
An Introduction to Geographical Economics

The need for a better understanding of the role location plays in economic life was made explicit by Bertil Ohlin in 1933. However, it is only recently, with the development of computer packages able to handle complex systems, as well as advances in economic theory (in particular, an increased understanding of returns to scale and imperfect competition), that Ohlin's vision has been met and a framework developed which explains the distribution of economic activity across space.

This book is an integrated, first-principles textbook presenting geographical economics to advanced students. Although not avoiding advanced concepts, its emphasis is on examples, diagrams, and empirical evidence.

STEVEN BRAKMAN is Associate Professor of Economics at the University of Groningen. He has published in journals including *Journal of Regional Science*, *Journal of Economics*, *Kyklos*, and *Applied Economics*. He has developed two scientific television programs (one on QWERTY and one on Keynes, together with Harry Garretsen).

HARRY GARRETSEN is Professor of Economics at the University of Nijmegen. He has published in journals including *Journal of Regional Science*, *Journal of Macroeconomics*, *Kyklos*, *Weltwirtschaftliches Archiv*, *Economics of Transition*, and *Journal of Economic Behavior and Organization*.

CHARLES VAN MARREWIJK is Associate Professor of International Economics at Erasmus University, Rotterdam. He has published in more than twenty international journals, including *Journal of International Economics*, *Oxford Economic Papers*, *Journal of Regional Science*, and *International Journal of Industrial Organization*.

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Harry Garretsen and Charles van Marrewijk

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An Introduction to Geographical Economics

Trade, Location and Growth

Steven Brakman

Harry Garretsen and

Charles van Marrewijk



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Contents

<i>List of figures</i>	page ix
<i>List of tables</i>	xii
<i>List of technical notes</i>	xiv
<i>List of special interest boxes</i>	xv
<i>List of symbols</i>	xvi
<i>List of parameters</i>	xvii
<i>Preface</i>	xix
<i>Suggested course outline</i>	xxii
1 A first look at geography, trade, and development	1
1.1 Introduction	1
1.2 Clusters in the world economy	2
1.3 Economic interaction	9
1.4 Rapid change in the distribution of population and production	15
1.5 Overview of the book	16
Appendix	18
Exercises	21
2 Geography and economic theory	22
2.1 Introduction	22
2.2 Geography in regional and urban economics	23
2.3 Trade theory	37
2.4 Economic growth and development	50
2.5 Conclusions	56
Exercises	57
3 The core model of geographical economics	59
3.1 Introduction	59
3.2 An example of geographical economics	60
3.3 The structure of the model	63
3.4 Demand	66

vi	Contents	
	3.5 Supply	76
	3.6 Transport costs: icebergs in geography	80
	3.7 Multiple locations	83
	3.8 Equilibrium	85
	3.9 A few remarks on dynamics	93
	3.10 The simple example and the core model	94
	Exercises	97
4	Solutions and simulations	100
	4.1 Introduction	100
	4.2 Short-run equilibrium	100
	4.3 Some first results	103
	4.4 Structural change I: transport costs	105
	4.5 Structural change II: other parameters	106
	4.6 Normalization analysis	108
	4.7 Sustain and break analysis	110
	4.8 Welfare	115
	4.9 Stability and welfare in the limit	118
	4.10 The racetrack economy: many locations in neutral space	119
	4.11 Conclusions	123
	Appendix	124
	Exercises	126
5	Geographical economics and empirical evidence	128
	5.1 Introduction	128
	5.2 The spatial distribution of economic activity	129
	5.3 The facts and economic theory	138
	5.4 The relevance of geographical economics I: the home-market effect	141
	5.5 The relevance of geographical economics II: a spatial wage structure	145
	5.6 A case study: the spatial wage structure for Germany	154
	5.7 Conclusions	164
	Exercises	165
6	Refinements and extensions	167
	6.1 Introduction	167
	6.2 Type I extensions: non-neutral space and transport costs	168
	6.3 Type II extensions: production structure and geography	177
	6.4 Type III extensions: the burden of history and the role of expectations	182
	6.5 Conclusions	185
	Exercises	186

	Contents	vii
7 Cities and congestion: the economics of Zipf's Law		187
7.1 Introduction		187
7.2 Congestion as an additional spreading force		190
7.3 Zipf's Law: definition, data, and estimation results		198
7.4 Explanations for Zipf's Law: the congestion model and other approaches		208
7.5 Conclusions		219
Appendix		220
Exercises		221
8 Agglomeration and international business		222
8.1 Introduction		222
8.2 Multinational production: stylized facts		223
8.3 Explaining multinational production		224
8.4 Multinationals in geographical economics		230
8.5 Empirical evidence		237
8.6 Conclusions		243
Exercises		244
9 The structure of international trade		245
9.1 Introduction		245
9.2 Two manufacturing sectors		248
9.3 Comparative advantage: Ricardo		249
9.4 Comparative advantage: factor abundance		255
9.5 Migration		262
9.6 Gravity		265
9.7 Conclusions		271
Appendix		271
Exercises		272
10 Dynamics and economic growth		274
10.1 Introduction		274
10.2 Adjustment dynamics		275
10.3 Some stylized facts of economic growth		281
10.4 Explaining the facts: endogenous growth and simulation dynamics I		286
10.5 Simulation dynamics II: an experiment		289
10.6 Economic growth		296
10.7 Conclusions		302
Appendix		303
Exercises		304

Cambridge University Press

0521770394 - An Introduction to Geographical Economics: Trade, Location and Growth - Steven Brakman,

Harry Garretsen and Charles van Marrewijk

Frontmatter

[More information](#)

viii

Contents

11	The policy implications and value-added of geographical economics	305
11.1	Introduction	305
11.2	Building a bridge: a simple policy experiment in non-neutral space	306
11.3	Policy relevance of geographical economics	313
11.4	An assessment of geographical economics	317
11.5	Geographical economics in 2020	324
	Appendix 1	326
	Appendix 2	329
	<i>References</i>	331
	<i>Index</i>	344

Figures

1.1	World Bank regional classification	<i>page</i> 2
1.2	Life expectancy and regional shares of population, land, and income	4
1.3	Characteristics of global regions	5
1.4	Population density in Europe	7
1.5	The rank–size distribution for India	9
1.6	The hard disk drive value chain	10
1.7	German exports and distance	14
1.8	Urban share of population in Europe	16
1.9	Share in world production, selected countries	17
2.1	The Von Thünen model	25
2.2	Average costs under increasing returns to scale	27
2.3	Central place system	33
2.4	Central places in a Dutch polder	34
2.5	Lock-in effect: example	44
2.6	Shares of world production in manufactures	49
3.1	Structure of the core model of geographical economics	63
3.2	Dependence of demand for a variety of manufactures on price and ε	72
3.3	Relationship between ρ and ε	73
3.4	Deviation between assumed demand and reality	75
3.5	Production function for a variety of manufactures	77
3.6	Division of labor over the regions	84
3.7	Distribution of manufacturing labor force: three examples	90
3.8	Monopolistic competition	91
4.1	The relative real wage in region 1	104
4.2	The impact of transport costs	105
4.3	The impact of some parameters	107
4.4	Sustain-point and break-point I	112
4.5	Sustain-point and break-point II	114
4.6	Allocation of manufacturing production and total welfare	116
4.7	Stability and inverse welfare (normalized)	117
4.8	Welfare and stability close to the break-point	118

x	List of figures	
4.9	Relationship between no-black-hole and limit-welfare conditions	119
4.10	The racetrack economy, number of locations = R	121
4.A1	Sketch of the function $f(T)$	125
5.1	Concentration, specialization, and agglomeration	130
5.2	Krugman specialization index	136
5.3	Agglomeration of manufacturing in the EU	137
5.4	Mexico	147
5.5	Relative real wage and transport costs	153
5.6	Evolution of growth rates in East and West Germany	155
5.7	Germany	158
6.1	Example of non-neutral space	170
6.2	Grid of locations in geographical space	171
6.3	A grid model of Western Europe	173
6.4	Experimental outcome	174
7.1	Total and average labor costs with congestion	192
7.2	The two-region core model with congestion	195
7.3	The racetrack economy with congestion	197
7.4	Frequency distribution of estimated coefficients	207
7.5	Rank-size distribution in the Netherlands	212
7.6	Simulating Zipf	214
7.7	Change in city sizes	215
7.8	Stepwise evolution	217
7.9	Manhattan circle with radius 2	218
7.10	Simulations with Manhattan circles	218
8.1	Development of world GDP, FDI, and trade	224
8.2	Foreign direct investment (FDI) flows	225
8.3	Production structure for variety 5 if headquarters are in country 1	232
8.4	Decision problem for vertical multinationals	234
8.5	Agglomeration with vertically integrated multinationals	237
9.1	Shares of world trade flows	247
9.2	EU trade orientation of prospective EU member-countries	247
9.3	Demand and symmetry structure	249
9.4	Comparative advantage structure: Ricardian model	250
9.5	The share of sector A firms in country 1	252
9.6	Ricardo and geographical economics	254
9.7	Production stages of the factor abundance model	256
9.8	Intermediate goods transformation curve	257
9.9	The Rybczynski line	259
9.10	Transformation curves	260
9.11	Ricardo and factor abundance	263
9.12	Initial and final distribution	270
10.1	Regular adjustment dynamics	277
10.2	Special adjustment dynamics	279

Cambridge University Press

0521770394 - An Introduction to Geographical Economics: Trade, Location and Growth - Steven Brakman,
Harry Garretsen and Charles van Marrewijk

Frontmatter

[More information](#)

	List of figures	xi
10.3	Income per capita	282
10.4	GNP per capita growth rates	284
10.5	GNP per capita	285
10.6	Distribution of manufacturing between two regions and the Herfindahl index	291
10.7	Evolution of agglomeration measured by the Herfindahl index	291
10.8	Several phases of the reallocation process	294
10.9	Evolution of share of manufacturing in regions 3, 6, and 9	295
10.10	Free-ness of trade index	301
10.11	Stability in the Baldwin–Forslid economic growth model	301
11.1	The pancake economy	307
11.2	Impact of building a bridge on spatial distribution: base scenario, pancake economy	309
11.3	Real income and welfare changes	311
11.4	Impact of transport costs: bridge between 4 and 10	313
11.A1	Impact of some parameters: bridge between 4 and 10	327
11.A2	Impact of adjustment speed	328

Tables

1.1	Ten largest urban agglomerations in India	page 8
1.2	Hard disk drives: indicators of nationality of production	11
1.3	Germany: fifteen largest export markets, 1998	12
1.A1	Global regional characteristics	19
1.A2	Correlation coefficients	20
2.1	Population of locations in the Noord-Oost Polder	35
3.1	Geography of sales	61
3.2	Transport costs	61
3.3	Cif/fob ratios, 1965–1990	82
3.4	When is a long-run equilibrium reached?	94
3.5	Total welfare and distribution of food production	95
4.1	Base scenario parameter configuration, two regions	102
4.2	Parameter normalization	110
5.1	Home-market effect for Japanese regions	144
5.2	Estimation of the market potential equation and the structural wage equation	151
5.3	GDP per capita, East and West Germany	156
5.4	Estimation of the spatial wage structure in Germany	159
5.5	Estimation results: German district wages and intra-German border	161
5.6	Estimating the structural parameters for Germany	163
5.7	Structural parameters for Germany, restricting δ	164
6.1	Growth in real earnings per income decile	181
6.2	Overview of extensions	185
7.1	Urban population as a percentage of total population, 1998	189
7.2	Congestion: number of motor vehicles, selected countries	190
7.3	Primacy ratio, selected countries	204
7.4	Summary statistics for q	207
7.A1	Country overview of rank–size distributions	220
8.1	Outward foreign direct investment	226
8.2	Top twenty transnational corporations, ranked by foreign assets, 1997	238
8.3	Geographical distribution of the activities of US foreign affiliates	240

Cambridge University Press

0521770394 - An Introduction to Geographical Economics: Trade, Location and Growth - Steven Brakman,

Harry Garretsen and Charles van Marrewijk

Frontmatter

[More information](#)

	List of tables	xiii
8.4	New US and Japanese investments in northwest Europe, 1981–1995	242
9.1	Intra-industry trade	248
9.2	World migrant stock by region, 1965–1990	264
9.3	Migration rates per decade	266
9.4	Estimates for the basic gravity equation	267
9.5	A spatial wage structure	269
9.6	Overview of the basic gravity equation in simulations	271
10.1	Economic growth and income per capita, selected developed countries	282
10.2	Economic growth and income per capita, selected developing countries	282
10.3	Summary statistics of GNP growth per capita	285
10.4	Overview of reallocations and the Herfindahl index	292
10.A1	Growth in GDP per capita	303
11.1	Average distances in the pancake economy	308
11.2	Distribution of manufacturing workers	309
11.3	Overview of welfare effects at long-run equilibrium	310
11.A1	Distances: pancake economy, no link	329
11.A2	Distances: pancake economy, link between 2 and 12	329
11.A3	Distances: pancake economy, link between 3 and 11	330
11.A4	Distances: pancake economy, link between 4 and 10	330

Cambridge University Press

0521770394 - An Introduction to Geographical Economics: Trade, Location and Growth - Steven Brakman,
Harry Garretsen and Charles van Marrewijk

Frontmatter

[More information](#)

Technical notes

3.1 Derivation of equation (3.3)	<i>page</i> 67
3.2 Derivation of equations (3.6) and (3.7)	70
3.3 Derivation of equation (3.12)	78
3.4 Derivation of equations (3.13)–(3.15)	79
3.5 Derivation of equation (3.17)	85
3.6 Derivation of equation (3.21)	88

Special interest boxes

2.1	External and internal economies of scale	page 26
2.2	Central place theory in a Dutch polder	33
2.3	Globalization, factor abundance, and clustering	39
2.4	New trade theory and external economies	43
2.5	New trade theory and the gravity model	46
2.6	The relevance of physical geography	53
3.1	Terminology	65
3.2	Dixit–Stiglitz monopolistic competition	69
3.3	The relevance of transport costs	81
3.4	Agglomeration and spreading forces: a simple diagram	91
5.1	Specialization, concentration, and agglomeration in the European Union	135
5.2	Border effects and mental distance: do Ossies and Wessies interact?	160
6.1	An experiment with non-neutral space: the Stelder approach	171
6.2	Geographical economics and globalization	180
7.1	Urbanization and congestion	188
7.2	Congestion, love of variety, and welfare	193
7.3	Primate cities	203
7.4	Zipf’s Law and economic changes in the Netherlands	211
8.1	Michael Porter	227
9.1	International trade flows	246
9.2	Factor endowments and the Rybczynski line	258
9.3	Wages around the world	267
10.1	Discounting the future	297
11.1	Changing transport costs with a bridge between cities 4 and 10	312
11.2	The \$100 bill on the sidewalk between 1980 and 1991	320

Symbols

C	consumption
c_i	consumption of manufacturing variety i
D_J	intermediate good for sector $J = A, B$
D_{rs}	distance from region r to region s
E_{rs}	expenditure in region r on goods from region s
F	food (representing immobile activity)
I	exact price index of manufactures
i, j	indices for varieties
K	capital stock
L	labor force
l_{ir}	labor required to produce variety i in region r
M	manufactures
N_r	number of varieties of manufactures produced in region r
P_r	locally charged price for a variety of manufactures in region r
R	number of regions
r, s	indices for regions
T	transport costs; units to be shipped to ensure 1 unit arrives
t	time index or iteration index
U	utility
W_r	wage in region r
w_r	real wage in region r
\bar{w}	average real wage
x_{ir}	amount of variety i produced in region r
x_r	total production of manufactures of a representative producer in region r
Y	income
y	real income

Parameters

α	fixed cost
β	marginal cost
γ	share of labor force in manufactures
δ	share of income spent on manufactured goods
ε	elasticity of substitution = $1/(1 - \rho)$
η	speed of adjustment
θ	miscellaneous parameter
κ	miscellaneous parameter (for Lagrangian multiplier, econometric equations and knowledge spillovers)
λ_r	share of manufacturing labor force working in region r
μ	capital intensity of sector A (factor abundance)
π	extent of comparative advantage; profits
ρ	love of variety
σ	threshold value for real wage differences in simulations
τ	congestion
ϕ_r	fraction of food labor in region r

Preface

This book offers an introduction to an important new field in economics, entitled *Geographical Economics*, which sets out to explain the distribution of economic activity across space. In doing so, it tries to bring together and apply insights from various fields of economics. The book will therefore be of interest to students and scholars of international economics and business, as well as of economic geography, regional economics, and urban economics. The fact that we offer an “introduction” does not mean that we avoid models or shy away from difficult concepts. It indicates that we have made an effort to write a book that is accessible to readers and students who are new to the field of geographical economics.

Although we introduce and discuss various modeling approaches, we keep the required technicalities to a minimum. Whenever possible we draw attention to important concepts and applications in *special interest boxes*, making ample use of examples and diagrams to explain the workings of the models. Chapter 3, which explains the structure of the core model of geographical economics, gives background derivations in six *technical notes*. Throughout the book the level of mathematical competence required does not rise above simple optimization techniques that should be familiar to upper-level undergraduate and graduate students, both in economics and in other fields of social science. The target audience of our book is not limited to these students, but includes professionals working at government agencies, banks, international organizations, and private research firms, as well as students and scholars of international business and economic geography. The latter category may find the book of interest, if only to get to know what they disagree with when it comes to the analysis of the location of economic activity!

To help the reader in developing his or her intuition for different aspects important in determining the interaction between location decisions and economic performance, and to get a better feel for the modeling structure and empirical relevance of geographical economics, we include discussions of many real-world examples, and present and evaluate the currently available empirical evidence. In addition, we explain in detail an important but often neglected aspect of the geographical economics approach: *computer simulations*. We discuss their advantages and disadvantages, show what is needed to perform such simulations, and give the reader access to a few user-friendly simple

simulations (see below). The emphasis on examples, diagrams, and empirical evidence, together with the introductory nature of the book, the limited technical requirements in our analysis, and the attention to explaining simulation exercises, sets our book clearly apart from, and makes it a suitable introduction to, *The Spatial Economy*, the seminal contribution of Masahisa Fujita, Paul Krugman and Anthony Venables which appeared in 1999 and caters to the needs of the academic world (Ph.D. students and fellow researchers).

For a number of reasons, a dedicated *website* is available for this book. First, the site gives brief general background information on the structure of the book. Second, it deals with the *exercises* to be found at the end of every chapter. The exercises not only test the reader's knowledge of the contents of the chapter but are also used to introduce some additional material. Third, the website provides some illustrations and data material on economic location, for example on the rank–size distribution for cities (see chapter 7). Fourth, it provides some simple and user-friendly simulation models, which can familiarize the reader with this aspect of the geographical economics approach. Fifth, for the interested reader the website provides some additional derivations of technical details not dealt with in the book itself, as well as some more advanced (working) papers. Sixth, the website is a source of information for links to relevant researchers and institutions. Finally, it provides some background information on the authors.

In our view, the approach in this book is best characterized as an attempt to put more geography into economics. It is the main reason for us to prefer the term *geographical economics* to alternatives, such as new regional science or the widely used term *new economic geography*. Not only does the label “new” inevitably wear off after some time, but the latter term also has the disadvantage that it suggests that the theory was developed by economic geographers. This is not the case. Instead, geographical economics has its roots firmly in international economics and modern international trade and economic growth theory. It adds the location of economic activity to these theories.

In the end a label is just a label and what really matters, of course, are the topics covered in geographical economics. In 1933 the Swedish economist Bertil Ohlin published a book called *Interregional and International Trade* in which he strongly advocated a closer collaboration between regional economics and what is now called international economics, as they share, in Ohlin's view, the same research objective. To a large extent, geographical economics can be looked upon as a (somewhat belated) reply to Ohlin's call, originating from within international economics. As Paul Krugman, the founding father of geographical economics, puts it, it is an attempt “to resurrect economic geography as a major field within economics.”¹ Moreover, it is an attempt in which the modern tools of mainstream economic theory are used to explain the *who*, *why*, and *where* of the location of economic activity.

Geographical economics takes as its starting point the empirical fact that economic activity is not distributed randomly across space. A quick look at any map suffices to

¹ Krugman (1991b, p. 7).

make clear that the clustering of people and firms is the rule and not the exception. Geographical economics seeks to give a micro-economic foundation for this fact using a general equilibrium framework. The building-blocks in this framework use *increasing returns to scale*, *technological and pecuniary spillovers*, as well as *imperfect competition*. These aspects make geographical economics models difficult to solve analytically, so the approach relies to a large extent on *computer simulations* to determine the distribution of economic activity across space and to develop intuition about the strength of the forces involved. Throughout the book we will also often use computer simulations.

Given the target audience, the heart of the book, in chapters 3 and 4, explains in detail the structure and main results of the so-called core model of geographical economics. This is preceded by an introduction in chapter 1 and a discussion of the antecedents of geographical economics in chapter 2. Chapters 5–11 deal with a wide variety of extensions to, and modified empirical applications of, the core model. In our selection of these extensions we deliberately chose ones that require only relatively small modifications of the core model.

The bulk of this book was written during our visit to the School of Management, Yale University in the summer of 1999 and our stay at Trinity College, University of Cambridge in the summer of 2000. We are grateful to both institutions for their hospitality and their willingness to provide us with the facilities necessary to carry out the research for this book. In particular, we would like to thank Jeffrey Garten, Stanley Gartska, Dick Wittink, Peter Leeflang, Willem Buiters, and David Coleman for making these two visits possible. We are also grateful for the financial support we received from our respective faculties, the Department of Economics, University of Groningen (Brakman), the Nijmegen School of Management and NICE (Garretsen), and the Department of Economics of the Erasmus University and the Erasmus University Trust Fund (van Marrewijk).

A number of fellow researchers have been very helpful by commenting on (parts of) this book and by their willingness either to discuss the ideas for this book or to let us use part of their research. We are especially grateful to the following: Xavier Gabaix, Vernon Henderson, Yannis Ioannides, Peter Neary, Ron Martin, Paul Krugman (for pointing out the location of the \$100 bill!), and (closer to home) Thijs Knaap, Dirk Stelder, Jolanda Peeters, Marc Schramm, Albert de Vaal, Wilfred Slegers, Huib Ernste, Rien Wagenvoort, Richard Gigengack, Marianne van den Berg, and Jan Oosterhaven. In addition we would like to thank Stefan Schueller for excellent research assistance and students of international economics at Erasmus University for their comments on drafts of various chapters of this book. At Cambridge University Press, we would like to thank Ashwin Rattan for guidance and support during this project, the five referees whose comments helped to shape the book and Chris Doubleday who prevented us from making embarrassing mistakes. Finally, we are grateful to our respective families for continuous support and for agreeing to let us set up summer camps in New Haven and Cambridge. Without those two stays this book would not have been written.

Website: <http://luk.cambridge.org/economics/resources/>

Suggested course structure for An Introduction to Geographical Economics

An introductory course in geographical economics will have to cover all the basics of the approach and at the same time motivate students by applying their newly developed apparatus. We therefore suggest the rather flexible four-part course structure for our book illustrated in the figure below. First, an introduction into geography, trade, and development based on chapter 1. Optionally, this part may include chapter 2 on earlier theoretical developments, of which Box 2.1 and section 2.3 are recommended. Second, the analysis of the core model of geographical economics based on chapters 3 and 4 (sections 4.8 and 4.9 may be skipped on first reading). Optionally, this part may include chapter 5 on empirical evidence, of which sections 5.5 and 5.6 are recommended. Third, applying the geographical economics model to various fields of research, based on a study of chapter 6 (extensions in general) and a selection of chapters 7 to 10 (cities, multinationals, international trade, and dynamics). Section 7.2 on congestion is recommended for a better understanding of chapters 9 and 11. Fourth, and finally, a concluding part based on chapter 11, which discusses the policy implications of geographical economics and gives a critical assessment of the approach.

Suggested course structure for An Introduction to Geographical Economics

xxiii

Course structure for *An introduction to geographical economics*

I Introduction

1 A first look

optional

2 Geography & economic theory

II Core

3 The core model

+

4 Solutions & simulations

optional

5 Empirical evidence

III Applications

6 Extensions

optional

7 Cities

optional

8 Multinationals

optional

9 International trade

optional

10 Dynamics

selection of

IV Conclusions

11 Policy implications