

10.3.4	Path-Switching Causation	324
10.3.5	Temporal Preemption	325
10.4	Conclusions	327
11	Reflections, Elaborations, and Discussions with Readers	331
11.1	Causal, Statistical, and Graphical Vocabulary	331
11.1.1	Is the Causal-Statistical Dichotomy Necessary?	331
11.1.2	d -Separation without Tears (Chapter 1, pp. 16–18)	335
11.2	Reversing Statistical Time (Chapter 2, p. 58–59)	337
11.3	Estimating Causal Effects	338
11.3.1	The Intuition behind the Back-Door Criterion (Chapter 3, p. 79)	338
11.3.2	Demystifying “Strong Ignorability”	341
11.3.3	Alternative Proof of the Back-Door Criterion	344
11.3.4	Data vs. Knowledge in Covariate Selection	346
11.3.5	Understanding Propensity Scores	348
11.3.6	The Intuition behind do -Calculus	352
11.3.7	The Validity of G -Estimation	352
11.4	Policy Evaluation and the do -Operator	354
11.4.1	Identifying Conditional Plans (Section 4.2, p. 113)	354
11.4.2	The Meaning of Indirect Effects	355
11.4.3	Can $do(x)$ Represent Practical Experiments?	358
11.4.4	Is the $do(x)$ Operator Universal?	359
11.4.5	Causation without Manipulation!!!	361
11.4.6	Hunting Causes with Cartwright	362
11.4.7	The Illusion of Nonmodularity	364
11.5	Causal Analysis in Linear Structural Models	366
11.5.1	General Criterion for Parameter Identification (Chapter 5, pp. 149–54)	366
11.5.2	The Causal Interpretation of Structural Coefficients	366
11.5.3	Defending the Causal Interpretation of SEM (or, SEM Survival Kit)	368
11.5.4	Where Is Economic Modeling Today? – Courting Causes with Heckman	374
11.5.5	External Variation versus Surgery	376
11.6	Decisions and Confounding (Chapter 6)	380
11.6.1	Simpson’s Paradox and Decision Trees	380
11.6.2	Is Chronological Information Sufficient for Decision Trees?	382
11.6.3	Lindley on Causality, Decision Trees, and Bayesianism	384
11.6.4	Why Isn’t Confounding a Statistical Concept?	387
11.7	The Calculus of Counterfactuals	389
11.7.1	Counterfactuals in Linear Systems	389
11.7.2	The Meaning of Counterfactuals	391
11.7.3	d -Separation of Counterfactuals	393

Contents	xiii
11.8 Instrumental Variables and Noncompliance	395
11.8.1 Tight Bounds under Noncompliance	395
11.9 More on Probabilities of Causation	396
11.9.1 Is “Guilty with Probability One” Ever Possible?	396
11.9.2 Tightening the Bounds on Probabilities of Causation	398
Epilogue The Art and Science of Cause and Effect	
A public lecture delivered in November 1996 as part of the UCLA Faculty Research Lectureship Program	401
<i>Bibliography</i>	429
<i>Name Index</i>	453
<i>Subject Index</i>	459