



Structural Economics



Measuring Change in Technology,
Lifestyles, and the Environment

F A Y E D U C H I N

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Preface

Structural economics is a body of theory and methods relating changes in technology, lifestyles, and the environment, an approach that makes it possible to address, and begin to answer, some of the most challenging questions of our time. This volume brings together for the first time a full description of structural economics and provides new material that develops not only its technological but also its social dimension. The effort involves integrating qualitative understanding into a flexible quantitative framework intended for describing and analyzing how people live in households and earn their livings producing goods and services on farms, in mines, in factories, and, increasingly, in offices. The framework also deals with how technologies change and how the lifestyles of different kinds of households change in the process of development. The case of Indonesia has been used in this book both for illustration and to test and improve new concepts by applying them to factual information.

This work has in part been supported by the program in sustainable development of the United Nations University in Tokyo. The program sets out to explore how it might be possible to ensure adequate protection of the natural world while satisfying the objectives of accelerated economic development in industrializing countries and maintaining current standards of living in the developed world. A distinctive feature of this effort of the United Nations University is its focus on the perspectives, challenges, options, and active participation of developing countries, especially those in the Asia Pacific region.

Many dimensions of structural economics have been developed over a period of decades, in particular its power for analyzing the implications of technological change. A relevant body of work is described in some detail in this book. New research about the social dimension of sustainable development seeks to conceptualize and

describe different categories of households and their lifestyles and to develop a framework for analyzing scenarios about alternative prospects for lifestyle changes. This is achieved by extending existing concepts, databases, and models in ways that parallel the treatment of technological change.

The present volume consists of nine chapters written over the past five years. Each chapter is intended to be self-contained in the treatment of some part of the overall subject while touching on most of the other themes as well. The reason for this approach is that the different aspects—classifications, data, mathematics, scenarios—are highly interdependent to such an extent that the research itself has moved in an iterative fashion from one to the next. To the extent possible I wanted to avoid a highly technical treatment that would isolate the topics in separate chapters. While most chapters thus take up overlapping material, I have tried to avoid redundancy and to provide the flow and integration that a reader has the right to expect.

The book is addressed to the general reader who is concerned with the public good, believes that substantial changes in how we live and work may be in store, and is convinced that a deeper understanding of our options is needed if we are to make reasonable decisions. Yet, while I strive for a clear presentation and avoid jargon, the book is not light reading and includes some mathematics.

I have two reasons for aiming the exposition at a general reader. First, at a time of extreme specialization within mutually exclusive academic disciplines, one of the few ways to try to address a variety of social scientists is to write for a general reader. Second, this work is based on the conviction that specialists, generalists, and ordinary (that is, nonexpert) citizens are reliant upon each other in effecting social change. For this reason, I want to point out that there is a pathway through the book, simply skipping chapters 5 and 6, that tells a coherent story while bypassing the most technical material.

The mathematical formulation of chapter 6 recapitulates the entire story of structural economics in a succinct form that makes it possible to carry out experiments. The nonmathematical reader, who will already be familiar with the story, may not be interested in the equations but may want to peruse the list of variables to get an intuition about the formal representation.

While all chapters include references to a scholarly literature, many of the cited books and articles may well be of interest to a general reader. This is least likely to be true for the references to the

social accounting literature in chapter 5. That work is nonetheless included because it serves as a major stimulus, and also a point of comparison, for the somewhat different approach that I propose.



This book marks a main turning point in my intellectual work. At the time I began the manuscript, I had no idea that the completion of the first draft would exactly coincide with my leaving the Institute for Economic Analysis at New York University, where I had been for twenty years, for a different kind of challenge.

In September of 1996 I moved to Troy, New York, to become the dean of the School of the Humanities and Social Sciences at Rensselaer Polytechnic Institute, a technological university and the home of the first school of engineering to be established in the United States (in 1824). The fresh perspective provided by this change, coupled with the detailed and incisive comments of Frank Ackerman of Tufts University, Bert Steenge of the University of Twente, and Reid Lifset of Yale University, informed a substantial revision of the scope of the manuscript. I am grateful to my editor at Island Press, Todd Baldwin, for his interest in this work and his substantial help in improving the text. The book is a synthesis of my work of the past twenty years and provides a point of departure for moving, with the collaboration of new colleagues, in fresh directions.

I want to thank Dr. Fu-chen Lo, deputy director of the Institute for Advanced Studies at the United Nations University in Tokyo, for his support of this project and his commitment, more generally, to the interplay of theoretical and empirical research. I gratefully acknowledge the collaboration of Glenn-Marie Lange in drafting an early version of chapter 5 and that of Karim Nauphal in carrying out the computations reported in chapter 8. I am extremely fortunate to have worked for two decades with Wassily Leontief, who shared with me his passion for understanding how economies function.