

# **Cost Proxy Models and Telecommunications Policy**

## A New Empirical Approach to Regulation

Farid Gasmi  
D. Mark Kennet  
Jean-Jacques Laffont  
William W. Sharkey

The MIT Press  
Cambridge, Massachusetts  
London, England

# Contents

Series Foreword	xiii
Preface	xv
1 Introduction	1
1.1 <i>The Need for Regulation in Telecommunications</i>	1
1.2 <i>The Historical Evolution of Practical Regulation</i>	3
1.3 <i>The New Theory of Regulation</i>	6
1.4 <i>Econometrics of Regulation</i>	8
1.5 <i>Cost Proxy Models</i>	10
1.6 <i>A New Empirical Approach to Regulation</i>	12
2 The Local Exchange Cost Optimization Model (LECOM)	15
2.1 <i>Introduction</i>	15
2.2 <i>The Local Exchange Network: An Overview</i>	17
2.3 <i>Technological Foundations of LECOM</i>	19
2.3.1 <i>The Distribution Plant</i>	19
2.3.2 <i>The Feeder Plant</i>	21
2.3.3 <i>Switching</i>	23
2.3.4 <i>The Interoffice Plant</i>	24

2.4	<i><b>Building an Optimal Network: Economic Trade-offs Modeled in LECOM</b></i>	26
2.5	<i>Total Cost and Optimization</i>	27
2.6	<i>From LECOM Simulations to a LECOM Cost Function</i>	32
<b>3</b>	<b>The Use of LECOM under Complete Information</b>	<b>37</b>
3.1	<i>Introduction</i>	37
3.2	<i>Data Problems Encountered in Prior Studies</i>	38
3.3	<i>Using the LECOM Model for Subadditivity Calculations</i>	41
3.4	<i>Empirical Results</i>	43
3.4.1	Measuring Economies of Scope	43
3.4.2	Economies of Scope in Switched Services	48
3.5	<i>Conclusion</i>	49
<b>4</b>	<b>Regulation under Incomplete Information</b>	<b>51</b>
4.1	<i>Introduction</i>	51
4.2	<i>The Model</i>	53
4.3	<i>Optimal Regulation under Incomplete Information with Cost Observability</i>	54
4.4	<i>Optimal Regulation without Cost Observability</i>	58
4.5	<i>Price-Cap Regulation</i>	59
4.6	<i>Cost-Plus Regulation</i>	62
4.7	<i>Remark</i>	63

**5 The Natural Monopoly Test 65**

*5.1 Introduction 65*

*5.2 Theoretical Framework 68*

*5.3 Empirical Methodology 72*

*5.3.1 Simulations of the Engineering Process Cost Model  
LECOM 73*

*5.3.2 Market Structure-Specific Cost Functions 75*

*5.3.3 Interconnection Costs 78*

*5.3.4 Calibration of Demand and Disutility 80*

*5.4 Empirical Results 81*

*5.4.1 Case I: Usage as Output 82*

*5.4.2 Case II: Access as Output 85*

*5.5 Conclusion 89*

**6 Optimal Regulation of a Natural Monopoly 91**

*6.1 Introduction 91*

*6.2 The Optimal Regulatory Mechanism: Theory 93*

*6.3 The Local Exchange Cost Function, Welfare, and Regulatory  
Uncertainty: Estimation and Calibration 94*

*6.4 The Optimal Regulatory Mechanism: Empirical  
Evaluation 98*

*6.5 Implications 101*

*6.5.1 Incentives and Pricing 101*

*6.5.2 Implementation of Optimal Regulation 104*

*6.6 Using an Alternative Disutility of Effort Function 109*

*6.7 Conclusion 111*

<b>7</b>	<b>Comparison of Performance of Incentive and Traditional Regulatory Schemes</b>	<b>113</b>
7.1	<i>Introduction</i>	113
7.2	<i>Alternative Regulatory Regimes</i>	114
7.3	<i>Overview of the Results</i>	117
7.4	<i>Comparisons and Implications</i>	123
7.4.1	Relative Performance	123
7.4.2	Redistributive Consequences	126
7.4.3	Effect of the Cost of Public Funds	130
7.5	<i>Conclusion</i>	132
<b>8</b>	<b>Universal Service</b>	<b>133</b>
8.1	<i>Introduction</i>	133
8.2	<i>The Theoretical Alternatives</i>	135
8.3	<i>Empirical Procedure</i>	142
8.4	<i>Empirical Results</i>	144
8.4.1	Technological Efficiency	144
8.4.2	Universal Service Obligation and Budget Balance	145
8.4.3	Implicit and Explicit Taxation of the Urban Sector	146
8.4.4	Impact of Incomplete Information	148
8.5	<i>Conclusion</i>	149
<b>9</b>	<b>Strategic Cross-subsidies and Vertical Integration</b>	<b>153</b>
9.1	<i>Introduction</i>	153
9.2	<i>Size of Cross-subsidies due to Allocation of Common Costs</i>	154

9.3	<i>Size of Effort Allocation Cross-subsidies</i>	156
9.4	<i>Strategic Cross-subsidies through Effort Allocation under Accounting Separation</i>	158
9.4.1	The Cost-of-Effort Channel	158
9.4.2	The Cost-of-Production Channel	160
9.5	<i>Empirical Results</i>	162
9.5.1	Simulation of LECOM: Basic versus Enhanced Services	162
9.5.2	Accounting and Strategic Cross-subsidies	165
9.6	<i>Conclusion</i>	175
<b>10</b>	<b>Conclusion</b>	177
10.1	<i>What Have We Learned?</i>	178
10.1.1	Implications for Incentive Regulation and Telecommunications Policy	178
10.1.2	Lessons for the Use of Proxy Models in Empirical Research	181
10.2	<i>Directions for Improvements in Our Approach</i>	184
10.3	<i>Some Issues Not Addressed in Our Analysis and Suggestions for Further Research</i>	186
<b>Appendix A</b>		189
A.1	<i>The Natural Monopoly Test (Chapter 5)</i>	189
A.1.1	Usage as Output (Section 5.4.1)	189
A.1.2	Access as Output	189
A.2	<i>Optimal Regulation of a Natural Monopoly (Chapter 6)</i>	190
A.3	<i>Universal Service (Chapter 8)</i>	191
A.4	<i>Strategic Cross-subsidies and Vertical Integration (Chapter 9)</i>	193

<i>A.5 Preparation of LECOM Cost Data</i>	201
<i>A.6 A Guide to the Mathematica Analysis</i>	207
<i>A.7 Contents of the CDROM</i>	209
<b>Appendix B</b>	211
<i>B.1 The Hybrid Cost Proxy Model (HCPM)</i>	111
<i>B.2 International Applications of HCPM</i>	217
B.2.1 Argentina	217
B.2.2 Portugal	220
Notes	223
References	243
Index	249