CONTENTS OF VOLUME 1 OF THE HANDBOOK

List of Contributors

Chapter 1
Structure, Regulation and Competition in the Telecommunications Industry
MARTIN E. CAVE, SUMIT K. MAJUMDAR and INGO VOGELSANG
1. Introduction 3
2. Economic Characteristics 5
   2.1. Historical Overview 5
   2.2. Network Effects 9
   2.3. Customer Demand Analysis 11
   2.4. Econometric Cost Functions 13
   2.5. Representation of Technology and Production 16
3. Regulation 19
   3.1. Price Regulation 21
   3.2. Theory of Access Pricing and Interconnection 22
   3.3. Interconnection Practices 24
   3.4. Universal Service 25
   3.5. Interaction Among Regulatory Institutions 27
4. Competition 29
   4.1. Competition Policy 29
   4.2. Long Distance Competition 32
   4.3. Mobile Telephone 34
   4.4. Economics of Spectrum Auctions 35
   4.5. Local Network Competition 36
5. Conclusion 38
References 39

SECTION I – STRUCTURE

Chapter 2
Historical Overview
GERALD W. BROCK
1. Introduction 44
2. Development of Regulated Monopoly Telecommunication 46
   2.1. The Early Telegraph and Telephone Industry 46
   2.2. Regulation and Monopoly 50
3. The Shrinking Boundary of Regulated Monopoly 54
   3.1. Competition in Customer Premises Equipment 54
   3.2. Competition in Long Distance Service 58
   3.3. The Divestiture 62
4. Efforts to Develop Interconnected Competition 65
   4.1. The Competitive Unregulated Internet 65
   4.2. The Telecommunications Act of 1996 and Local Telephone Competition 70
5. Conclusion 73
References 74

Chapter 3
Network Effects
STANLEY J. LIEBOWITZ and STEPHEN E. MARGOLIS
1. Network Externalities 76
2. Classifications 77
3. Impacts of Network Effects 79
   3.1. Choosing Network Size 80
   3.2. Choosing Among Competing Networks 83
4. Features of Modern Network Effects Models 86
5. The Empirical Importance of Network Effects 88
   5.1. Network Effects in Principle 88
   5.2. Measuring Network Effects 89
6. Policy Implications 92
7. Conclusions 93
References 94

Chapter 4
Customer Demand Analysis
LESTER D. TAYLOR
1. Introduction 98
2. Telecommunications Demand Analysis in the 1970s and 1980s 98
3. The General Nature of Telecommunications Demand 101
4. Theoretical Considerations 105
   4.1. A Generic Model of Access Demand 105
   4.2. Models of Toll Demand 106
   4.3. Point-to-Point Toll Demand 108
5. Empirical Studies 109
   5.1. Studies of Residential Access Demand and Local Usage;
       Residential Access Demand: Taylor and Kridel, 1990 109
   5.2. Bypass via EAS: Kridel, 1988 113
5.3. Choice of Class of Local Service: Train, McFadden and Ben Akiva, 1987 116
5.4. Studies of Toll Demand, Point-to-Point Toll Demand: Larson, Lehman, and Weisman, 1990 117
5.5. Toll Demand Models Estimated from a Sample of Residential Telephone Bills: Rappoport and Taylor, 1997 119
5.7. Two-Stage Budgeting and the Total Bill Effect in Toll Demand: Zona and Jacob, 1990 124

6. An Overview of What We Know About Telecommunications Demand 126
7. Challenges for the Future 136
References 138

Chapter 5
Econometric Cost Functions
MELVYN A. FUSS and LEONARD WAVERMAN
1. Introduction 144
   1.1. Monopoly or Competition 144
   1.2. Regulation and Price-Caps: The Need for Assessing Productivity 145
   1.3. Efficiency Measurement and the Use of Alternative Approaches 148
   1.4. General Comments 150
2. The Concepts of Economies of Scale, Scope and Subadditivity 151
   2.1. Economies of Scale and Scope 151
3. Technological Change 158
   3.1. Estimating Marginal Costs 161
   3.2. Revenue Weights versus Cost Weights in Price-Caps Formulas 162
4. A Selective Review of the Evidence 164
5. Conclusion 170
Appendix 171
References 175

Chapter 6
Representation of Technology and Production
WILLIAM W. SHARKEY
1. Introduction 180
2. Network Design Principles 181
   2.1. Telecommunications Network Elements 181
   2.2. The Trade-Off Between Switching and Transmission 186
   2.3. Telecommunications Traffic Theory 188
   2.4. Optimization in the Local Access Network: Minimum Distance and Minimum Cost Networks 190
2.5. Network Optimization in the Interoffice and Intercity Networks 193
3. Network Facilities and Technologies 195
  3.1. Wireline Subscriber Access 195
  3.2. Alternative Subscriber Access Technologies 197
  3.3. Switching 199
  3.4. Interoffice Transport Facilities 200
  3.5. Interconnection Arrangements and Costs 202
  3.6. Broadband Standards and Technologies 203
4. Cost Proxy Models of the Telecommunications Network 204
  4.1. A Brief Survey of Cost Proxy Models in Telecommunications 205
  4.2. The Hybrid Cost Proxy Model 210
  4.3. International Applications of HCPM 215
5. Conclusion 220
References 221

SECTION II – REGULATION

Chapter 7
Price Regulation
DAVID E. M. SAPPINGTON
1. Introduction 227
2. Forms of Incentive Regulation 228
  2.1. Banded Rate of Return Regulation 228
  2.2. Earnings Sharing Regulation 228
  2.3. Revenue Sharing Regulation 230
  2.4. Rate Case Moratoria 230
  2.5. Price Cap Regulation 231
  2.6. Partial Deregulation 232
  2.7. Yardstick Regulation 233
  2.8. Options 234
3. Trends in Incentive Regulation 236
4. General Issues in the Design and Implementation 240
   of Incentive Regulation
   4.1. Reasons for Incentive Regulation 240
   4.2. Incentive Regulation in Practice 243
   4.3. Possible Drawbacks to Incentive Regulation 245
5. Designing Price Cap Regulation 248
   5.1. Setting the X Factor 248
   5.2. Determining the Length of Time Between Reviews 251
   5.3. Mid-Stream Corrections: Z Factors 253
   5.4. Implementing the Price Cap Constraint 253
Chapter 8

The Theory of Access Pricing and Interconnection

MARK ARMSTRONG

1. Introduction
2. One Way Access Pricing
   2.1. The Effect of Unbalanced Retail Tariffs
   2.2. The Problem of Foreclosure in an Unregulated Market
   2.3. Fixed Retail Prices with No Bypass: The ECPR
   2.4. Fixed Retail Prices and Bypass
   2.5. Ramsey Pricing
   2.6. Unregulated Retail Prices
   2.7. Introducing Dynamic Issues
   2.8. Controversies and Conclusions
3. Competitive Bottlenecks
   3.1. Mobile Call Termination
   3.2. Access Charges for the Internet
4. Two Way Access Pricing and Network Interconnection
   4.1. Fixed Subscriber Bases: International Call Termination
   4.2. Interconnection with Competition for Subscribers
5. Conclusion: Instruments and Objectives
References

Chapter 9
Interconnection Practices
ELI M. NOAM

1. Interconnection as the key policy tool of telecommunications
   1.1. Why regulate interconnection
   1.2. Regulation of interconnection and unbundling in a competitive market

2. Interconnection as a tool for the creation of monopoly: the U.S. experience

3. Interconnection as a tool for competitive entry
   3.1. Reforming access charges

4. Interconnection as a tool for protecting competition
   4.1. Local competition
   4.2. Unbundling
   4.3. Quality
   4.4. Cable television interconnection
   4.5. Mobile interconnection
   4.6. Internet interconnection

5. Pricing and pricing wars
   5.1. Regulated pricing of interconnection
   5.2. Arbitrage
   5.3. Incremental cost

6. Interconnection around the world

7. Interconnection and common carriage

8. The future of regulation of interconnection
References

Chapter 10
Universal Residential Telephone Service
MICHAEL H. RIORDAN

1. Introduction

2. Telephone Penetration in the United States

3. Normative Economics of Universal Service
   3.1. Price distortions
   3.2. Scale economies
   3.3. Network externalities
   3.4. Third degree price discrimination
   3.5. Second degree price discrimination

4. Positive Economics of Universal Service
   4.1. Cross-subsidies in the price structure?
SECTION III – COMPETITION

Chapter 11
Competition Policy in Telecommunications
DANIEL F. SPULBER
1. Introduction
2. Monopolisation
   2.1. Monopolisation
   2.2. Predatory Pricing and Raising Rivals’ Costs
   2.3. Natural Monopoly
   2.4. Market Power
3. Leveraging
   3.1. Essential Facilities
   3.2. Barriers to Entry
   3.3. Tying
   3.4. Cross Subsidisation
4. Mergers
5. Conclusion
References

Chapter 12
Competition in the Long Distance Market
DAVID L. KASERMAN and JOHN W. MAYO
1. Introduction
2. Structure – Conduct-Performance
   2.1. Structure
   2.2. Conduct
   2.3. Performance
   2.4. Summary
3. Empirical Analysis of Relaxed Regulation
4. The Access Charge Pass Through Debate
   4.1. Theoretical Issues
4.2. Empirical Analyses 538
4.3. Summary 543
5. NEIO Studies 544
  5.1. Residual Demand Studies 544
  5.2. Conjectural Variation Studies 547
  5.3. An Alternative Test for Tacit Collusion 549
6. Competition for International Calling 553
7. Conclusion 558
References 559

Chapter 13
Mobile Telephone
JERRY HAUSMAN
1. Introduction 564
2. Description of the Mobile Industry 567
  2.1. Technology 567
  2.2. Competing Firms and Countries 571
  2.3. Government Frequency Allocation 572
3. International Comparisons 575
  3.1. Performance Across Countries 575
  3.2. Pricing Within the U.S. 579
  3.3. Pricing in Europe 582
4. Increased Consumer Welfare from Mobile Telephone 583
  4.1. Economic Theory to Measure Increased Consumer Welfare 583
  4.2. Estimation of the Amount of Increased Consumer Welfare 585
  4.3. Estimation of a Corrected Telecommunications Service CPI 586
5. Government Regulation of Mobile Telephone 588
  5.1. Estimation of the Cost of Regulatory Delay in the U.S. 589
  5.2. Regulation of Mobile Prices 591
  5.3. Regulation of Mobile Access and Mandated Roaming 594
  5.4. Regulation of Wireline Call Termination on Mobile 595
6. Taxation of Mobile Services 596
  6.1. Estimation of Economic Efficiency Losses 597
  6.2. Comparison with Alternative Taxes 601
7. Conclusion 602
References 603

Chapter 14
Spectrum Auctions
PETER CRAMTON
1. Introduction 606
2. Why Auction the Spectrum? 607
3. Auction Design 608
3.1. Open Bidding is Better than a Single Sealed Bid 609
3.2. Simultaneous Open Bidding is Better than Sequential Auctions 610
3.3. Package Bids Are Too Complex 611
3.4. Other Issues 612
4. Simultaneous Ascending Auction 613
5. Demand Reduction and Collusive Bidding 617
6. Lessons Learned and Auction Enhancements 621
7. Package Bidding 623
8. UMTS Auctions in Europe and Asia 626
9. Advice to Governments 630
9.1. Allocating the Spectrum is Just as Important as its Assignment 631
9.2. Use Care When Modifying Successful Rules 631
9.3. Allow Discretion in Setting Auction Parameters 631
9.4. Reduce the Effectiveness of Bidders' Revenue-Reducing Strategies 632
9.5. Use Spectrum Caps to Limit Anticompetitive Concentration 633
9.6. Implement Special Treatment for Designated Entities with Care 633
9.7. Implementing an Effective Auction: Time and Difficult Tradeoffs 635
9.8. Facilitate Efficient Clearing When Auctioning Encumbered Spectrum 636
10. Conclusion 637
References 637

Chapter 15
Local Network Competition
GLENN A. WOROCH
1. Introduction 642
1.1. Scope and objectives of this chapter 642
1.2. Patterns and themes 643
2. Local Network Competition in Historical Perspective 644
2.1. Local competition in one city, a century apart 644
2.2. U.S. experience with local competition and monopoly 647
2.3. The experience abroad 656
3. Economic Conditions of Local Network Competition 659
3.1. Defining local services and markets 659
3.2. Demand for local network services 663
3.3. Cost of local service and technical change 668
4. The Structure and Regulation of the Local Network Industry 676
4.1. Structure of the U.S. local exchange industry 676
4.2. Regulation of local network competition 680
5. Strategic Modelling of Local Network Competition 684
5.1. Causes and consequences of local network competition 684
5.2. Strategic choices of local network entrants 689
5.3. Strategic models of local network competition 692
5.4. Entry barriers 693
6. Empirical Evidence on Local Network Competition 697
7. Wireless Local Competition 698
   7.1. Wireless communications technologies 699
   7.2. Wireless services as wireline competitors 702
   7.3. Structure of the wireless industry 705
   7.4. An assessment of the wireless threat 706
8. The Future of Local Competition 708
References 711

Subject Index 717