## Contents

**Preface**  xi  
**Endorsements**  xv  

### 1 Well-Being as a Multidimensional Phenomenon  
1.1 Introduction  1  
1.2 Income as a Dimension of Well-Being and Some Related Aggregations  4  
1.3 Scales of Measurement: A Brief Exposition  10  
1.4 Preliminaries for Multidimensional Welfare Analysis  11  
1.5 The Dashboard Approach and Weights on Dimensional Metrics in a Composite Index  14  
1.6 Multidimensional Welfare Function Axioms  17  
1.6.1 Invariance Axioms  17  
1.6.2 Distributional Axioms  19  
1.7 Multidimensional Welfare Functions  27  
1.8 Concluding Remarks  37  
References  38  

### 2 An Overview of Multidimensional Economic Inequality  
2.1 Introduction  49  
2.2 A Review of One-Dimensional Measurement  51  
2.2.1 Normative One-Dimensional Inequality Indices  51  
2.2.2 Subgroup-Decomposable Indices of Inequality  53  
2.3 Multidimensional Inequality Indices  56  
2.3.1 The Direct Approach  56  
2.3.1.1 Axioms for a Multidimensional Inequality Index  56  
2.3.1.2 Examples of Indices  60  
2.3.2 The Inclusive Measure of Well-being Approach  69  
2.4 Concluding Remarks  77  
References  78
3 A Synthesis of Multidimensional Poverty 85
3.1 Introduction 85
3.2 A Brief Review of One-Dimensional Analysis 89
3.3 Preliminaries for Multidimensional Poverty Analysis 93
3.4 Identification of the Poor and Deprivation Counting 95
3.5 Axioms for a Multidimensional Poverty Metric 99
3.5.1 Invariance Axioms 100
3.5.2 Distributional Axioms 103
3.5.3 Decomposability Axioms 108
3.5.4 Threshold Limit Sensitivity Axiom 111
3.5.5 Technical Axioms 112
3.6 Multidimensional Poverty Measurement 113
3.6.1 The Dashboard Approach 113
3.6.2 The Direct Approach 117
3.6.3 The Inclusive Measure of Well-being Approach 123
3.7 Multidimensional Poverty Orderings 125
3.7.1 A Brief Outline of One-Dimensional Orderings 126
3.7.2 Multidimensional Orderings 129
3.8 Dimensions of Well-Being with Ordinal Significance and Multidimensional Poverty 131
3.9 Orderings Based on Deprivations Counts 134
3.10 Multidimensional Material Deprivation 138
3.11 Concluding Remarks 142
References 143

4 Fuzzy Set Approaches to the Measurement of Multidimensional Poverty 163
4.1 Introduction 163
4.2 Fuzzy Membership Function 165
4.3 Axioms for a Fuzzy Multidimensional Poverty Index 173
4.3.1 Invariance Axioms 175
4.3.1.1 Fuzzy Strong Ratio-Scale Invariance 175
4.3.1.2 Fuzzy Strong Translation-Scale Invariance 177
4.3.1.3 Fuzzy Weak Focus 177
4.3.1.4 Fuzzy Strong Focus 178
4.3.1.5 Fuzzy Symmetry 178
4.3.1.6 Fuzzy Population Replication Invariance 179
4.3.2 Distributional Axioms 179
4.3.2.1 Fuzzy Monotonicity 179
4.3.2.2 Fuzzy Monotonicity Sensitivity 180
4.3.2.3 Fuzzy Dimensional Monotonicity 181
4.3.2.4 Fuzzy Transfer 182
4.3.2.5 Increasing Fuzzy Poverty under Correlation-Increasing Switch 184
4.3.3 Decomposability Axioms 185
4.3.3.1 Fuzzy Subgroup Decomposability 185
4.3.3.2 Fuzzy Factor Decomposability 185
4.3.4 Fuzzy Sensitivity Axiom 186
4.3.4.1 Increasing Fuzzy Poverty for Increased Membership Function 186
4.3.5 Technical Axioms 187
4.3.5.1 Fuzzy Boundedness 187
4.3.5.2 Fuzzy Continuity 187
4.4 Fuzzy Multidimensional Poverty Indices 187
4.5 Fuzzy Poverty Orderings 191
4.6 Concluding Remarks 195

References 195

5 Poverty and Time: A Multidimensional Appraisal 201
5.1 Introduction 201
5.2 Preliminaries 207
5.3 The Block Approach 208
5.3.1 Individual Multidimensional Intertemporal Poverty Index 208
5.3.2 Aggregate Multidimensional Intertemporal Poverty Index 218
5.3.3 A Review of Some Related One-Dimensional Proposals 220
5.4 An Exploration of the Counting Approaches to Multidimensional Intertemporal Deprivations 226
5.5 The Multidimensional Duration Approach 229
5.5.1 A Review of One-Dimensional Duration-Reliant Offers 229
5.5.2 Axioms for a Chronic Multidimensional Poverty Quantifier 231
5.5.3 The Bourguignon–Chakravarty Approach to Chronic Multidimensional Poverty Measurement 240
5.6 Intertemporal Poverty Orderings 243
5.7 Concluding Remarks 245
References 246

6 Vulnerability to Poverty: A Multidimensional Evaluation 251
6.1 Introduction 251
6.2 A Review of One-Dimensional Measurement 254
6.3 Multidimensional Representation of Vulnerability to Poverty: An Axiomatic Investigation 262
6.4 Concluding Remarks 269
References 271