Preface

This book focuses on three questions. First, what are the impacts of location decisions of firms—by affecting prices in various markets—on the locations of their customers, suppliers, and competitors in a market economy? Second, how, when, and why does this result in the clustering of firms in geographic space? Third, when and how is society—overall or by sector within it—made better or worse off as a result? At its heart, this book is in an area of scholarship that I label competitive location theory. Broadly, this is the study of how competition among firms leads to localization: geographic patterns of concentration among firms in markets in equilibrium. Competitive location theory takes the form of a set of interesting problems or stories. In this book, each story is constituted as a model, and placed within a set of models for the purposes of comparison. Methods of analysis in this book take the form of model construction and interpretation. What is meant by these terms? Dorfman (1960, p. 579) suggests three aspects to model building: (1) inventing symbols for the components and writing down the relationships connecting them; (2) creative hypothesizing wherein behavioral and technological assumptions are introduced; (3) quantification and statistical estimation. Location theory, as presented in this book, emphasizes primarily the first two aspects. In this book, I reinterpret 11 sets of basic models in competitive location theory focusing on these three questions. From this reinterpretation, I conclude that (1) competitive location theory offers diverse, rich, and profound ideas about the nature of a regional economy and that (2) the conceptualization of geography is central to economic analysis.

Answers to the three questions above are of great interest to students and scholars in a variety of disciplines: e.g., City Studies, Civil Engineering, Development Studies, Economics, Geography, Housing Studies, Management, Public Finance, Public Policy, Real Estate, Regional Science, Regional Studies, Transportation, and Urban Planning. Much of competitive location theory is drawn from Economics. It is mathematical and logically rigorous. As such, students in other disciplines who would benefit from its insights and could contribute to its debates do not readily grasp it. A geographer myself, I have written this book in part to make this area of scholarship more accessible to students from outside Economics. My goal here is to enable the kind of intellectual breakthroughs that are made possible by a broader discussion of ideas. What is it that makes study in this area problematic for students outside Economics? These students quickly discover that the discipline is perhaps
unique among the social sciences. More than any other discipline, Economics starts
from a core body of theory. As this book is focused on microeconomic applications,
I take this to include neoclassical theory of consumer demand, theory of the firm,
and welfare economics. Students begin to learn this theory from their first course in
the subject. As I remember, it was a rush; students are challenged to use the theory
from their first course and often feel empowered after just a few courses. Just as their
professors, they are soon able to assess and critique the work of others. Contrast this
with other social sciences such as Geography, Anthropology, Sociology, or Political
Science where the absence of a common integrated core means students often have
to learn multiple perspectives over a longer period of time before they can begin to
critique work in a meaningful way. This has the further implication that observation
and measurement play a more important role in the early stages of study in social
science disciplines other than Economics. 1 Arguments are made there partly on the
basis of evidence (whatever the intellectual lens used to see this evidence) and partly
on the basis of theory. The same is true in Economics, but here there is an emphasis
from the outset on the idea that evidence and core theory must be jointly consistent.

Economic reasoning has a distinctive logic. As a child, I remember a particu-
ar set of economic stories my father told me. They were fascinating accounts of
the nature of money and banking, risk, insurance, and investment. In each case, as
appropriate to a storyteller, the tale was cast in the simplest of terms to enable the
listener to see how and why something worked. My father’s purpose was to get me
to better understand the working of business. Later, as an undergraduate student
studying Economics, I came across similar stories told in lectures. Of course, at
the University level, these stories were more sophisticated and disciplined, heav-
ily graphical and mathematical, and even more intriguing. Strangely, though, my
father always was uncomfortable with what might be thought to be straightforward
extensions of economic reasoning. When I came home from university for a holi-
day, he would have assembled newspaper articles or quotes from radio or television
interviews in which an economist had made a prediction about the future based on
economic reasoning. He would pounce on cases where he thought the prediction
was incorrect or improbable. He could not understand that the economist was not
actually predicting the future per se. What the economist was doing was to show
economic analysis could be relevant to a matter of popular concern or public policy.
The caveat, always implicit in the economist’s argument, is that a certain economic
outcome will follow based on a certain set of assumptions. But, my father scoffed,
if the assumptions are not tenable, what is the value of the prediction? It took me a
while to realize his own economic stories also were based on assumptions and that
the conclusions to his stories were actually predictions: as flawed as those of the
economists he scorned.

1 See, for example, the classic statement by Sauer (1924) on the survey method in geographic
research. I am not arguing here that the teaching of economics ignores empirical evidence; it does
not. What I am arguing is the relative importance of core theory early on in a student’s study of
economics.
I will return to that strand of thought in a moment. First, let me make a connected argument. My minor subject at university was Mathematics. On the one hand, my studies in Mathematics helped a lot with my studies in Economics. Areas of Mathematics provide tools economists use to advance their thinking. However, it quickly becomes apparent to students of Mathematics at the University level that the subject is much more than that. Mathematics enables a kind of reasoning that is pure; it is tied only to assumptions (axioms) from which a set of deductions can then be derived. This is pure reasoning; there is no requirement these deductions be applicable to anything in the real world. At the same time, even a mathematician recognizes that it is the application that makes pure reasoning relevant to a broader audience. They too have to worry about a reader’s suspension of disbelief and the criticism that they are otherwise being self-indulgent.

In any science, mathematical tools—and the stories we build with them—must be appropriate to the real world in which they are to be applied. It is never enough simply to lay out some assumptions and then draw conclusions from them only in the abstract. Adding to the confusion, some economists do not lay out all of their assumptions at the outset of their model: perhaps because it might make the story too dry or formal. Instead, they reveal assumptions—sometimes explicitly, sometimes not—at appropriate points in the course of telling the story. This can be maddening to readers from outside Economics: my sense is that they like to know what is being assumed at the outset of an argument. However, this raises a fundamental problem in economic analysis. Is it ever possible to outline fully the assumptions that underlie a real-world problem in economics? Take one simple economic problem. A market consists of \( N \) identical individuals. Some are endowed only with one unit of commodity A. The rest of them, otherwise identical, each have only one unit of commodity B. Assume the proportion endowed with commodity A is \( p_a \) and that the two commodities are each indispensable. These \( N \) individuals somehow gather in a market to exchange commodity A for commodity B. However it is determined, what will be the market equilibrium rate of exchange between A and B? Economists here usually assume in such cases an auctioneer and motivated individuals who have identical preferences characterized by a well-behaved utility function. Stated as such, the problem is simple, even elegant. Notice, however, I say nothing here about how a legal system, social institutions, and other mechanisms make the market work. The reluctance of economists to define even the notion of a market adds to the discomfort. Other things have to be assumed in order for there to be a predictable market rate of exchange. Therein is the source of a key shortcoming in any attempt to build economic models. Compared to Mathematics where the axioms constitute all that can be assumed, economic models assume more than the author typically states at the outset. Strangely, it can be viewed also as a source of richness. After all, what makes economics and the other social sciences so intriguing (especially to those of us who are relativists\(^2\)) is the nuance: the ambiguity about underlying motivations.

\(^2\) An essentialist sees explanations as ultimate truths. A relativist sees explanations simply as bettering current understanding.
and processes. The differing simplifications we invoke to understand behavior (here the set of assumptions underlying each model) each give insights into the human condition. By varying the model (i.e., the set of assumptions), we come to better understand the importance of each assumption and, indeed, the complexity of the human condition.

In analyzing models, economists emphasize comparative statics: a comparison of outcomes (endogenous values) predicted by a model when a given (exogenous variable or parameter) is changed by a small amount. Some models describe market equilibrium: here comparative statics details the changes in equilibrium when a given is changed by a small amount. In other cases, models describe optimal outcomes: here comparative statics detail changes in optimal outcome when a given is changed. Basically, comparative statics are predictions of how—based on core theory—equilibrium or optimal outcomes will change conditional upon a one-time change in a single given. Critics (including my father) would question the value of the comparative statics exercise if in fact the future turns out differently from what is predicted here. However, the economist would argue that we learn from this that the assumptions were not appropriate to a given situation. After all, they might argue that comparative statics results are simply derived from the set of assumptions that underlie the model. For my students, this is typically a higher and deeper understanding of the use of models. It goes well beyond simple exposition of a model. In my experience, some students are captivated initially by the elegant structuring of models: others by model predictions that are unexpected, even startling. For most students, the idea that we need to focus on assumptions and their effects on location outcomes comes later. From my relativist perspective, the objective of this book is to bring the reader to understand the key role of assumptions. Of course, the reader might well ask, “why bother?” If the reader’s interest ultimately is in using location theory to study problems of interest to them, what is to be made of the idea that assumptions are everything? My advice here is that practitioners need to work with a model that best approximates the situation they currently confront. Even so, they need to be mindful of how the assumptions of that model color the conclusions they seek to draw. It is that level of facility with location models that I aspire to instill in the reader.

For readers from other disciplines, the reasoning that underlies models in competitive location theory is something relatively new and thus requires introduction. Four approaches to reasoning come to mind: descriptivist, functionalist, explanatory, and instrumentalist.

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3 See, for example, the discussion of assumptions in Dantzig (1991, p. 22).

4 Although the focus of this book is on theory, there is a close relationship here to the three notions from exploratory data analysis as discussed in Mosteller and Tukey (1977, pp. 259–262): association, dependence, and causation. Imagine we have a sample of observations, for each of which we have values for two variables: \( Y \) (dependent or endogenous) and \( X \) (independent or exogenous). Association is a statistical relationship evidenced between two variables \( (Y \text{ and } X) \) observed from a sample of data. Dependence is a statistical relationship backed up by a theory that explains how the
In a descriptivist approach, a theory or model is simply a summary of observed experience: this is aspect one in Dorfman’s view of model building. The approach here is inductive and sometimes labeled atheoretic. However, critics argue that observations (what is observed and how measured) are, in fact, theory laden. That is, our selectivity in observation and measurement (i.e., the intellectual lens through which we look at the world) means some things are not being observed or measured: presumably, these are not important. The decision as to what and how to measure already involves implicitly some notion of theory, however rudimentary. A second critique of theory as summary is that this is in itself a theory: a criticism that I raise in the context of Barnes (2003) in Chapter 1 below. In my view, descriptivists necessarily invoke theory (i.e., they are not atheoretic) even if that theory is itself ill defined. I mention this argument because parts of the social sciences do adhere to descriptivist principles. Whatever the attraction of this perspective, I exclude it from further consideration in this book, as it does not help us think about competitive location theory other than as antithesis.

In a functionalist approach, models are constructed using “as if” and analogies. Typically, here we borrow a model from elsewhere in sciences, show that the outcomes of the model are like the outcome of some problem in locational competition, and then assert the belief that the model provides insight into what will happen in the process of interest. As a rudimentary model of the spatial structure and organization of a city, we might argue, for example, that a city is like the human body; it has traffic (blood flow), a central business district (brain), and a variety of specialized land uses (corresponding to body organs). We might then try to model the growth and decline of a city in terms of maturing and aging of the human body. Why do we use these kinds of analogies? Usually, the reason is that there has been a breakthrough in method or conceptualization in another discipline, and we want to explore whether this might lead to a breakthrough in our discipline as well. Although critics can be dismissive of such work, I think the use of analogies can be an important tool in the scientist’s kit when thinking about how to advance a discipline.

In an explanatory approach, we build directly a theory that explains the process. In Economics, this is usually based on an agency perspective wherein individual economic actors (be they firms or consumers, suppliers or demanders) each act to explain variation in \( Y \) across the sample is explained by variations in \( X \). Causation is a statistical relationship, a theory as described above, plus the belief that were we to change \( X \) for any one observation in our sample, the value of \( Y \) for that observation would change correspondingly. In the terminology of Mosteller and Tukey, if we had a sample of data, there would be only the possibility of association here: not dependence or causation. In economics, Morehouse, Strotz, and Horwitz (1950) used an electrical system analogy to study inventory accumulation. Enke (1951) also used an electrical system analogy to study interregional price differences. Fisher (1925) used a number of hydraulic analogies to study economic behavior. Can a functionalist approach ever imply dependence or causation? At first glance, the answer might seem to be “no”; what we have here is at best statistical association. However, a fuller answer would be that dependence or causation might be possible depending on how close the analog is to the process under study.
maximize the benefit of their participation in a market. To avoid ad hoc modeling, economists prefer that their assumptions include at least one universal law drawn from their core theory. Here is an important way in which building of theory differs from other social sciences. In parts of the social sciences, for example, it is common to begin with a process under study then ask what kind of theory might explain it regardless of whether that theory is core or contains a universal law. The economic approach more typically is to ask what core theory has to say about a process under study.⁸

Now let us consider the instrumentalist approach. One matter that troubles some scholars outside Economics is the reliance core theory that puts on relatively simple forms of rational behavior by firms and consumers. After all, critics argue, is it not true that people can be motivated by considerations other than the consumption of commodities that typically underlies the neoclassical conceptualization of consumer utility; if so, what is the relevance of core theory? The instrumentalist approach argues that we should judge core theory by what it predicts about behavior not by what it assumes.⁹ This concern over the fundamental assumptions of core theory has led economists to propose an instrumentalist approach to reasoning sometimes called modeling for prediction.¹⁰ It specifically argues the assumptions of models are not to be tested. The only possible test of a model concerns whether the model predicts correctly. Critics ask just how different a prediction has to be from an assumption in order for it to be testable. Put differently, they argue that people behave as if they maximized utility even if their motivation is something else. However, in my view, this now blurs the distinction between functionalist and explanatory approaches.¹¹

In this book, I focus on models that explain location as an outcome behavior by market participants that can be thought to be rational.¹² In talking about explanation, my view is relativist rather than essentialist. An essentialist sees explanations

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⁸I should be careful here. Not all economists concur with all aspects of the core theory. Nonetheless, a widespread acceptance of the relevance of core theory within the economics discipline is sometimes thought by readers from other social science disciplines as verging on the ideological.

⁹See Roth (1989)

¹⁰See Friedman (1953, pp. 3–43).

¹¹It also instances the question, raised above, of how close the analog has to be to generate dependence or causality.

¹²By rational, I mean simply that an economic actor makes choices consistently: see Becker (1962). A consumer is deemed to be rational if, in choosing between alternatives, he or she exhibits preferences among these alternatives that are (1) well-ordered and (2) stable over time. Here well-ordered means that if the consumer prefers alternative A to B and also prefers B to C, then that consumer will prefer A to C. The phrase “stable over time” is to suggest that if the consumer preferred A to B yesterday, then other things being equal, will still prefer A to B today. However, economists typically impose additional constraints on rationality, including diminishing marginal utility, limitations on separability, and notions of expected utility. For an interesting discussion of the nature and paradoxes of rational choice, see Sugden (1991).
as ultimate truths. A relativist like me sees explanations simply as bettering current understanding. Of course, current understanding will differ from one person to the next. Therefore, a relativist must pitch his or her argument in terms of an intended audience: the people for whom the arguments presented will see it as an improved understanding. In my case, I have aimed this book primarily at graduate and advanced undergraduate students in Geography, Planning, Business, and Urban Studies as well as Economics. However, I hope there is much in each chapter that will be novel even for seasoned readers of location theory.

There are still other respects in which Economic methodology might seem puzzling to students from elsewhere in the social sciences. Six come to mind.

- **Deductive approach.** Broadly speaking, there are two kinds of methodologies in the social sciences: Case Study and Deductive. Both are valuable. While the advantage of the Case Study approach is the rich detail it can offer about an occurrence of the phenomenon, the significant disadvantage is the risk of ad hoc explanation: we just do not know whether the story is equally applicable to what might be thought to be other occurrences of the same phenomenon. Ad hoc explanation is less likely in the Deductive approach (although not necessarily eliminated) because we are looking at whether many different cases are consistent with the theory. This book is concerned with the construction of theory applicable to a Deductive approach. In a Deductive approach, one tells a special kind of story to readers: one that explains a phenomenon while clarifying the generality of application. Be it fiction or nonfiction, Case Study or Deductive, any story to be told successfully must engage readers to the extent that they, the readers, are prepared to suspend their disbelief; that is the craft of the storyteller. Otherwise, any writer risks being seen by the reader as simply self-indulgent: i.e., without appeal to a broader readership. The onus on the scholarly storyteller (especially in the Deductive approach) is perhaps even greater here. We do not have quite the same access to fantasies, ambiguities, subtleties, and other tricks as do writers...

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13 A Case Study approach makes use of in-depth analysis involving one or a few examples. Here typically—in a process sometimes called process tracing—proponents construct an explanation for the case study and then show that the explanation is consistent with all information available about the process.

14 The Deductive approach is based on a theory (definitions, classifications, and logic) and makes use potentially of data for a large number of examples (alternatively, observations or cases) thought to illustrate the phenomenon. Here proponents typically identify a theory to be evaluated (the so-called alternative hypothesis) and a null hypothesis (its negation), a statistical population (the set of cases generated by the same process), a sufficiently large sample of cases from that population, and then a statistical test using the sample data to see if the null hypothesis can be rejected in favor of the alternative hypothesis.

15 Rodwin (1945) nicely compares the two approaches with respect to industrial location analysis.

16 The exercise is similar in a Case Study.
of fiction. We are more like writers of “how to” books than books of fiction.\textsuperscript{17} This book is no different; my objective is to use a deductive approach to tell compelling stories: i.e., stories structured to pique the curiosity of readers while leaving no escape from their sometimes startling conclusions.

\begin{itemize}
  \item \textit{Reductionism.} Reductionism is at the core of this book. A reductionist like me believes the best way to improve our understanding is to focus on an aspect of the process under study and simplify the problem enough to permit us to represent it as a model (often mathematical). Inherently, this involves a suspension of disbelief (is the model informative even if it is unrealistic): i.e., the sense we have assumed away something in fact important.\textsuperscript{18} In using a model, we hope to better our understanding of the process under study: i.e., our ability to describe, simulate, explain, predict, or control it. In an idealized (mathematical) setting, a model is built from a set of assumptions (axioms); logical deduction then leads to a set of outcomes (or hypotheses). The outcomes themselves sometimes initially surprise: as in “I did not know these assumptions would necessarily give this outcome!” The derivation of such outcomes can be boring, tedious and mechanical but is always necessary; altogether too often in my own humbling experience, errors arise when we take shortcuts in the derivations. At the same time, reductionists have an obligation to consider the broader implications of their thinking, not just the immediate conclusions. To avoid the label self-indulgent, reductionists need to consider just how generalizable are their findings.\textsuperscript{19} To a greater extent than in the other social sciences, reductionism is at the heart of economic reasoning. Economic reasoning consists of applying notions from core theory to the sub-discipline. To do this, questions in the sub-discipline must be recast in, or reduced to, a form consistent with core theory. There are several goals here. One is to confirm that core theory is applicable to each sub-discipline: otherwise the theory is not core. A second is to garner insights about the process. A third is to create testable hypotheses that can then be refuted on the basis of data analysis. If the data lead to rejection of a hypothesis consistent with core theory, this may raise important questions about the core. In an explanatory approach, the model can generally be subjected to an independent test. For instance, the model to be statistically estimated allows for the possibility that either X affects Y or it does not. Economists are fond of such models; (human) geographers—more
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\textsuperscript{17}Worse than that for the wary reader, scholarly writers overtly proselytize; they seek to convert readers from disbelievers into believers. The Case Study approach seeks to convince the reader through immersion in detail applicable to that one case; the Deductive approach seeks that suspension of the reader’s disbelief through an appeal to generalization (an escape from detail). Truth be told, the drive for compellingness typically means scholarly writing often has the subtlety of a sledgehammer.

\textsuperscript{18}I include here the translation problem raised by Dennis (1982a, 1982b, 2002), wherein economists do not prove by deductive exercises what they claim to prove about their economic subject matter.

\textsuperscript{19}This well-known point is made in Edgeworth (1888, p. 348, Footnote 6) and in Solow (1956, p. 65).
skeptical of reductionism—see a tradeoff here between thick analysis (detailed consideration of a small number of cases) and thin (statistical analysis of a large number of cases); to them, there is a choice here between statistical testing and comprehensiveness. Put more crudely, they do not share the idea of core theory in Economics as a holy grail. As a geographer and a relativist, I prefer to think core theory is useful even if there are respects in which I might prefer something better.

- **Agency.** In the social sciences, there are broadly two complementary categories of explanation: structural and agency. An agency explanation focuses on how individuals (e.g., persons or firms) make choices from among alternatives coping with the exigencies of daily life. These choices then explain outcomes. An agency explanation typically does not dwell on the question of how the set of alternatives gets structured, determined, or limited. A structural explanation, in contrast, sees social science outcomes as determined by the institutional and structural constraints that limit or deny choice. Why these constraints exist, how they operate, and how they change over time are central questions addressed in a structural explanation. While we find both agency and structural explanations in all disciplines, agency explanations are more prevalent in Economics than in other social science disciplines. This is especially true in competitive location theory, which—almost by definition—focuses on the choices made by rational firms. This book similarly focuses on agency explanations.

- **Theory and model.** Every area of social science may be said to deal in theory, but only a small subset are typically thought to deal with models. A mathematical model usually takes a simple form: givens (exogenous values and parameters), relationships (behavioral and identity), and outcomes (endogenous). Implicit here is a notion of causality; the givens determine the outcomes (and not vice versa). Implicit in both the givens and the relationships is an underlying theory. There are two ways to think about the theory here. One is that the theory identifies parameters and exogenous values and provides the basis for the relationships used to solve for the endogenous variables. The other is that the theory is a set of deductions arising from a set of assumptions. Surprisingly, it is not easy to move back and forth between these two ways of viewing theory. It would be nice for example if assumptions corresponded to givens and deductions to relationships. However, there is no particular reason to expect this. This makes for some interpretation of models; we cannot just look at a mathematical structure. How do I make use of models in this book? What I do is to compare the outcomes of models with similar assumptions. I want to show how, when one assumption is altered, the outcomes of the model change. After we have repeated this process from one model to the next, we begin to see patterns (a characterization) to the effect of a particular assumption. Economic analysis is often typified by use of a theoretical...
model,\textsuperscript{21} something readers from Geography and other social science disciplines can find mystifying, impenetrable, inappropriate, unrealistic, or too deterministic. Economists favor a parsimonious writing style—at its best, breathtakingly insightful—that other kinds of readers may see as either narrowly focused ways of thinking about behavior or simply as too dense or terse. This book attempts to overcome aspects of that by casting models in terms readers from other disciplines can more easily understand. In general, the objective here is to make some of the tools of competitive location theory better understood in broad swaths of the social sciences to which it should be of interest.\textsuperscript{22}

- \textit{The origins of economic models}. Where do models come from? Put differently, when a location theorist first identifies a problem (i.e., a question to be addressed), how does he or she come to represent it in the form of a model? Sometimes the model is spawned directly from a body of theory; sometimes it is an extension to an already-existing model. And, sometimes, as Murphy and Panchanadak\textsuperscript{(1997, p. 342)} state, it is an analog (as in the functionalist approach), wherein we abstract features of our problem, look for similar problems that have been solved elsewhere, and then apply those solution methods to our own problem. Part of the unease that other scholars have with neoclassical economics is the way in which that area of study has borrowed models from Newtonian physics. Put differently, these critics see microeconomic explanations as functionalist rather than as explanatory or instrumentalist. In this book, I hope to convince skeptical readers that the benefit to be derived from use of these models outweighs the limitations.

- \textit{Refutability}. Another source of bewilderment to some scholars is the emphasis placed by economists on the refutability of scientific propositions.\textsuperscript{23} A model is generally deemed inappropriate in Economics if it does not permit the possibility of being refuted. In areas of the social sciences where the culture is one of inclusiveness of ideas rather than exclusiveness, this emphasis on refutability may seem unwarranted. However, I think that every scholar would agree that it is important to cull arguments or ideas that can be shown to be incorrect or inappropriate; in my view, refutability is valuable in that exercise.

\textsuperscript{21}Here, I use model to mean a simplified representation of the real world whose purpose is to describe, simulate, explain, predict, or control a process under study. Although models can take various forms from physical to chart to mathematical, I use the term in this book to mean only something that can be expressed mathematically. In this situation, a model includes values that are exogenously given (typically parameters and exogenous or lagged variables) and equations (both behavioral and identities) that link these to the values of endogenous variables.

\textsuperscript{22}In large part, this is due to the way economists practicing competitive location theory look at the world in general and location in particular; their ideas and methods, however insightful, do not come easily to students in other disciplines. Of course, every discipline has its own sensibilities, and the starting assumptions that characterize one discipline may well be the antithesis of another discipline’s creed. Indeed, one might ask, why else have disciplines?

\textsuperscript{23}See, for example, Ellsberg (1954, p. 529).
Let me conclude this preface with a few statements on the background assumed and the pedagogical approach of this book. In this book, I assume the reader has completed first-year university calculus. Even though I do not explain calculus concepts and derivations here, readers without that background should still be able to follow the main ideas presented in each chapter. The book uses other mathematical methods as well: notably vector analysis, fixed point analysis, variational inequalities, and mathematical programming. In such cases, the text does not assume readers are knowledgeable: I therefore take time to explain important concepts and procedures where needed. In keeping with the emphasis on mathematical basics, this book uses elementary representations of geography. In every chapter, the importance of distance is emphasized, typically for its effect on transaction cost. This generally includes a shipping cost or commuting cost. Usually here, I assume unit transportation cost is strictly proportional to distance. The book also assumes familiarity with introductory economics that includes basic elements in the theory of the consumer, theory of the firm, and welfare economics. This is the kind of material students acquire in their first two undergraduate semester courses in microeconomics. I make no attempt to derive microeconomic fundamentals here, but I try to provide enough details about concepts for readers to follow the main arguments in case their background in microeconomics is rusty. The book is written to accommodate different styles of learning: mathematical, graphical, and verbal. The body of each chapter is a verbal exposition of a model and its outcomes. Mathematical renditions of the model are presented in tables at the end of each chapter. Graphical renditions are similarly presented as a set of figures.

Finally, let me end on a personal note regarding conclusions. In each chapter that follows, I present one or more models: 44 in total. As befitting the idea that each model is a story, the chapter is in part an exposition on structure and in part deductions or derivations that necessarily follow from this. In this, I strive for parsimony. Some authors (and editors) like to end each chapter with a restatement of conclusions. I do not. The chapters that follow end with a section titled “Final comments” but nothing titled “Conclusions.” In part, my objection is philosophical. To a relativist like me, a conclusion is just the point in your analysis that you reach when you decide to stop thinking any further. In part, my objection is in terms of parsimony. If a conclusion I reach midway through a chapter, say on p. 6, required understanding the derivation and qualification on the pages that preceded it, how do I then write a conclusions section at the end of the chapter without having to repeat derivations and qualifications. To me, a model is like a well-told story. It is something to be appreciated for the craft in telling it, not something with which to bludgeon the reader at the end. I apologize now to the readers who get to the end of each succeeding chapter and wonder why the conclusions are not restated.

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John R. Miron
The Geography of Competition
Firms, Prices, and Localization
Miron, J.R.
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