

## Urban Economics

Prof. J. M. Pogodzinski  
Lecture 9

### Chapter 6

#### Land Rent: Introduction

- Smith, 1776. Value determined by cost of production. Land not produced, how is value determined? (Marx continued the tradition.)
- Ricardo, 1821. Agricultural theory of land rent. Land is another factor of production. Rents determined by fertility of soil.
- Von Thunen, 1826. Still agricultural, but rent determined by access to market.
- Alonso, 1964. Theory of urban land rent, determined by access to workplace. Adapted from Von Thunen.

#### Land Rent or Land Value?

- Most models are static. Rents do not change over time.

In general, 
$$Value = \sum_{t=0}^n \left\{ \frac{R_t}{(1+i)^t} \right\}$$

- In equilibrium:  $t$  is infinite

$$Value = \sum_{t=0}^{\infty} \left\{ \frac{R}{(1+i)^t} \right\} = \frac{R}{i}$$

### Excel Examples – Present Value (see Excel\_Examples.xls)

r=	0.1	
Year	Cost/net return	Present Value
0	-\$1,000.00	-\$1,000.00
1	\$210.00	\$190.91
2	\$210.00	\$173.55
3	\$210.00	\$157.78
4	\$210.00	\$143.43
5	\$210.00	\$130.39
	50	-\$203.93
IRR=	1.6487%	

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### Ricardo, Land Rent and Soil Fertility

- Corn Laws introduced in England in 1815 when prices dropped after Napoleonic Wars. Tariffs on imported corn (wheat). Farmers were no better off than before, why?
- Answer: increase in corn prices increased land rents, raised the value of land. Land rent goes up by the amount that assures that farmers – who rented land in England – continued to get zero profits. Only landowners gained.

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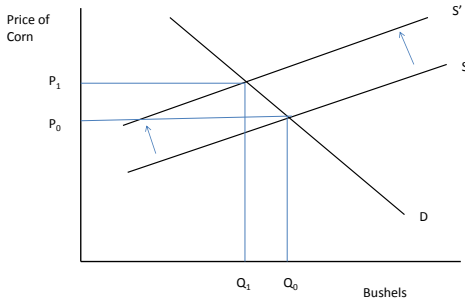
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### Tariff Raises Corn Prices




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## Ricardian Land Rent Model

- ❑ Corn prices determined in national market; taken as given by farmers. Price the same everywhere.
- ❑ Zero economic profit. Free entry into farming.
- ❑ Land varies in fertility
- ❑ Landowners rent land to the highest bidder
- ❑ Zero transport cost

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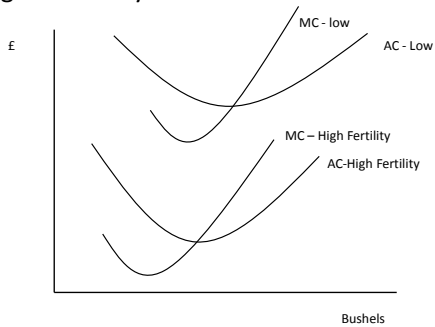
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### Higher Fertility Lowers Cost of Production




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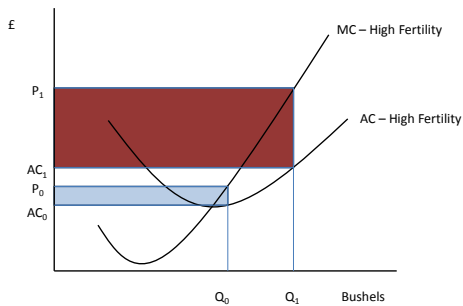
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### Higher Prices = Higher Land Rent




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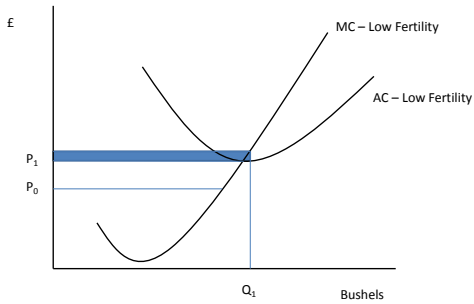
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Higher Prices = More Land Used in Production




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Leftover Principle

- In equilibrium, land rent equals the excess of total revenue over non-land costs – landowner gets the leftover
- Increase in price of corn increases land rent to the point where farmers again have zero profits
- Increase in price of corn brings more land into production
- Price of land is high because price of corn is high; high land prices don't cause high corn prices

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Who Gains from Tariffs?

- Not farmers – zero profits before and after
- Not consumers – they pay higher price for corn
- Landowners – paid higher rents; land increases in value

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## Von Thünen – Land Rent and Accessibility

- Corn is transported by farmer to central market town, farmer pays shipping cost
- All land is equally productive
- Price of corn and inputs is determined in national markets, so farmers take prices as given. Prices are the same in all locations.
- Free entry; zero profits in equilibrium.

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## No substitution between land and other inputs in production

- Fixed inputs – one acre of land with fixed number of other inputs produce  $Q$  bushels of corn
- $PQ$  = Revenue
- $C$  = costs of non-land inputs
- $R$  = land rent per acre (use one acre)
- $x$  = distance to market
- $t$  = cost of shipping one bushel one mile
- $tQx$  = transport cost

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## Bid-Rent Function

- The bid-rent function shows the maximum amount that will be paid for a unit of land at a given location
- Profit =  $PQ - C - tQx - R = 0$
- Bid-Rent Function:  $R = PQ - C - tQx$
- Land rent declines with distance to marketplace because farmers are willing to pay more for land with lower shipping costs.

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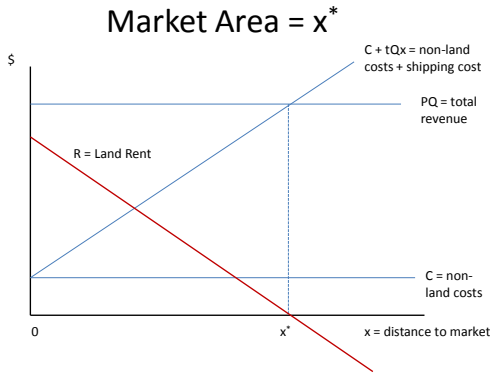
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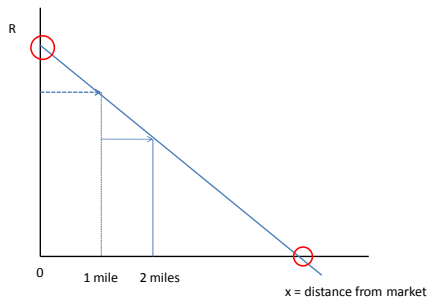
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**Bid-Rent Function Interpretation**




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**Bid-Rent Function with Substitution between Land and Other Inputs**

- L = Acres of Land
- Profit =  $PQ - C - tQx - RL$
- Bid-Rent Function =

$$R = \frac{PQ - C - tQx}{L} = \left( \frac{PQ - C}{L} \right) - \left( \frac{tQ}{L} \right) x$$

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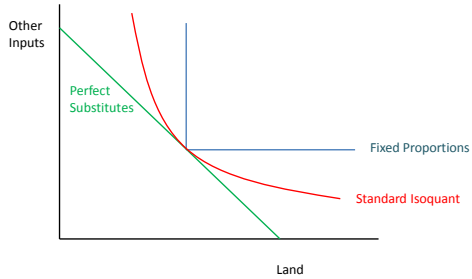
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### Substitution between Land and Other Inputs in Production




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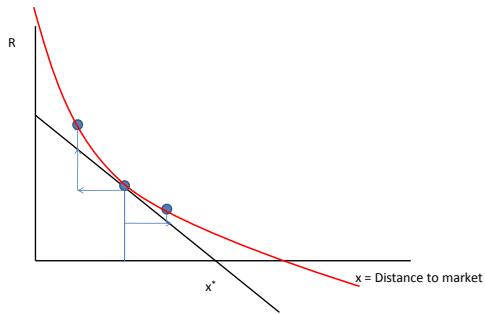
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### Effect of Substitution Possibilities on Bid-Rent Function




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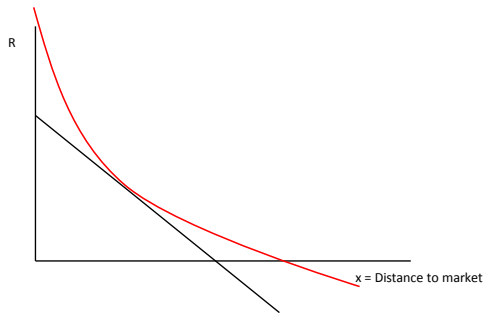
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### Effect of Substitution Possibilities on Bid-Rent Function



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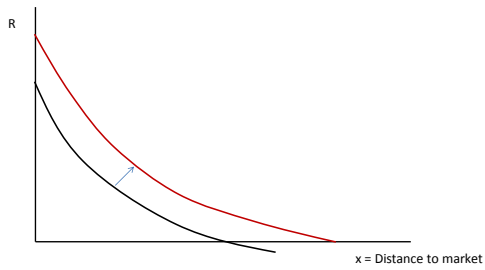
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### Increase in Output Price (P) or Decline in Other Input Cost (C)



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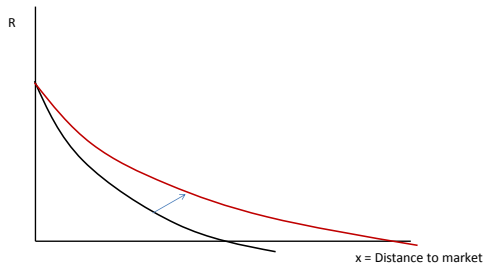
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### Decrease in Shipping Cost (t)



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