Introduction

Josh Lerner, Harvard Business School and NBER
Scott Stern, MIT Sloan School of Management and NBER

This volume is the sixteenth annual volume of the National Bureau of Economic Research (NBER) Innovation Policy (IPE) group. The IPE group seeks to provide an accessible forum to bring the work of leading academic researchers to an audience of policymakers and those interested in the interaction between public policy and innovation. Our goals are as follows:

• To provide an ongoing forum for the presentation of research on the impact of public policy on the innovative process
• To stimulate such research by exposing potentially interested researchers to the issues that policymakers consider important
• To increase the awareness of policymakers (and the public policy community more generally) concerning contemporary research in economics and the other social sciences that usefully informs the evaluation of current or prospective proposals relating to innovation policy.

This volume contains revised versions of the papers presented in the group’s meeting in Washington, DC, in April 2015.

Over the past decade, the landscape and financing of innovation have been changing rapidly. The papers in this volume offer insights into these changes by highlighting recent developments in two broad areas: the financing of innovation and entrepreneurship and the economics of innovation and intellectual property.

The first chapter explores the process of experimentation in the context of financing technology start-ups by venture capitalists. Experimentation, characterized by multiple investments and staging of the flow of funds, allows investors to learn about a venture’s potential over time without committing to the full investment amount upfront. Ra-
mana Nanda and Matthew Rhodes-Kropf, drawing on the insights of a simple model and a body of recent empirical research, highlight the importance of this experimentation process in a setting where the quality of ideas in technology ventures is inherently uncertain. By staging their financing as “real options,” venture capitalists receive more information about the quality of the venture’s idea over time.

Nanda and Rhodes-Kropf highlight three factors shaping the nature of this experimentation process and the financing of entrepreneurship: the costs of running entrepreneurial experiments, the potential for financing risk (when concerns about the future availability of capital limits the willingness to fund early stage investments), and the potential consequences of failure: entrepreneurs may be unwilling to undertake risky projects if the stigma for failure impacts their future opportunities. Environments where experimentation costs are relatively low, follow-on financing is feasible if intermediate results are positive, and the stigma of failure is low are more likely to fund more risky exploratory (and potentially high-impact) ventures than more traditional settings. Each of these findings offers insight for those that would like to promote economic performance through the encouragement of risky entrepreneurial ventures.

The second paper, by Yael V. Hochberg, reinforces the role of entrepreneurial experimentation by taking a systematic examination of the rise of start-up accelerators. This new institutional form, as exemplified by accelerators such as Y Combinator and TechStars, are organized as fixed-term, cohort-based boot camps for start-ups. They offer educational and mentorship programs, exposing founders to a variety of mentors and investors, and conclude with a public pitch event during which the graduating cohort pitches their start-up to potential investors and other stakeholders.

While there has been a boom in accelerators over the past few years, our systematic understanding about the efficacy of these programs, either for the start-up companies participating in the programs or for the economic development of the regions in which they are founded, has been limited. Hochberg first reviews an emerging body of evidence about the impact of accelerator program on the start-up participants: though the accelerator movement has been able to point to a few high-profile successes (usually associated with the most “prestigious” accelerators), there is less clear evidence for a systematic effect across all accelerator programs (a finding which may be due to the early maturity of many of these programs).
Hochberg then turns to her recent research with Daniel Fehder, which offers the first systematic examination of the impact of accelerators on the overall regional entrepreneurial ecosystem in which they participate. Leveraging the fact that it is possible to construct a “control” set of regions for each region in which an accelerator is founded (outside of traditional hotspots such as Silicon Valley or Boston), Fehder and Hochberg are able to compare how the financing of entrepreneurial ventures changes with the introduction of an accelerator to a given region. They document very significant effects, including a 104% increase in the number of seed and early stage venture capitalist deals in the area, an increase of 1,308% in the total dollar amount of seed and early stage funding provided in the region, and a 97% increase in the number of distinct investors investing in the region. Particularly with the rise of corporate and university accelerators and the franchising of accelerator programs such as TechStars and Mass Challenge, Hochberg argues for continued evaluation of these programmatic interventions and their impact on regional entrepreneurial ecosystems over time.

The second pair of papers in the volume focuses on the impact of the intellectual property system. Heidi L. Williams revisits a central research area for the economics of innovation (and the IPE series in particular): what is the relationship between the strength of intellectual property rights and innovation? Addressing this classical and important question has traditionally been hampered by an inability to clearly measure innovation and the fact that the extent of intellectual property protection often varies with economic conditions. Williams addresses this impasse by developing a methodology that relies on identifying a set of technologies that have an (ex ante) equal potential for innovation but vary in their degree of intellectual property protection and then tracing out whether that variation in protection is associated with different levels of investment or innovation outcomes.

In one study, Williams and her coauthors examine differences across different types of cancer drugs which vary in whether they require short or long clinical trials. They document how changes in the effective term of protection for a patent (that is, the amount of time a drug would have exclusivity under the US Food and Drug Administration [FDA] rules) has an important influence on the level of innovative effort put forth by private sector pharmaceutical companies. In a second study, Williams examines the innovation arising from the sequencing of the human genome, exploiting the fact that some genes (for example, those first sequenced by the private sector effort led by Celera) were subject to
upstream (temporary) intellectual property rights while others (for example, those first sequenced by the Human Genome Project) were not. This variation in early stage intellectual property protection allows Williams to examine whether such rights had a deterrent effect on downstream innovation. She finds important evidence that the intellectual property rights provided during the “race” to sequence the genome indeed did reduce long-term research. Williams argues that any policy evaluation of intellectual property must be grounded in a clear understanding of what alternatives firms and researchers will use in the absence of intellectual property and undertake an analysis of the benefits and costs of alternative intellectual property regimes.

In the fourth paper, Fiona Scott Morton and Carl Shapiro turn their attention to a more broad-gauged assessment of the impact of the flurry of recent legal and policy changes that have occurred within the patent system over the last several years. Their analysis is organized around a simple yet powerful organizing principle: whether particular policies or legal changes align the rewards from intellectual property with the marginal contributions made by innovators and other stakeholders (for example, those that commercialize a technology).

Scott Morton and Shapiro first provide an assessment of changes in the role and impact of patent assertion entities (PAEs), organizations whose primary activity is to assert patent rights against firms who are commercializing technologies, usually without direct participation in the market themselves. In response to a flurry of criticism and concern about the impact of PAEs on innovation and commercialization, several changes have been made. Though Scott Morton and Shapiro caution that fully addressing concerns about PAEs requires additional policy action, they observe a significant reduction in the ability of PAEs in response to policies that better link reward and contribution.

Scott Morton and Shapiro also offer an update on recent initiatives to align reward and contribution in the area of standard-essential patents (SEPs). Even though standard-setting organizations usually require a “FRAND” (Fair, Reasonable, and Nondiscriminatory) licensing commitment regarding SEPs, these terms are often vague and enforcement is negligible. While some recent initiatives (such as the reforms instituted by the Institute of Electrical and Electronics Engineers [IEEE]) represent a significant effort to align reward and contribution, ensuring alignment will require significant policy attention and action going forward.

The final paper, by Kevin J. Boudreau and Karim R. Lakhani turns
to a more exploratory direction. It focuses on the potential use of field innovation experiments and contests to inform innovation policy and management. Traditionally, though economists and policy analysts have often acknowledged that experimental evidence would be ideal, very few randomized field experiments have directly informed central questions in innovation policy. Over the past few years, Boudreau and Lakhani have led an ambitious effort at the Harvard Crowd Innovation Laboratory (CIL) to change this state of affairs.

Their paper provides an overview of their overall approach and some of the most significant findings to be established thus far. For example, in one recent study, the researchers established a contest for a challenging computational biology problem in immunogenomics, which they posted to an online coding platform. More than 650 solutions were submitted; more saliently, 30 of the proposed solutions were above a benchmark standard established by the National Institutes of Health, and the best solution advanced the state of the art by a factor of 1,000. Lakhani and Boudreau review their use of this experimental approach to address questions across a variety of domains in innovation policy.

Not simply recounting their findings, Boudreau and Lakhani offer insights on the design of field innovation experiments. In particular, they note that running a successful field innovation experiment requires significant attention to selecting the appropriate innovation task, being attuned to relevant outcome measures, and ensuring randomization throughout the experimental design procedure. Their approach offers a new vista for innovation policy and science going forward.

Together, these essays continue to highlight the important of economic theory and empirical analysis in innovation policy analysis. While the issues involved are undoubtedly difficult, the chapters in this year’s volume continue to suggest that contemporary research in economics informs the evaluation of current and prospective innovation policy alternatives.

Endnote

We are grateful to the Ewing Marion Kauffman Foundation for financial support for the Innovation Policy and the Economy workshops and this publication. For acknowledgments, sources of research support, and disclosure of the authors’ material financial relationships, if any, please see http://www.nber.org/chapters/c13582.ack.