

Summary of:

**Accelerating Innovation Ecosystems:
The Promise and Challenges of Regional Innovation Engines¹**

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Overview

In 2015, the San Francisco Bay Area accounted for more than 17% of all patented inventions and over half of all venture capital investment, despite including only about 2% of the U.S. population (Forman, Goldfarb, and Greenstein, 2016; Delgado and Murray, 2022). This example is emblematic of the fact that – in general -- locational differences in research investments (particularly but not limited to private investments), research productivity, and innovation outputs are highly skewed. This skewness has motivated a significant body of research on the drivers and consequences of place-based innovation “ecosystems,” by which we mean the interconnected set of institutions – universities, corporations, government, start-ups, and investors – within a geographic region whose connectivity allows each organization and researcher in that region to leverage the knowledge, resources, and specialized capabilities of other co-located institutions and individuals (Nelson, 1993; Feldman, 1994; Furman, Porter and Stern, 2002; Bressnahan and Gambardella, 2004; Budden and Murray, 2022).

Through the lens of an ecosystems perspective, the productivity of a given researcher depends not simply on the quality of their research but also on the degree to which researchers in that location are able to build on each other’s knowledge, inventions, and discoveries, and participate in different stages of commercialization. Perhaps more importantly, the precise configuration of the overall system – that is, how different elements of the ecosystem interact and the rules and norms that govern those interactions – influence the aggregate rate of regional innovative productivity. For example, an ecosystem characterized by shared research infrastructure that allows university and private sector researchers to collaborate and learn from one another might be able to realize a higher rate of innovative output than an ecosystem that expends an equivalent level of investment but researchers operate in institutional siloes.

While innovation ecosystems have been the subject of both theoretical and empirical research, the practical criteria used historically to allocate the vast majority of Federal science and research investments has largely abstracted away from place-based characteristics. For example, the standard NSF Merit Review Criteria focuses on two core dimensions – Intellectual Merit and Broader Impact – to ensure a “fair and level” playing field for America’s science and engineering researchers. By design, this NSF Merit Review Criteria provides neither an

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advantage nor a penalty based on the location of a given research team or whether a particular geography offers a more supportive environment for commercialization and economic impact.

This historical neglect of location in innovation policy has now ended. Over the past decade, the U.S. Federal government started to undertake increasingly large “experiments” with place-based approaches to innovation policy, such as the Department of Commerce i6 Challenge grant in the early 2010s. Similar efforts have been undertaken by governments elsewhere around the globe. Policy advocates, particularly Gruber and Johnson (2019), synthesize the implications of these experiences by suggesting that a potentially powerful approach to “jump-start” America is to center place-based innovation policy interventions, particularly those focused on ecosystems outside the “top tier,” as the mechanism through which to create a more inclusive and powerful economic growth (Gruber and Johnson, 2019).

The Regional Innovation Engines (RIE) program currently being launched by the National Science Foundation (NSF) is one of the most prominent recent initiatives focused on place-based innovation ecosystem interventions. Codified into law by the CHIPS and Science Act, within the newly created Technology, Innovation and Partnerships (TIP) Directorate, the RIE program intends to catalyze a broad base of innovation ecosystems throughout the U.S. and "significantly [expand] our Nation's innovation capacity by investing in key areas of national interest and economic promise in every region of the United States." The NSF RIE program focuses specifically on prioritizing "U.S. geographic regions that do not have well-established innovation ecosystems" and commits up to \$160 million per region over ten years to allow local stakeholders to design and develop a regional innovation cluster (NSF, 2022).

The purpose of our paper “*Accelerating Innovation Ecosystems: The Promise and Challenges of Regional Innovation Engines*,” is to develop a comprehensive assessment of the logic, challenges, and opportunities for innovation “Engines:” place-based strategic interventions whose aim is to “wire” or “re-wire” a location-specific innovation ecosystem in order to enhance innovative productivity and impact.

To accomplish this objective, we begin by synthesizing the broad potential for place-based innovation policy and the Engines approach. While there have been a variety of descriptive analyses of the current Engines program and the hoped-for impact of these interventions, our paper provides the first comprehensive synthesis of the economic literature on innovation ecosystems and the way it relates to the Engine program’s approach.

We then delve more deeply by considering the underlying “logic” model of an Engines approach. Specifically, building on the framework developed in Jones and Summers (2021), we highlight the potential of an Engine intervention to increase the innovative productivity of an entire ecosystem through modest (but real) improvements in the conditions supporting a regional innovation ecosystem. Such small changes have the potential to offer an outsized impact in terms of social returns. However, this logic model also suggests that, in order to realize this potential return, the Engine must be designed to remove a key bottleneck, leverage a previously under-tapped latent capability, or introduce a new capacity to address an economically significant weakness in the current state of the regional innovation ecosystem.

The perspective that an Engine intervention must be fit-for-purpose, aligned with the strengths and weaknesses of the region in which it is implemented, motivates an in-depth analysis of the conditions that must be present within a given innovation ecosystem in order to realize the promise of the logic model.² Consistent with the need for government to “set the table” (Lerner, 2009), place-based innovation policy is more likely to be realized more effectively if it is based on a clear logic model of how an Engine intervention is likely to induce change.

Critically, it is not enough to simply assume that the logic model will hold in the presence of Federal investment in Engines. Instead, the promise of an Engines approach requires a “theory of change” in the ecosystem: a concrete proposal for how changes in access to resources, capabilities and knowledge will induce real changes in behavior of relevant actors. Our analysis highlights the importance of overcoming three distinct and interrelated set of challenges: stakeholder engagement, holistic ecosystem assessment, and implementable strategic choice.

Stakeholder engagement is critical for facilitating the behavioral changes underlying an Engine. Indeed, Feldman’s (2014) emphasis on the critical role of regional champions highlights the importance of supporting specific individuals and organizations who might encourage coordinated change across many stakeholder groups. But stakeholder engagement will only be effective if those stakeholders have a shared (and holistically accurate) assessment of their ecosystem and how particular interventions might enhance innovation. However, even if stakeholders are engaged and a promising set of investments is successfully identified, realizing the potential of an Engine depends on effective strategic choice and implementation. Many interventions fail due to the challenges associated with making strategic choices and thus choosing what not to do within a region (or at least what activities are de-emphasized to make space for others).

By articulating the necessary conditions for place-based innovation policy and ecosystem support, and the unique individual characteristics necessary to drive successful implementation, our paper provides insight into the overall selection of Engine-type interventions by Federal agencies, and how such Engine interventions serve as part of an overall portfolio of activities and investments. Our analysis also has implications for the real-time assessment and course-correction of an Engines program over time, as well as the evaluation of individual regional interventions and a programmatic portfolio.

Ultimately, the effective design and implementation of Engines-oriented innovation policies are a valuable pre-condition towards a more inclusive and powerful innovation economy. The ideas set forth in this paper are only but the beginning of this important research agenda.

² The analysis of these conditions builds on an emerging body of both academic research and practitioner insight, including the experiences of a subset of the authors within MIT REAP.

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