

94	8.3	Causal Graphs for Complex Patterns of Self-Selection	35
95	3.6	Appendix to Chapter 3: Graphs, Interventions, and Potential Outcomes	278
	4.8	Conclusions	292
9		Estimating Causal Effects by Conditioning on Observed Variables to Block Back-Door Paths	III
	1.9	Causal Effect Estimation with Instrumental Variables	192
	2.9	Models of Causal Exposure and Identification Criteria	192
102	3.9	Instrumental Variable Estimators in the Presence of Conditioning Estimators	203
102		Conditioning and Directed Graphs	203
109	4.9	Heterogeneity	224
		The Back-Door Criterion	224
		Conclusions	224
118		Models of Causal Exposure and Point Identification Based on the Potential Outcome Model	225
128	4.4	Conditioning to Balance and Conditioning to Adjust	226
		The Dangers of Inequality and Conditioning to Adjust	226
		Conclusions	226
		Appendix to Chapter 4: The Back-Door and Adjustment Criteria	page xiii
		Descendants, and Colliders Under Matching	xvii
		Acknowledgments for First Edition	xxi
		Acknowledgments for Second Edition	xxiii
	I	Causality and Empirical Research in the Social Sciences	
1	1	Introduction	3
181	1.1	The Potential Outcome Model of Causal Inference	4
187	1.2	Causal Analysis and Observational Social Science	6
188	1.3	Examples Used Throughout the Book	14
188	1.4	Observational Data and Random-Sample Surveys	27
194	1.5	Causal Graphs as an Introduction to the Remainder of the Book	29
	II	Counterfactuals, Potential Outcomes, and Causal Graphs	
2	2	Counterfactuals and the Potential Outcome Model	37
217	2.1	Defining the Causal States	37
224	2.2	Potential Outcomes and Individual-Level Treatment Effects	43
226	2.3	Treatment Groups and Observed Outcomes	44
226	2.4	The Average Treatment Effect	46
229	2.5	The Stable Unit Treatment Value Assumption	48
231	2.6	Treatment Assignment and Observational Studies	53
234	2.7	Average Causal Effects and Naive Estimation	54
238	2.8	Over-Time Potential Outcomes and Causal Effects	62
243	2.9	The Potential Outcome Model for Many-Valued Treatments	70
243	2.10	Conclusions	73
	2.11	Appendix to Chapter 2: Population and Data Generation Models	74
3	3	Causal Graphs	77
268	3.1	Identification	78
269	3.2	Basic Elements of Causal Graphs	79
	3.3	Graphs and Structural Equations	84
	3.4	Causal Graphs and the Potential Outcome Model	90

3.5	Conclusions	94
3.6	Appendix to Chapter 3: Graphs, Interventions, and Potential Outcomes	95
III	Estimating Causal Effects by Conditioning on Observed Variables to Block Back-Door Paths	
4	Models of Causal Exposure and Identification Criteria for Conditioning Estimators	105
4.1	Conditioning and Directed Graphs	105
4.2	The Back-Door Criterion	109
4.3	Models of Causal Exposure and Point Identification Based on the Potential Outcome Model	118
4.4	Conditioning to Balance and Conditioning to Adjust	128
4.5	Conclusions	130
4.6	Appendix to Chapter 4: The Back-Door and Adjustment Criteria, Descendants, and Colliders Under Magnification	130
5	Matching Estimators of Causal Effects	140
5.1	Origins of and Motivations for Matching	141
5.2	Matching as Conditioning via Stratification	143
5.3	Matching as Weighting	150
5.4	Matching as a Data Analysis Algorithm	158
5.5	Remaining Practical Issues in Matching Analysis	181
5.6	Conclusions	187
6	Regression Estimators of Causal Effects	188
6.1	Regression as a Descriptive Tool	188
6.2	Regression Adjustment as a Strategy to Estimate Causal Effects	194
6.3	Regression as Conditional-Variance-Weighted Matching	206
6.4	Regression as an Implementation of a Perfect Stratification	214
6.5	Regression as Supplemental Adjustment When Matching	215
6.6	Extensions and Other Perspectives	217
6.7	Conclusions	224
7	Weighted Regression Estimators of Causal Effects	226
7.1	Weighted Regression Estimators of the ATE	227
7.2	Weighted Regression Estimators of the ATT and the ATC	231
7.3	Doubly Robust Weighted Regression Estimators	234
7.4	Remaining Practical Issues in Weighted Regression Analysis	238
7.5	An Extended Example	243
7.6	Conclusions	262
IV	Estimating Causal Effects When Back-Door Conditioning Is Ineffective	
8	Self-Selection, Heterogeneity, and Causal Graphs	267
8.1	Nonignorability and Selection on the Unobservables Revisited	268
8.2	Selection on the Unobservables and the Utility of Additional Posttreatment Measures of the Outcome	269

8.3	Causal Graphs for Complex Patterns of Self-Selection and Heterogeneity	278
8.4	Conclusions	290
9	Instrumental Variable Estimators of Causal Effects	291
9.1	Causal Effect Estimation with a Binary IV	291
9.2	Traditional IV Estimators	296
9.3	Instrumental Variable Estimators in the Presence of Individual-Level Heterogeneity	305
9.4	Conclusions	324
10	Mechanisms and Causal Explanation	325
10.1	The Dangers of Insufficiently Deep Explanations	326
10.2	The Front-Door Criterion and Identification of Causal Effects by Mechanisms	330
10.3	The Appeal for Generative Mechanisms	338
10.4	The Pursuit of Explanation with Mechanisms That Bottom Out	346
10.5	Conclusions	352
11	Repeated Observations and the Estimation of Causal Effects	354
11.1	Interrupted Time Series Models	355
11.2	Regression Discontinuity Designs	360
11.3	Panel Data	363
11.4	Conclusions	392
11.5	Appendix to Chapter 11: Time-Varying Treatment Regimes	392
V	Estimation When Causal Effects Are Not Point-Identified by Observables	419
12	Distributional Assumptions, Set Identification, and Sensitivity Analysis	419
12.1	Distributional Assumptions and Latent Variable Selection-Bias Models	420
12.2	Set Identification with Minimal Assumptions	422
12.3	Sensitivity Analysis for Provisional Causal Effect Estimates	429
12.4	Conclusions	434
VI	Conclusions	437
13	Counterfactuals and the Future of Empirical Research in Observational Social Science	437
13.1	Objections to Adoption of the Counterfactual Approach	438
13.2	Modes of Causal Inquiry in the Social Sciences	446
References		451
Index		497