial action. What makes public-sector entrepreneurship different is not its fundamental nature but rather its observable behaviors that are due to the different institutional environment in which the public-sector entrepreneur operates. Like the private sector, it is possible to characterize the institutional conditions necessary for generating innovation in the public sector. To understand the nature of these conditions, consider first why a private-sector model of innovation cannot be applied directly to the public sector (Fig. 3 shows a summary of these challenges along with the public-sector environmental changes necessary to address these challenges):

- *Lack of competition*—The promise of financial reward (and the threat of failure) that is so

⁶ Witness, for example, the continuing debates in the USA about appropriate patent policy and about access to capital for startups.

⁷ See, for example, Banerjee, Chandrasekhar, Duflo, and Jackson's (2013) work on the importance of micro financing in developing economies.

Fig. 3 Creating an entrepreneurial public sector



important to the private-sector entrepreneurial process comes from the ability to sell innovations in the marketplace. Innovations that are of value in the marketplace replace goods and services now considered inferior by the market. Likewise, innovations that are not valued by the market are quickly eliminated. The public sector, by contrast, without such competition is typically a more stable environment. Indeed, competition is often viewed as a destructive force in the public sector. Such a view is not without reason. Particularly in a democratic society, success requires that competing views be brought together for the greater common good. But that need for social cohesion reduces the ability of the public sector to

encourage innovation through the promise of reward and the threat of failure.

- *Need for openness*—Private-sector entrepreneurial activity, which generates the innovations that are so valuable, depends on recognizing what others miss (Knight 1921). Indeed, it is precisely this ability that creates the entrepreneurial returns that motivate the entrepreneur to innovate. But such ability often depends on the ability to act in secrecy. Democratic institutions generally require a sufficient level of openness to maintain trust with citizens and that makes such secrecy a difficult thing to achieve (Bellone and Goerl 1992).
- *Constrained ability to act*—As Schumpeter (1928) emphasized, the ability and willingness to act is a

distinguishing characteristic of the entrepreneur. But democratic accountability generally requires that such autonomy be constrained in the public sector (Bellone and Goerl 1992). As a result, action in the public sector often requires that others (superiors or other branches of government) be informed beforehand and give explicit approval to the action. Add to this a requirement that approved actions follow prescribed procedures (at its worst, known as red tape), and the result is that entrepreneurial action becomes more difficult to engage in.

- *Intolerance of failure*—Private-sector entrepreneurs willingly take on the risks of uncertainty and the associated chance of failure because it is only through such action that they may achieve the success that they desire. By contrast, in the public sector such exposure to possible failure is seen as being irresponsible; being a good steward of the public good becomes the standard. Add to this, the more tenuous link between effort and reward in the public sector and the fact that funding in large part is not voluntary but instead the result of (coercive) taxation, and the result is that those in the public sector often tend to be risk averse and intolerant of failure. That is not to say that risks are never taken. But such exposure is more measured and, in keeping with justifiable democratic principles, often only undertaken after public buy-in (Bellone and Goerl 1992).
- *Difficulty of perceiving demand*—In the private sector, entrepreneurs quickly learn through the market process whether the innovation that they have developed is of value, with profits indicating value and losses indicating a lack of value. But this market mechanism does not in general exist in the public sector. To be sure, elections provide some feedback, but because they typically center on a number of issues and occur infrequently, they do not provide useful feedback for assessing the value of individual policies. Add to this problem the fact that the delivery of goods and services in the public sector is typically separated from the funding mechanism, and the result is that those in the public sector have only a vague sense of the value of the goods and services that they provide.

In summary, then, the difficulty with stimulating entrepreneurial action in the public sector is not so

much the lack of opportunity as it is an institutional environment that does not allow potential entrepreneurs to recognize and exploit opportunities. Empirical evidence (Sahni et al. 2013), however, demonstrates that it is possible to create a more entrepreneurial public-sector environment that overcomes this problem. In general, such a solution requires (see again Fig. 3):

- *Developing an institutional structure that generates a creative environment*—As with the private sector, public-sector innovation requires that entrepreneurs have access to a social network that is the source of the creativity needed to generate new ideas and see them through to fruition. If public-sector creativity is to be fostered, it is necessary that a creative environment be created and exploited. Policies that allow for the creation of such a “white space” (Sahni et al. 2013, p. 31) for experimenting eliminate perhaps the most fundamental uncertainty for the would-be public-sector entrepreneur—the uncertainty that innovative efforts will be honestly considered rather than dismissed out of hand. The specific form of that creative environment can vary. Thus, for example, we can speak in terms of structures in which those in the public sector can experiment with changes, create prototype goods or services, or conduct pilot programs. Typically such environments start small and at a level low enough to be close to those who will benefit from the resulting innovation. But, as Sahni et al. emphasizes, it is important to structure such environments and the ensuing activities in a way that doesn’t disrupt the flow of current goods and services to citizens, keeps costs low, and embeds costs in existing budgets to avoid giving rise to debilitating scrutiny in the name of openness and concerns over failure. If successful, these efforts reduce the constraints on the would-be public-sector entrepreneur and therefore give that entrepreneur the ability to investigate possible innovations and develop them so that they become viable.
- *Creating incentives for public-sector entrepreneurial action*—Creating an environment in which the public-sector entrepreneur can engage in the innovation process has limited value if there is no incentive to engage in that innovation process. While the intrinsic personal satisfaction that comes

from serving the common weal is of some value as a motivating force, it needs to be complemented with more extrinsic forms of incentive that public-sector entrepreneurs can count on if their innovative activities are successful. Among those other forms of incentive are individual and organization recognition, opportunities for career advancement, re-appointment, and recognition of the benefits that spill over from a given innovation to other parts of the individual's or organization's responsibilities. Examples of such spillovers include innovations that reduce the cost of delivering goods or services and therefore free up resources for other obligations, innovations that result in end users having less need for other public services, and innovations that serve as a complement to other public-sector activities, thereby increasing the value of those activities. Together, all these incentives can eliminate the reward uncertainty that public-sector entrepreneurs typically perceive and serve as a useful substitute for the role that profits play in the private sector in inducing entrepreneurial action.

- *Creating an institutional structure that mimics competitive-market forces*—Entrepreneurial action, as Schumpeter (1950) famously recognized in his notion of creative destruction, often results in the elimination of older institutions, methods of production, and goods and services. Both the likelihood and the specific nature of such destruction, however, are an uncertain prospect, and particularly in the public sector, the fear that accompanies such uncertainty often leads to conservative attitudes toward public-sector institutions and policies. One way to avoid such problems is to wait until the innovation is fully vetted and functioning (which makes experimentation all the more important) and to devise changes so as to hold harmless end users and public-sector employees affected by the changes (Sahni et al. 2013).

Another important characteristic of competitive markets is that they provide entrepreneurs with valuable feedback about the value of their innovations. To create a substitute in public sector for this feedback, a variety of options are available among which include appropriately designed experiments, prototypes, and pilot programs that involve getting feedback from end users by direct observation of end user behavior or through such mechanisms as

surveys, focus groups, and public meetings. In addition, a mechanism that holds great promise is that of eGovernment which can facilitate communication between the public sector and its citizenry. A third important characteristic of competitive markets because of its implications for consumer satisfaction is the freedom of choice that buyers have. To mimic this in the public sector, one can change the public-sector environment by being sure to frame innovations for end users as matters of informed choice (Sahni et al. 2013). Thus, for example, one can offer an innovative service improvement without eliminating the original service and allowing end users to choose. Such framing is important both because it can serve as the precursor for additional feedback and because it provides a way of overcoming citizen risk aversion (or fear of failure) and gives them a sense of choice. Interestingly, to the extent such framing leads to a more satisfied citizenry, the potential for such satisfaction can serve as an additional incentive for the public-sector entrepreneur to engage in innovation.

Together, these acts of direct public-sector entrepreneurship can foster a more effective public-sector environment that reduces the uncertainty that the public-sector entrepreneur and the public are otherwise subject to, thereby encouraging and supporting public-sector entrepreneurial action. Particularly if such policies are embedded in a public-sector cultural change supported by all levels of the public sector, it can contribute to a sustainable public-sector entrepreneurial environment. However, as noted at the beginning of this section, there are significant factors that work to inhibit such a public-sector entrepreneurial environment. As a result, the entrepreneurial environment of the public sector is likely to always be more fragile than the private-sector entrepreneurial environment.

4 Conclusions

This paper constructed an NSE-based theoretical model of the entrepreneurial environment that integrates into a functional whole the various subsets of that environment that others have investigated and used that model to explore a variety of NSE-guided

public policies that can play a role in improving that environment for both private-sector and public-sector entrepreneurs, thus promulgating a more sustainable innovative economy.

Because all economies provide varying degrees of support for entrepreneurial action, the value of a given policy improvement will depend on the particular circumstances of the country being considered. For some countries, the most fruitful focus might be on improving private-sector entrepreneurial access to capital markets. For other countries, the most fruitful focus might be improving the effectiveness of social networks for those same private-sector entrepreneurs. And for still other countries, the most fruitful focus might be developing an institutional structure that generates a creative environment in the public sector. Thus, while it is not possible to recommend specific policies outside the context of a specific country, what this model provides is a systematic way to consider the various avenues of improvement. In conjunction with the empirical results of NSE analyses such as that which is embodied in the GEM project or the GEDI Index, this approach can be used to assess which policy avenues are likely to have the greatest marginal benefit for a particular country.⁸

It is also important to keep in mind that not all entrepreneurs are the same, and therefore, policy changes in general are likely to have differential effects. The choice of which policy changes to pursue, then, has an inherently normative dimension. Should policy choices be based on a desire for the highest rate of economic growth? Or are there other norms (for example, distributional or environmental) that should be thrown into the balance?

An interesting example, in that regard, is the distinction between established and nascent entrepreneurs.⁹ For entrepreneurs in developed economies that are well established, the critical need is for a social

network structure that maintains or increases weak ties that are associated with heterogeneous knowledge and new ideas. For nascent entrepreneurs in those same developed economies, the critical need is not for weak ties (which they typically have in relative abundance) but for strong ties that are needed for the entrepreneur to engage in the focused pursuit of bringing their desired innovation to fruition. In addition, while all entrepreneurs need access to resources, nascent entrepreneurs are likely to have more limited resources and greater volatility in cost and revenue streams that make their goals more difficult to pursue. Thus, a desire to focus on improvements to the entrepreneurial environment of nascent entrepreneurs is likely to be different from one focused on established entrepreneurs.

But regardless of the normative focus of the policy analysis, what distinguishes the NSE approach is not a concern with picking entrepreneurial winners or developing specific public-sector institutions to engage in innovative activity. Instead, it is a concern with improving private- and public-sector entrepreneurial environments and allowing entrepreneurial instincts to act as those entrepreneurs see fit. Given the fundamental uncertainty that characterizes the entrepreneurial process, such a focus holds the greater promise.

Acknowledgments An earlier version of this paper was presented at the Conference on National Systems of Entrepreneurship at the Zentrum für Europäische Wirtschaftsforschung (ZEW) in Mannheim, Germany. Thanks to the participants of that conference (especially David Audretsch and Sameeksha Desai) for their useful comments and perspectives and to an anonymous referee for a close reading of the paper and a number of valuable suggestions.

References

- Ács, Z. J., Autio, E., & Szerb, L. (2014). National systems of entrepreneurship: measurement issues and policy implications. *Research Policy*,. doi:10.1016/j.respol.2013.08.016.
- Ács, Z. J., Braunerhjelm, P., Audretsch, D. B., & Carlson, B. (2009). The knowledge spillover theory of entrepreneurship. *Small Business Economics*,. doi:10.1007/s11187-008-9157-3.
- Audretsch, D. B., & Lehmann, E. E. (2005). Does the knowledge spillover theory of entrepreneurship hold for regions? *Research Policy*,. doi:10.1016/j.respol.2005.03.012.
- Banerjee, A., Chandrasekhar, A. G., Duflo, E., & Jackson, M. O. (2013). The diffusion of microfinance. *Science*,. doi:10.1126/science.1236498.

⁸ Efforts such as the GEM project and the GEDI Index focus almost entirely on indirect public-sector entrepreneurship. Though desirable, engaging in a similar effort for direct public-sector entrepreneurship is a more difficult task given the current state of statistics collected and the difficulty of surveying individuals about the internal structures and constraints associated with engaging in entrepreneurial activity within the public sector.

⁹ The knowledge spillover theory of entrepreneurship (Ács et al. 2009; Audretsch and Lehmann 2005) argues that the distinction between established firms (what it refers to as incumbents) and nascent firms (what it refers to as start-ups) is fundamental to understanding the entrepreneurial process.

- Baudeau, N. (1910). *Premiere introduction a la philosophie economique* (A. Dubois, Trans.). Paris, France: P. Geuthner. Original work published 1767.
- Bellone, C. J., & Goerl, G. F. (1992). Reconciling public entrepreneurship and democracy. *Public Administration Review*, 52, 130–134.
- Burt, R. S. (2005). *Brokerage and closure: An introduction to social capital*. Oxford, UK: Oxford University Press.
- Cantillon, R. (1931). *Essai sur la nature du commerce en general* (H. Higgs, Ed. & Trans.). London, UK: Macmillan. Original work published 1755.
- Freeman, C. (1995). The 'National System of Innovation' in historical perspective. *Cambridge Journal of Economics*, 19, 5–24. <http://www.jstor.org/stable/23599563>.
- Granovetter, M. S. (1973). The strength of weak ties. *American Journal of Sociology*, 78, 1360–1380.
- Hoang, H., & Antoncic, B. (2003). Network-based research in entrepreneurship. *Journal of Business Venturing*,. doi:10.1016/j.respol.2005.03.012.
- Kirzner, I. M. (1973). *Competition and entrepreneurship*. Chicago, IL: University of Chicago Press.
- Knight, F. H. (1921). *Risk, uncertainty, and profits*. Boston, MA: Houghton Mifflin.
- Knight, F. H. (1951). *The economic organization*. New York, NY: Augustus M. Kelley.
- Leyden, D. P., & Link, A. N. (2014). Toward a theory of the entrepreneurial process. *Small Business Economics*,. doi:10.1007/s11187-014-9606-0.
- Leyden, D. P., & Link, A. N. (2015). *Public sector entrepreneurship: US technology and innovation policy*. New York, NY: Oxford University Press.
- Mroczkowski, T. (2014). From breakthrough to incremental innovation leadership: lessons from Germany. *Journal Of the Knowledge Economy*,. doi:10.1007/s13132-014-0184-9.
- Renucci, A. (2014). Bargaining with venture capitalists: When should entrepreneurs show their financial muscle? *Review of Finance*,. doi:10.1093/rof/rft051.
- Sahni, N. R., Wessel, M., & Christensen, C. M. (2013). Unleashing breakthrough innovation in government. *Stanford Social Innovation Review*, 11(3), 27–31.
- Schacht, W. H. (2009). The Bayh–Dole Act: Selected issues in patent policy and the commercialization of technology. Washington, DC: Congressional Research Service. http://assets.opencrs.com/rpts/RL32076_20090203.pdf.
- Schumpeter, J. A. (1928). The instability of capitalism. *Economic Journal*, 38, 361–386.
- Schumpeter, J. A. (1934). *The theory of economic development* (R. Opie, Trans.). Cambridge: Harvard University Press. Original work (2nd Edn.) published 1926.
- Schumpeter, J. A. (1950). *Capitalism, socialism and democracy* (3rd ed.). New York, NY: Harper and Row.
- Shalley, C. E., & Perry-Smith, J. E. (2008). The emergence of team creative cognition: the role of diverse outside ties, sociocognitive network centrality, and team evolution. *Strategic Entrepreneurship Journal*,. doi:10.1002/sej.40.
- Shapira, P., Youtie, J., & Kay, L. (2011). National innovation systems and the globalization of nanotechnology innovation. *Journal of Technology Transfer*,. doi:10.1007/s10961-011-9212-0.
- Stam, E. (2014). July). *The Dutch entrepreneurial ecosystem*,. doi:10.2139/ssrn.2473475.
- Szerb, L., Aidis, R., & Ács, Z. J. (2012). The comparison of the global entrepreneurship monitor and the global entrepreneurship and development index methodologies: The case of Hungary. http://www.gemconsortium.org/assets/uploads/1337684852GEM_GEDI_Hungary_2006-2010_Report.pdf.
- von Thünen, J. H. (1960). *The isolated state in relation to agriculture and political economy*, vol. 2 (B. W. Dempsey, Trans.). Chicago, IL: Loyola University Press. Original work published 1826.
- Ward, T. B., Smith, S. M., & Finke, R. A. (1999). Creative cognition. In J. Sternberg (Ed.), *Handbook of creativity* (pp. 189–212). New York, NY: Cambridge University Press.
- Welter, F. (2011). Contextualizing entrepreneurship: conceptual challenges and ways forward. *Entrepreneurship Theory and Practice*,. doi:10.1111/j.1540-6520.2010.00427.x.
- Zahra, S. A., & Wright, M. (2011). Entrepreneurship's next act. *Academy of Management Perspectives*,. doi:10.5465/amp.2010.0149.