

INNOVATION POLICY AND THE ECONOMY: INTRODUCTION TO VOLUME 11

Josh Lerner
Scott Stern

This volume is the eleventh annual volume of the National Bureau of Economic Research (NBER) Innovation Policy and the Economy (IPE) group. The appreciation of the importance of innovation to the economy has increased over the past decade. There is an active debate regarding the implications of rapid technological change for economic policy and the appropriate policies and programs regarding research, innovation, and the commercialization of new technology. This debate has only intensified as policymakers focus on new sources of innovation and growth in light of the economic downturn and the arrival of a new administration.

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:

- 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 2010.

The first two chapters of this year's volume examine innovation in two industries of particular interest: health care and cleantech. In different ways, they explore the unique challenges that innovation in these areas pose and the implications for public policy.

In the essay, "Where are the Health Care Entrepreneurs?," David Cutler begins with an inconvertible observation: that managing ever-rising health care costs is a critical challenge to American policymakers. Rising medical costs have led to—and will continue to, unless checked—much of the dramatic rise in federal and state budget deficits, as well as to distortions in private sector employment. While some of these costs may be due to beneficial innovations, a considerable body of evidence suggests that there is an enormous amount of inefficiency in the U.S. healthcare system, totaling over \$700 billion of excess spending annually.

The paper seeks to understand why this inefficiency has persisted. The problems of the medical system—such as inadequate coordination of care and poorly designed systems—are well understood. Why haven't the rapid progress in cost reduction and quality control associated with

firms like Wal-Mart and (until recently) Toyota been mirrored here? Put another way, where is the new firm that could transform healthcare like Amazon did book selling or Expedia travel?

Cutler argues that there are two fundamental barriers that have deterred entrepreneurs who might transform the health care system. First, there is a lack of good information on quality.

Thus, the gains that a truly innovative entity which developed a superior product could enjoy are very limited. Second, the way in which public insurance plans reward doctors and hospitals is very troubled. In most industries, higher quality is associated with higher prices. That is not true in medical care, largely because the largest buyer of health care services by far, the federal government, pays on the basis of volume, not value. As a result, inefficient care is the natural outcome. The essay discusses how the recent reform legislation dealt with these issues and other approaches to addressing them.

Suzanne Scotchmer focuses on the energy sector, and in particular, the challenge of encouraging the development of new technologies that can reduce carbon emissions that may lead to global warming. A wide variety of mechanisms have been proposed to discourage carbon emissions, with much attention being devoted to concept of a “cap”—the issuance of a fixed number tradable allowances that give firms the right to emit a certain amount of carbon—and the imposition of a tax on carbon emissions. This paper explores on what these mechanisms for innovation are.

Scotchmer points out that there are really two goals behind these policies. Regardless of which type of regulation is chosen, such as an emissions tax or a carbon cap, the policy must perform two tasks. One task is to encourage innovation: the development of future generations of technologies. In the short run, however, regulators must ensure that efficient choices regarding the energy which is consumed today: energy should be produced at the lowest cost (taking into account the price that the user pays and the broader impacts on society). Moreover, the price of energy should be equal to the (marginal) cost of producing it, again considering the broader impact on society.

The paper argues that the effects of a cap-and-trade system and a carbon tax are not the same. If demand for energy is relatively fixed (i.e., not price sensitive), a carbon tax will create greater incentives for firms to innovate. In particular, if a new, more efficient technology is invented under a cap-and-trade system, an excess supply of allowances can result. The price of allowances falls, leading to more production of energy at a lower price. As a result, the fall in the price of allowances reduces power generators' willingness to adopt the new innovation. (Indeed, the inventor may not even wish to make the new technology widely available in order to keep up prices.) As a result, the new technology may not be broadly adopted, leading to an inefficient outcome. In many cases, a carbon tax will generate more incentives to innovate.

In the third essay, Joshua Gans reconsiders the relationship between antitrust and innovation. Building on earlier research published in the *Innovation Policy and the Economy* series (Evans and Schmalensee, 2002; Katz and Shelanski, 2005; Gilbert, 2006), Gans focuses on the antitrust policy in markets where competition is not “in the market” but “for the market.” When a single firm can dominate a market at a point in time (but may be displaced by entrant innovators over time), it is important to consider the dynamic consequences of antitrust policy: a policy which

reduces the ability of a current monopolist to deter a potential entrant may also reduce the innovation incentives of the entrant (and so perhaps reduce the overall rate of industry innovation). Gans narrows the analysis by analyzing whether the criteria used to identify anticompetitive conduct based on *static* analysis – for example, below-cost pricing, exclusionary long-term contracts, and certain types of tying arrangements – is undermined or enhanced when one incorporates dynamic considerations.

His analysis covers two important cases. First, building on a formal framework developed in Segal and Whinston (2008), Gans shows that allowing certain types of behavior that reduce the ability of a potential entrant to compete with an established incumbent ultimately have the effect of *reducing* the level of industry innovation. Since the benefits of earning profits (as an entrant) are in the near-term, while the costs of a more restrictive antitrust policy are borne at the end of the firm's life as a monopolist, the present value of the near-term costs outweigh the present value of the long-term benefits, thus depressing innovation incentives. In other words, when considering the impact of policies designed to enhance the ability of entrants to compete in the market, dynamic considerations reinforces the logic underlying static analysis.

Gans then examines an environment where potential entrants also have the option of licensing to (or being acquired by) the established firm. The option of licensing or acquisition makes antitrust analysis more subtle. Notably, antitrust policy that impacts the ability of a potential entrant to compete shapes the outside options of both entrant and incumbent in the context of negotiations. The ultimate impact of antitrust policy thus depends on how these shifts in bargaining position affect the licensing or acquisition price (and thus the potential returns to entrant innovation). Gans shows that the dynamic impact of some policies (e.g., those that disallow exclusive long-term contracts) complement the static analysis, while the dynamic impact of other policies is more ambiguous. More generally, the essay illustrates the potential for sophisticated antitrust analysis that directly accounts for the dynamic impact of antitrust policy on innovation incentives.

Raymond Fisman and Eric Werker shift the analysis to consider broader macroeconomic issues in their evaluation of innovations in governance. Motivated by striking differences in institutions across countries (e.g., in the extent of the rule of law) and the linkage between institutional quality and economic prosperity, Fisman and Werker examine the types of innovations and conditions that promote the adoption of rules and institutions that encourage investment and economic growth. They are particularly interested in cases of reform, where policymakers have proactively attempted to enhance the efficacy of rules and institutions. They examine a range of diverse cases, including innovations in governance emerging from within the system, arising from events external to the system, and those involving attempts at wholesale governance change.

Their analysis then synthesizes these cases to identify the key factors associated with growth-enhancing innovations of governance. In particular, they highlight the importance of competition (among jurisdictions), information (providing knowledge that enhances the ability to advocate for governance innovations), trade in institutions (allowing institutions effective in one location to be used in others), and shifting culture (which shifts informal norms in order to build on novel innovations in governance). Fisman and Werker then use their framework to consider a recent

wave of proposals by economists and others to promote innovations and governance. Their analysis suggests that the likely success of such efforts depends on the ability (and incentives) of policymakers to implement these proposals in a way that promotes economic investment and growth.

In the final essay, Ben Jones considers the impact of the changing nature of scientific research and technological innovation on science policy. Jones is motivated by the dynamic nature of scientific research – as science progresses over time, the investment required by young researchers to reach the “frontier” of science increases. The direct effect of the “burden of knowledge” is to increase the time required to become an innovator, and Jones presents striking evidence that there is an upward shift over time in the age distribution of discovery and innovation. Researchers can attempt to overcome the burden of knowledge in several ways, most notably by increasing their level of specialization (i.e., developing mastery over a narrower range of knowledge) which in turn increases the returns to collaboration and teamwork.

Jones then considers the impact of the changing nature of science on science policy, focusing on three central issues: (a) maintaining incentives to enter scientific careers even as the training phase extends, (b) ensuring effective evaluation of ideas as evaluator expertise narrows, and (c) providing appropriate effort incentives as scientists increasingly work in teams. Jones considers the potential impact of alternative policies (across a range of institutions) to address these issues. For example, while the individualistic nature of traditional science prizes (such as the Nobel Prize) may have been particularly appropriate when most scientific research was solo-authored, now team-based science is both more prevalent and impactful. Should the rules and design of the Nobel Prize be changed to adapt to these changes in the structure of scientific research?

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