

Contents

Contents	
----------	--

Introduction

### Part I Organization of the Transport Sector

#### 1 The Traffic and Transport System

1	Preli	minaries	21
2	The	traffic and transportation system	23
	2.1	The difference between traffic and transportation	23
	2.2	Transportation subsystems	23
		2.2.1 Classification by type of load	24
		2.2.2 Classification by mode	27
		2.2.3 Scheduled and non-scheduled transportation	38
		2.2.4 Own-account transportation versus professional	
		transportation	38
	2.3	Measuring traffic and transportation performance	39
		2.3.1 Traffic performance versus transportation performance	39
		2.3.2 Capacity Utilization Ratio	53
Bił	oliogr	aphy	54

### 2 Regulation in the Transport Sector

1	Intr	roductory remarks	59
2	Reg	ulation of road haulage	60
	2.1	Own-account transportation	60
	2.2	Third-party haulage	60
		2.2.1 Admission to the occupation	60
		2.2.2 Access to the market	62
		2.2.3 Social harmonization	65
		2.2.4 Technical harmonization	68
		2.2.5 Pricing	69
		2.2.6 Tolls and user charges	69
3	Reg	ulation in rail transport	73

5

4 Regulation of inland waterway transport	83
4.1 Own-account transportation	83
4.2 Third-party transport	83
4.2.1 International versus national transport	83
4.2.2 Technical requirements with which vessels must comply	84
4.2.3 Access to the occupation of carrier of goods by waterway	85
4.2.4 Conditions for obtaining boatmasters' certificates	86
4.2.5 European rationalization	87
4.2.6 The market mechanism and pricing	91
4.2.7 Aid Regulations	93
Footnotes	94
Bibliography	94

## **Part II Economics of Transport Management**

## **3 Cost Calculation in a Transport Firm**

1	Time costs and distance costs	109
2	<ul> <li>Hour coefficient and kilometre coefficient</li> <li>2.1 Cost coefficients in road transportation</li> <li>2.2 Cost coefficients for inland waterway transportation</li> <li>2.3 Economies of scale</li> </ul>	112 113 116 117
3	Variable costs	118
4	Common costs	119
5	Costs for peak and off-peak periods	122
Fo	potnotes	123
Bi	bliography	123
4	Waiting Time in Transport Firms	
1	The standard queueing model	127
2	The Pollaczek-Khintchine correction	130

3	Parallel service channels	132

8

Contents	9
4 Monte-Carlo simulation	134
<ul> <li>5 Special Cases</li> <li>5.1 Waiting time in scheduled transport services</li> <li>5.2 Waiting for the tide</li> </ul>	135 135 137
Footnotes	140
Bibliography	
5 Routing	
1 Shortest-path method	143
2 Round-trip methods	148
3 Assignment of origins to destination	155
4 Further applications	157
Footnotes	158
Bibliography	

# **6 Pricing in a Transportation Firm**

Specific circumstances	164
1.1 Short-term or long-term decisions	164
1.2 Quantity adjustment or pricing by the operator	164
1.3 Equal or differentiated feasibility	165
1.4 Single or joint products	167
1.5 Dealing with capacity shortage	167
A simple case	167
Rate setting by the operator	174
Joint products	176
Further applications	181
otnotes	182
Bibliography	
	Specific circumstances 1.1 Short-term or long-term decisions 1.2 Quantity adjustment or pricing by the operator 1.3 Equal or differentiated feasibility 1.4 Single or joint products 1.5 Dealing with capacity shortage A simple case Rate setting by the operator Joint products Further applications otnotes bliography

# 7 Investing in Vehicles

1	Opti	imal size and composition of the vehicle fleet	187
2	Opti	imal replacement	190
	2.1	Three approaches to optimal replacement	190
		2.1.1 Optimal replacement age	191
		2.1.2 The optimal repair limit	191
		2.1.3 Optimal repair limits with maximum replacement age	191
	2.2	Cost data	193
		2.2.1 Purchase of new vehicles	193
		2.2.2 Maintenance costs	194
		2.2.3 Interest costs	197
		2.2.4 Failure costs and quality deterioration	197
		2.2.5 Taxes	198
	2.3	Calculation without interest costs	198
	2.4	Calculation with interest costs	200
	2.5	Future prices	204
	2.6	Replacement by a different type of vehicle	204
	2.7	Replacement by a second-hand vehicle	205
	2.8	Conclusions regarding the calculation of time and distance costs	206
	2.9	Taxation	208
Fo	otnot	es	210
Bil	oliogr	raphy	210

## **8 Logistical Costs**

1	The concept of business logistics	215
2	Transportation costs	217
3	Handling costs	218
4	<ul> <li>Inventory costs</li> <li>4.1 Cycle stock</li> <li>4.2 In-transit inventory</li> <li>4.3 Safety stock <ul> <li>4.3.1 Calculating σ</li> <li>4.3.2 Setting K</li> </ul> </li> </ul>	218 221 223 224 228 230
	4.4 Speculative stock	234
	4.5 Seasonal stock	235
	4.6 Dead stock	235

5	Stock-out costs	235
6	Packaging costs	237
7	Costs of order processing and administration	237
8	Start-up costs	238
9	Costs of customer service	238
10	Location costs	239
11	Just-in-time supply and zero stocks 11.1 Just-in-time supply 11.2 Zero stock	239 240 241
Foo	otnotes	243
Bib	liography	243

11

# **9 Transport Decisions from a Logistical Perspective**

1	Square root law	247
2	<ul> <li>Optimal order size in inland waterways</li> <li>2.1 Survey of the data</li> <li>2.2 Simplified calculation of optimal order quantity</li> <li>2.3 Exact calculation of optimal order quantity</li> </ul>	251 252 253 256
3	<ul> <li>Optimal order quantity in road transport</li> <li>3.1 Survey of the data</li> <li>3.2 Simplified calculation of optimal order quantity</li> <li>3.3 Exact calculation of optimal order quantity</li> </ul>	259 259 260 262
4	Choice of transport mode	263
5	<ul> <li>Stock consolidation</li> <li>5.1 Savings of safety stock</li> <li>5.2 Savings of cycle stock</li> <li>5.3 Savings of fixed costs per consignment</li> <li>5.4 Limits of consolidation</li> </ul>	267 267 269 270 270
Footnotes		271
Bibliography		271

# Part III Transport Supply and Demand

## **10 Demand for Transport**

1	Introduction	277	
2	Aggregate models	278	
-	2.1 The Methodological Framework	278	
	2.2 Trip generation	282	
	2.2.1 Trip generation in passenger transport	282	
	2.2.2 Trip generation in freight transport	284	
	2.3 Trip distribution	285	
	2.3.1 Distribution of passenger traffic	285	
	2.3.2 Distribution in freight transport	290	
	2.4 Modal split	291	
	2.4.1 The modal split in passenger traffic	292	
	2.4.2 The modal split in freight transport	293	
	2.5 Traffic conversion	295	
	2.6 Assignment to infrastructure	295	
3	The microeconomic approach to transport-choice behaviour	297	
4	The activity-based approach	300	
5	An empirical application: freight transport in Europe	301	
	5.1 The framework	301	
	5.2 Economic activity and freight transport, measured empirical	y 302	
	5.3 Using the empirical findings	313	
6	Some concluding remarks on demand analysis	315	
Bił	Bibliography		
11	1 Transport Supply		
1	Introduction	323	

2	Out	put, inputs, heterogeneity and calculation	324
	2.1	The output unit in transport	324
	2.2	Inputs in the production of transport	325
	2.3	The heterogeneity of transportation supply	326
	2.4	Cost allocation in joint production processes	329
		2.4.1 Joint products	329
		2.4.2 Allocation keys for joint costs	329
		2.4.3 Fluctuations in transportation demand	330
		*	

3	The	use of cost functions	331
	3.1	The cost concept and methods of cost analysis	331
	3.2	Econometric cost functions	332
		3.2.1 Linear or quadratic functions	332
		3.2.2 A theoretically specified underlying production technology	333
		3.2.3 The translog cost function	334
		3.2.4 The hedonic transport cost function	335
		3.2.5 Evolutions in the literature	335
	3.3	Calculating the relevant indicators	337
		3.3.1 Economies of scale	337
		3.3.2 Economies of density	338
		3.3.3 Economies of scope	338
	3.4	Supply and policy: a public transport application	339
4	Emp	irical findings: building blocks for transport policy	343
Bibliography 349			

## 12 Equilibrium and Market Structure

1	The	vicious circle of public transport	355
	1.1	Lagged response	355
	1.2	Theory of the vicious circle	356
	1.3	Application: frequency proportional to the number of passengers	359
	1.4	Application: assignment with feedback	361
	1.5	Partial analysis with transport price	362
	1.6	A general analysis	363
2	Marl	ket structures in the transport sector	364
	2.1	Modelling market structures	364
	2.2	An application: liner shipping	370
Fo	Footnote		373
Bił	Bibliography		373

### **Part IV Transport Policy**

### **13 Transport Policy as Part of General Policy**

1	Tran	sport as the favoured tool	382
	1.1	Objectives of regional development	385
	1.2	Social objectives	388

	<ol> <li>1.3 Employment objectives</li> <li>1.4 One-sided planning</li> </ol>	390 391
2	First best: exclusively direct measures	392
3	Second best: exceptional indirect measures	396
Fo	otnote	398
Bił	oliography	398
14	Charging for External Costs	
1	Justification of charges for external costs	401
2	Composition of the marginal external cost	405
3	Marginal congestion costs 3.1 Speed/flow relationships 3.2 Queueing analysis	$408 \\ 408 \\ 411$
4	Marginal infrastructure costs	423
5	Marginal environmental costs 5.1 Noise 5.2 Air pollution	$425 \\ 426 \\ 429$
6	Marginal accident costs	430
7	<ul> <li>Second-best solutions</li> <li>7.1 No congestion tax on road traffic</li> <li>7.2 Budgetary constraints</li> <li>7.3 Other second-best considerations</li> </ul>	433 433 437 441
Fo	otnotes	443
Bił	oliography	443

### **15 Taxation Methods and Alternative Measures**

1	Surv	vey of taxation methods	447
	1.1	Électronic toll collection	448
	1.2	Local licences	450

	<ol> <li>Parking levies</li> <li>Variabilization of automobile tax</li> </ol>	451 451
2	Costs and benefits of a levy	452
3	Measures besides taxation 3.1 Quantity measures 3.2 Cost-reduction measures	457 457 459
4	The path of equilibrium	461
5	Second-best solutions	465
Fo	otnotes	467
Bil	bliography	467
16	3 Pricing Policy	
1	Short-term or long-term?	473
2	Capacity restrictions	474
3	Stochastic fluctuations in demand	475
4	Joint supply	
5	Decreasing costs	476
6	<ul> <li>Second-best solutions</li> <li>6.1 Inadequate charging for external costs</li> <li>6.2 Budget constraints</li> <li>6.3 Distortions in prices of competing modes</li> <li>6.4 Employment</li> <li>6.5 Social grants or subsidies to sectors of industry</li> </ul>	$\begin{array}{c} 480 \\ 480 \\ 480 \\ 485 \\ 486 \\ 488 \end{array}$

Bibliography 

# **17 Infrastructure Policy**

1	Dire	ect costs and benefits	494
	1.1	Benefits: area under the demand curve for products	495
		1.1.1 A new toll road	496
		1.1.2 Improving the quality of an existing toll road,	
		at constant toll level	498
		1.1.3 Improving the quality of an existing toll road and raising	
		the toll	500
		1.1.4 Increasing the capacity of an infrastructure	501
	1.2	Costs: area under the supply curve of inputs	502
2	Indi	irect costs and benefits	504
	2.1	Erroneous calculations	504
	2.2	Congestion relief in road traffic as an indirect benefit	505
	2.3	Employment as an indirect benefit	506
9	M		500
э	Mea	isuring winnigness to pay	509
4	Disc	counting	513
	4.1	Interest rate on government bonds	514
	4.2	Corporate rate of return	515
	4.3	Social versus personal discount rate	516
	4.4	Pigouvian discount rate	516
	4.5	Conclusion	516
Б	Proi	iect Selection	517
5	5 1	Misleading rules of thumb	517
	5.1	5.1.1 Pay back period	518
		5.1.9 Internal rate of return	510
		5.1.2 Benefit to cost ratio	519
	59	Overview of correct criteria	520
	5.4	5.9.1 Static criterion for independent projects	520
		5.2.1 Static criterion for mutually evolution projects	520 599
		5.2.2 Static criterion for initially exclusive projects	923 597
		5.2.5 Static criterion for fully interdependent projects	527 528
			010
6	Mul	ticriteria analysis	529
Fo	Footnotes		531
Bi	bliog	raphy	531
T٣	dov		299
11	IUEX 5.		