



## Session Four: Land Use

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## What is land?

- ☞ *Land*, which first and foremost denotes space.
- ☞ Every human activity requires some elbowroom.
- ☞ The qualities of land include:
  - the topographic, structural, agricultural, and mineral properties of the site;
  - the climate; the availability of clean air and water; and finally
  - a host of immediate environmental characteristics such as quiet, privacy, aesthetic appearance, and so on.

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## Competition for use of land (1)

- ☞ Most land can be utilized by any of several activities.
- ☞ Even an uninhabitable and impassable swamp may have to be allocated between the competing claims of those who want to drain or fill it and those who want to preserve it as a wetland wildlife sanctuary.
- ☞ The normal multiplicity of possible uses means that in considering spatial patterns of land use, we can no longer think in terms of the individual location unit or of one specific activity but must move up to another level of analysis: that of the multi-activity area or *region*.

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## Competition for use of land (2)

- ☞ Competition for land plays an important locational role in areas where activities tend to concentrate for any reason.
- ☞ Locations having good soil, climate, and access to other areas, and areas suitable for agglomeration under the influence of local external economies are in demand.
- ☞ The price of land, which is our best measure of the intensity of demand and competition for land, varies with quality and access, and rises abruptly to high peaks in the urban areas.

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### Competition for use of land (3)

- ☞ There are activities that need large expanses of land in relation to value of output and are, at the same time, sensitive to transfer cost considerations—agriculture being the most important, though the same considerations apply to forestry and some types of outdoor recreation as well.
- ☞ These activities require so much space that although they do not effectively compete for urban land, their location patterns are strongly affected by competitive uses. Such activities are a second important area of application for land-use analysis.

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### Rent gradients and rent surfaces (1)

- ☞ There are countless reasons why an individual, firm, or institution will pay more for one site than for another.
- ☞ A site may be highly desirable because of its mineral resources, soil quality, water supply, climate, topography, agreeable surroundings, good *input-output access* (that is, access from input sources and to markets), supply of labor, supply of public services, prestige, and so on.
- ☞ In fact, the number of possible reasons for offering more for one site than for another is equal to the number of relevant location factors, less one (the price of the site).

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## Rent gradients and rent surfaces (2)

- ☛ For any particular activity, or kind of land use, there is a geographical pattern of site preference, represented by the amounts that practitioners of that activity would be willing to pay or "bid" for the use of each of the various sites.
- ☛ If we picture such a pattern, with the activity's *bid rent* (or *rent bid*) represented by height, we have a *rent surface*, with various hollows at the less useful sites and peaks at the more useful sites.
- ☛ A cross section of this surface, representing rent bids for sites along a specific route, is called a *rent gradient*.
- ☛ The rent surfaces and gradients will vary in their conformation according to the type of land use, and we shall see later how space can be allocated among alternative uses on the basis of their bids.

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## Interactivity competition for space (1)

- ☛ Although we have explained why any one activity can afford to pay a higher price for land in some locations (primarily, closer to market), and why that activity's intensity of land use shows a similar spatial pattern of variation, nothing has been said yet about land requirements as a factor influencing the *relative locations of different activities*.
- ☛ If we consider a number of different activities, all locationally oriented toward a common market point, a comparison of their respective rent gradients or rent surfaces will indicate which activity will win out in the competition for each location.

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## Interactivity competition for space (2)

- ☛ The foundations for a systematic understanding of the principles of land use were laid more than a century and a half ago by a scientifically minded North German estate owner named Johann Heinrich von Thünen.
- ☛ The most efficient spatial layout of the various crops and other land uses on his estate, and in the process developed a more general model or theory of how rural land uses should be arranged around a market town.
- ☛ The basic principle was that each piece of land should be devoted to the use in which it would yield the highest rent.

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## Interactivity competition for space (3)

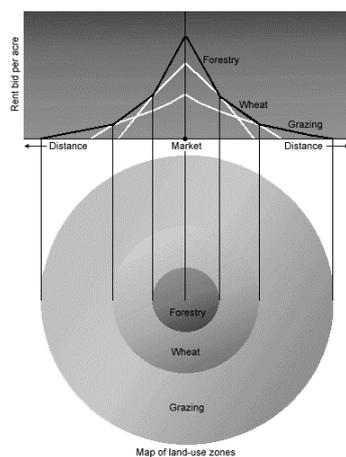


FIGURE 6-4: Hypothetical Rent Gradients and Land-Use Zones

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## Interactivity competition for space (4)

- ☛ In von Thünen's basic model (which assumes that each crop has the same delivered price and transfer rate, and a fixed intensity of land use regardless of location or rent), the rule for determining the position of a particular land use in the sequence is a simple one.
- ☛ The activity with the largest *amount of output per acre* has the steepest rent gradient and is located closest to the market, and the other activities follow according to their rank in per-acre output.
- ☛ The situation is not quite so simple, however, when we recognize that land-use intensity and output per acre can vary for any given activity; that the outputs of the different activities are transferred at different rates of transfer cost per ton-mile; and that the rent gradients themselves are characteristically curved rather than straight, so that conceivably any two of them might intersect twice rather than just once.

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## Interactivity competition for space (5)

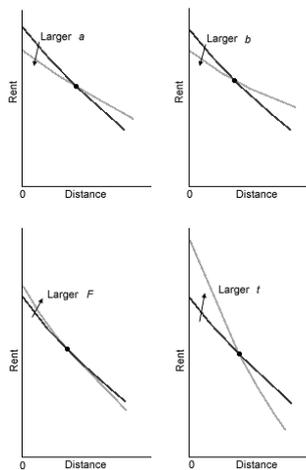


FIGURE 6-5: Effect of Production and Transfer Cost Characteristics on Rent Gradient Slopes (See Appendix 6-1 of this chapter for details)

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## Rural dan urban land use allocation (1)

- ☛ The general principles of land-use competition and location of space-using activities that we have developed thus far are relevant to the highly extensive rural land uses to which this theory was originally addressed and also to the relatively microscale land-use patterns within urban areas.
- ☛ These principles can also be used to explain how land is allocated *between* rural and urban uses.

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## Rural dan urban land use allocation (2)

- ☛ In order to appreciate how these principles may be applied in a rural/urban context, it is only necessary to realize that the activities which compose an urban area have assumed relatively central locations because they have been successful in bidding that land away from competing uses.
- ☛ As in the preceding discussion of land-use competition among rural activities, our explanation of this outcome rests on identifying the *transfer* and *production* characteristics that cause urban land users to place high value on access considerations

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### Rural dan urban land use allocation (3)

- ☛ One special feature of activity in urban areas is the important role played by the *movement of people* and the necessity of direct and regular *face-to-face contact* in location decisions.
- ☛ A crucial function of cities is to enable large numbers of people to make contact easily and frequently—for work, consultation, buying and selling, negotiation, instruction, and other purposes. People are more expensive to transport than almost anything else, mainly because their time is so valuable.
- ☛ Accordingly, intracity locations are governed by powerful linkage attractions operating over short distances and emphasizing speed of travel.

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### Rural dan urban land use allocation (4)

- ☛ The production and transfer characteristics of activities that occupy urban areas thus enable them to use land intensively and to bid high rents for central locations.
- ☛ We now have some explanation of the sequence in which we could expect different activities to arrange themselves around a common focal point, such as a market or central business district. However, we have yet to examine the factors that contribute to the width of an activity's zone, and consequently our analysis of factors that might affect the allocation of land among uses is incomplete.

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## Rural and urban land use allocation (5)

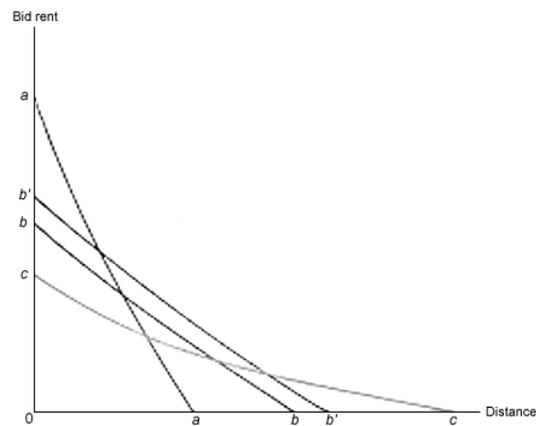


FIGURE 6-7: An Increase in Demand and Land-Use Conversion

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## Residential location (1)

- ☛ One of the first and most widely recognized efforts to explain residential location behavior is that of William Alonso.
- ☛ Alonso applies the concept of bid rent in order to isolate factors that contribute to the household's willingness to pay for access to the *central business district (CBD)* of an urban area.
- ☛ Bid rents have been defined as the maximum rent that could be paid for an acre of land at a given distance from the market center, if the activity in question is to make normal profits.
- ☛ Here, however, we want to analyze *residential* location behavior, so the concept of profits is no longer relevant to the decision-making process.
- ☛ Instead, Alonso recognizes that households make choices among alternative locations based on the utility or satisfaction that they expect to realize..

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## Residential location (2)

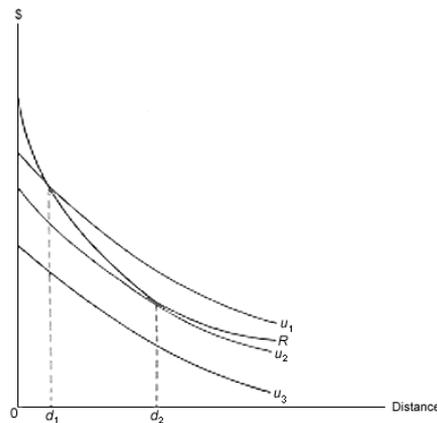


FIGURE 6-8: Bid Rent Curves and Residential Location

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## Residential location (3)

- ☛ These curves have several important characteristics. First, they are *negatively* inclined. As developed earlier in this chapter, the rent gradient of a particular activity plots out decreasing rent bids as distance from the market increases because of transfer costs.
- ☛ Household rent bids are similarly affected by transfer considerations. An individual facing a daily commute to the CBD for work or shopping, or both, must pay lower rents in order to offset the associated transfer costs of a longer trip, if utility is to be held constant.
- ☛ Second, *lower* bid rent curves are associated with *greater* utility. Assuming that the household's budget is fixed, at any given distance from the CBD, if a lower rent bid is accepted, more other goods can be consumed. Therefore, utility will increase.
- ☛ Finally, bid rent curves are *single valued*. This means that for a given distance from the CBD only one rent bid is associated with each level of utility. By implication, we may state that bid rent curves cannot intersect; otherwise they could not be single valued

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## Rent and land value (1)

- Our discussion of rents and competition for land has placed almost exclusive emphasis on the *location* of a site (relative to markets and sources of inputs) as an index of its value.
- Location has determined how much rent any particular activity can afford to pay for the use of a site; the purchase price has been explained as simply the capitalized value of the expected stream of future rents. At this point we need to recognize some significant complications that have until now been ignored.

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## Rent and land value (2)

- First, the expected future returns on a parcel of land may sometimes be quite different from current returns, particularly in locations where radical changes of use are taking place or expected. This is generally true around the fringes of urban areas, where the change involves conversion from farm to urban uses. The price that anyone will pay for the current use of the land may be quite low in relation to the speculative value based on a capitalization of expected returns in a new use.

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## Rent and land value (3)

TABLE 6-1: Acreage, Rent per Acre, and Value per Acre of Farms,  
by Distance from Louisville, Kentucky

	Distance from Louisville (Miles)			
	8 or Less	9 to 11	12 to 14	15 or More
(1) Average acres per farm	102	221	256	257
(2) Land rent per acre (\$ per annum)	11.85	5.59	5.37	4.66
(3) Land value per acre (\$)	312	110	106	95
(4) Capitalization rate (%) (2)/(3)	3.8	5.1	5.1	4.9
(5) Rent per farm per annum (\$) (1) x (2)	1210	1235	1430	1295

Source: J. H. Arnold and Frank Montgomery, *Influence of a City on Farming*, Bulletin 678 (Washington, D.C.: U.S. Department of Agriculture, 1918).

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## Rent and land value (4)

- ☛ *A further complication is that land is ordinarily priced, sold, and taxed in combination with whatever buildings and other "improvements" have been erected on it, since such structures are usually durable and difficult (if not impossible) to move.*
- ☛ *On urban land, improvements may account for a major part of the value of the parcel of real estate; and in all cases it is probably difficult to estimate just how much of the price represents the value of space per se, or "site value."*
- ☛ *Sometimes the "improvements" have a negative value: In other words, the land would be more desirable if it were cleared of its obsolete structures.*

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