The theory of environmental policy

Second edition

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with contributions by
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Since the publication of the first edition of this book in 1975, there have been several important contributions both to the theory of externalities and to the design of policy instruments making use of economic incentives for environmental management. Perhaps most important has been the emergence of instruments that control quantity directly rather than through price adjustments; these measures represent an alternative to the standard Pigouvian prescription for a unit tax on activities with detrimental external effects. Since publication of the seminal paper by Martin Weitzman, economists have explored the properties of a system under which the regulatory authority issues a limited number of transferable permits. This work has shown that in a setting of uncertainty, the expected gain in welfare may be higher or lower under such a permit system than under a tax regime, depending on the shapes of the control cost and damage functions. The choice of one system over the other thus depends on the way damages and control costs change with the level of pollution.

At the same time, there has been growing interest at the policy level in the use of transferable permit systems for the attainment of our environmental standards. In the United States, the Environmental Protection Agency has introduced the Emissions Trading Program for the regulation of air quality; this program allows polluters (subject to certain restrictions) to trade emissions entitlements. Environmental economists have studied emissions trading and have, more generally, investigated the properties of a number of variants of transferable permit systems. From these efforts is emerging the exciting prospect of an effective system of market incentives for protection of the environment. Economists have long argued that economic incentives have an important role to play in environmental policy; there are now cases where such incentives are being embodied in actual environmental legislation.

In the revision of this book, we have devoted considerable attention to the use of quantity instruments for environmental management. Two of the three wholly new chapters address this topic. The first half of the book, which deals with the theory of externalities, has been augmented...
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by a chapter based on the work of Weitzman and others describing the relative welfare gains promised by quantity and price instruments where the environmental authority is uncertain about the true damage and abatement cost functions. In the second half of the book, where we address more directly the design and implementation of policy measures, we present a new chapter on systems of transferable discharge permits and their potential for attaining a predetermined level of environmental quality at the least cost. We investigate a number of alternative permit systems and contend that one, the pollution offset system, is the most promising of such systems for the achievement of our environmental targets.

The second edition has also allowed us to explore some further topics in environmental policy, to update various results, and to correct mistakes from the first edition. The third new chapter in the book considers the setting of standards for environmental quality and asks whether such standards should be set by national or “local” authorities. There is a real conflict between the desire to tailor environmental measures to particular local conditions and the fear that economic competition for jobs and incomes will lead local governments to compete in environmental degradation as a means to attract new industry. We explore this conflict in the context of a model of interjurisdictional competition; although the issue is admittedly a complicated one, we believe that the analysis provides a persuasive case for the introduction of some local variation in environmental measures.

We should also note that in response to a series of articles by A. Myrick Freeman and others, we have reworked Chapters 3 and 4 to correct our treatment of depletable and undepletable externalities. As Freeman showed, our claims concerning the different policy implications of these two types of externalities were incorrect. We think that (thanks to this assistance) we have it straight now. We have also corrected and extended our treatment of the taxation of monopolists and of the use of subsidies for pollution abatement. Finally, we have introduced some new material on the redistributive properties of environmental measures and on environmental policy in an international economy.

In order to keep the book to a reasonable size, we have deleted the three concluding chapters from the first edition, which examined the provision of public services and the tax system. While the public sector obviously makes a crucial contribution to the quality of life, these chapters turned out to be somewhat peripheral to the interests of most readers.

We are grateful to several economists for their assistance in this revision. In particular, we wish to thank Peter Coughlin, Robert Schwab, and Eyton Sheshinski for their invaluable help with the new material.
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This book is one of a pair of companion volumes devoted to the study of economic policies to enhance the quality of life.* Our willingness to embark on so considerable a subject only reflects our conviction that economists as a body have already made sufficient headway on these problems to make such an undertaking worthwhile. We believe, in short, that this is a subject on which economists have a great deal to say that is useful; these books are intended both to bring that material together and to carry the investigation some stages further.

This volume is primarily theoretical and is consequently addressed to our fellow economists. However, it is not meant to be theory for theory's sake. Here our prime concern is policy; we are interested in the theory as a means of understanding the complexities of environmental programs.

The orientation of the other book is primarily empirical; there we will present and evaluate pertinent data and experience for guidance in the choice of policies for environmental protection and for the improvement of other aspects of the quality of life. Though it will be less technical than the theoretical volume and will consequently address itself to a broader audience, we intend it to provide the empirical counterpart to the theoretical structure developed in this book.

Our most direct debt is that to the National Science Foundation, whose support has made our work on the two volumes possible. In particular, the collection and analysis of the empirical materials in the companion volume has, predictably, proved to be a long and difficult undertaking which would have been impossible without the Foundation's generosity.

Happily, intellectual debt does not carry with it the threat of bankruptcy, for in writing this volume the debts we have accumulated have been numerous and heavy. Our deepest obligations for help above and beyond what might reasonably be asked of anyone, are those to our colleagues, David Bradford and Elizabeth Bailey. Their painstaking reading of the

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entire manuscript and their extensive and valuable suggestions and comments have resulted in enormous improvements both in substance and in exposition (and, incidentally, have added considerably to the labor of revision).

Professor Bradford also contributed more directly by his co-authorship of an article which served as the basis for Chapter 8 and by his authorship of Appendix B to Chapter 8. A second such contribution was provided by Dr. V. S. Bawa of Bell Laboratories, who in his very illuminating appendix to Chapter 11 solved some basic problems underlying our discussion in that chapter.

We also owe special thanks to Lionel Robbins for urging us to undertake this project (though there have been moments when we doubted whether this was cause for gratitude) and to Robert Dorfman and a number of advanced students at the Stockholm School of Economics for detecting some critical errors in our arguments.

For their very useful comments on particular parts of the analysis, we are also most grateful to Polly Allen, Hourmouzis Georgiades, Peter Kenen, Harold Kuhn, Edwin Mills, Herbert Mohring, Richard Musgrave, Fred Peterson, Robert Plotnick, Michael Rothschild, Ralph Turvey, and Edward Zajac. The opportunity to work through these materials in two separate lectures delivered by one of us at the Stockholm School served as a stimulus for our ideas and the completion of this book, and for this too we are most grateful.

Finally, for patience, good humor, skill at deciphering our hieroglyphics, and for ability to produce order out of chaos, we want to thank Sue Anne Batey, who has acted as research assistant, secretary, and a repository of sanity, and who, we trust, will not be excessively embarrassed as she types these words.
When the “environmental revolution” arrived in the 1960s, economists were ready and waiting. The economic literature contained an apparently coherent view of the nature of the pollution problem together with a compelling set of implications for public policy. In short, economists saw the problem of environmental degradation as one in which economic agents imposed external costs upon society at large in the form of pollution. With no “prices” to provide the proper incentives for reduction of polluting activities, the inevitable result was excessive demands on the assimilative capacity of the environment. The obvious solution to the problem was to place an appropriate “price,” in this case a tax, on polluting activities so as to internalize the social costs. Marshall and Pigou had suggested such measures many decades earlier. Moreover, pollution and its control through so-called Pigouvian taxes had become a standard textbook case of the application of the principles of microeconomic theory. Economists were thus ready to provide counsel to policy makers on the design of environmental policy.

However, things have proved not quite so simple as this. First, at the policy level, environmental economists have been dismayed at their modest impact on the design of environmental measures. Rather than introducing the economist’s taxes or “effluent fees” on polluting activities, policy makers have generally opted for the more traditional “command-and-control” instruments involving explicit limitations on allowable levels of emissions and the use of specified abatement techniques. Pricing measures for the regulation of pollution have been rare.

Second, the profusion of literature on the theory of externalities and its applications to environmental management suggests that there were more than just a few loose ends to the available analysis. This literature over the past three decades runs into hundreds of papers. These papers explore the properties of the Pigouvian solution, its limitations, and the potential of a number of alternative policy instruments, including subsidies for pollution abatement, deposits for damaging materials, and systems of marketable emission permits. There is much more to the economic