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## FOREWORD\*

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The continuing debate over the benefits of government economic regulation has received a great deal of public attention in recent years. Consumer groups and businessmen have argued that the actual social benefits derived from particular regulations are not worth the costs they impose on society. Government regulation may impose costs on society in several ways. The administration of regulations imposes costs on taxpayers in general and the regulated industry in particular. A less direct, but perhaps more important, cost of government regulation is the effect of such regulations on innovation. Government regulations may impose a cost on society by discouraging the development and implementation of innovations that would increase the capacity of the economy to produce goods and services.

Government regulation may discourage innovation in several ways. For example, environmental and safety regulation by the Environmental Protection Agency (EPA) and the Occupational Safety and Health Administration (OSHA) may have diverted a portion of private investment funds away from innovative production capital equipment and toward investment in equipment that enables businesses to comply with the regulations, but does not increase production as traditionally measured. Although the benefits to consumers and workers from environmental and safety regulation may be worth the costs of these regulations, this is a decision that should be made only in full recognition of the effects that such regulations may have on innovation. Regulation of public utilities and transportation may discourage innovation by prohibiting free entry into the regulated market by producers who would introduce innovative capital equipment or production techniques. Again, such regulation may offer some benefits, such as increased stability of the regulated market, but the effect on innovation must be considered in evaluating the overall desirability of the regulation.

The effect of regulation on innovation was the topic of a one day conference in May 1979, at Duke University. The conference was sponsored by the

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Duke University Center for the Study of Business Regulation and was organized and chaired by Professor Bruce M. Owen. The articles in this issue were presented originally in draft form at the conference.

Wesley A. Magat's article, *The Effects of Environmental Regulation on Innovation*, examines five methods of environmental regulation which are in use or have been proposed in the literature. The author discusses the effect that each regulatory method is likely to have on the innovation undertaken by a typical profit-seeking firm. By focusing on the innovation activities of a typical firm, the article highlights the overall impact on incentives for innovation of a policy decision to use one type of environmental regulation over another. The types of environmental regulation considered include: effluent charges, non-technology-based effluent standards, marketable permits, technology-based effluent standards and subsidies for abatement capital.

In *Regulating the Diffusion of Hospital Technologies*, Louise B. Russell discusses the pattern of hospital technology diffusion in both the absence and presence of government regulation. The diffusion of hospital technology has been encouraged by government medical research and education programs and by the growth of third party payers such as private medical insurers and public Medicare and Medicaid programs. The increased use of expensive hospital technology is cited as a major cause of increasing medical care costs. In response to rising costs, cost containment regulations have been implemented that have significant effects on the diffusion of hospital technology. The author discusses the problems of evaluating the success of these regulations, provides some comparisons of American hospital regulatory programs with those of other countries and also comments on the attitudes of hospital regulators who carry out these programs.

Although it is evident that the enactment of regulatory legislation may introduce disincentives for innovation, it is also true that the repeal of such legislation may have the same effect. The effect of the repeal of drug anti-substitution laws on innovation is examined in *Substitution Laws and Innovation in the Pharmaceutical Industry*, by Henry G. Grabowski and John M. Vernon. Drug anti-substitution laws were adopted widely by the states in the 1950s in response to concerns over drug quality, but in recent years most states have repealed these laws under the impetus of federal medical cost containment programs and the consumer movement. By allowing generic substitution of drugs, the repeal of anti-substitution laws also allows the manufacturers of imitative drug products to compete more effectively with the innovative manufacturers. This lowers the expected rate of return on investment in new drug product research and development and thereby reduces the incentives to develop new drugs. The authors examine the various aspects of this problem, conduct a sensitivity analysis on the effect of the repeal of anti-substitution laws on drug innovation research and development, and conclude with comments on the public policy implications of their study.

Linda Cohen's article, *Innovation and Atomic Energy: Nuclear Power Regulation, 1966–Present*, discusses the impact of the Nuclear Regulatory Commission's (NRC) construction and operating licensing procedures on innovation in commercial nuclear technology. The time, expense and uncertainty involved in acquiring NRC licenses are posited as key factors inhibiting innovation. The author presents an empirical analysis of the impact of particular objections raised to the issuance of licenses during the licensing proceedings on the decisions of the NRC and on the length of the licensing proceeding. An interesting conclusion of this article is that proposals to reduce the licensing time delay by standardizing nuclear plant designs are unlikely to succeed, since most licensing delays appear to be associated with objections to the reactor site or the safety of nuclear power in general, as opposed to the design features that might be standardized.

Innovation in the form of technological advancement usually requires investment in research and development. Firms that make such investments face some uncertainty as to whether the effort will result in a useful technological advancement, how long it will take to develop, and what the net benefit of the effort will be to the firm. Regulated firms face additional uncertainty as to whether actual implementation of an innovation will be delayed by a regulatory agency and, if so, for how long. These matters are addressed in Ronald R. Braeutigam's article, *The Effect of Uncertainty in Regulatory Delay on the Rate of Innovation*. The author's analysis confirms some of the traditional assumptions regarding the effects of regulation on innovation while offering some perhaps unexpected results on how uncertainty in the regulatory process may decrease or increase the incentives for innovation.

Jerome Rothenberg's article, *The Impact of Regulation on an Exhaustive Resource Industry: A Methodological Approach and a Model*, presents an economic model for evaluating the effects of various forms of government regulation on the United States copper industry. The author outlines the general features of the model and discusses the application of the model to three areas in which government regulation affects the copper industry: assignments and alterations of water rights, withdrawal of federal lands from mineral exploitation, and air pollution controls. While the primary focus of this article is on the development of a general theoretical and quantitative model for evaluating the consequences of regulation of the copper industry, the model's implications for the effect of regulation on innovation by the U.S. copper industry are also discussed.

The success of the 1979 conference on regulation and innovation has encouraged the Center for the Study of Business Regulation to hold a conference in May 1980, entitled, "Managing the Transition from Regulated Industry to Competitive Industry." Professor Wesley A. Magat is coordinating this conference and many of the articles presented will be published in a future issue of *Law & Contemporary Problems*.