

Contents

Part I ANTECEDENTS

1	Introduction	3
2	Background	7
2.1	Transportation geography	9
2.2	Optimization and network design	10
2.3	Empirical models of network growth	12
2.4	Economics of network growth	13
2.4.1	Transportation economics	14
2.4.2	Urban economics	14
2.4.3	Fiscal federalism	15
2.4.4	Network effect	15
2.4.5	Path dependence	16
2.4.6	Coalition formation	17
2.5	Network science	17
2.6	Summary and discussion	20
3	Framework	25
3.1	Supply	26
3.2	Demand	27
3.3	Time	28
3.4	Space	29
3.5	Summary and discussion	29

Part II NETWORK GROWTH IN THE PAST

4	Skyways in Minneapolis	33
4.1	Introduction	33
4.2	Methodology	35
4.2.1	Accessibility analysis	35

4.2.2	Connect-choice analysis	40
4.3	Results	41
4.4	Findings and concluding remarks	42
5	Interurbans in Indiana	45
5.1	Introduction	45
5.2	Connect-choice analysis	47
5.3	Hypotheses	49
5.4	Results	50
5.5	Findings and concluding remarks	52
6	Streetcars in the Twin Cities	55
6.1	Introduction	55
6.2	Hypotheses	57
6.3	Historic Data	59
6.3.1	Network data	59
6.3.2	Population data	59
6.4	Methodology	62
6.4.1	Residential density vs. line density	62
6.4.2	Proximity to line vs. residential density	65
6.5	Results	66
6.6	Findings and concluding remarks	70
7	First Mover Advantages	71
7.1	Introduction	71
7.2	Rail in London	72
7.3	Aviation	76
7.4	Container ports	78
7.5	Roads in the Twin Cities	79
7.6	Findings and concluding remarks	82
 Part III SPONTANEOUS ORGANIZATION		
8	Hierarchy	87
8.1	Introduction	87
8.2	Model	89
8.2.1	Land use allocation	89
8.2.2	Travel demand models	90
8.2.3	Investment	92
8.3	Hypothesis and experiments	93
8.4	Findings and concluding remarks	98

- 9 Topology** 101
 - 9.1 Introduction 101
 - 9.2 Model 102
 - 9.3 Measurement 103
 - 9.3.1 Connectivity 104
 - 9.3.2 Density 105
 - 9.3.3 Heterogeneity 105
 - 9.3.4 Connection patterns 107
 - 9.4 Model validation 108
 - 9.5 Simulation experiments 112
 - 9.5.1 Idealized network structures 112
 - 9.5.2 Simulation experiments 113
 - 9.5.3 Experimental results 115
 - 9.5.4 Sensitivity tests 124
 - 9.6 Findings and concluding remarks 124

- 10 Sequence** 127
 - 10.1 Introduction 127
 - 10.2 Model 128
 - 10.2.1 Incremental connection problem 128
 - 10.2.2 Model framework 130
 - 10.3 Simulation 132
 - 10.4 Results 133
 - 10.5 Findings and concluding remarks 137

Part IV LAND USE

- 11 Network Diffusion and Place Formation** 141
 - 11.1 Introduction 141
 - 11.2 Model 142
 - 11.2.1 Major assumptions 142
 - 11.2.2 Place formation model 144
 - 11.2.3 Link formation model 146
 - 11.3 Simulation experiments 146
 - 11.4 Hypotheses 147
 - 11.5 Results 149
 - 11.6 Sensitivity analysis 151
 - 11.7 Discussion 153
 - 11.8 Findings and concluding remarks 155

- 12 Coevolution of Network and Land Use** 157
 - 12.1 Introduction 157
 - 12.2 Model 159
 - 12.2.1 Travel demand models 159
 - 12.2.2 Investment models 162
 - 12.2.3 Accessibility and land use models 163

12.3	Hypotheses and experiments	165
12.4	Results	168
12.4.1	Results related to Hypotheses 1 & 2	168
12.4.2	Results related to Hypotheses 3 & 4	171
12.5	Sensitivity analysis	174
12.6	Findings and concluding remarks	175

Part V GOVERNANCE AND PLANNING

13	Governance Choice - A Theoretical Analysis	179
13.1	Introduction	179
13.2	Model setting	184
13.3	Decisions on road spending	187
13.3.1	Pigouvian governments model	189
13.3.2	Citizen-candidate model	190
13.4	Choice of spending structure	192
13.5	Findings and concluding remarks	197
14	Governance Choice - A Simulation Model	199
14.1	Introduction	199
14.2	Model	202
14.2.1	Travel demand models	203
14.2.2	Pricing models	205
14.2.3	Investment models	209
14.3	Simulation experiments	215
14.4	Findings and concluding remarks	220
15	Forecasting	223
15.1	Introduction	223
15.2	Model	225
15.2.1	Travel demand models	227
15.2.2	Investment Models	228
15.3	Scenarios	236
15.4	Results	237
15.5	Findings and concluding remarks	244

Part VI CONCLUSIONS

16	Retrospect	249
17	Prospect	255
17.1	Perspectives on innovative planning	255
17.2	Future research	257

A	Mathematical Derivations of Governance Choice Analysis	259
A.1	Pigouvian governments model	259
A.2	Citizen-candidate model	261
References	265



<http://www.springer.com/978-1-4419-9803-3>

Evolving Transportation Networks

Xie, F.; Levinson, D.

2011, XVIII, 278 p., Hardcover

ISBN: 978-1-4419-9803-3