

Preface

This book explains the role of energy efficiency in economic development and analyzes trends in energy demand to explore the feasibility of regional economic growth under environmental constraints. Amidst growing environmental constraints, a comprehensive examination is needed of sustainable policies to stimulate regional economic development, while balancing energy use and addressing environmental problems. To accomplish this objective, the book closely examines energy demand trends in Japan by region and clarifies the factors behind changes in energy demand. In addition, this book focuses on the effects of energy efficiency on energy demand, demonstrates quantitatively the factors behind energy efficiency improvements, and explains the use of energy efficiency indicators. From these analyses, readers can investigate favorable regional economic and environmental policies that promote improvements in energy efficiency and contribute to the realization of a low-carbon society.

To date, while various publications have presented studies that individually evaluated energy demand levels and energy efficiencies on a country-by-country basis, I am not aware of any publications that have explained the trends and determining factors for energy demand and energy efficiency from the perspective of regional economies. In particular, hardly any investigations have been conducted on favorable energy efficiency indicators suited to the study of energy and environmental policy. To overcome this issue, I present in this book the results of an extended analysis based on an indicator that I developed to determine the factors behind improvements in energy efficiency. In addition, the book highlights various factors behind changes to energy demand within regional economies.

The purpose of this research is twofold. First, this book aims to understand the actual regional energy demand situation, in order to clarify the manner in which energy efficiency influences energy demand fluctuations. Second, this book develops an index to measure energy efficiency and analyze its determinants. Based on the above results, the present work identifies the desirable economic environments that will increase energy efficiency.

A unique feature of this book is its proposal of numerous new analytical approaches. The first approach is the use of dynamic shift-share analysis to clarify

the factors behind changes in energy demand. This new analytical method can overcome the weaknesses of traditional static shift-share analysis. I show the results of applying this method to energy demand analysis. In the second new approach, I use stochastic frontier analysis, instead of data envelopment analysis, to measure energy efficiency. I propose a new analytical approach that applies the former method.

Readers of the book will learn new methods for analyzing energy demand at the regional economic level and the factors behind improvements in energy efficiency, which are topics on which very few empirical studies have been conducted worldwide. The book will also enable readers to define precisely the role of improvements in economic efficiency in regional economic development in order to ascertain quantitatively the effects of energy efficiency improvements on regional economic growth. Such an analysis would make it possible to propose favorable regional policies toward realizing a low-carbon society.

I envisage that readers will primarily be graduate students, academic researchers, and policymakers in the fields of regional studies, energy, and environmental economics. This book introduces an analysis of regional energy demand and methods for developing energy efficiency indicators, along with case studies of their application. No other publication has addressed these areas so comprehensively, and therefore, this book can be considered to be highly original in content, with no competing texts.

This book is organized into five chapters—a new article, a translated articles, and three previously published journal articles. I have obtained permission for the reuse, for which I would like to thank Wiley-Blackwell Publishing Company and Central Research Institute of Electric Power Industry. The Japanese version of the first chapter is “Findings of Regional Energy Demand,” published in *Denryokukeizaikenkyu* (No.63, pp. 66–81). The original article of the second chapter is “Regional Energy Demand in Japan: Dynamic Shift-Share Analysis,” published in *Energy, Sustainability and Society* (Vol. 6, No. 10, pp. 1–10). The original article of the third chapter, entitled “Energy efficiency and agglomeration economies: The case of Japanese manufacturing industries,” appeared in *Regional Science Policy & Practice* (Vol. 6, No. 2, pp. 195–212). The original of the fourth, “Estimation and determinants of energy efficiency in Japanese regional economies,” was published in *Regional Science Policy & Practice* (Vol. 7, No. 2, pp. 89–101). Each chapter is a revision of the original paper.

Finally, I would like to thank my wife Harumi Otsuka for her dedication in supporting me during the book writing. In addition, I thank Prof. Mika Goto and Prof. Toshiyuki Sueyoshi as coauthors of original articles for encouraging me to proceed with the research. This work was supported by a Japan Society for the Promotion of Science (JSPS) Grant-in-Aid for Scientific Research (KAKENHI) 15K17067. In addition, I have received Grant-in-Aid as Young Scientific Research by Yokohama City University.

Regional Energy Demand and Energy Efficiency in Japan

An Application of Economic Analysis

Otsuka, A.

2017, VIII, 98 p. 15 illus., 13 illus. in color., Softcover

ISBN: 978-3-319-47565-3