

# PRODUCTION, MULTI-SECTORAL GROWTH AND PLANNING

Essays in Memory of Leif Johansen

*Edited by:*

Finn R. FØRSUND

*Department of Economics  
University of Oslo  
Oslo, Norway*

Michael HOEL

*Department of Economics  
University of Oslo  
Oslo, Norway*

and

Svein LONGVA

*Central Bureau of Statistics of Norway  
• Oslo, Norway*



1985

NORTH-HOLLAND  
AMSTERDAM · NEW YORK · OXFORD

## CONTENTS

INTRODUCTION TO THE SERIES	v
EDITORS' PREFACE	vii
LEIF JOHANSEN'S CONTRIBUTIONS TO THE THEORY OF PRODUCTION, PLANNING, AND MULTISECTORAL GROWTH	
Robert M. Solow	1
1. Production theory	1
2. Multisectoral models and macroeconomic planning	6
References	8
AN INTERCOUNTRY COMPARISON OF CEMENT PRODUCTION: THE SHORT-RUN PRODUCTION FUNCTION APPROACH	
Finn R. Førsund, Lennart Hjalmarsson and Øyvind Eitrheim	11
1. Introduction	11
2. The construction of the short-run industry production function	14
3. The activity regions	17
4. Data	20
5. Individual country analyses	24
6. Intercountry comparisons	31
7. Tentative conclusions	38
References	39
ESTIMATION OF THE CAPACITY DISTRIBUTION OF AN INDUSTRY: THE SWEDISH DAIRY INDUSTRY 1964-1973	
Joan Muysken	43
1. Introduction	43
2. The distribution approach	44
3. Estimation of the capacity distribution	46
4. The beta-capacity distribution	47

6. Concluding remarks	55
Appendix 1	56
Appendix 2	58
Appendix 3	59
Notes	60
References	62

PROPERTIES OF PRODUCTION AND PROFIT FUNCTIONS  
ARISING FROM THE AGGREGATION OF A CAPACITY  
DISTRIBUTION OF MICRO UNITS

Atle Seierstad	65
Part I. Survey of results	65
Part II. Precise definitions and results	70
Appendix	82
References	84

FLUCTUATIONS AND FACTOR PROPORTIONS:  
PUTTY-CLAY INVESTMENTS UNDER UNCERTAINTY

Karl Ove Moene	87
1. Introduction	87
2. Plant design and capacity utilization	89
3. Optimal plant designs	91
4. The impact of fluctuations	94
5. Economic interpretations	96
5.1 The sensitivity of utilization rates to price fluctuations	97
5.2 The optimal degree of subcontracting	98
5.3 Stabilization policies	100
5.4 Coordination of investments	102
5.5 The effect of public unemployment compensation	103
6. Concluding remarks	105
Appendix	105
Notes	106
References	107

# THE INTERPLAY BETWEEN SECTORAL MODELS BASED ON MICRO DATA AND MODELS FOR THE NATIONAL ECONOMY

Finn R. Førsund and Eilev S. Jansen	109
1. Introduction	109
2. Micro-based models for one sector	111
2.1. The industry production function	111
2.2. The frontier production function	114
3. The interaction between sectoral models and models for the national economy	115
4. Some further considerations	119
Notes	122
References	123

## EXTENSIONS AND APPLICATIONS OF THE MSG-MODEL: A BRIEF SURVEY

Lars Bergman	127
1. Introduction	127
2. A stylized version of the MSG-model	128
3. The MSG-model and the development of CGE-modelling	136
4. Extensions of the MSG-model	143
4.1. Endogenous foreign trade	143
4.2. Input substitution, heterogeneous labor, and budget constraints	150
5. Concluding remarks	152
Appendix	155
Notes	156
References	157

## A VERSION OF THE MSG-MODEL WITH PUTTY-CLAY AND VINTAGE TECHNOLOGY

Håkan Persson	163
1. Introduction	163
2. The framework	164
2.1. Investment and capital	165
2.2. Prices	167
2.3. Capacity expansion	169
3. The model	171
4. Some extensions	178

Appendix	180
References	185

## THE MULTI-SECTORAL GROWTH MODEL MSG-4. FORMAL STRUCTURE AND EMPIRICAL CHARACTERISTICS

Svein Longva, Lorents Lorentsen, and Øystein Olsen	187
1. Model background and history	187
2. Choice of theoretical content in an equilibrium model to be used in long-term macroeconomic planning	189
2.1 Macroeconomic planning, theory, and practice	189
2.2 The modelling of labour and capital markets and of external trade	192
3. Economic and formal structure of MSG-4	195
3.1 Basic concepts and balance equations for commodities and prices	199
3.2 The submodel for production	202
3.3 Labour and capital markets	205
3.4 The submodel for household consumption	206
3.5 Other main parts of the model	208
3.6 Special features of the MSG-4 model	209
4. Empirical characteristics of MSG-4 illustrated by long-term total elasticities	213
4.1 Some elasticity concepts	214
4.2 Elasticities with respect to changes in the growth potential	217
4.3 Energy demand elasticities	224
4.4 Transition paths and long-run properties	228
Appendix	231
Notes	235
References	236

## ON THE INTRODUCTION AND APPLICATION OF THE MSG-MODEL IN THE NORWEGIAN PLANNING SYSTEM

Per Schreiner and Knut Arild Larsen	241
1. Institutional background	241
1.1 Historical background	241
1.2 Economic planning and policies in Norway	243
1.3 Models and plans	244

1.4 The economic triangle	245
2. The first steps in applying the MSG-model	247
2.1 The beginning	247
2.2 From research to administrative instrument	248
2.3 Integration of the model into the administrative system	250
3. A short survey of applications	253
3.1 Perspective analyses in official documents based on MSG	253
3.2 Special studies based on MSG	253
4. Political and administrative aspects of utilizing the MSG-model	255
4.1 General properties of the model	255
4.2 Characteristics of the projections	256
5. Some reflections on the future of the MSG-model and its applications	260
References	262

# THE USE OF THE MSG-MODEL IN PREPARING A "PERSPECTIVE ANALYSIS 1980-2000" FOR THE NORWEGIAN ECONOMY

Olav Bjerkholt and Sigurd Tveitereid	271
1. Introduction	271
2. Diminished perspectives for growth	272
3. Medium-term problems and long-run efficiency	279
4. Uncertainty and strategies	283
References	287

# CERTAINTY EQUIVALENCE PROCEDURES IN DECISION-MAKING UNDER UNCERTAINTY: AN EMPIRICAL APPLICATION

Iulie Aslaksen and Olav Bjerkholt	289
1. The Johansen approach to certainty equivalence procedures in decision-making under uncertainty	289
2. An illustration of the parametric certainty equivalence procedure	293
3. Static and dynamic optimization in a two-period context	296
4. A multi-period framework with stochastic rates of return	301

5. Preference functions derived from macroeconomic projections	309
6. A strategy for optimal consumption under uncertainty: empirical applications	317
References	329
 AUTHOR INDEX	 331
 SUBJECT INDEX	 333