

# **Chapter 5:**

## **Inside the City II: A Closer Look**

# Introduction

Chapter 4 & the Monocentric City Model presented the basics, but we need to broaden our study of urban form and land value to include some key aspects of the real world that are important for real estate practitioners and investors...

# Chapter 5 Learning Objectives:

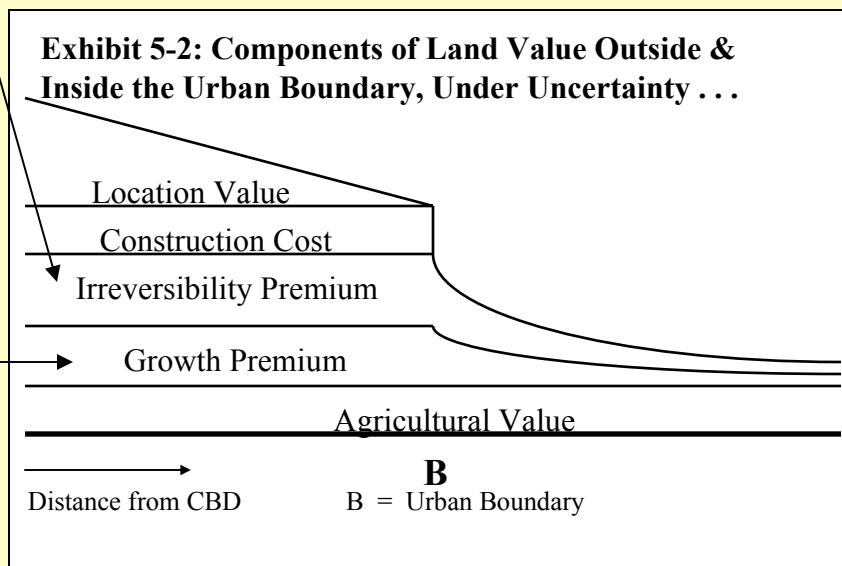
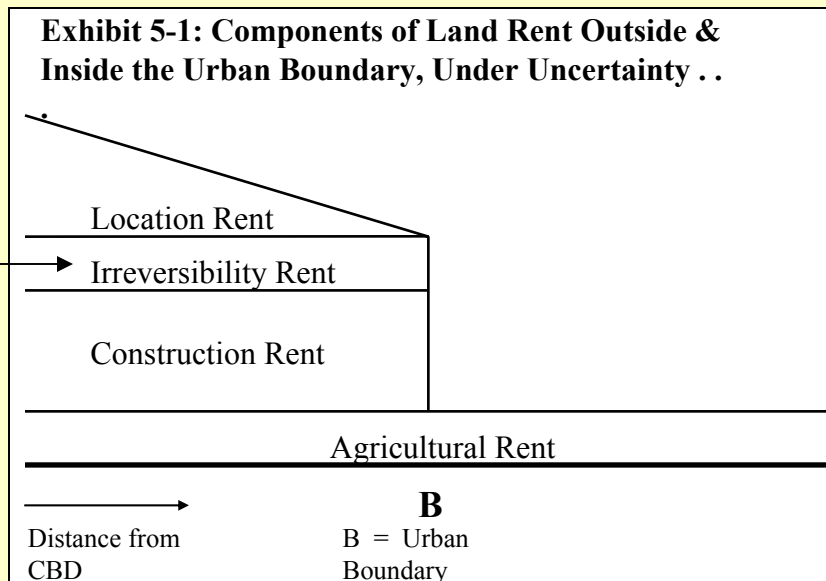
- *The difference between land value and land rent, and the key determinants of land values in and around a city.*
- *Why uncertainty can result in higher land values but less land development in a city.*
- *Why different land uses and densities occur at different locations within a city.*

# Chapter 5 Learning Objectives (cont'd):

- *How neighborhoods grow and mature and sometimes decline and rise again.*
- *The concept of property life cycle, and its implications for real estate investors.*
- *The nature and cause of the major characteristics of the urban form of the typical American city, and how this form has been changing.*

# Effect of Urban Growth & Uncertainty on Land Rents & Land Values Just Beyond the Urban Boundary...

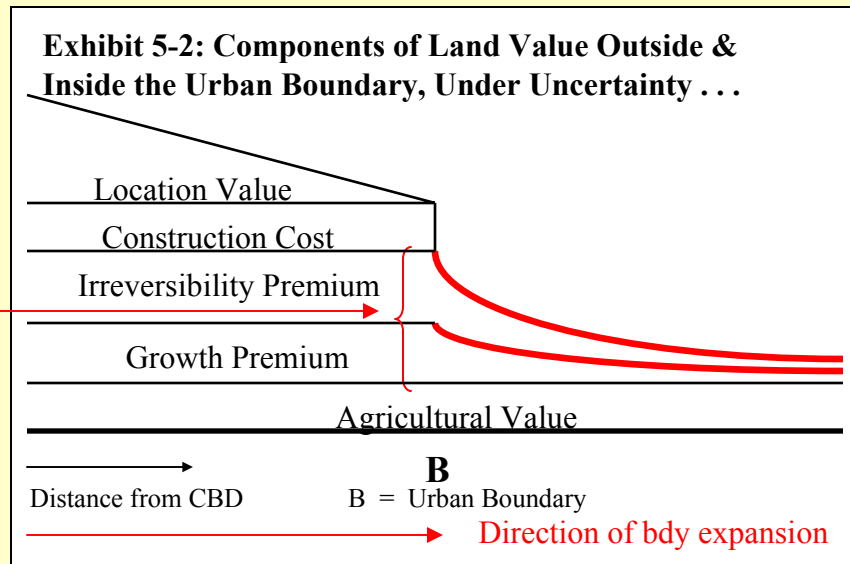
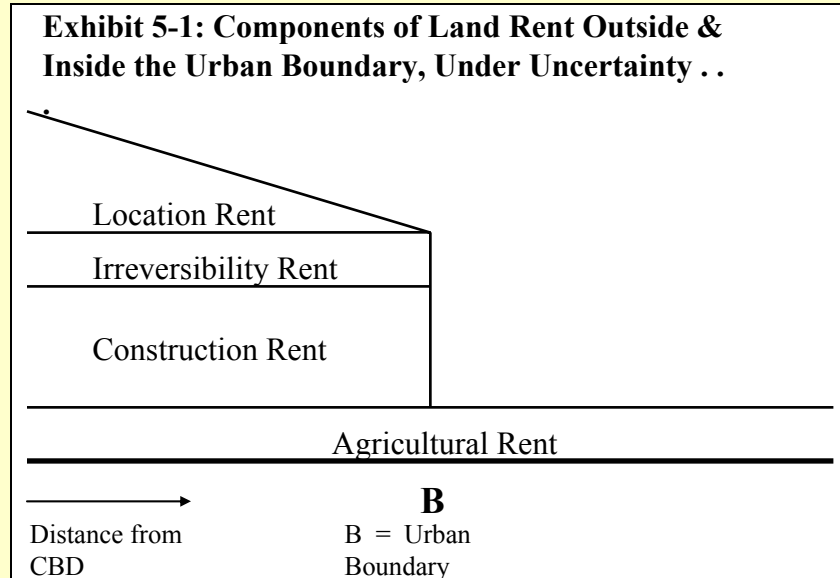
When you develop today, you give up the option to develop tomorrow instead. Devlpr needs to be compensated for loss of this **option**.



PV of property asset includes PV of expected future **growth** in rents developed property can earn after its development.

# Effect of Urban Growth & Uncertainty on Land Rents & Land Values Just Beyond the Urban Boundary...

As boundary expands, land value just beyond boundary can grow rapidly, due to increase in growth premium & irreversibility (option) premium values, depending on how fast the boundary is expanding, and the magnitude of the location value rent gradient inside the boundary.



Direction of time flow ←

*These considerations give us a fifth principle of urban form:*

*Principle 5:*

*"Faster urban growth and greater uncertainty in that growth will tend to increase urban land values, with the uncertainty also suggesting that a smaller, denser city is optimal, as rational development is postponed longer than it otherwise would be."*

# Varied Land Use and Density...

- In Circlopolis we had only one land use (housing) of only one density (2 houses/acre).
- Real world cities have multiple land uses:
  - Commercial
  - Industrial
  - Residential
- And multiple densities:
  - High-rise
  - Mid-rise
  - Low-rise
  - Spread-out



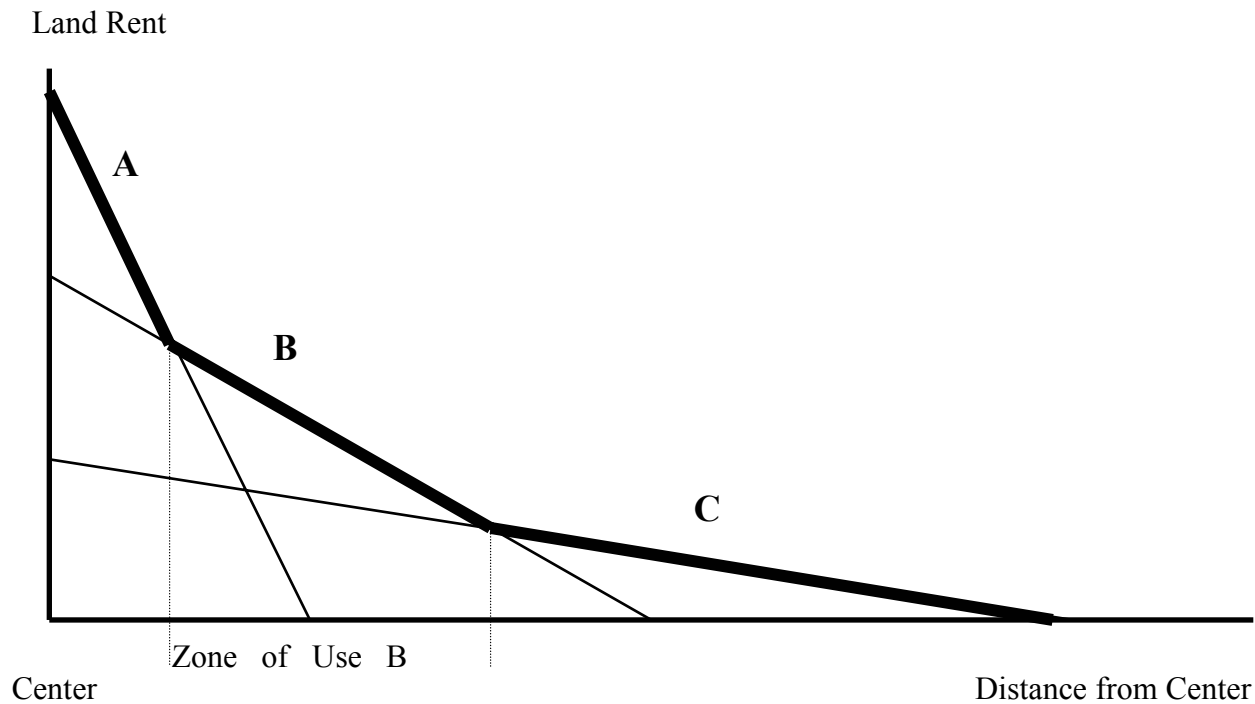
## Varied Land Use and Density...

In cities in countries with market-based economies and more or less freely-functioning land markets, we tend to see *higher-intensity land uses* (e.g., commercial uses and higher-density uses, taller buildings closer together), in the *more central locations* (CBD & other transport nodes).

***What determines how  
different uses & densities  
are located and distributed  
within the city?...***

# *Recall the bid-rent function and the land rent gradient concepts from Chapter 4...*

**Exhibit 5-3: Bid-Rent Functions of Three Land Uses With Differing Productivity & Sensitivity to Transport Cost . . .**



What indicates the ***productivity*** of a land use?...

*Height of bid-rent (residual) at central point.*

What indicates the ***sensitivity*** of a land use to ***accessibility*** (transport costs)?...

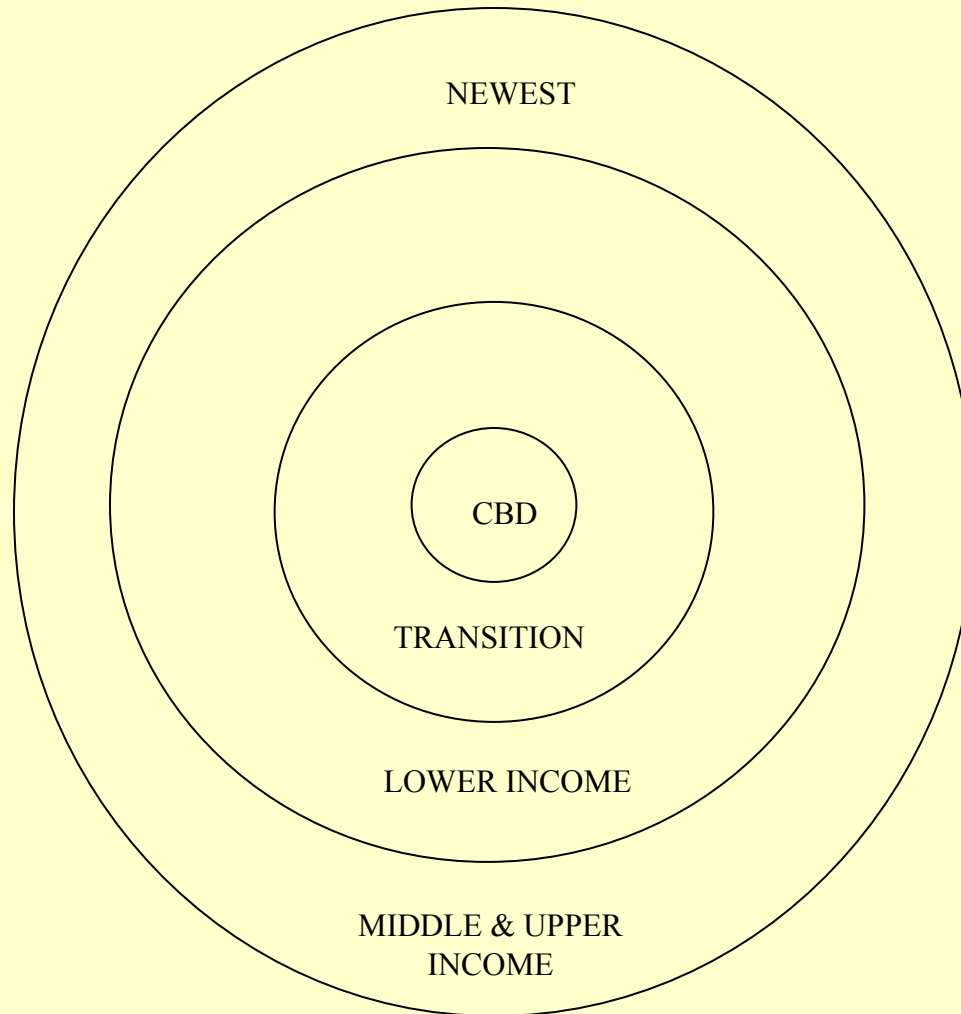
*Steepness of bid-rent function (land rent gradient for that use).*

# Why is **density** (or intensity) of land use positively correlated with both land use **productivity** and **sensitivity to accessibility**? ...

- *Greater density → More labor & capital applied per acre (→ Greater Productivity)*
- *Greater density → More value of inputs & outputs per acre, most needing to be transported → Greater Sensitivity (rent gradient). e.g., \$250/Mi/Yr/Person transport cost → \$500/Mi rent gradient @ 2 hab/acre density, but \$750/Mi gradient @ 3 hab/acre density.*

**In the land market, which type of use will prevail nearest the center?...**

This result in part explains the classical ***Burgess Concentric Ring Model of Urban Form...***



This is a good model of the typical American city in the mid-20<sup>th</sup> century, and not a bad model even now.



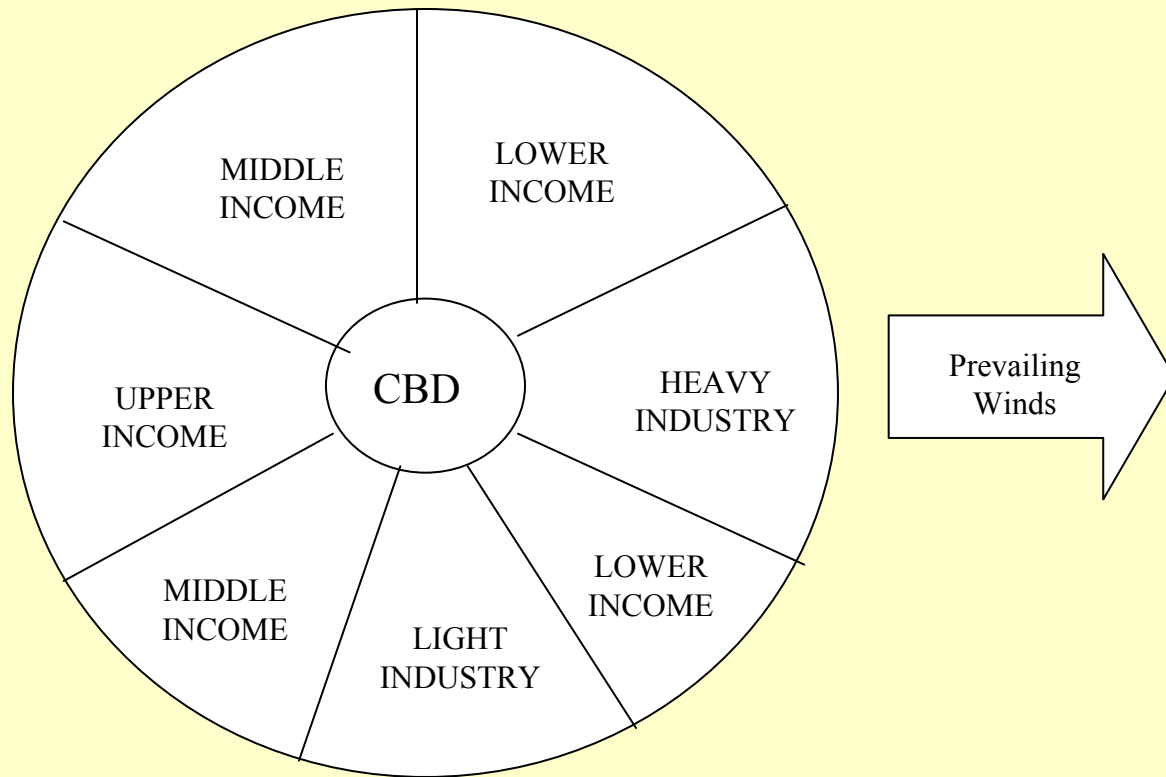
*In the Burgess Model . . .*

***How does it happen that higher-income residences are farther from the central point, given that higher-income people have higher value of their time, causing them to have higher transport costs and therefore greater value of accessibility? . . .***

*[Hint 1: Consider cultural preferences for density, and the relation between density and land rent gradient.]*

*[Hint 2: Consider historical development patterns, from the center outward, and cultural/income preferences for “newness” of construction (latest building design styles, latest building technology).]*

# Here's a famous alternative model: *The Hoyt Sector Model of Urban Form...*



*Which model do you think is a more accurate depiction of urban land use structure? ...*

*How would you draw the rings and sectors in the Boston metro area? ...*

## Effect of Land Use Boundaries...

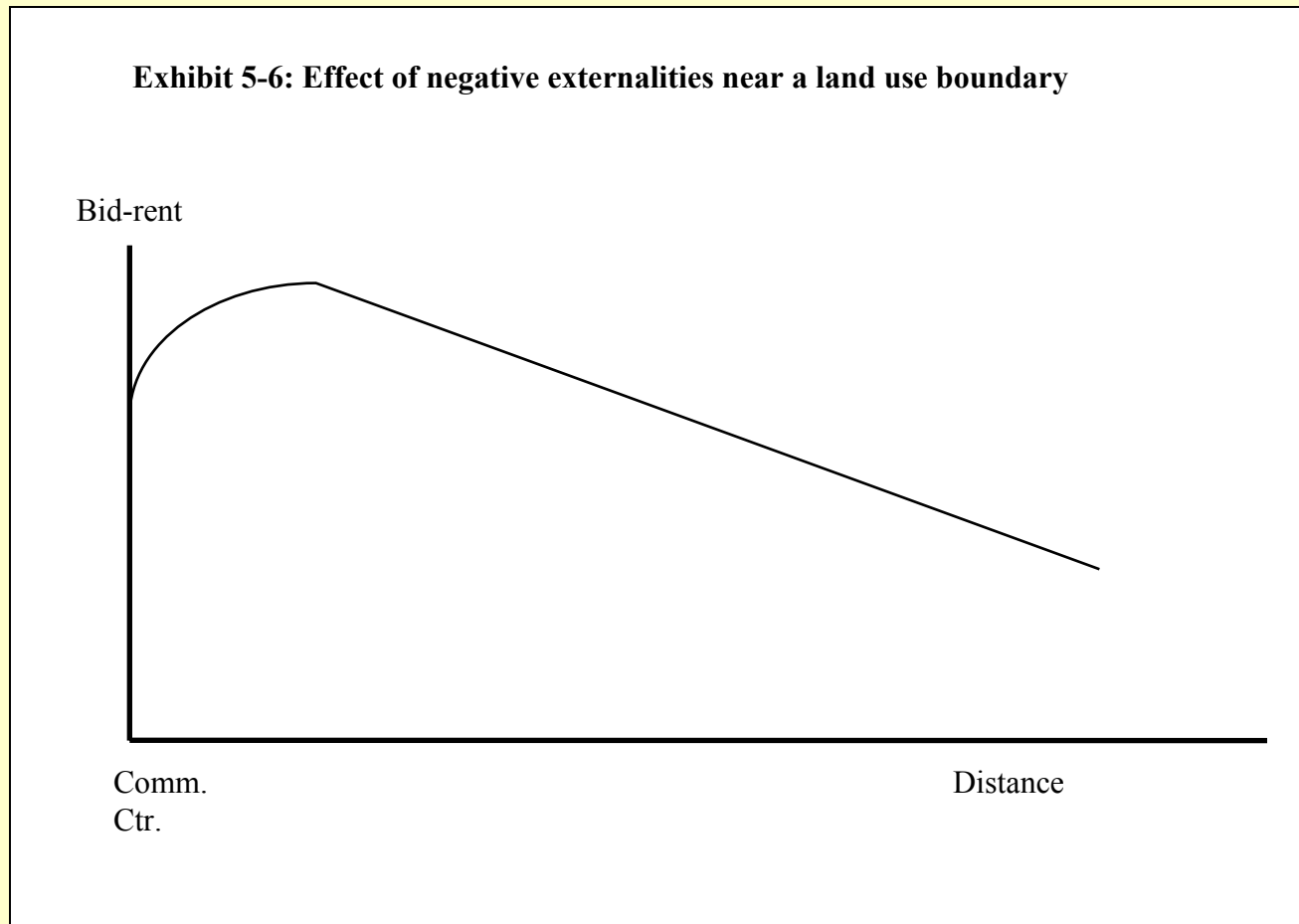
- Similar land uses tend to clump together in *districts* or *zones*.
- Some adjacent uses are more compatible than others.

*What are some examples of compatible land uses (with favorable location externalities)?...*

*What are some examples of incompatible land uses (with negative location externalities)?...*

# Zones → *Boundaries* between zones.

The boundary may have a depressing effect on adjacent location rent (even for compatible land uses)...

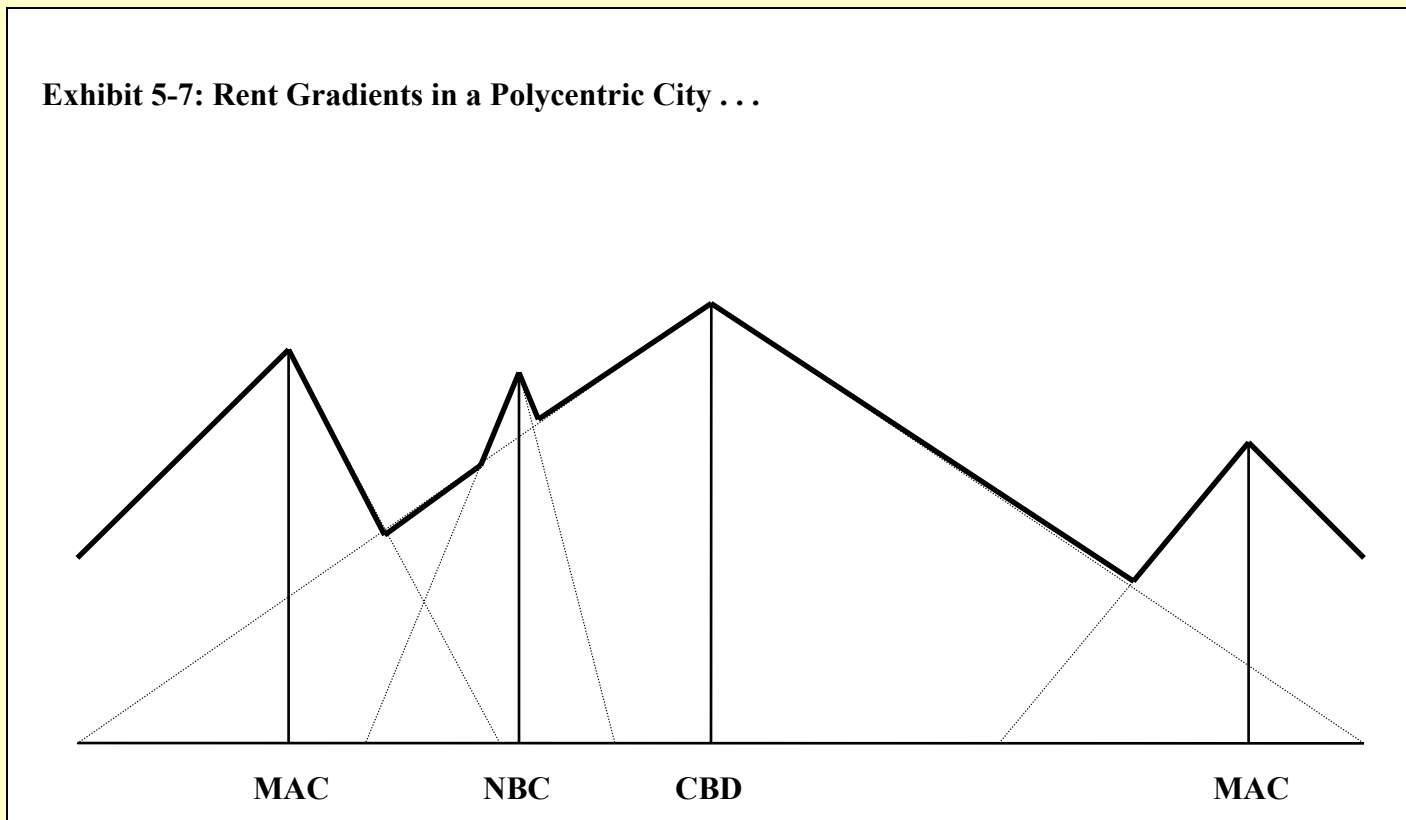


# Real cities are “polycentric” (not monocentric)...

- *CBD (Central Business District -- “Downtown”)*
- *NBD (Neighborhood Business District -- “Community Ctr”)*
- *MAC (Major Activity Ctr, e.g., Airport, Harvard Sq, Fenway, Foxboro)*
- *“Edge Cities” (as big or bigger than the CBD, e.g., Galleria in Atlanta, Tysons Corner in Washington/N.Va, Burlington/Hanscom in Boston...)*
- *Polynuclear cities (Minneapolis-StPaul, Los Angeles, Ruhr)*

***All cities must be polycentric because different land uses have different and multiple “central points”.***

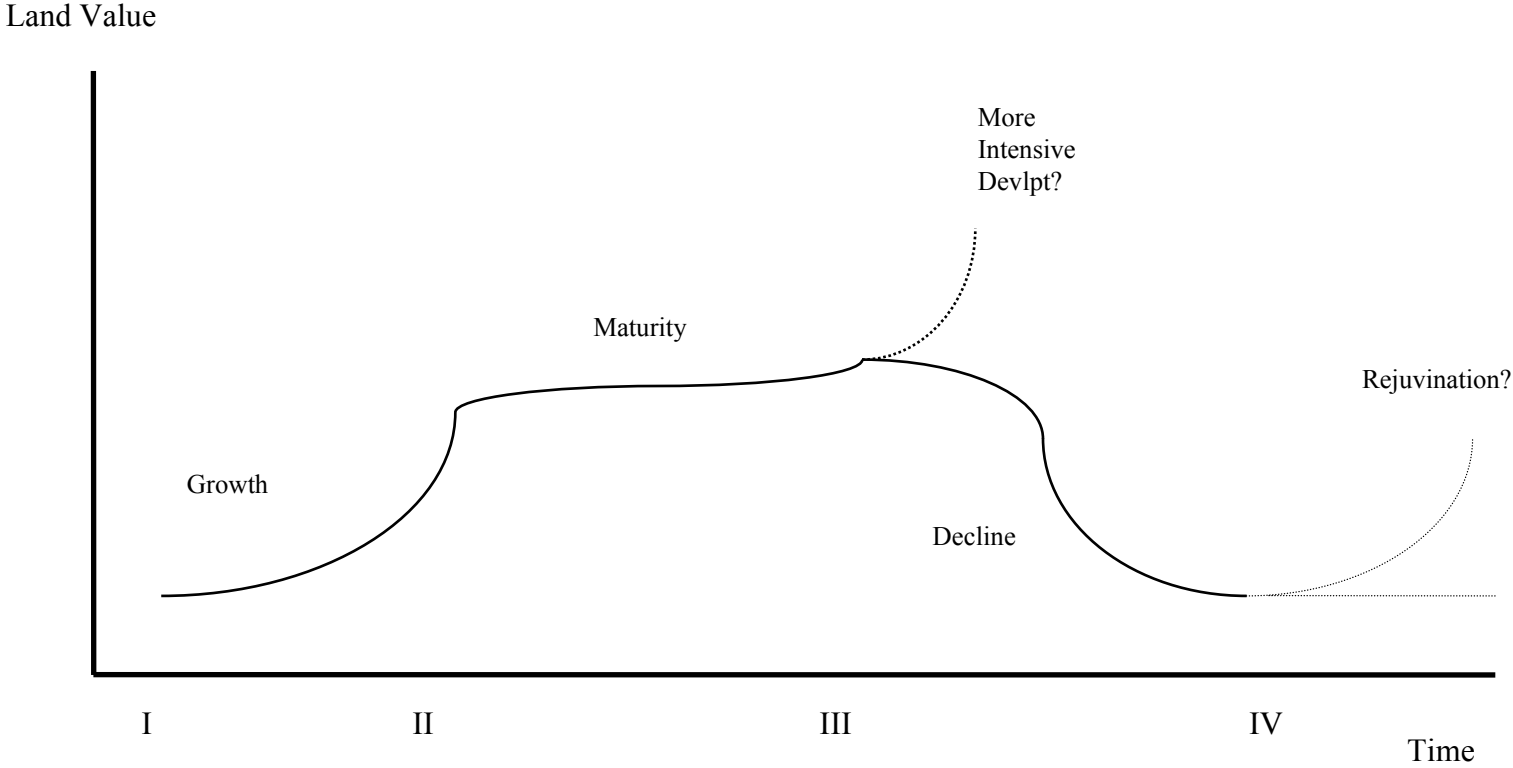
Rent gradients and land values reflect this...



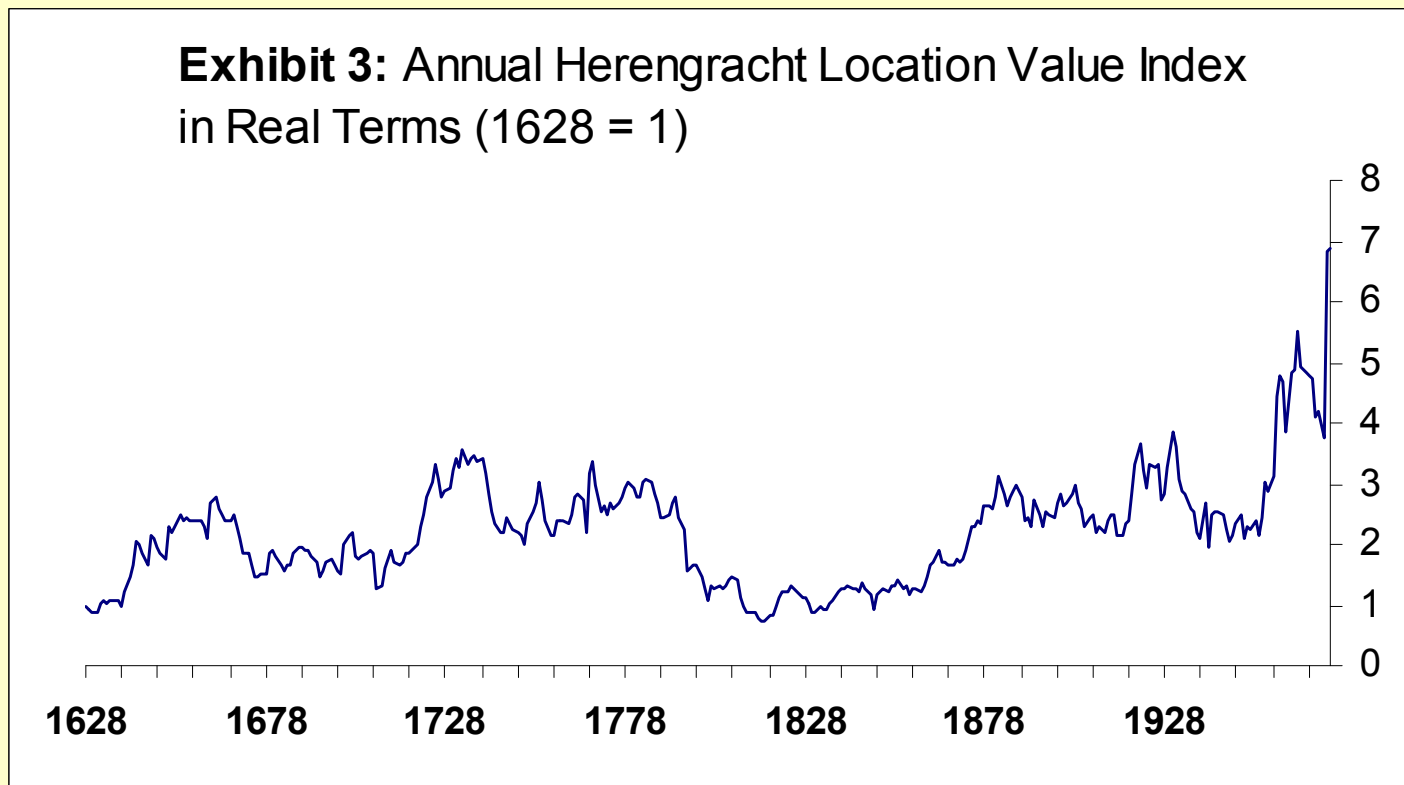


# Neighborhood Succession Theory...

Exhibit 5-8: The Neighborhood Succession Model ...



**Example: Property prices on the Herengracht (canal) in central Amsterdam, 1628-1972 (adjusted for inflation, based on a repeat-sale regression). Note, in this location, buildings remained largely the same, usage almost entirely residential until 20<sup>th</sup> century, when substantial commercial conversion occurred.**



Source: P.Eichholtz & D.Geltner, "Four Centuries of Location Value: Implications for Real Estate Capital Gain in Central Places" Working Paper, 1997.

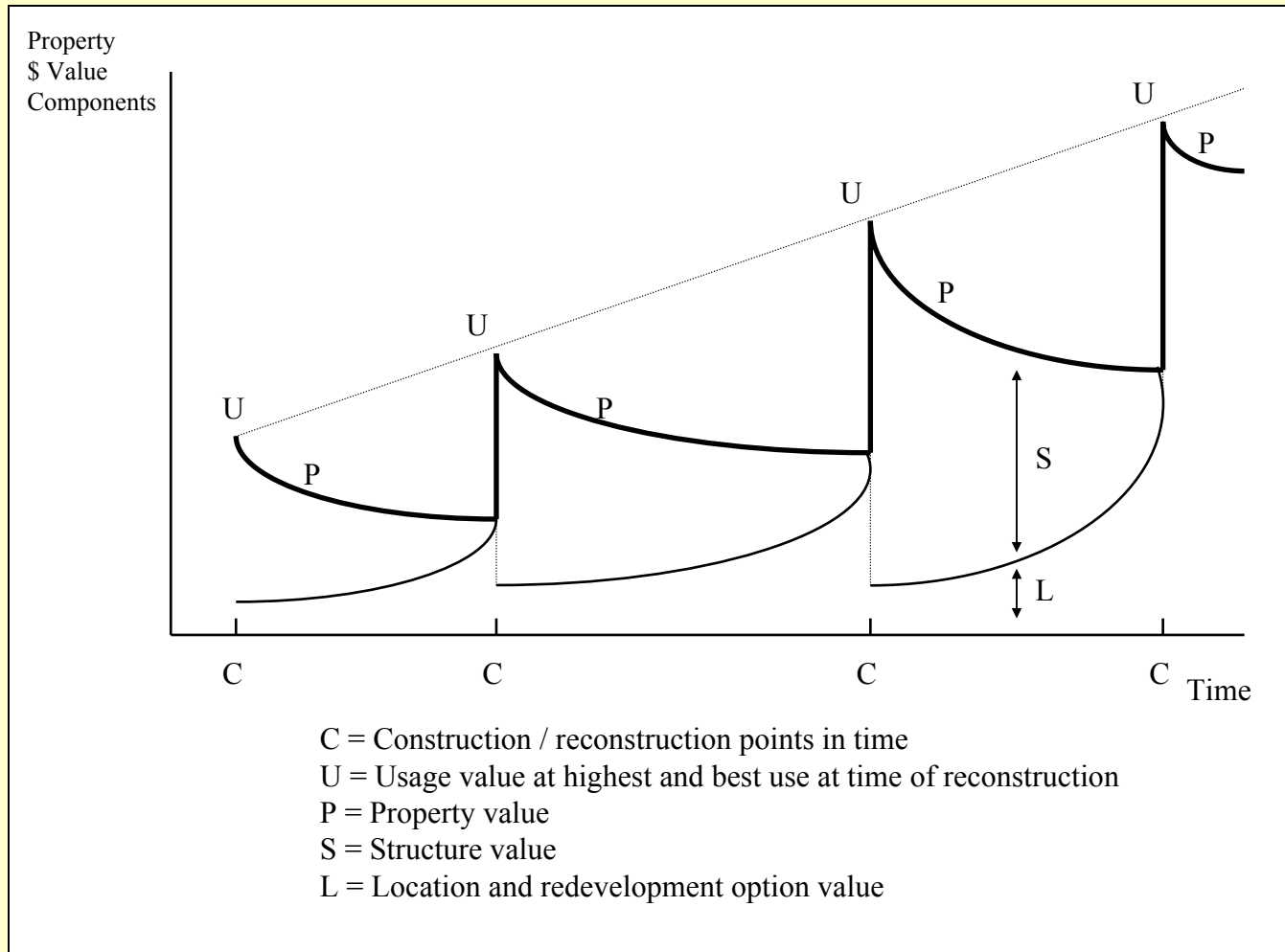
*When will major growth in land value occur?...*

*What are the implications for how common will be (and for the conditions underlying) large capital gains for real estate investors?...*

## 5.4 Property Life Cycle & the Effect of Structural Depreciation

In addition to possible evolution of neighborhood HBU over time, each individual property will experience a *life cycle* related to the deterioration and rehabilitation (or redevelopment) of the *structure* on the site.

# Property Value = Land Value + Structure Value



# **The Depreciation Principle:**

*Real estate investment appreciation return (capital gain) is reflected by the change in “P” between reconstruction points in time (“C”), not by the change in land value or usage value of the site (the change in “U” or “L” values). Investment returns reflect the effect of real depreciation of the structure (the “S” value).*

## Example:

- What is the rate of *real depreciation* (per year) relative to the usage value (value of HBU as if vacant) of a property that gets redeveloped on average every 50 years, and in which the land cost typically equals 20% of the total development cost (land + construction) at the time of construction?...
- i.e., At point “C” in time:
  - $P_{OLD} = L_{OLD} = 0.2U = 0.2P_{NEW} ..$

Answer:

3.17%/Year real depreciation:

- $(1 - x)^{50} = 0.2 \rightarrow x = 1 - 0.2^{1/50}$

- $\rightarrow x = 0.0317$

- That is:  $(1 - 0.0316)^{50} = 0.2$ .



Suppose location value increases 2%/Yr in real terms. (In monocentric city model what could cause this?...)

Then with the above property life-cycle (structural depreciation), what would be the expected long-run average annual rate of ***appreciation*** in property value (“capital gain”) experienced by investors?...

Answer:

- Approximately  $2\% - 3.16\% \approx -1.2\%$ .

- More exact answer:

$$(1 + 0.02)(1 - 0.0316) - 1 = (1.02)(0.9684) - 1 \\ = 0.9878 - 1 = -0.0122 = -1.22\%/Yr.$$

- i.e., *negative* appreciation (positive *depreciation*), of 1.2% per year.

# ***Three causes (sources) of structure (building) depreciation...***

- (1) **Physical depreciation:**
  - *The structure physically “wears out”, costs more and more to operate and keep up, and/or gradually falls apart. Example: Roof leaks, foundation cracks, etc...*
- (2) **Functional depreciation:**
  - *The structure becomes more and more “out of date” in terms of the current needs and preferences of the market (potential users of the building). Example: Class A office buildings need atriums, fiber-optic cables, and satellite access instead of lobbies, copper wiring, and phone lines.*
- (3) **Economic depreciation:**
  - *The structure no longer serves the HBU of the site. Example: HBU (as if vacant) is now high-density apartment or condo, or commercial usage, instead of the single-family home that is on the site (and that was the HBU when the home was built).*

# Of the three forms of depreciation . . .

- *Physical* depreciation normally requires relatively **frequent, routine capital improvement expenditures** (small injections of capital at frequent “C” points).
- *Functional* depreciation can often (but not always) be mitigated by **less frequent, more major reconstruction or rehabilitation** of the existing structure (larger injections of capital at occasional “C” points).
- *Economic* depreciation usually (but not always) requires **demolition and complete redevelopment** of the site with a new structure (major injections of capital) at very infrequent points in time (infrequent “C” points), if ever.