# CONTENTS


Preface . . . . . v

1. Introductory; Use of Mathematical Models . . . . . 1
   1.1. Aims and Means of Development Policies . . . . . 1
   1.2. Mathematical Models as a Hard Core of Programming . . . . . 4
   1.3. Conditions of Practical Applicability . . . . . 8
   1.4. Successive Approximations as a Method . . . . . 9
   1.5. Main Elements of Models. . . . . 10
   1.6. Arrangement of Subject Matter . . . . . 14

2. One Scarce Factor; One Sector. . . . . 15
   2.1. Macromodel; No Gestation Lag; No Depreciation. . . . . 15
   2.2. Macromodel; No Gestation Lag; with Depreciation and Replacement . 17
   2.3. Macromodel with Gestation Lag; No Depreciation . . . . . 22
   2.4. The Optimum Rate of Development . . . . . 24

3. Several Scarce Factors; One Sector. . . . . 32
   3.1. Population-Capital-Technical-Change Model; Continuous Substitution between Factors . . . . . 32
   3.2. Models with Various Types of Technological Change. . . . . 37
   3.3. Models with Accounting Prices . . . . . 41
   3.4. Models with Restricted Substitution between Factors . . . . . 45
   3.5. The Role of Aims in the Design of Policy . . . . . 47

4. Several Sectors; Fixed Prices; No Substitution. . . . . 52
   4.1. Models without Interindustry Deliveries . . . . . 52
   4.2. Closed Economy; One Capital Good . . . . . 52
   4.3. Models with Second-order Capital Goods . . . . . 56
   4.4. Open Economy; One Capital Good . . . . . 63
   4.5. Input-Output Models with Uniform Lags; One Capital Good . . . 65
   4.6. Input-Output Models with Uniform Lags; Several Capital Goods . . 67
   4.7. Input-Output Models with Different Lags . . . . . 72
   4.8. Input-Output Models with Variable Coefficients . . . . . 73

**5. Several Sectors; Fixed Prices; Substitution** . . . . . **76**
5.1. Model with Substitution between Factors . . . . . 76
5.2. Open-economy Models . . . . . 80
5.3. Models with a Structural Break . . . . . 84
5.4. Models with Increasing Marginal Costs. . . . . 85
5.5. Indivisibilities . . . . . 86
5.6. Nonlinear Partial Models. . . . . 90

**6. Several Sectors; Variable Prices**. . . . . **93**
6.1. Two-sector Model for Terms of Trade . . . . . 93
6.2. Open-economy Input-Output Model with World-demand Equations . 94
6.3. Nonlinear Cost Functions. . . . . 96
6.4. Other Demand Functions. . . . . 97
6.5. Alternative Techniques: a Linear Programming Model . . . . . 97

**7. Several Sectors and Several Regions** . . . . . **100**
7.1. Rigid Distribution of Inputs over Sectors of Origin . . . . . 100
7.2. Transportation Costs Neglected; Prices Varying between Regions . . 104
7.3. Static Models with Transportation Costs . . . . . 106
7.4. Development Model with Transportation Costs . . . . . 109

**8. Some Critical and Concluding Remarks**. . . . . **113**
8.1. Some Critical Remarks on the Present State of the Discipline . . . 113
8.2. Some Practical Suggestions . . . . . 116

**Appendix. Symbols Used**. . . . . **119**

**Bibliography**. . . . . **127**

**Index**. . . . . **129**