Economics and Information Systems

Edited by
T. Hendershott
University of California
# Contents

Introduction xv

CHAPTER 1
Diffusion of Information and Communication Technologies to Businesses
C. Forman and A. Goldfarb 1
1. Introduction 1
2. ICT diffusion and its impact 4
   2.1. Diffusion modeling 4
   2.2. The impact of ICT diffusion 8
3. ICT adoption and organizational characteristics 9
   3.1. Adoption, internal firm organization, and organizational change 9
   3.2. Adoption and firm boundaries 14
   3.3. Adoption and size 17
   3.4. Technical infrastructure 18
   3.5. Adoption, assimilation, intra-firm diffusion, and usage 19
4. Geographic differences in adoption 21
   4.1. Adoption of ICT across urban and rural areas 23
   4.2. Evidence of how ICT use influences location patterns 24
   4.3. Future research 24
5. Trade-offs between organization and environment 25
   5.1. Co-invention 26
   5.2. Strategic issues in technology adoption 28
6. Network effects 30
   6.1. Theoretical literature on direct and indirect network externalities 32
   6.2. Evidence of network effects of any kind in ICT 33
   6.3. Evidence of positive network externalities in ICT 35
7. Internet diffusion across countries 37
8. Conclusion 42
Acknowledgments 43
References 43

CHAPTER 2
Economics of Data Communications
P. Afèche 53
1. Introduction 53
2. Problem definition and discussion framework 56
   2.1. Service demand 57
   2.2. Service contracts: QoS guarantees and service designs 59
## Contents

4.1. Assignments with homogenous products 157  
4.2. Assignments with differentiated products 161  
4.3. Second-best assignments 165  
5. Networks and the core in a two-sided market 166  
  5.1. The core with homogenous products 166  
  5.2. The core with differentiated products 167  
6. Stable assignments in a decentralized two-sided market: costly computation 168  
  6.1. Stable assignments with homogenous products 169  
  6.2. Stable assignments with differentiated products 172  
7. Firms and stable assignments in a centralized two-sided market 173  
  7.1. Firms and stable assignments with homogenous products 174  
  7.2. Firms and stable assignments with differentiated products 179  
8. Matchmaking and market making by a firm using double auctions 181  
  8.1. Market making by a firm using double auctions for homogenous products 182  
  8.2. Matchmaking and market making by a firm using double auctions for differentiated products 183  
9. Two-sided markets in random networks 188  
  9.1. Search and random assignments 188  
  9.2. Markets and random networks 193  
10. Conclusion 196  
Acknowledgments 197  
References 197

## CHAPTER 4

**Organization Structure**

T. Marschak 201  
1. Introduction 201  
2. Goals, mechanisms, and informational costs: the "incentive-free" case, where individuals obey the designer's rules without inducement 204  
  2.1. Two general frameworks for judging the organization's actions 204  
  2.2. How the organization finds its current action when incentives are not an issue 207  
  2.3. Finite approximations of mechanisms whose message spaces are continua 230  
  2.4. The dynamics of a mechanism 233  
  2.5. Constructing an informationally efficient mechanism 236  
  2.6. Finding a best action rule (outcome function) once a mechanism has conveyed information about the environment to each person: the methods of the Theory of Teams 238  
  2.7. Designing an organization "from scratch": choosing its members, what each observes, and the speak-once-only mechanism that they use 240  
3. Models in which the designer is concerned with incentives as well as Informational costs 264  
  3.1. The message-space size required for implementation of a goal 265
3.2. Models in which the organization’s mechanism is partly designed by its self-interested members, who bear some of the informational costs 266
3.3. Networks of self-interested decision-makers, who bear the network’s informational costs 275
4. Organizational models in which the primitive is a “task”, “problem”, “project”, or “item” 278
5. Concluding remarks 280
References 281

CHAPTER 5
Open Source Software: The New Intellectual Property Paradigm
S. M. Maurer and S. Scotchmer 285
1. Introduction 285
2. Incentives for R&D 287
  2.1. Intellectual property and open source 288
  2.2. Own use 290
  2.3. Complementary goods and services 290
  2.4. Signaling 293
  2.5. Education 295
  2.6. Achieving network externalities and denying them to others 295
  2.7. Social psychology 296
3. Stability and organizational issues 300
  3.1. Who contributes, and how much? 300
  3.2. Who pays? 301
  3.3. Why licenses? 302
  3.4. Why leadership? 304
  3.5. Network effects 305
4. Efficiency implications 306
  4.1. Disclosure of code 306
  4.2. Meeting users’ needs 307
  4.3. Deadweight loss and pricing 308
  4.4. Training and using programmers 308
  4.5. Free riding 310
  4.6. Modularity and the organization of the research effort 310
5. Open source and proprietary software 312
  5.1. Competition between open source and proprietary software 312
  5.2. Market segmentation 314
6. Limitations and extensions 315
  6.1. Limits to open source software 315
  6.2. Beyond software: drug discovery, geographic information systems, and Wikipedia 315
7. Conclusion 318
Acknowledgments 319
References 319
CHAPTER 6
Information, Search, and Price Dispersion
M. R. Baye, J. Morgan, and P. Scholten

1. Introduction

2. Theoretical models of price dispersion
   2.1. Search-theoretic models of price dispersion
       2.1.1. The Stigler model
       2.1.2. The Rothschild critique and Diamond’s paradox
       2.1.3. The Reinganum model and optimal sequential search
       2.1.4. Remarks on fixed versus sequential search
       2.1.5. The MacMinn model
       2.1.6. The Burdett and Judd model
   2.2. Models with an “Information Clearinghouse”
       2.2.1. The Rosenthal model
       2.2.2. The Varian model
       2.2.3. The Baye and Morgan model
       2.2.4. Models with asymmetric consumers
       2.5.5. Cost heterogeneities and the Spulber model
   2.3. Bounded rationality models of price dispersion
   2.4. Concluding remarks: theory

3. Empirical analysis of price dispersion
   3.1. Measuring price dispersion
   3.2. Price dispersion in the field
       3.2.1. Dispersion and the “benefits” of search
       3.2.2. Dispersion and the “cost” of search
       3.2.3. Dispersion and the number of sellers
       3.2.4. Dispersion and price persistence
   3.3. Concluding remarks: empirics

Acknowledgments
References

CHAPTER 7
Behavior-Based Price Discrimination and Customer Recognition
D. Fudenberg and J. M. Villas-Boas

1. Introduction

2. Monopoly
   2.1. Two-period model
       Base model
       No customer recognition
       Customer recognition and behavior-based price discrimination
       The role of commitment
   2.2. Overlapping generations of consumers
       No constant prices in equilibrium
       Price cycles in equilibrium
   2.3. Long-lived consumers
## Contents

<table>
<thead>
<tr>
<th>Section</th>
<th>Page</th>
</tr>
</thead>
<tbody>
<tr>
<td>Long-term contracts</td>
<td>391</td>
</tr>
<tr>
<td>Relationship to durable goods and bargaining</td>
<td>393</td>
</tr>
<tr>
<td>2.4. Two-good monopoly</td>
<td>396</td>
</tr>
<tr>
<td>3. Competition</td>
<td>398</td>
</tr>
<tr>
<td>3.1. Two periods, short-term contracts</td>
<td>399</td>
</tr>
<tr>
<td>Analysis of the two-period model under the MHR assumption</td>
<td>400</td>
</tr>
<tr>
<td>Discrete distributions</td>
<td>403</td>
</tr>
<tr>
<td>Welfare</td>
<td>404</td>
</tr>
<tr>
<td>3.2. Infinite lived firms, overlapping generations of consumers, and</td>
<td>404</td>
</tr>
<tr>
<td>short-term contracts</td>
<td>406</td>
</tr>
<tr>
<td>3.3. Long-term contracts</td>
<td>408</td>
</tr>
<tr>
<td>3.4. Switching costs</td>
<td>408</td>
</tr>
<tr>
<td>4. Behavior-based pricing with multiple products, and product design</td>
<td>413</td>
</tr>
<tr>
<td>4.1. Upgrades and buybacks with an anonymous second-handmarket</td>
<td>414</td>
</tr>
<tr>
<td>4.2. Upgrades and buybacks with non-anonymous consumers</td>
<td>417</td>
</tr>
<tr>
<td>4.3. Endogenous innovation</td>
<td>418</td>
</tr>
<tr>
<td>4.4. Endogenous location choice in duopoly</td>
<td>420</td>
</tr>
<tr>
<td>5. Related topics: privacy, credit markets, and customized pricing</td>
<td>422</td>
</tr>
<tr>
<td>5.1. Privacy</td>
<td>422</td>
</tr>
<tr>
<td>5.2. Credit markets</td>
<td>426</td>
</tr>
<tr>
<td>5.3. Customized pricing</td>
<td>429</td>
</tr>
<tr>
<td>6. Conclusion</td>
<td>431</td>
</tr>
<tr>
<td>Acknowledgements</td>
<td>433</td>
</tr>
<tr>
<td>References</td>
<td>433</td>
</tr>
</tbody>
</table>

---

### CHAPTER 8

**Information Technology and Switching Costs**

Pei-yu Chen and L. M. Hitt

1. Introduction                                                        | 438  |
2. Switching cost: definition and measurement issues                   | 440  |
3. Switching costs, competition, and firm strategy                     | 444  |
   3.1. Switching costs and competition                                 | 444  |
   3.2. Endogenous switching costs                                     | 444  |
   3.3. Switching costs in information-intensive markets                | 445  |
   3.4. Empirical evidence                                              | 448  |
      Switching costs in software and other “high-tech” markets         | 449  |
      Switching costs in online markets                                 | 450  |
4. Endogenous switching costs and firm strategy in information-intensive markets | 451  |
5. A framework for managing switching costs                            | 455  |
   5.1. Introduction                                                    | 455  |
   5.2. A model of customer retention                                  | 457  |
   5.3. Measuring switching costs                                       | 461  |
6. Conclusion                                                          | 464  |
Acknowledgments                                                        | 466  |
References                                                             | 467  |
CHAPTER 9
The Economics of Privacy
K.-L. Hui and I.P.L. Png

1. Introduction
2. “Free market” approach
3. Within-market consequential externalities
   3.1. Non-productive information
   3.2. Productive information
4. Cross-market consequential externalities
5. Direct externalities
6. Property rights
7. Regulation
8. Empirical evidence
9. Future directions
Acknowledgment
References

CHAPTER 10
Product Bundling
X. Geng, M. B. Stinchcombe, and A. B. Whinston

1. Introduction
2. Bundling for price discrimination: the case of two products
   2.1. The base model
   2.2. Issues to be considered in monopoly bundling
       2.2.1. Pure bundling, mixed bundling, and the combinatorial issue
       2.2.2. Bundling products and bundling buyers
       2.2.3. Monitoring purchase
       2.2.4. Posted price and auction
   2.3. Pure bundling
   2.4. Mixed bundling
   2.5. Extension: bundling complements or substitutes
   3.1. The integer programming approach
   3.2. Pure or simple mixed bundling of many products
4. Bundling as competition tools
   4.1. A monopoly market plus a competitive market
   4.2. A monopoly market plus a potentially duopoly market: the additive valuations case
   4.3. A monopoly market plus a potentially duopoly market: the complements case
   4.4. Duopoly bundling
5. Concluding remarks
Acknowledgment
CHAPTER 13
Reputation Mechanisms
C. Dellarocas
1. Introduction 629
2. Signaling and sanctioning role of reputation mechanisms 633
3. Reputation in game theory and economics 635
   3.1. Basic concepts 635
   3.2. Reputation dynamics 638
   3.3. When is reputation bad? 640
   3.4. Other extensions to the basic theory 642
4. New opportunities and challenges of online mechanisms 643
   4.1. Eliciting sufficient and honest feedback 643
   4.2. Exploring the design space of feedback mediators 645
   4.3. Coping with cheap online identities 647
   4.4. Understanding the consequences of strategic manipulation 648
   4.5. Distributed reputation mechanisms 649
5. Empirical and experimental studies 651
   5.1. Empirical studies and field experiments 651
   5.2. Controlled experiments 654
6. Conclusions: opportunities for IS research 655
References 657

Subject Index 661