

# Contents

|          |                                                                             |           |
|----------|-----------------------------------------------------------------------------|-----------|
| <b>1</b> | <b>Introduction</b>                                                         | <b>1</b>  |
| <b>2</b> | <b>An Overview of General Equilibrium Theory</b>                            | <b>5</b>  |
| 2.1      | Agents, Behavior and Markets                                                | 5         |
| 2.2      | Positive Analysis of the Walrasian Equilibrium                              | 8         |
| 2.2.1    | Walras' Law and the Walrasian Equilibrium: Definitions                      | 8         |
| 2.2.2    | Existence and Uniqueness of Walrasian Equilibrium                           | 11        |
| 2.3      | Normative Properties of Walrasian Equilibrium                               | 17        |
| 2.4      | Summary                                                                     | 19        |
| <b>3</b> | <b>A Simple General Equilibrium Model</b>                                   | <b>21</b> |
| 3.1      | Households                                                                  | 21        |
| 3.2      | Firms                                                                       | 22        |
| 3.3      | Equilibrium                                                                 | 26        |
| 3.4      | A Simple Example                                                            | 29        |
| 3.5      | The Numerical Solution                                                      | 32        |
| 3.6      | Summary                                                                     | 36        |
|          | Appendix 3.1: The Detailed Equations of the General<br>Equilibrium Example  | 37        |
|          | Appendix 3.2: GAMS Code for Solving the Simple<br>General Equilibrium Model | 39        |
| <b>4</b> | <b>A General Equilibrium Model with a Government Sector</b>                 | <b>41</b> |
| 4.1      | An Indirect Tax on Output with Lump-Sum Transfers                           | 41        |
| 4.1.1    | The Micro Effects of Output Taxes: An Example                               | 44        |
| 4.1.2    | The Aggregate Effects of the Output Tax                                     | 48        |
| 4.2      | Factor and Income Taxes                                                     | 50        |
| 4.2.1    | The Effects of Factor and Income Taxes:<br>Another Example                  | 51        |
| 4.3      | Savings, Investment, and the Government Budget Constraint                   | 53        |
| 4.3.1    | Government Activities with a Balanced Budget                                | 53        |
| 4.3.2    | Running a Non-balanced Budget                                               | 54        |

|                                                                              |                                                                                                  |            |
|------------------------------------------------------------------------------|--------------------------------------------------------------------------------------------------|------------|
| 4.3.3                                                                        | Investment and Savings                                                                           | 55         |
| 4.3.4                                                                        | The Equilibrium System                                                                           | 57         |
| 4.3.5                                                                        | Taxes, Expenditure and the Deficit: A Final Example                                              | 58         |
| 4.4                                                                          | Summary                                                                                          | 59         |
| Appendix 4.1: GAMS Code for the CGE Model Generating Tables 4.1, 4.2 and 4.3 |                                                                                                  | 62         |
| Appendix 4.2: GAMS Code for the CGE Model Generating Table 4.4               |                                                                                                  | 64         |
| <b>5</b>                                                                     | <b>Further Extensions of the Model: External Sector, Labor Market and Consumption Technology</b> | <b>67</b>  |
| 5.1                                                                          | The External Sector                                                                              | 67         |
| 5.1.1                                                                        | The Armington Assumption                                                                         | 68         |
| 5.1.2                                                                        | Equilibrium and Model Closure                                                                    | 70         |
| 5.1.3                                                                        | Tariffs                                                                                          | 71         |
| 5.2                                                                          | The Labor Market                                                                                 | 71         |
| 5.3                                                                          | The Consumption Technology                                                                       | 75         |
| <b>6</b>                                                                     | <b>Data Base and Model Calibration</b>                                                           | <b>77</b>  |
| 6.1                                                                          | Social Accounting Matrices                                                                       | 78         |
| 6.1.1                                                                        | A Simple Macroeconomic <i>SAM</i>                                                                | 78         |
| 6.1.2                                                                        | A Detailed Microeconomic <i>SAM</i>                                                              | 80         |
| 6.1.3                                                                        | Assembling a <i>SAM</i>                                                                          | 81         |
| 6.2                                                                          | Calibration                                                                                      | 83         |
| 6.2.1                                                                        | Calibration of Cobb–Douglas Utility Functions                                                    | 84         |
| 6.2.2                                                                        | Calibration of Cobb–Douglas Production Functions                                                 | 85         |
| 6.2.3                                                                        | Calibration of CES Production Functions                                                          | 86         |
| 6.2.4                                                                        | Calibration in the Presence of Taxes                                                             | 88         |
| 6.2.5                                                                        | Calibration of the Fixed Coefficients Technology                                                 | 90         |
| 6.2.6                                                                        | Calibration of Tax Rates                                                                         | 91         |
| 6.3                                                                          | Summary                                                                                          | 94         |
| Appendix                                                                     |                                                                                                  | 97         |
| <b>7</b>                                                                     | <b>Real-World Examples of Applied General Equilibrium Analysis</b>                               | <b>99</b>  |
| 7.1                                                                          | Theoretical Origins                                                                              | 100        |
| 7.2                                                                          | From Theory to Applications                                                                      | 101        |
| 7.3                                                                          | Computational Issues                                                                             | 102        |
| 7.4                                                                          | Representative Uses of AGE Analysis and Models                                                   | 104        |
| 7.4.1                                                                        | Fiscal Policies                                                                                  | 104        |
| 7.4.2                                                                        | Trade Policies                                                                                   | 105        |
| 7.4.3                                                                        | Stabilization Policies                                                                           | 106        |
| 7.4.4                                                                        | Environmental Analysis                                                                           | 107        |
| 7.5                                                                          | Summary                                                                                          | 108        |
| Appendix                                                                     |                                                                                                  | 109        |
| <b>Bibliography</b>                                                          |                                                                                                  | <b>111</b> |
| <b>Index</b>                                                                 |                                                                                                  | <b>117</b> |