TOPICS IN MICROECONOMICS

INDUSTRIAL ORGANIZATION, AUCTIONS, AND INCENTIVES

ELMAR WOLFSTETTER

Humboldt University at Berlin



Contents

Preface pag				
Ac	Acknowledgments			
Ι	Impe	erfect Co	ompetition	1
1	Mon	opoly		3
	1.1	Introd	uction	3
	1.2	Courn	ot Monopoly – Weak Monopoly	5
		1.2.1	Cournot Point	5
		1.2.2	Deadweight Loss of Monopoly	14
		1.2.3	Social Loss of Monopoly and Rent Seeking	16
		1.2.4	Monopoly and Innovation	17
		1.2.5	Monopoly and Product Quality	21
	1.3	Price-	Discriminating or Strong Monopoly	22
	1.3.1 First-Degree Price Discrimination			23
		1.3.2	Second-Degree Price Discrimination	24
		1.3.3	Third-Degree Price Discrimination	24
		1.3.4	Limits of Price Discrimination	26
	1.4	Hidde	n Information and Price Discrimination	26
		1.4.1	Solution of the Restricted Program	29
		1.4.2	The Optimal Sales Plan	30
		1.4.3	Why it Pays to "Distort" Efficiency	31
		1.4.4	Sorting, Bunching, and Exclusion	32
	1.5 Price Discrimination and Public Goods*		Discrimination and Public Goods*	34
	1.6	Interte	emporal Price Discrimination	36
		1.6.1	Durable-Goods Monopoly	37
		1.6.2	Time-Inconsistency Problem	39
		1.6.3	Optimal Time-Consistent Price Discrimination	40
		1.6.4	Coase Conjecture	42
		1.6.5	An Example Where the Coase Conjecture Fails*	42
	1.7	Bilate	eral Monopoly and Bargaining*	43
		1.7.1	A Finite-Horizon Bargaining Game	44
		1.7.2	Infinite-Horizon Bargaining	45

	1.8	Digres	ssion: The Case Against Microsoft	49
	1.9	Conclu	uding Remarks	50
	1.10	Biblio	graphic Notes	50
2	Regulation of Monopoly			
	2.1	Introd	uction	52
	2.2	Positiv	ve Theory: The Averch-Johnson Effect*	53
		2.2.1	Assumptions	53
		2.2.2	Effects of Regulation	54
		2.2.3	Relation to Cost Minimization	55
		2.2.4	Welfare Implication	56
	2.3	Norm	ative Theory: Two Almost Perfect Regulations	57
		2.3.1	The Total Surplus Subsidy Mechanism	57
		2.3.2	The Incremental Surplus Subsidy (ISS) Mechanism	58
	2.4	Biblio	graphic Notes	63
3	Oligo	poly an	d Industrial Organization	65
	3.1	Introd	uction	65
		3.1.1	Game-Theoretic Foundations	65
		3.1.2	Historical Note	67
	3.2	Three	Perspectives	67
		3.2.1	The Three Market Games	68
		3.2.2	Cournot Competition	70
		3.2.3	Bertrand Competition	72
		3.2.4	Stackelberg Competition	74
		3.2.5	Welfare Ranking	77
		3.2.6	The Dual of Cournot Duopoly	77
		3.2.7	Discussion	78
	3.3	More	on Stackelberg Competition	79
		3.3.1	Criticism and Extensions	79
		3.3.2	Managerial Incentives as Commitment Mechanism	80
 1.10 Bibliographic Notes 2 Regulation of Monopoly 2.1 Introduction 2.2 Positive Theory: The Averch-Johnson Effect* 2.2.1 Assumptions 2.2.2 Effects of Regulation 2.2.3 Relation to Cost Minimization 2.2.4 Welfare Implication 2.3 Normative Theory: Two Almost Perfect Regulations 2.3.1 The Total Surplus Subsidy Mechanism 2.3.2 The Incremental Surplus Subsidy (ISS) Mechanis 2.4 Bibliographic Notes 3 Oligopoly and Industrial Organization 3.1 Introduction 3.1.2 Historical Note 3.2 Three Perspectives 3.2.1 The Three Market Games 3.2.2 Cournot Competition 3.2.3 Bertrand Competition 3.2.4 Stackelberg Competition 3.2.5 Welfare Ranking 3.2.6 The Dual of Cournot Duopoly 3.2.7 Discussion 3.3 More on Stackelberg Competition 3.3.1 Criticism and Extensions 3.3.2 Managerial Incentives as Commitment Mechanis 3.3.3 Commitment and Observability 3.4 More on Cournot Competition 3.4.1 Existence and Uniqueness 3.4.2 Digression: A Prescription for Leviathan* 3.4.3 What Does a Cournot Equilibrium Maximize?* 3.4.4 What If Suppliers Form a Cartel? 3.4.5 Selten's "Four Are Few and Six Are Many" 3.4.6 Are Mergers Profitable? 3.4.7 The Welfare Loss of Cournot Oligopoly 3.4.8 A Corrective Tax 3.4.9 The Generalized ISS Regulatory Mechanism* 3.4.11 Exit* 	Commitment and Observability	85		
	3.4 More on Cournot Competition		on Cournot Competition	89
		3.4.1	Existence and Uniqueness	89
		3.4.2	Digression: A Prescription for Leviathan*	95
		3.4.3	What Does a Cournot Equilibrium Maximize?*	97
		3.4.4	What If Suppliers Form a Cartel?	98
		3.4.5	Selten's "Four Are Few and Six Are Many"	100
		3.4.6	Are Mergers Profitable?	102
		3.4.7	The Welfare Loss of Cournot Oligopoly	104
		3.4.8	A Corrective Tax	105
		3.4.9	The Generalized ISS Regulatory Mechanism*	106
		3.4.10) Entry*	107
		3.4.1	l Exit*	111

	3.5	More of	on Bertrand Competition	116
		3.5.1	Capacity-Constrained Price Competition: An Example	117
		3.5.2	An Alternative Rationing Rule	122
		3.5.3	Generalizations	124
	3.6	A Defe	ense of Cournot Competition*	125
		3.6.1	Benchmark Cournot Equilibrium	125
		3.6.2	The Price-Competition Subgame	126
		3.6.3	Equilibrium of the Overall Game	130
		3.6.4	Excess Capacity and Collusion	131
		3.6.5	Discussion	131
	3.7	Biblio	graphic Notes	132
Π	Risk	, Stoch	astic Dominance, and Risk Aversion	133
4	Stoch	astic Do	ominance: Theory	135
	4.1	Introd	uction	135
	4.2	Assum	ptions and Definitions	136
	4.3	First-C	Order Stochastic Dominance (FSD)	136
		4.3.1	Main Results	137
		4.3.2	FSD and the "Stochastically Larger" Relationship*	138
		4.3.3	Relationship to Other Stochastic Orderings	139
	4.4	Secon	d-Order Stochastic Dominance	140
		4.4.1	Main Results	141
		4.4.2	SSD and the "Stochastically More Risky" Relationship*	142
	4.5	An Inv	variance Property*	143
	4.6	Ranki	ng Transformations of Random Variables*	144
	4.7	Comp	arative Statics of Risk	145
		4.7.1	Framework	145
		4.7.2	Key Issue	145
		4.7.3	Summary Table	148
	4.8	Biblio	graphic Notes	148
5	Stock	nastic D	ominance: Applications	149
	5.1	Introd	uction	149
	5.2	Portfolio Selection I 1		
	5.3	The Competitive Firm under Price Uncertainty		
	5.4	Labor Supply		
	5.5	Entry	in Cournot Oligopoly	153
	5.6	Auctions		
	5.7	Portfolio Selection II*		155
	5.8	Income Inequality*		
	5.9	Suppl	ement: Variance-Minimizing Portfolios*	159
		5.9.1	Portfolios	160
		5.9.2	Conjectures	160
		5.9.3	Outlook	160

Contents

vii

		5.9.4	Assumptions	161
		5.9.5	A Lemma That Clears the Road	161
		5.9.6	Main Result	162
		5.9.7	Summary	163
		5.9.8	Discussion	163
	5.10	Biblio	graphic Notes	163
6	Risk .	Aversio	n	165
	6.1	Introd	uction	165
	6.2	Absol	ute and Relative Risk Aversion	165
		6.2.1	Pratt's Theorem	166
		6.2.2	. An Incomplete-Insurance Puzzle	167
	6.3	Strong	g Absolute Risk Aversion*	168
		6.3.1	Ross's Theorem	169
		6.3.2	A Portfolio Selection Puzzle	170
	6.4	Wealt	h-Dependent Risk Aversion*	171
	6.5	Biblio	graphic Notes	172
Ш	[Inc	omplet	e Information and Incentives	173
7	Mate	hing: Tl	he Marriage Problem*	175
	,7.1	Introd	uction	175
	7.2	Notati	on and Basic Assumptions	175
	7.3	Stable	Two-Sided Matchings	176
	7.4	Who I	Benefits from Which Procedure?	178
	7.5	Strate	gic Issues	179
		7.5.1	Two Impossibility Results	179
		7.5.2	Stable Matchings?	180
	7.6	Biblio	graphic Notes	181
8	Auct	ions		182
	8.1	Introd	luction	182
		8.1.1	Information Problem	182
		8.1.2	Basic Assumptions	182
		8.1.3	Cournot-Monopoly Approach	183
		8.1.4	Auctions – What, Where, and Why	184
		8.1.5	Popular Auctions	185
		8.1.6	Early History of Auctions	186
	8.2	The B	Basics of Private-Value Auctions	186
		8.2.1	Some Basic Results on Dutch and English Auctions	186
		8.2.2	Revenue Equivalence	187
		8.2.3	Solution of Some Auction Games - Assuming	
			Uniformly Distributed Valuations	188
		8.2.4	An Alternative Solution Procedure*	195
		8.2.5	General Solution of Symmetric Auction Games	196
		8.2.6	Vickrey Auction as a Clarke-Groves Mechanism*	202

	8.3	Robus	stness*	203		
		8.3.1	Introducing Numbers Uncertainty	204		
		8.3.2	Discrete Valuations	204		
		8.3.3	Removing Bidders'Risk Neutrality	205		
		8.3.4	Removing Independence: Correlated Beliefs	205		
		8.3.5	Removing Symmetry	206		
		8.3.6	Multiunit Auctions	207		
		8.3.7	Split-Award Auctions	208		
		8.3.8	Repeated Auctions	208		
	8.4	Auctio	on Rings	209		
	8.5	Optim	al Auctions	211		
		8.5.1	A Simplified Approach	212		
		8.5.2	The Mechanism-Design Approach	214		
		8.5.3	Secret Reservation Price?	221		
		8.5.4	Optimal Auctions with Stochastic Entry*	222		
	8.6	Comn	non-Value Auctions and the Winner's Curse	225		
		8.6.1	An Example: The Wallet Auction	225		
		8.6.2	Some General Results	226		
	8.7	Affilia	ated Values*	229		
		8.7.1	Private and Common Value Generalized	229		
		8.7.2	Stochastic Similarity: Affiliation	230		
		8.7.3	Generalized Solution of the Vickrey Auction	230		
		8.7.4	Linkage Principle	232		
		8.7.5	Why the English Auction Benefits the Seller	233		
		8.7.6	Limits of the Linkage Principle	234		
	8.8	Furthe	er Applications*	235		
		8.8.1	Auctions and Oligopoly	235		
		8.8.2	Natural-Gas and Electric Power Auctions	238		
		8.8.3	Treasury-Bill Auctions	239		
	8.9	Biblic	ographic Notes	241		
	8.10	Appe	ndix: Second-Order Conditions (Pseudoconcavity)	241		
9	Hidd	Hidden Information and Adverse Selection				
	9.1	Introc	243-^			
	9.2	Adve	rse Selection	243		
		9.2.1	The Market for Lemons	244		
		9.2.2	Adverse Selection in Labor Markets	245		
	9.3	Positi	ve Selection: Too Many Professors?	248 ',		
		9.3.1	Assumptions	248		
		9.3.2	Occupational Choice	249		
		9.3.3	Positive vs. Adverse Selection	249		
		9.3.4	Subgame-Perfect Equilibrium	250		
		9.3.5	A Corrective Tax	250		
	9.4	Adve	rse Selection and Rationing	251		
			-			

Contents

ix

|--|

(9.5	Adverse Selection and Screening	252
		9.5.1 Screening in Insurance Markets	253
	^	9.5.2 Screening in Labor and Credit Markets	258
		9.5.3 Alternative Equilibrium Concepts	258
		9.5.4 Limits of Screening	259
^ <u>ç</u>	9.6	Screening without Competition*	259
		9.6.1 Price Discrimination with a Continuum of Types	259
		9.6.2 Implementation by Nonlinear Pricing	265
	9.7	Bibliographic Notes	266
x 10	Hidd	en Information and Signaling	267
	10.1	Introduction	267
	10.2	The Education Game	268
		10.2.1 Rules of the Game	268
		10.2.2 Payoff Functions	269
		10.2.3 Subgame	269
		10.2.4 Sequential Equilibrium	269
	10.3	Equilibrium – Embarrassment of Riches	270
	10.4	Equilibrium Selection: Intuitive Criterion*	272
		10.4.1 The Criterion When Type 2 Is Rare	273
		10.4.2 The Criterion When Type 1 Is Rare	274
	' 10.5	Screening vs. Signaling	275
	10.6	Bibliographic Notes	276
x'11	Hidd	len Action and Moral Hazard	278
	11.1	Introduction	278
	11.2	Risk Aversion and Incentives	279
		11.2.1 A Simple Model	279
		11.2.2 Generalization	285
	11.3	Limited Liability and Incentives	288
		11.3.1 A Simple Model	289
		11.3.2 Generalization	291
		11.3.3 Monitoring and Incentives*	294
	11.4	Renegotiation Problem	297
	11.5	Bibliographic Notes	299
	11.6	Appendix	300
12	Ran	k-Order Tournaments	302
	12.1	Introduction	302
	12.2	A Simple Model	302
		12.2.1 First Best Effort and Wage	303
		12.2.2 Tournament Game	304
	12.3	Tournaments under Risk Neutrality	304
		12.3.1 Tournament Subgame	304
		12.3.2 Equilibrium Prizes	305

			Contents	xi
		12.3.3 Two Illus	strations	306
		12.3.4 Discussi	on	307
	12.	Tournaments und	er Common Shocks	307
	12.	5 Bibliographic No	tes	308
IV	Te	chnical Supplements		309
A	Nonl	near Optimization: T	he Classical Approach	311
	A.l	Introduction		311
	A.2	Unconstrained Optin	nization	311
	A.3	Equality-Constrained	l Optimization	314
	A.4	Digression: Quadrati	c Forms	317
В	Inequ	ality-Constrained Opt	timization	320
	B.l	Introduction		320
	B.2	The Problem		320
	B.3	First-Order Necessar	y Conditions	321
	B.4	Second-Order Condi	tions	323
С	Conv	exity and Generalizati	ions	324
	C1	Introduction		324
	C.2	Convex Sets		324
	C.3	Convex Functions		325
	C.4	Strongly Convex Fun	nctions	327
	C.5	Convexity and Globa	l Extreme Values	328
	C.6	Generalized Convexi	ty: Quasiconvexity	329
	C.7	Convexity Properties	of Composite Functions	333
	C.8	Convexifiable Quasic	convex Programs	336
D	Fron	Expected Values to C	Order Statistics	339
	D.1	Introduction		339
	D.2	Expected Value		339
	D.3	Variance, Covariance	e, and Correlation	340
	D.4	Rules to Remember		340
		D.4.1 Expected Va	lue	340
		D.4.2 Variance, Co	ovariance, Correlation	341
		D.4.3 Expected Ut	ility	342
		D.4.4 Transformat	ions of Random Variables	343
		D.4.5 Order Statist	tics	344
	D.5	Proofs		345
Ri	hling	anhy		351
Index				