

Agricultural Economics

Background Economic Theory

How do we measure wellbeing (welfare) in economics?

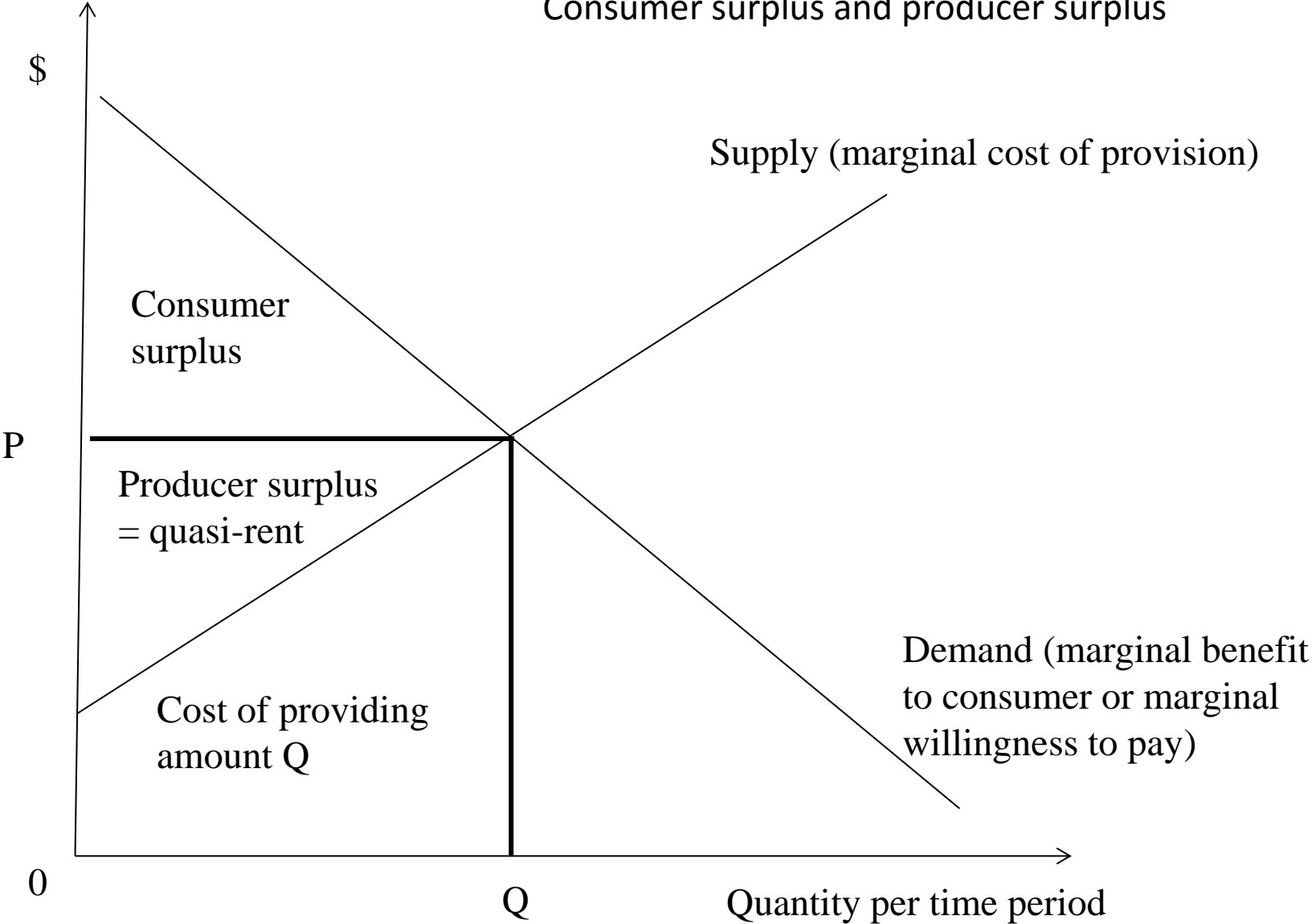
Answer: As a **surplus**.

- **Surplus** is the difference between the benefits that people receive and what it costs to provide something (where costs include environmental spillovers, non-monetary costs, etc.).
- A good, service or amenity should be provided as long as the benefit exceeds the costs at the margin.

Four Measures of Surplus for Policy Analysis

1. Consumer Surplus (CS) = Total willingness to pay (TWP) for good or service minus what is actually paid.
 - TWP is area under demand curve up to amount consumed
 - CS is area under demand function but above price
2. Producer Surplus (PS) or Quasi-rent (QR) = Total revenue from sale of good or service minus cost of providing the good or service
 - PS is area above the (some-factors-fixed) supply curve but below price
 - QR = total revenue minus total **variable** costs

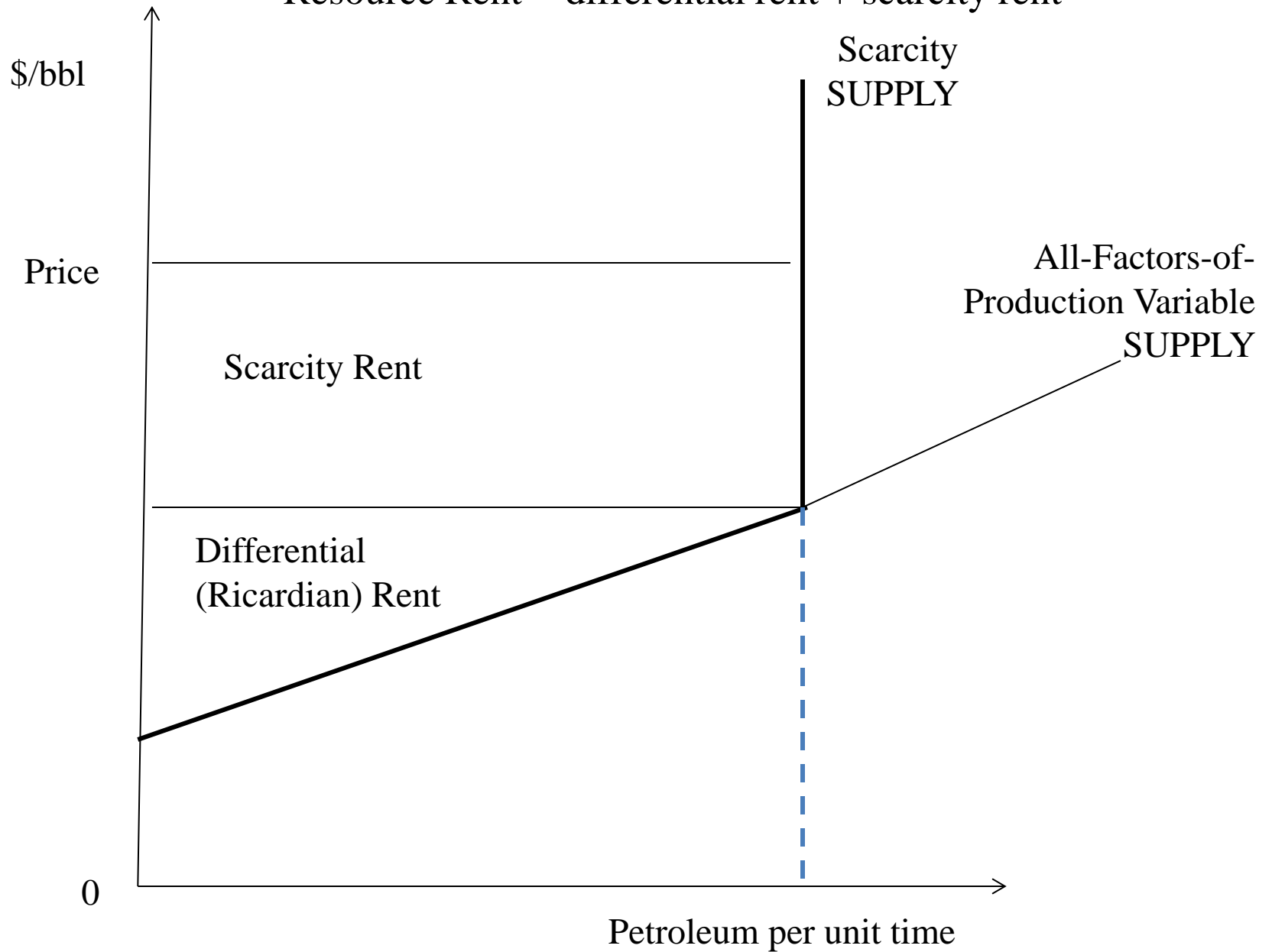
Consumer surplus and producer surplus



Four Measures of Surplus (cont)

3. Resource rent = Differential (Ricardian) rent plus scarcity rent.
 - Differential rent is area above the **all-factors-variable** supply curve and below the marginal cost of producing the marginal (or last) unit
 - Scarcity rent is due to resource scarcity and is the area below market price but above the marginal cost of producing the last unit
4. Indirect costs or benefits
 - Costs/benefits in related (affected) markets that are distorted because $P > MC$
 - Resulting from externalities for which markets do not exist or are incomplete (e.g., environment) and often need to be measured using non-market valuation methods.

$$\text{Resource Rent} = \text{differential rent} + \text{scarcity rent}$$



We return to resource rents below

How do we measure surplus?

- Consumer surplus (S) is the usual measure, but there are 'better' measures → consumer surplus is only an approximate measure
- Four measures (identified by John Hicks):
 1. Compensating variation (CV)
 2. Compensating surplus (CS)
 3. Equivalent variation (EV)
 4. Equivalent surplus (ES)

Compensating vs Equivalent Surplus vs Consumer Surplus

- Consumer surplus is the area under an ordinary (Marshallian) demand curve minus price \times quantity
- CV and EV are measured as the area under a compensated (Hicksian) demand curve

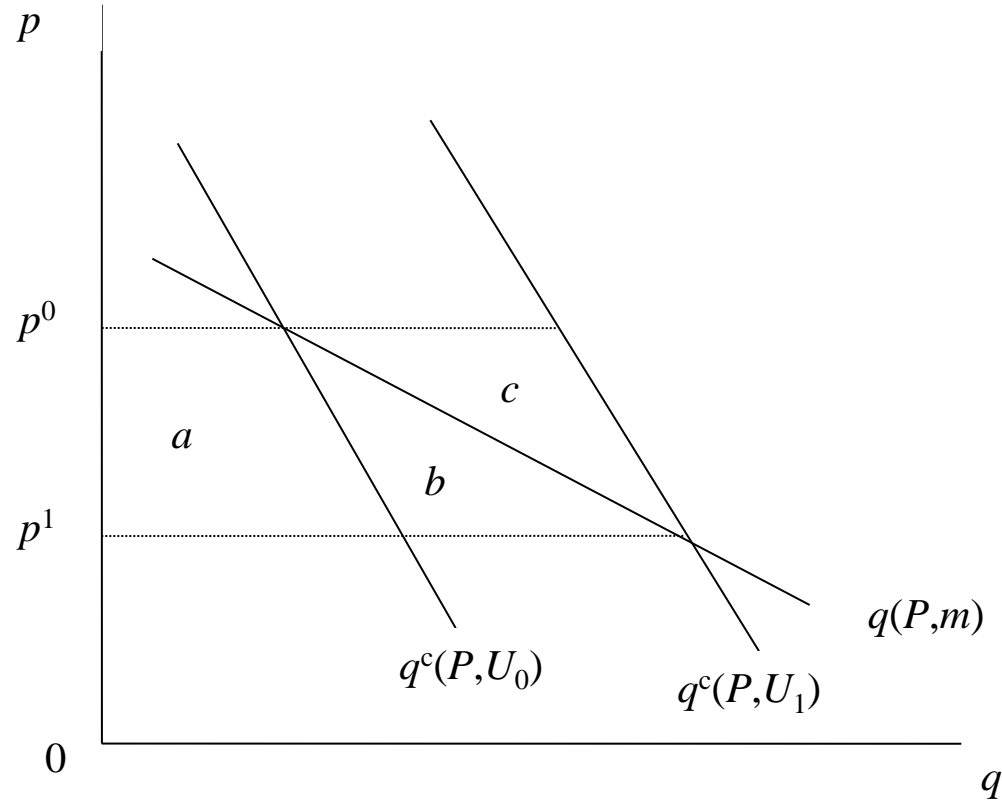
Compensating Variation

- CV uses new prices as the base and asks: What income change is needed to make a person as well off with the change as they would be if the change never occurred?
- It is the maximum amount a person is willing to pay for the change, or the minimum compensation needed to permit the change, so as to leave the individual as well off in the new situation as she was in the old one.

Equivalent Variation

- Uses current prices as base and asks: What income change is needed to make a person as well off without the change as they would be if the change did indeed take place?
- The minimum amount of compensation an individual is willing to receive, or the maximum amount she is willing to pay, to forgo a move from the initial to the final situation. The objective is to leave them as well off in the original situation as they would be had the change occurred.

Comparing CV, S and EV



For Price decline:

CV = area a

S = area $(a+b)$

EV = area $(a+b+c)$

$CV \leq S \leq EV$

For Price rise:

EV = area a

S = area $(a+b)$

CV = area $(a+b+c)$

$EV \leq S \leq CV$

Compensating & equivalent surpluses

Two points for nonmarket valuation:

1. The compensating surplus is the maximum amount a person would be willing to pay (WTP) for the increase in the availability of the public good, G .
2. The equivalent surplus is the minimum amount a person would be willing to accept (WTA) as compensation to forgo the increase in the availability of the public good, G .

Compensating & equivalent surpluses are used in nonmarket valuation

- The objective of nonmarket valuation is to design appropriate questionnaires and econometric tools that enable us to elicit maximum WTP or minimum WTA compensation.
- The point is: WTP and WTA are grounded in welfare measurement – namely, in Hicksian notions of welfare measurement as areas under compensated demand functions.
- Environmental Economics examines how we get a compensated demand function for public goods

Producer Surplus

Let $TR = p q$ = total revenue

TC = total costs

TVC = total variable costs

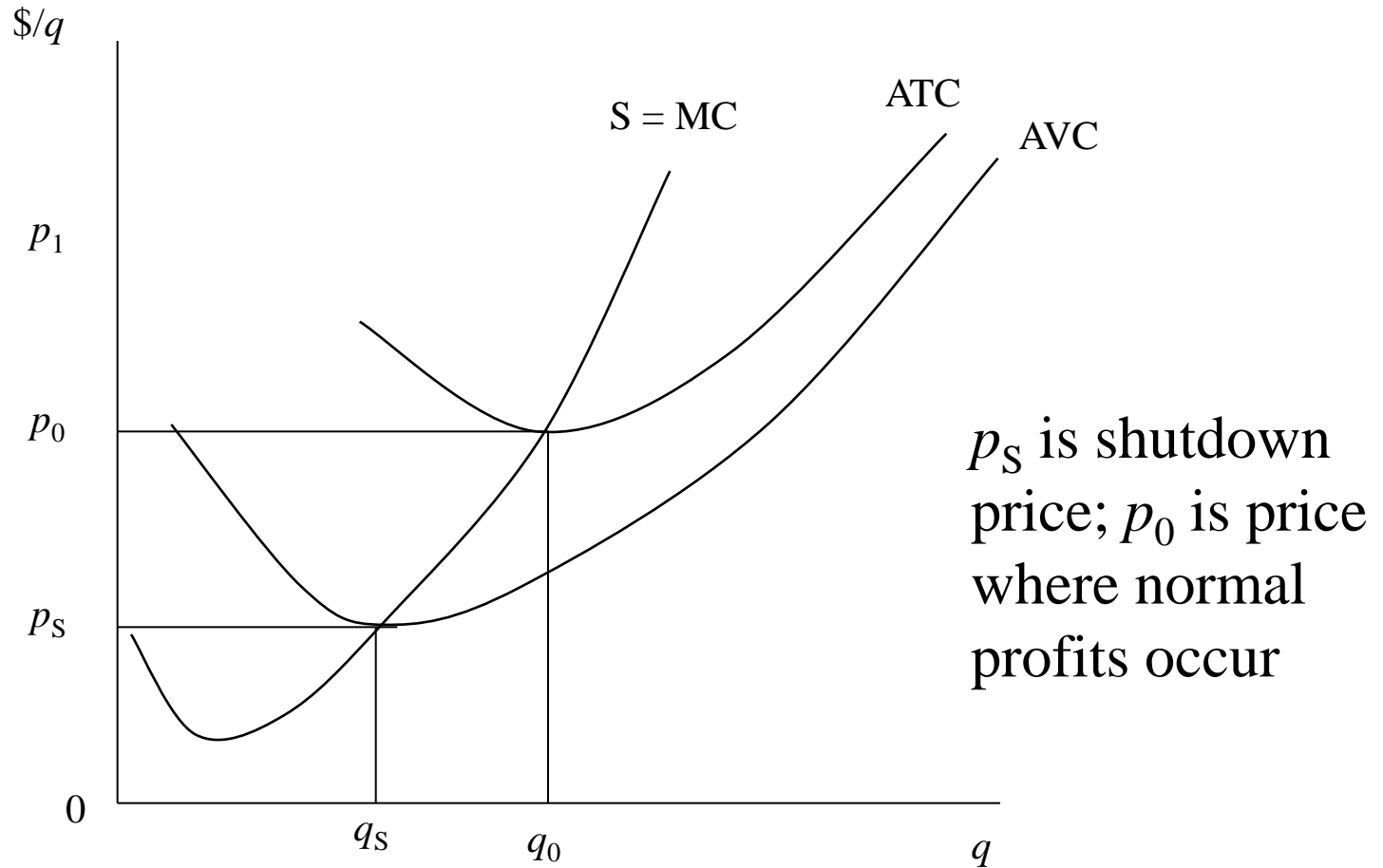
FC = fixed costs

AVC = average variable costs

ATC = average total costs

MC = marginal costs

Producer Surplus (cont)



Producer Surplus (cont)

- As long as $p > p_S$, the firm earns returns to the fixed factors
- Define:

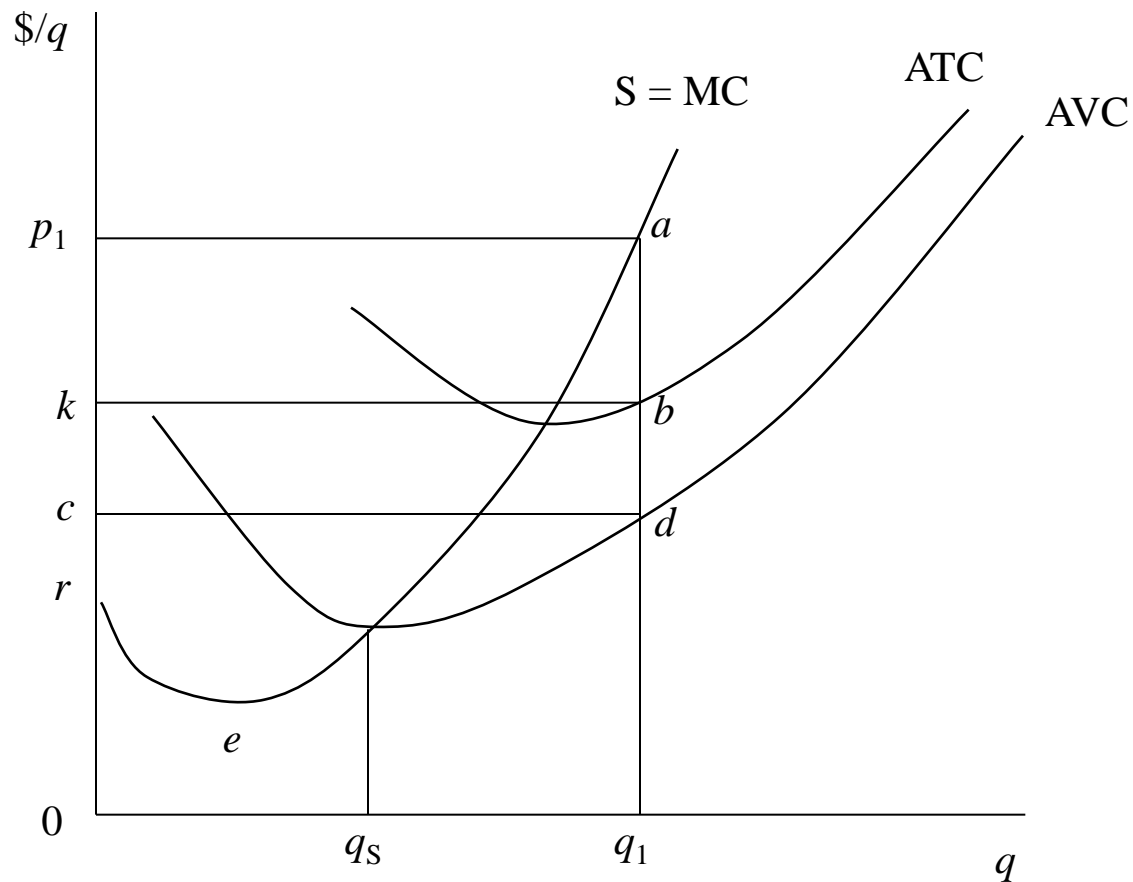
$$\text{Pure profit} = \pi = \text{TR} - \text{TC}$$

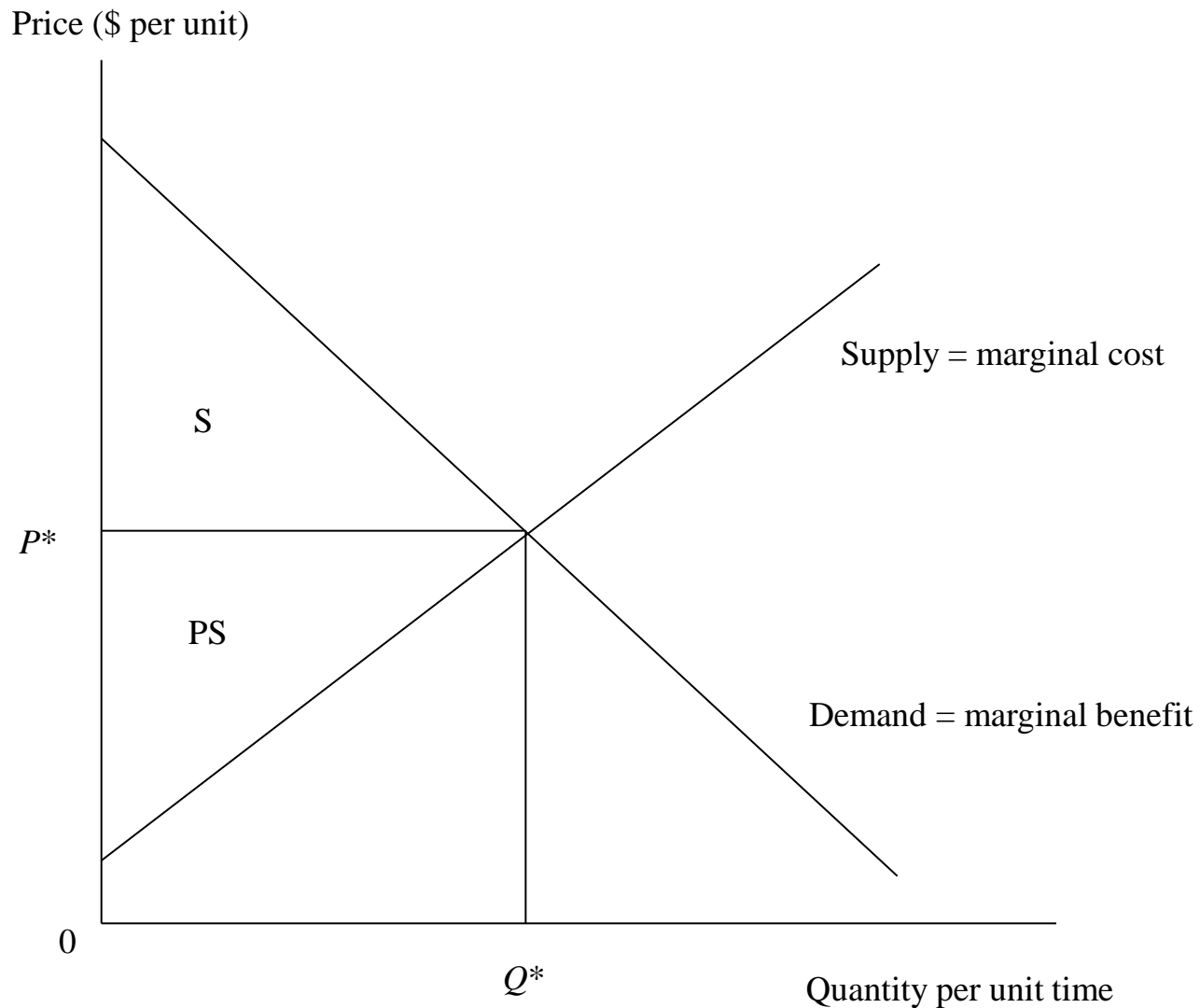
$$\begin{aligned}\text{Quasi-rent (QR)} &= \text{TR} - \text{TVC} \\ &= \pi + \text{TFC} \\ &= \text{producer surplus (PS)}\end{aligned}$$

$$QR \text{ (at } p_1) = TR - TVC = \pi + TFC$$

$$\pi = \text{area } (p_1abk) \text{ and } TFC = \text{area } (k b d c)$$

$$\rightarrow QR = \text{area}(p_1adc) = \text{area } (p_1aer) = PS$$





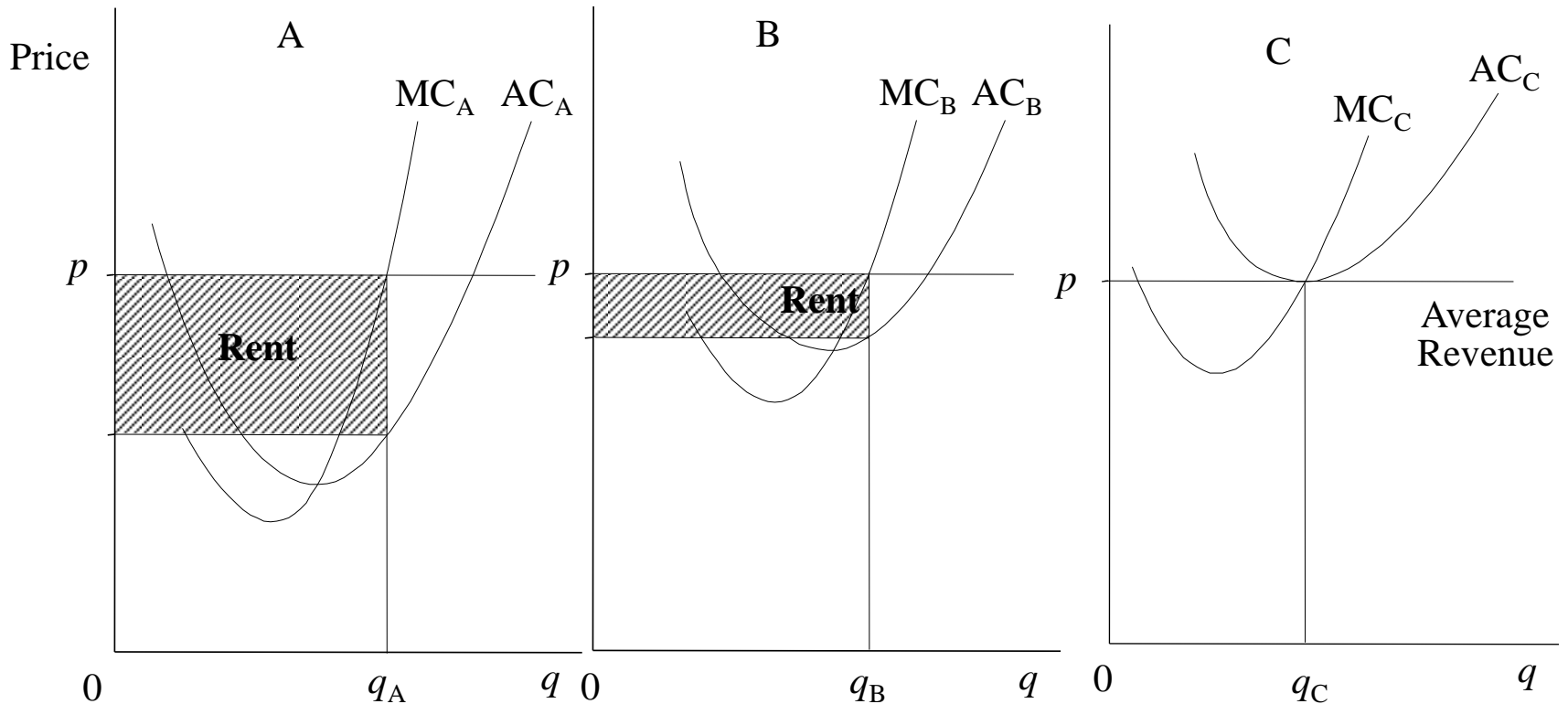
Back to this diagram, with S approximating either EV or CV (or CS or ES) – Willig's argument

Two types of rent

1. Differential rent or Ricardian rent (Ricardo 1817)
2. Scarcity rent that results because land or the natural resource is scarce.*

* Scarcity rent can sometimes be created by humans simply by restricting access of one form or another. We discuss this in the case of marketing boards, but the U.S.-Canada softwood lumber trade is another example.

Ricardian Land Rent: Land Quality



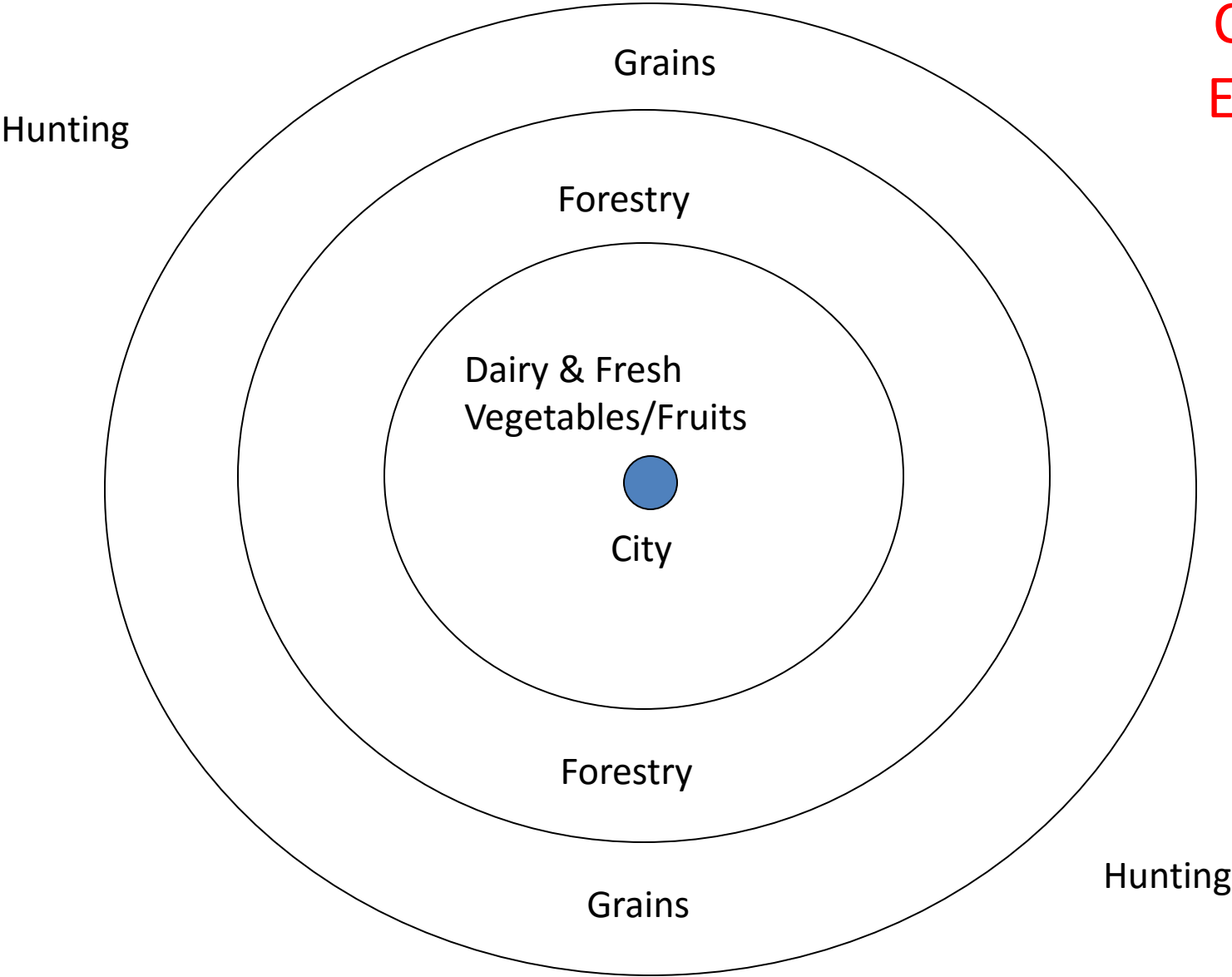
Three fields illustrating differential rent. The marginal field earns no differential rent, although this does not mean there is not a normal profit or even excess profit.

Von Thuenen Rent: Location

- Johann von Thuenen's (1840) critique of Ricardo based on observation that land in Germany was everywhere of approximately the same quality
- He observed circular patterns of land use around cities, as in the next diagram.
- Note that forestry is close to city because wood is needed for fuel.

Observed land-use pattern about cities in early 1800s

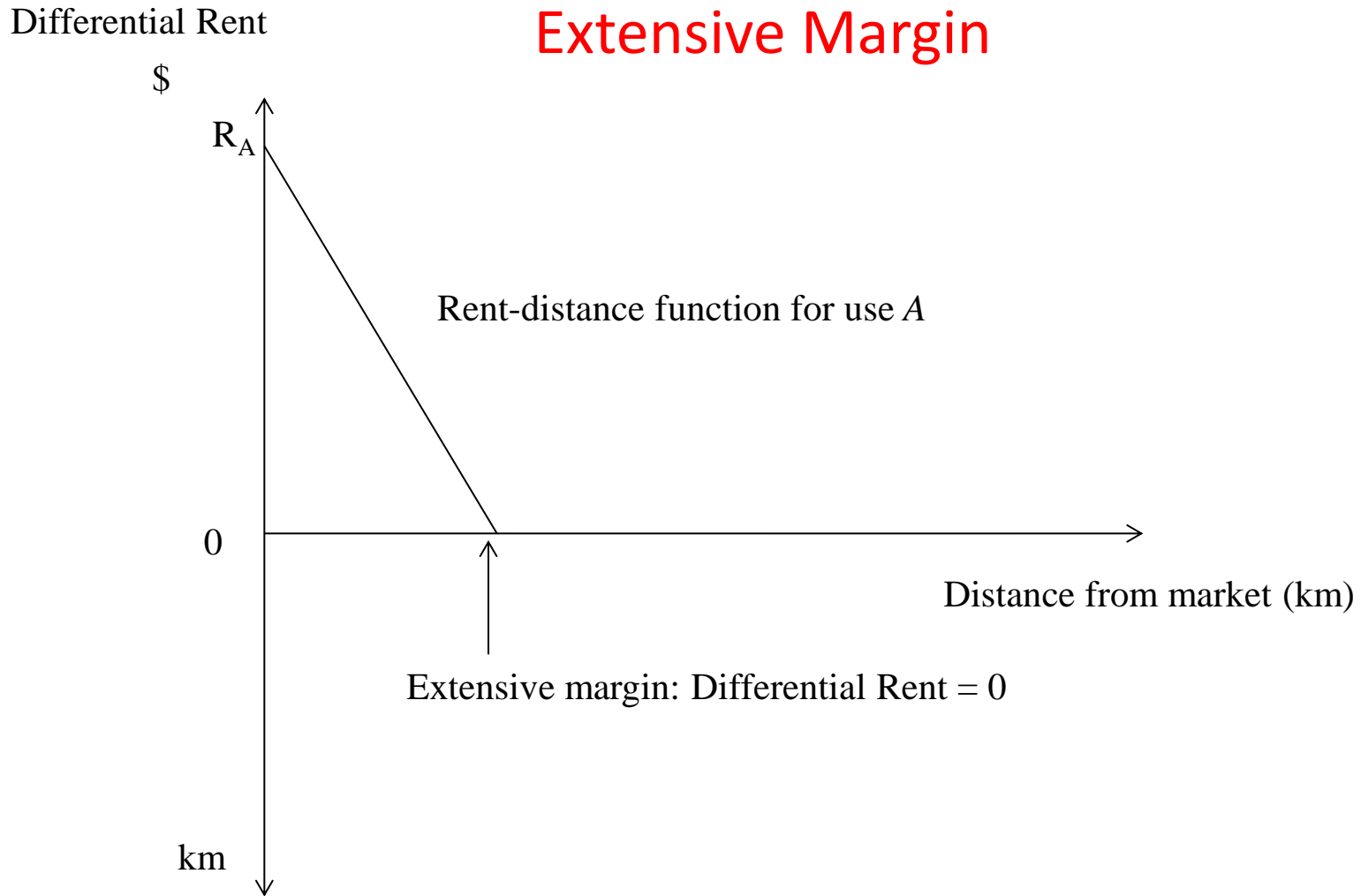
Central
Europe



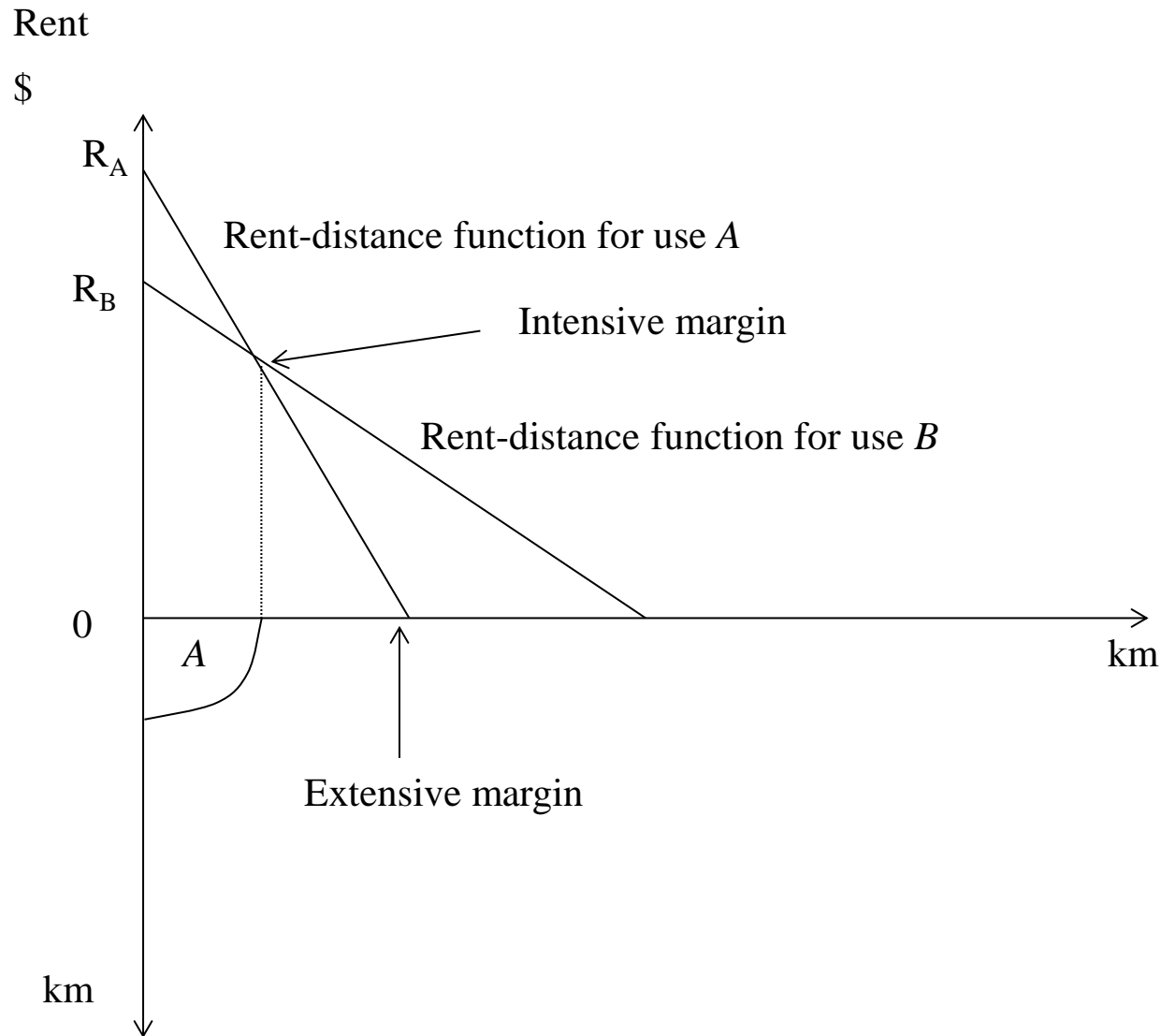
Von Thuenen Rent (cont)

- von Thuenen relied on rent-distance functions to explain the observed land-use pattern around a city
- Distinguishes extensive and intensive margins of land use

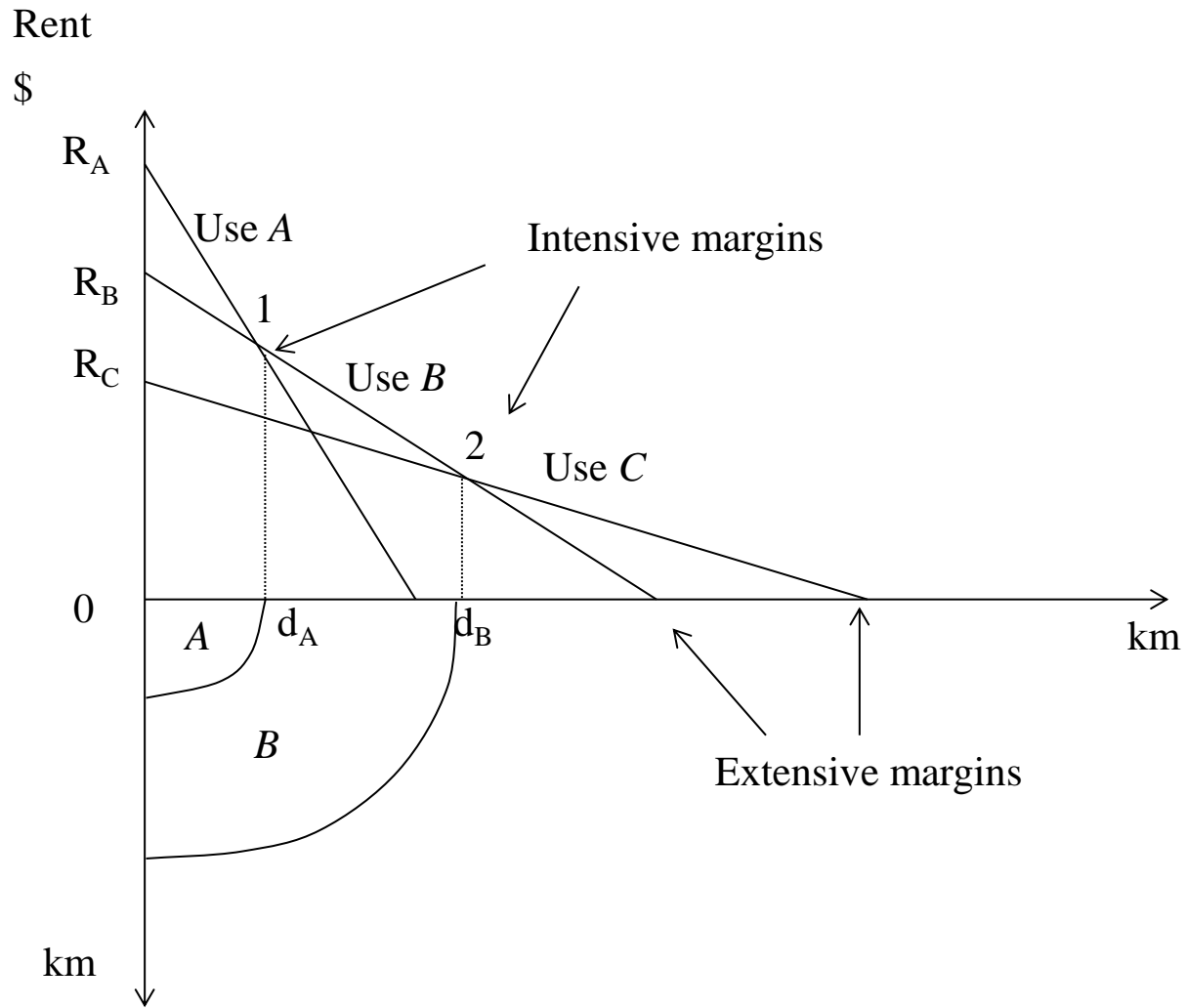
Rent-Distance Function and Extensive Margin

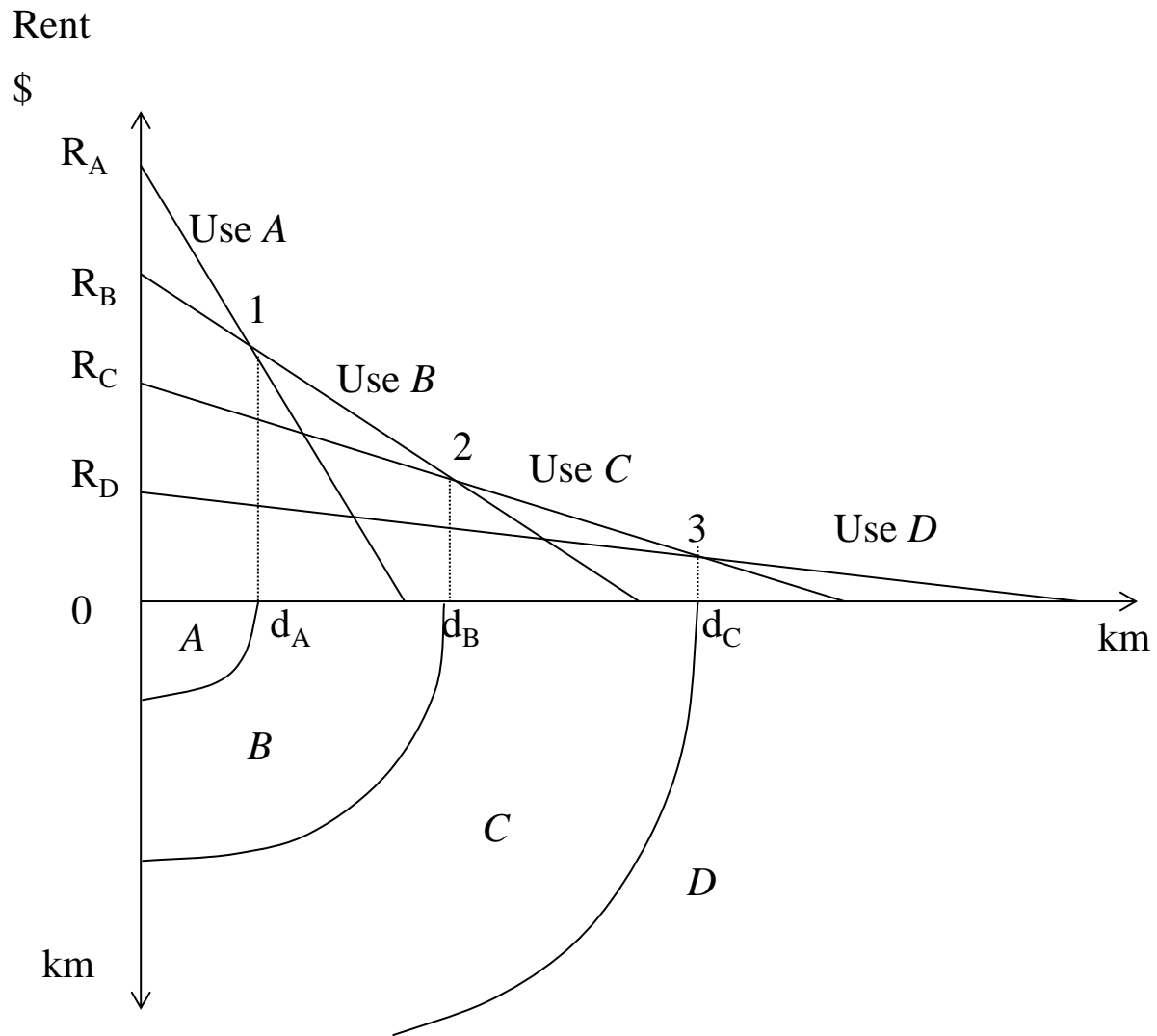


Not clear in previous Ricardian example whether the marginal field is at **extensive** or **intensive** margin.

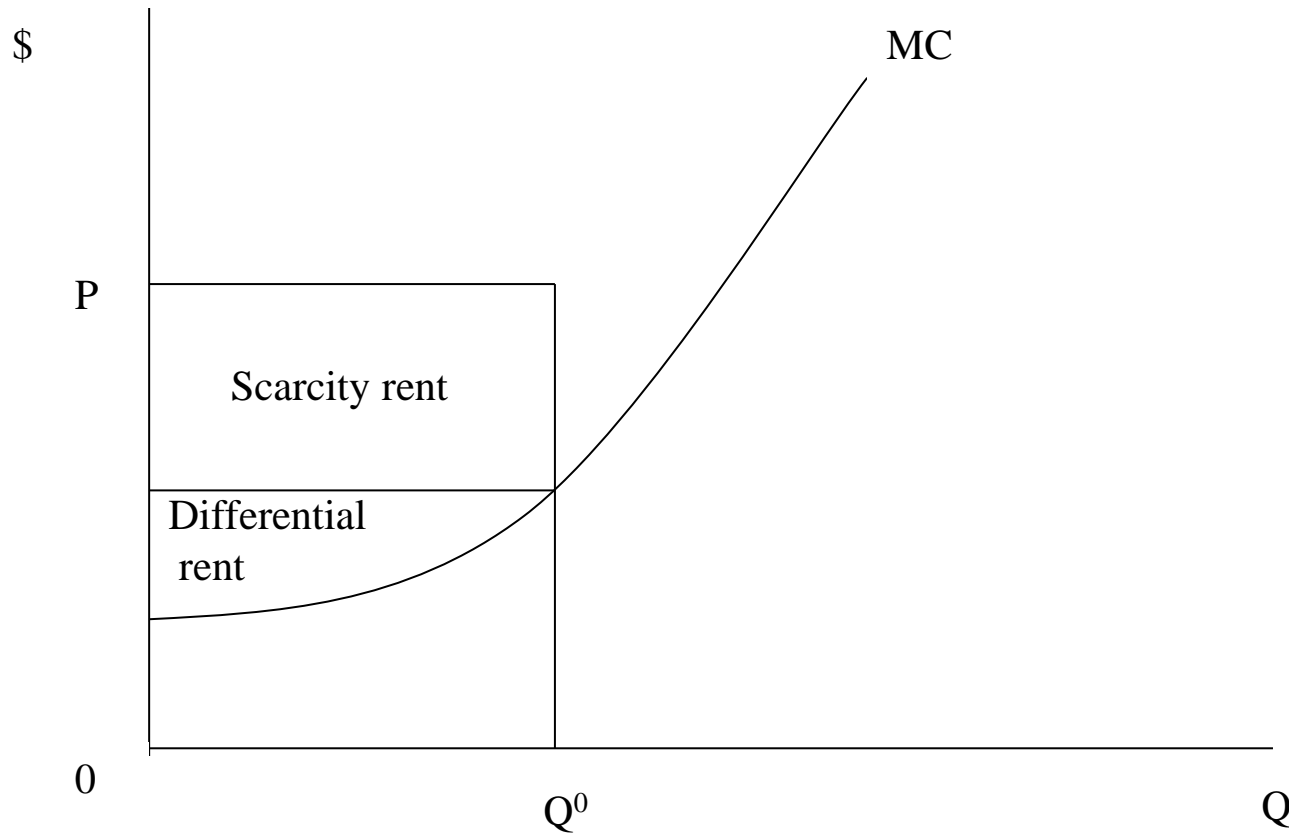


NOTE: It is possible for differential rent to be positive at the intensive margin (e.g., where land is marginal with respect to use A)





Scarcity Rent versus Differential Rent



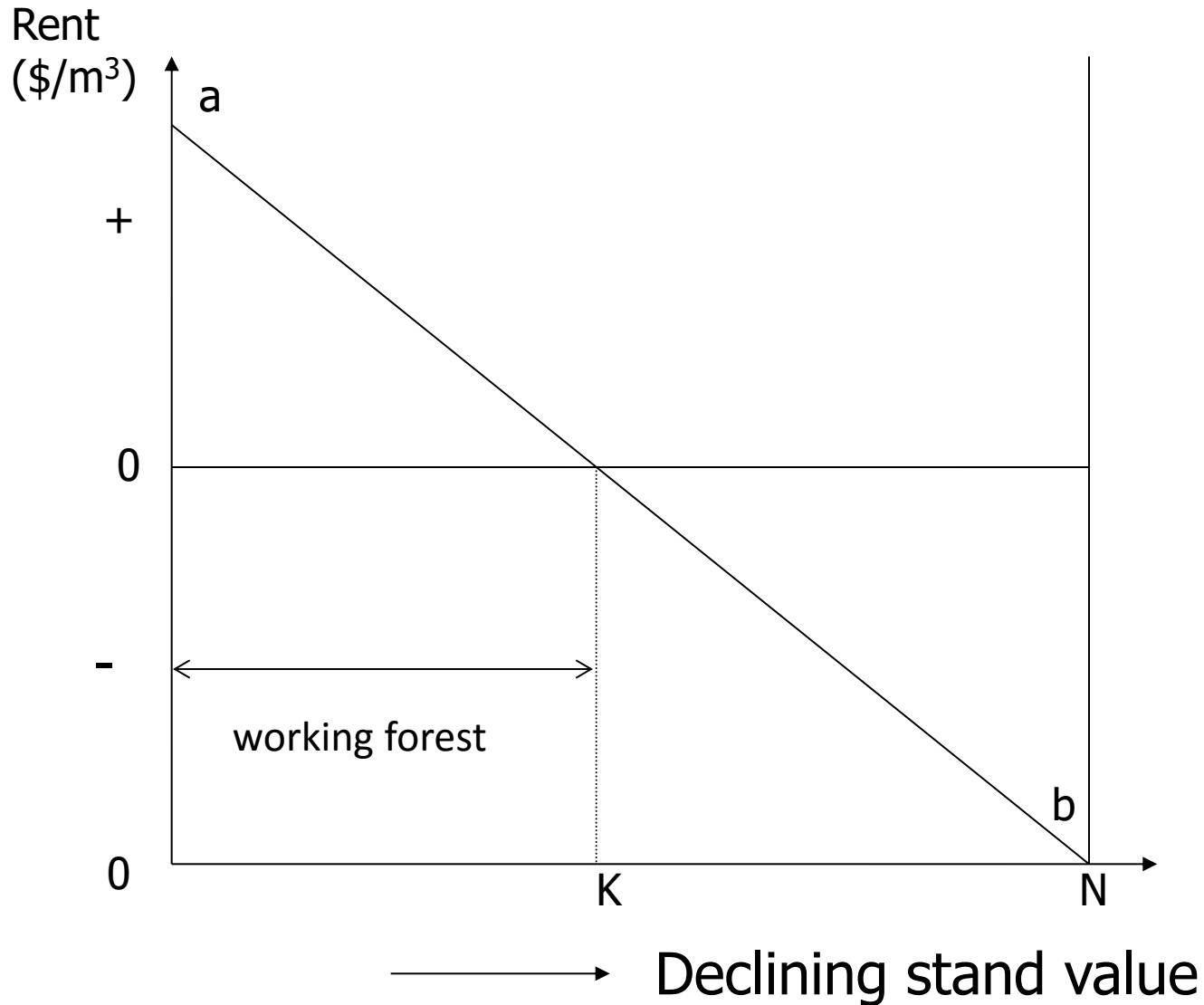
NOTE: MC includes ALL human factors of production; No human created factors are fixed, ALL are variable. Only the natural resource is fixed.

Type of rent	Definition	Implication for taxation
<p>Resource</p> <p><i>Scarcity</i></p>	<p>Sum of scarcity and differential rents</p> <p>Difference between marginal revenue and marginal production cost that can only come about as a result of the natural or policy-induced scarcity of a resource.</p>	<p>Taxation of rents does not affect behavior of firms or resource suppliers, assuming the rent capture mechanism itself does not distort behavior.</p>
<p><i>Ricardian/differential</i></p>	<p>The excess of the market value of non-marginal units of <i>in situ</i> resources over current scarcity rents.</p>	
<p>Quasi</p>	<p>Returns that accrue to resources supplied out of human and human-created capital, and which are not attributable to natural capital. Only for human factors of production do they equal the difference between total revenue and total variable cost.</p>	<p>Taxation of rents affects long-run efficient behavior of firms and resource suppliers.</p>

Forest Rents: Two types

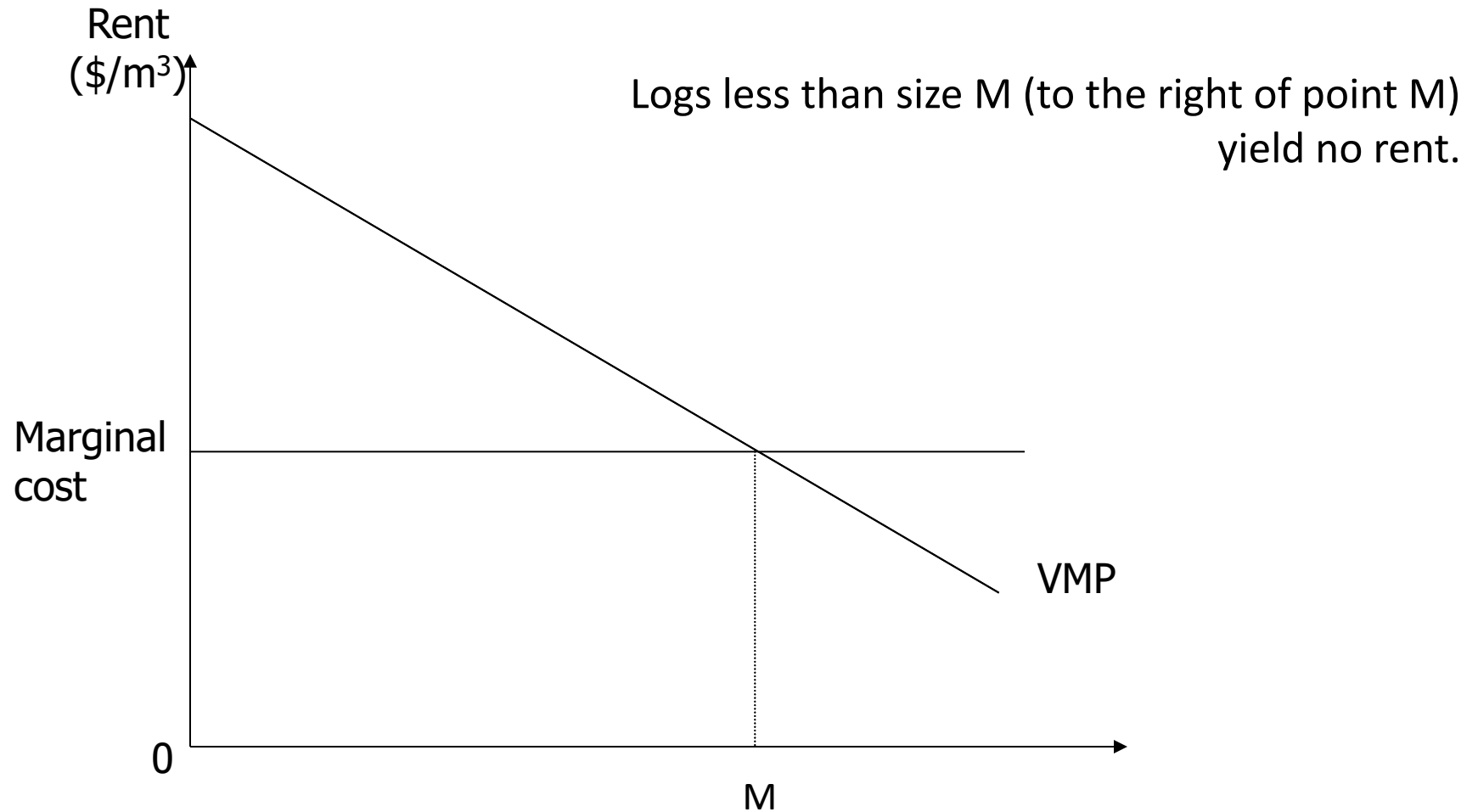
1. Location: The extensive margin is the boundary between the 'working forest' and nature – in Sweden, working forest is >95%; in B.C. <60%.
2. On-site: It does not pay to remove all logs on a site. Timber companies will remove logs as long as what they will earn is at least as much as the cost of removing the log.

Rent due to Location: Extensive Margin



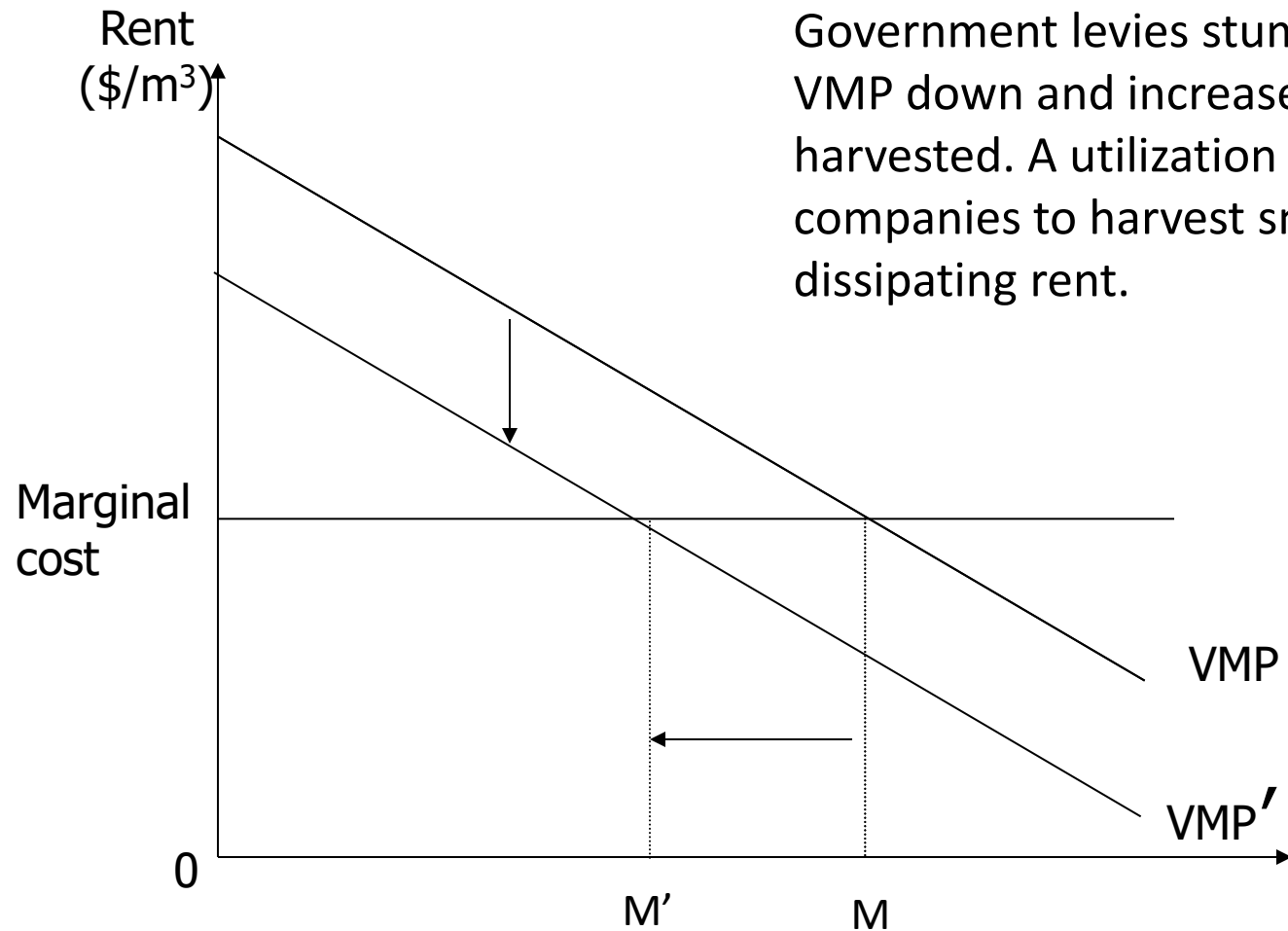
Number of stands = $0N$; Stands with positive rent = $0K$

Rent at the site: Intensive Margin



Logs arranged in decreasing size and value

Rent at the site: Intensive Margin (cont)



Government levies stumpage fee that shifts VMP down and increases size of logs harvested. A utilization standard can force companies to harvest small logs, thereby dissipating rent.

Logs arranged in decreasing size and value