

ENTREPRENEURSHIP AND INNOVATION POLICY AND THE ECONOMY:

INTRODUCTION TO VOLUME 2

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This volume is the second installment in the National Bureau of Economic Research (NBER) *Entrepreneurship and Innovation Policy and the Economy* (EIPE) series. Entrepreneurship and innovation are widely recognized as key drivers of economic dynamics and long-term prosperity, including rising wages and improved human health. The EIPE series draws together leading researchers to review, synthesize, and communicate key findings about the drivers and implications of entrepreneurial and innovative activity across the economy. The EIPE meeting and volume acts as a bridge between public policy and research. In addition to communicating key research insights into the policy sphere and public square, our goal is to further stimulate research by exposing researchers to the issues, goals, and constraints that policymakers face.

This year's meeting was held in a hybrid format in May 2022, with the in-person meeting in Washington, DC. The six contributions, collected in this volume, all address critical innovation issues. The first two chapters focus on special challenges associated with pharmaceuticals, including vaccine innovation and generic drugs. The second pair of chapters focus on climate change and clean technologies, including the role of venture-capital and startups in driving green technological advance and the role of corporate governance in incentivizing clean innovation in public firms. The final chapters address equity issues in innovation, focusing on regional inequality in innovation investment in the United States and the constraints in accessing financial markets for black-owned businesses. Collectively, these chapters draw out lessons from recent research in economics and related fields that can help shape key policy questions while also helping direct future research into entrepreneurship and innovation.

In "Accelerating Vaccine Innovation for Emerging Infectious Diseases via Parallel Discovery," Joseph Barberio and co-authors explore substantial incentive challenges associated with developing vaccines against future pandemics. They highlight the pharmaceutical firms have relatively weak incentives to develop vaccines against prospective diseases. While vaccines are expensive to develop, the investments are risky and the expected returns are frequently modest because, unlike medicines for regular and high-incidence health challenges like cancer or heart disease, the potential pandemic often does not materialize and the revenues from vaccine sales may be limited.

The authors consider whether a portfolio approach could be a powerful way to finance vaccine research. In particular, a number of promising drug candidates could be financed through a

vehicle that pays off if any (or multiple) of the candidates yield profits. This kind of “megafund” has been applied to diseases outside the vaccine space. The paper applies this investment idea to mRNA vaccines and undertakes a variety of simulations, using plausible assumptions. The simulations suggest that, while pooling investments is more attractive than financing each vaccine project individually, the pooled financing vehicle in the vaccine context will still not be sufficiently attractive to financially motivated investors. The authors thus suggest that these initiatives will need financial subsidies from the government.

In “The Generic Drug Trilemma,” Daniel Hemel and Lisa Ouellette focus on generic pharmaceuticals. Traditional economic reasoning suggests that the expiry of a patent – entrance to the “patent afterlife” in the authors’ evocative phrase – should result in a competitive market, with businesses providing the formerly-patented product at prices close to costs and the market being served in an efficient manner. As the authors point out, however, the patent afterlife often does not run smoothly in the context of generic drugs. For example, there are numerous instances of enormous price increases appearing among generic products. In addition, there can be shortages of key medicines, which can be surprisingly persistent.

The authors locate these challenges in a “trilemma” based on tradeoffs between quality, price, and access that appear in this post-patent phase. The authors’ framework elucidates key tensions that can help explain outcomes we observe. A core insight concerns quality. Since the public is concerned about quality (i.e., the safety and efficacy of the drugs), regulatory requirements are implemented that help ensure quality but raise barriers to entry, limiting the number of producers. The resulting decrease in competition raises prices and also raises the risk of disruptions and shortages. On the other hand, failing to address quality can result in problematic safety lapses.

Meanwhile, regulatory instincts often push toward lowering prices to provide greater access, and more equitable access, for key medicines. But capping prices also makes entry less profitable. Thus, price constraints can ultimately limit access while further raising risks of shortages as the number of producers shrinks. Hemel and Ouellette elucidate numerous tradeoffs along these lines, indicating that it is difficult in a regulatory context to achieve distinct goals around price, access, and quality simultaneously. They then consider how various public interventions – including antitrust policy and supply chain initiatives - might help limit these tradeoffs.

The next two chapters consider the advance of green technologies. In “Innovating to Net Zero: Can Venture Capital and Startups Play a Meaningful Role?,” Ramana Nanda and Silvia Dalla Fontana examine the transition to a carbon-free world. To get a handle on these complex issues, they examine a primary means through which new ideas are protected in this arena: patents. The authors highlight several provocative findings. First, relative to other technological areas, “Net Zero patents” (as they term them) are close to the scientific frontier. This is particularly true when it comes to the subset of these awards to firms backed by venture investors. This subset of awards is particularly influential to future innovators, as seen in the

citations in subsequent patent documents. But on a less encouraging note, the share of “Net Zero patents” that are venture-backed is quite modest. Moreover, patenting by venture-backed firms has been increasingly directed to areas outside cleantech and other “deep” technologies in recent years. The authors suggest that this shift is a consequence of the difficulties of successfully commercializing these inventions. They offer a variety of suggests that may help address these barriers.

In “To Starve or to Stoke? Understanding Whether Divestment vs. Investment Can Steer (Green) Innovation,” Jacquelyn Pless examines investor behavior as a means to meet clean innovation goals. Specifically, investors may consider divestment from firms in dirty industries. A primary economic aim in such divestment is to raise the cost of capital for these firms and thus slow their growth. However, drawing on extant literature, this chapter points out that divestment even by large numbers of investors will have negligible effects on the costs of capital for these industries, so long as other investors are willing to own these companies. Moreover, by departing these investments, green-oriented investors lose their vote and voice to help shape practices from within the firm. Indeed, the “clean” oriented investors end up leaving the corporate boards under the control of those who care less about green innovation.

In light of the potentially limited effectiveness of divestment, this chapter goes on to consider how staying “in” the firm and addressing specific management practices and priorities may help shift firms toward cleaner solutions. Performing a deep dive into ESG metrics, Pless further shows that certain management practices predict substantially better carbon-mitigation performance for firms. While ESG scores overall come in many forms and have limitations that Pless elucidates, this chapter’s investigations suggest that specific sub-metrics may have real value for management behavior. This conclusion reinforces the hypothesis that staying invested and engaging with green corporate governance practices may be a far more effective approach than divestment.

The final pair of papers turn to a different challenge: the uneven distribution of entrepreneurship and innovation across the economy. These chapters focus on differences in access to investment across race and geography in the United States.

In “Racial Inequality in Capital Access for Innovative Firms,” Rob Fairlie and David Robinson examine the ability of innovative firms to access capital. This analysis builds on an abundant literature showing that business ownership appears to be a key avenue for wealth accumulation. The chapter further builds on the authors’ earlier work demonstrating large disparities between startups begun by founders of different races in the use of financial capital in the first few years of operations.

Turning specifically to the subset of innovative-intensive new businesses, which can have especially broad and substantial economic impact, the authors find that Black-owned businesses start smaller than their peers and do not converge in size over time. Exploring the drivers of this difference, the chapter highlights that differential access to bank financing is a

major factor. In many cases, the Black-owned businesses do not even approach banks, anticipating that their applications will be rejected. These differences persist among incorporated business with intellectual property, and the differences are more severe in areas where bank lending to small businesses are commonplace. The authors highlight how the reliance on “soft information,” which is often thought to help new businesses that don’t have established track records, can instead exacerbate bias in lending, increasing barriers for black founders and limiting entrepreneurial pathways to prosperity.

Finally, in “Place-Based Productivity and Costs in Science,” Jonathan Gruber, Simon Johnson, and Enrico Moretti consider the regional concentration of innovative activity in the United States. The chapter starts by noting that innovative activity is extremely geographically concentrated, and increasingly so. This concentration may have several benefits, such as the leveraging of local knowledge spillovers, which make researchers more productive when co-locating in dense areas. However, innovation clusters often coincide with expensive urban areas, where real estate, labor, and other costs are substantially higher -- especially in ‘superstar’ locations like New York City and the San Francisco Bay Area.

This paper empirically weighs the local agglomeration advantages against the local production costs to see whether innovative activity would be more or less efficient were it to spread to less dense areas. The analysis finds the concentration of activity has net advantages today: the productivity gain from co-locating researchers exceeds the additional costs it imposes. The findings are thus consistent with the tendency towards increased spatial concentration.

However, it also appears that the concentration of innovation may have hit its limit. The net advantages appear small to non-existent in the (very expensive) highest-density research locations. These findings are informative in light of recent policy steps (and proposals) to diversify innovative activity across more regions of the United States. While the short-run assessment of costs and benefits favors concentration, it is also critical to understand the longer-run benefits (including equity, industrial diversification, and talent development) of seeding innovation clusters elsewhere. Both these sets of considerations are key to assessing the ultimate welfare implications of greater regional diversification.

Together, these six contributions tackle substantive and timely dimensions of entrepreneurship and innovation policy – regarding pharmaceuticals and vaccines, clean technologies and climate change, and issues of regional and racial inequality. The conceptual frameworks and empirical evidence synthesize recent research literature and push beyond its boundaries, providing important insights on contemporary issues and helping delimit the bounds of current knowledge. These chapters can both inform contemporary policy opportunities while highlighting open issues for future research to undertake.