

---

# Natural monopoly regulation

## Principles and practice

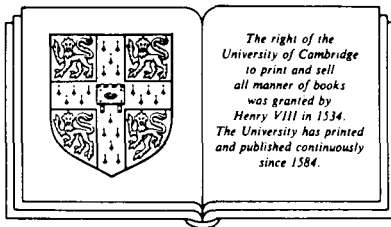
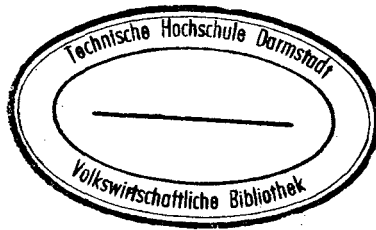
---

SANFORD V. BERG

*University of Florida*

JOHN TSCHIRHART

*University of Wyoming*



CAMBRIDGE UNIVERSITY PRESS

CAMBRIDGE

NEW YORK NEW ROCHELLE MELBOURNE SYDNEY

# Contents

<i>Preface</i>	<i>page</i>	ix
1 Introduction to regulatory economics		1
1.1 Historical background		1
1.2 Regulatory goals		6
1.3 Overview of <i>Natural monopoly regulation</i>		11
 <b>Part I. Optimal pricing and investment for natural monopolies</b>		
2 Natural monopoly and the justification for regulation		21
2.1 Natural monopoly in the single-product firm		22
2.2 Regulation for the single-product firm		24
2.3 Natural monopoly in the multiproduct firm		34
2.4 Regulation for the multiproduct firm		44
2.5 Marginal-cost pricing with subsidies		45
2.6 Summary		51
3 Efficient pricing using linear prices		53
3.1 Ramsey prices		55
3.2 An application of more complex Ramsey prices		62

3.3	More on Ramsey pricing with a competitive fringe	68
3.4	Rivalry among strong natural monopolies	79
3.5	Impediments to Ramsey pricing and second-best considerations	85
3.6	Fully distributed cost pricing	91
3.7	Summary	100
4	Efficient pricing using nonlinear prices	103
4.1	The rationale for two-part tariffs	106
4.2	A two-part tariff for a single-product natural monopoly	109
4.3	Discriminating two-part tariffs	120
4.4	Examining the stability of two-part tariffs using game theory	123
4.5	Pareto-superior two-part tariffs	136
4.6	Multipart pricing	142
4.7	Summary	150
5	Peak-load pricing	153
5.1	A model of peak-load pricing	154
5.2	Fixed-coefficient production technologies	165
5.3	Diverse technology and interdependent demands	172
5.4	Practical considerations for peak-load pricing	179
5.5	Summary	191
6	Pricing and capacity under stochastic demand	193
6.1	Stochastic demand in a peak-load model	195
6.2	Accounting for excess demand and deficits	201
6.3	A comparison of pricing rules	206
6.4	Monopoly determination of interruptible rates	218
6.5	Fuses for load management and rate design	227
6.6	Summary	233
7	Sustainability of natural monopolies	236
7.1	Pricing and sustainability in a strong natural monopoly	238
7.2	Pricing and sustainability in a weak natural monopoly	251

7.3	Conditions for sustainability	254
7.4	Ramsey prices and sustainability	270
7.5	Summary	276
	Appendix	278

## **Part II Natural monopoly regulation in practice**

8	Regulation in practice: Why and how are firms regulated?	283
8.1	Why are firms regulated?	284
8.2	How are firms regulated?	291
8.3	Problems with rate-of-return regulation	299
8.4	Regulatory behavior	307
8.5	Summary	320
9	Models of regulatory constraints	323
9.1	Rate-base regulation: the A-J effect in a single-product firm	324
9.2	Pricing and multiple outputs	333
9.3	Complications in the search for an A-J effect	339
9.4	Automatic adjustment clauses	365
9.5	Industry-wide regulatory constraints	373
9.6	Summary	380
	Appendix	382
10	Technological change under regulation	385
10.1	Characteristics of technological change	386
10.2	Incentives for cost-reducing innovative activity	396
10.3	Input bias and induced technological change	408
10.4	Innovations and the output mix	415
10.5	Institutional structures for innovation	419
10.6	Summary	425
11	Partial regulation, deregulation, and diversification	428
11.1	Issues under partial regulation	430
11.2	Sustainability under partial regulation	435
11.3	Deregulation and residual regulation	452
11.4	Expansion of the product line	460

11.5	Vertical integration	464
11.6	Determining the benefits from deregulation	468
11.7	Summary	476
	Appendix	478
12	Alternatives to traditional regulation	480
12.1	Public ownership	480
12.2	Competition for the market via a franchise	484
12.3	Regulating quality	488
12.4	Regulatory incentive schemes	497
12.5	Concluding remarks	520
	<i>References</i>	523
	<i>Author index</i>	551
	<i>Subject index</i>	556