URBAN DEVELOPMENT

THEORY, FACT AND ILLUSION

J. VERNON HENDERSON

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Preface

This book examines the role and nature of cities, set in an economy composed of a system of cities, towns, and an agricultural sector. There are three components to this examination. The first, which is theoretical, develops a general equilibrium model of an economy composed of cities. The model allows for different sizes and types of cities, economic growth, development and technological change, international trade, and natural resource impacts. It solves the patterns of wages, prices, production and trade, investment, and residence, and how these evolve.

The second part develops a set of facts and econometric results about cities. The book focuses on production patterns and technology, the population composition of cities in terms of high skill in relation to low skill workers, the determinants of urban concentration in large versus small cities, and the process of urban decentralization.

The third component examines the impact and role of government policies. What are the impacts upon population movements and urban development of such national policies as import restrictions, minimum wage laws, price regulation, transport pricing, capital market restrictions, and subsidies to investment in urban infrastructure? What the impacts of spatial policies such as those constraining location of heavy industry, restricting city sizes and land development, and limiting infrastructure investment in particular cities? What is the appropriate role of government in a system of cities, in terms of affecting population allocation and industrial location?

This book is intended for academics, practicing professionals, and students in the fields of economic development, urban economics, regional science, and geography. Even the technical sections of the book can be read by a nontechnical audience, since they contain extensive diagrams and supplementary exposition. Large portions of the book are not technical and are policy oriented. There is a summary of the findings at the end of each chapter, as well as a chapter of conclusions drawing together the central conceptual issues in the book.

Acknowledgments

The actual writing and preparation of the manuscript and some of the research undertakings reported in Chapters 3, 5, 7, 10 and 11 were financed by Fellowships from the John Simon Guggenheim Memorial and Earhart Foundations. While parts of the book contain previously published material, there is also extensive material that is either new or not previously published. All the previously published material has been completely rewritten and often reworked, to make the book as comprehensive and consistent as possible.

The theoretical work reported in Chapters 2 to 4 and 8, the empirical and econometric work on the United States in Chapters 1, 5 and 6 and the econometric results on Brazil in Chapter 7 were supported by grants from the National Science Foundation (NSF grant numbers SOC 79-01592 and SES 8013482). The econometric and empirical work on Brazil in Chapters 1, 5, and 6 and the work on China in Chapter 11 were supported by the World Bank. The Brazil work was under the auspices of the Bank's former Urban and Regional Economics Division directed by Douglas Keare during a period of high research fertility and the China work was carried out under the auspices of the Bank's China Division. I thank these foundations and agencies for making this work possible, and contributing to the enhancement of our understanding of the nature of the world in which we live.

A project such as this involves extensive support from research assistants and fellow economists. The following research assistants worked ably on the project: B. Dillinger, J. Klerman, R. Kochhar, R. Neupert, T. Pham, H. Streeter and P. Wilson, as well as D. Brooks, J. Brown, D. Keen, K. Knapp, T. Miceli, A. Rangarajan, and J. Sheraga. Over the years strong intellectual support and inspiration for the project have been provided by Yannis Ioannides, Peter Mieszkowski, Bertrand Renaud, George Tolley, and Charles Upton. The complementary work of Oded Hochman and Yoshi Kanemoto as well as Eitan Berglas had a strong influence on my work, and they share credit for developing the foundations of an economic model of systems of cities. Other individuals providing helpful comments include Andrew Hamer, Ed Lim, Ian Porter, and Adrian Wood, all of the World Bank. Finally the encouragement and support of Douglas Keare of the World Bank and Dan Newlon of the National Science Foundation, as well as Gregory Ingram and Ed Mills are gratefully acknowledged. Also, Ed Mills and several anonymous referees read the initial version of the manuscript and made very helpful comments used in revisions.

Marion Wathey typed the entire manuscript with her (un)usual tireless efficiency and dedication.

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Urban Development

Introduction

This book develops two general themes. First, basic economic forces and simple economic models can explain the key characteristics of the spatial patterns of production and population observed in a country. These models can be adapted to explain changes over time in a country or to do comparisons for a cross section of countries. For example, in developing countries, the processes of massive rural–urban migration, population explosion of large metro areas with their overcrowded industrial neighborhoods and squatter settlements, deconcentration of industries from large metro areas into specialized smaller cities, switches in production patterns of cities, draining of skilled workers from small towns, and individual city limits on growth and entry are all natural outcomes of market forces operating in particular institutional environments.

The second theme stresses the often inadvertent and misunderstood negative impacts on the urbanization processes of common government policies. The designing and construction of modern national capital regions potentially offering excellent amenities for residents, the stress on and accompanying financial inducements for development of heavy manufacturing industries, the rise of state capitalism, and even minimum wage laws all tend to increase unnecessarily the degree of urban concentration in a country. Urban concentration is a measure of the extent to which a country's population is housed in bigger relative to smaller cities. Increases in urban concentration involve further population flows from smaller traditional cities to metropolitan areas with the accompanying erosion of the country's traditional social fabric. The population flows require massive reinvestment in urban infrastructure in metropolitan areas with the accompanying financial and administrative burdens. This bias toward larger city development is enhanced by notions of hierarchy in some developing countries. Government industrial development in larger cities is viewed as being more efficient than the "uncoordinated" efforts of private producers in smaller cities, despite the clear evidence that typically the private producers who cluster in smaller cities are more efficient than the state firms located in large cities.

These two themes are developed in the book by looking at the key characteristics of cities in various countries. In particular, detailed Census Data for Brazil and the United States are utilized, as well as more general data on China, India,

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Japan, Korea and a cross section of other countries. The key characteristics are then explained in terms of a simple general equilibrium model of a system of cities, incorporating growth, technological change, international trade, and government policies. Some of the key results and assumptions of the model are econometrically formulated and tested.

In the process of this development of the two themes a number of sets of questions are examined, as discussed next. After presenting the sets of questions, an overview of the content of different chapters is given.

1. Sets of Questions

What is it about the technology of production or consumption that induces people to agglomerate in population clusters called cities, rather than spreading out over the countryside in a completely rural existence? It is usual to presume that agglomeration in net is costly on the consumption side, producing disamenities such as congestion, pollution, crime, and so on, although there can obviously be some initial social and retailing benefits to agglomeration. Under that presumption, agglomeration must occur because of some type of scale economies in production. That raises the following questions. What is the nature of these scale economies? What is their extent? How do they vary across industries?

Given the existence of cities, what types of goods are produced for export, or traded across cities and between the urban and rural sectors? A wide range of urban goods and services are nontraded across cities, or produced and sold within the same city. In terms of traded goods, many are goods in which cities tend to specialize for production. This raises the questions of when do cities specialize and what types of goods are the ones they specialize in. When are cities highly diversified and what types of goods do diversified cities tend to produce for export?

Cities of different sizes coexist in an economy on a sustained basis. What is it about the spatial nature of national production that makes a very small city relatively just as efficient in net as a very large city? In comparing cities of different sizes how do wages, costs of living, amenities, capital intensities, and so on vary?

With population growth in an economy, do individual city sizes, city numbers, or both grow? Over the past century there has been an ongoing revolution in the nature of transport and commuting technology. What has been the impact of that on city sizes and agglomerations? How does the urban system react and adjust to a technological shock?

What is the impact of economic development on not just rural vs. urban population allocation, but also on urban concentration? Richardson (1977) suggests that many countries experience initial concentrations of resources into one or two major metro areas, followed by a period of subsequent deconcentration of resources into secondary cities. Is this explained by the nature of the development process and adaptation of existing technologies from developed countries or by changes in government policies?

In comparing different countries, how do their trade patterns affect their systems of cities? Do traditional international trade theorems extend to general equilibrium models of systems of cities with their economies of scale and implicit spatial complexities? Do countries with different endowments of natural amenities (e.g., climate) have different features to their systems of cities? Within countries dif-

ferent urban sites have different quality dimensions in terms of climate and access. How are sites allocated to different types of cities?

What are the determinants in general of the location of different industries? Which ones are resource bound to particular locations for production purposes versus footloose to pursue better amenity locations for their employees?

In some countries, there is a strong correlation between city size and skill composition of the work force, with smaller cities being drained of skilled labor. Are skilled laborers drawn to larger cities by the "bright lights"—amenities specific to their tastes? Do such amenities arise naturally in larger cities or are they the result of government policies? Are skilled laborers drawn to larger cities by relatively better job opportunities? Are skill mixes rigidly determined by the production mix reflecting the industrial base of a city, or are workers of different skills highly substitutable?

What are the determinants of urban concentration in a country, in terms of whether the urban population is primarily located in larger or smaller types of cities? How is concentration likely to vary with economic development or international trade patterns? What are the determinants of whether cities have one major business center or are multinucleated—having many major business districts? This is often the distinction between smaller cities (say under one-half million people) versus large metropolitan areas. How does multinucleation interact with urban concentration on a national level?

Finally and most centrally to the book, the role of government in influencing the development of systems of cities is questioned. Most directly is the role of the local government. Its role must be critical, since for example in the United States about 50% of urban land (Clawson, 1969) is devoted to public use. Such public use involves long-range planning and massive investment in fixed durable capital structures such as roads, water mains, sewers, public buildings, parks, and so on. How do public investment decisions affect urban growth and development? How does the degree of local autonomy impact a system of cities? Are there recognizable differences between the urban system of a federal market economy vs. the market economy in a centralized governmental system vs. a centralized planned economy?

At a national level, what are the perhaps unintended impacts of national policies such as tariff protection policies, minimum wage policies, and capital market restrictions and interventions? If there is national economic planning, it can involve restrictions on both prices and input and output allocations as in China, as well as quantity restrictions on interregional flows of goods. Alternatively it may involve mostly price interventions in the form of subsidies or taxation, plus some level of state capitalism as in the case of India. On what basis are these countries making location plans and decisions? What motivates them? What is the impact on the system of cities of different forms of control?

2. Chapter Overview

In Chapter 1, the production patterns of cities and empirical relationships between city sizes and production patterns are examined. The goods in which cities tend to specialize for traded good production are identified and sizes of different types of cities calculated. Most manufactured goods tend only to be produced in significant amounts in a small proportion of cities and for any industry most cities

have no production of the good. The basic data refer to Brazil and the United States, although the data for India are also examined.

In Chapter 2, we turn to a theoretical model to explain the empirical evidence from Chapter 1. The basic model of a system of cities is presented, assuming a competitive market economy with autonomous democratic local govenments. The model yields the determinants of city sizes, wages, costs of living, and capital intensities, as well as the determinants of the size distribution of cities. Comparative static exercises are conducted to illustrate both the power and workings of the model. Finally, social and economic conflicts between different types of economic agents (e.g., capitalists vs. laborers vs. rentiers) are examined in the determination of city sizes.

In Chapter 3, the model is placed in a dynamic setting. The sources of economic development are identified and their spatial impacts analyzed. Issues include rural–urban migration and changes in urban concentration and their relationship to adaptation of new technologies and the product cycle. The impacts of population growth and of technological change in the construction of cities are assessed. For the latter the underlying issue is the impact of the successive revolutions in commuting technology over the last hundred years. Complexities in adjusting to growth and technological change such as immobility of urban infrastructure capital are considered.

In Chapter 4 the basic model is further extended to the impact of international trade on an urban system and the methodology for doing international comparisons of systems of cities. Natural resource considerations are introduced in a preliminary fashion to allow for differing natural qualities of city locations, or sites. This gives a Ricardian flavor to the model.

In Chapter 5, we turn to econometric models that test some of the basic assumptions of the model. The focus is on the nature of scale economies and their magnitude. For manufacturing in Brazil, Japan, and the United States it is shown that scale effects for an industry tend to be ones of localization (own industry) and unrelated to overall urban scale or even scale of related industries. Scale effects tend to decline as scale increases and are Hicks' neutral.

Chapter 6 introduces different skill types of laborers and estimates both their substitutability on the production side in different industries and their tastes for amenities on the consumption side. Econometric issues, such as whether skilled laborers in Brazil are drawn to large cities by the bright lights or by skill requirements of industries, are explored. Also estimated are the tastes of one skill group for the other as neighbors. The estimation issues are complex and the data for the United States on tastes and for Brazil on the technology of skill usage are excellent.

Chapter 7 and succeeding chapters raise policy issues. Three types of policies are considered: government policies with unintended spatial impacts (Chapter 7), explicit industrial location policies (Chapter 8), and city size policies (Chapter 9). In policy discussion much of the focus is on aspects of urban concentration and how resource allocation between big and small cities is affected by government policies.

Based on the theoretical model in Chapters 2 to 4, Chapter 7 examines the spatial impact of national government policies, which have no intended spatial components. Common policies of this type are trade protection policies (international tariffs or quotas), minimum wage policies, national capital region development, national subsidies to local urban infrastructure investments, and cap-

ital market restrictions. Given typical policy formulations, the general practical impact of all these policies is to increase urban concentration beyond natural developmental levels.

Chapter 8 deals with two types of explicit location policies. First is the decision in some countries to focus the location of heavy industry in very large metropolitan areas. The economic justification for this focus is explored and considered fallacious. The potential welfare costs of an improper location policy are explored with an example. Second are recent policies in some countries encouraging private industrial deconcentration from large cities. The rationale for the policies is examined. A methodology for analyzing private location decisions is developed focusing on the decisions of firms of one industry to locate in some cities and not others.

Chapter 9 examines the welfare economics of population relocation policies. Under what limited circumstances are national population policies justified? When will individual cities be induced to impose their own entry restrictions to achieve an efficient allocation of population, without national intervention. What are the bases for the urban deconcentration policies of countries determined to halt the flow of people into their largest metropolitan areas? The deconcentration policies of India are examined.

Given the focus in Chapters 7 to 9 on decentration, Chapter 10 turns to the gross empirical determinants of urban concentration in a cross section of countries. At this point it becomes essential to deal theoretically and practically with the issue of what is a city. What is New York City? Does it consist of the five boroughs, or those plus the immediately contiguous "cities"—production centers with their own residential neighborhoods? Or is it the whole population mass exceeding some critical density, ending only in the forests of Connecticut, Delaware, and New York state? A model of the clustering of "economic cities," or production centers plus their neighborhoods, into metropolitan areas is developed. Then the determinants of cross-country measures of urban concentration are analyzed. Although clustering and economic development measures play a role, the prime determinants of urban concentration are the size of the country and the system of government. Federalized countries have much lower indices of concentration, suggesting that centralization of power leads to centralization of resources and public spending.

Chapter 11 turns to the urban system of a nonfree market economy—China. The peculiarities and regularities of the Chinese urban system are presented, to the extent they are known. Then the evolution of the urban peculiarities is analyzed, to see their relationship to the special nature of the Chinese economic system in general and the tendencies inherent in a planned economy.

The last chapter summarizes the findings and conclusions, with an eye to promoting enlightened policy formulation in developing countries.

CHAPTER 1

Facts about Urban Production Patterns

This chapter examines certain key production characteristics of a system of cities. The patterns found suggest a strong link between the spatial distribution of resources in a system of cities and the composition of national output. With this link, in later chapters, government policies that affect the composition of national output can be linked to changes in the spatial distribution and concentration of resources in an economy. The empirical evidence presented is based on Brazil and the United States. However, the available evidence on China and India reviewed in this book and casual evidence on Canada, Korea, Japan, and Britain as reviewed by Richardson (1977), Renaud (1979), and others suggest the reported phenomena are widespread.

Within any city it appears that at least 50% to 60% of the labor force must be engaged in production of goods and services which are inherently nontradable across cities. Because of transport costs of shipping these outputs between cities they are locally produced and consumed. Examples are structures, landscaping, roads, services (e.g., haircuts, laundry, primary education, repairs, general retailing, warehousing, and some live entertainment) and intermediate inputs (e.g., cement, fabricated metals, and ordinary glass). Thus only a maximum of 40% to 50% of local employment is engaged in production of goods that can be traded across cities. There is an obvious difficulty in classifying production into tradable and nontradable goods. The percentages cited are based on a casual examination of employment figures for "one industry" towns, where virtually the only production for export beyond a small regional radius is all in one industry—typically iron and steel, textiles, or food processing in Brazil and the United States. It appears that maximum proportion of employment in traded good production is higher in less developed countries such as Brazil, China, and India than in the United States.

This chapter focuses on how the composition of traded good production varies across cities. Small and medium size cities, such as those with populations under 500,000, tend to specialize either in production of just one type of manufactured product or in production of traditional services for a local regional rural area. Larger cities and particularly metropolitan areas tend to have more diversified production over a range of particular manufacturing and modern service industries.

The numbers examined in this chapter suggest there is a link between city size and city type as defined by a city's composition of output. Then at the national level there must be a link between the composition of national output and urban concentration, or the size distribution of cities. Apart from these links, basic questions explored in later chapters are why specialization in production occurs, what products are ones in which cities specialize, and do these patterns vary with a country's level of economic development.

Section 1 of this chapter reviews evidence, partially based on Henderson (1983), describing the relationship between city size and composition of output for the United States. The results correspond to Renaud's (1979) work on Japan and Korea. Section 2 examines evidence for the United States specific to the issue of specialization, as well as location of different manufacturing activity. Section 3 repeats the examination on specialization for Brazil, and Section 4 briefly reviews evidence for India. These last two sections also examine the stability of the size distribution of cities across time in developing countries. Finally, Section 5 summarizes the implications of the results.

1. General Production Patterns

To get a general picture of the relationships between city sizes and employment in gross industrial categories, patterns of association for the United States are examined. Structural estimates and relationships are explored in later chapters; here the concern is just with associations. The association of concern is how employment in different industrial categories varies with city size and region.

To see how employment concentrations in different industries vary with city size, each industry's share of employment in each urban area is regressed on urban population (POP) and its square (POPSQ), as well as regional dummy variables and a dummy for urban areas with more than 15% of their employment in state or federal public administration. These later variables control for the exogenous influences of gross regional variations in climate and geography and location patterns of governmental activity. Data sources are detailed in Appendix A to Chapter 6; the employment figures are drawn from the Sixth Count of the 1970 Population Census. The basic sample is 242 Standard Metropolitan Statistical Areas (hereafter SMSA) in the United States. Except for the Northeast, roughly speaking, an SMSA is the area of a county or group of counties centered around one or more core cities, whose urban population exceeds 50,000. Because SMSAs are based on counties, they include rural activities and populations. In the Northeast, SMSAs are put together as collections of townships.

The gross industrial categories examined are:

1. Resource-bound manufacturing (primary metals, machinery, autos, ships, rail products, wood products, and some agricultural processing)
2. Footloose manufacturing (all manufacturing except resource-bound and high-tech)
3. High-tech manufacturing (aircraft, computers, instruments, weapons, medical equipment)
4. Professional services (health, legal, engineering, architectural, accounting, auditing, and bookkeeping and miscellaneous)
5. Wholesale services (wholesale, trucking, and warehousing and storage)

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