MICROECONOMICS I.
B

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ELTE Faculty of Social Sciences, Department of Economics

Microeconomics I.
"B"

week 4
WORKING TOOLS, PART 2

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ELTE ECON

The course was prepaerd by Gergely Kőhegyi, using *Jack Hirshleifer, Amihai Glazer and David Hirshleifer (2009) Mikroökonómia. Budapest: Osiris Kiadó, ELTECON-books (henceforth HGH)*, and *Gábor Kertesi (ed.) (2004) Mikroökonómia előadásvázlatok. http://econ.core.hu/ kertesi/kertesimikro/ (henceforth KG)*.

1. Optimization
   - Total, average and marginal quantities
   - Relationship between quantities

Total, average and marginal quantities

- Sold quantity: Q
- Price: P
- Revenue: $R = PQ$
- Average revenue: $AR = \frac{R}{Q} = \frac{PQ}{Q} = P$
- Marginal revenue: $MR = \frac{\Delta R}{\Delta Q}$

Note

The Δ shows a small or unit change.

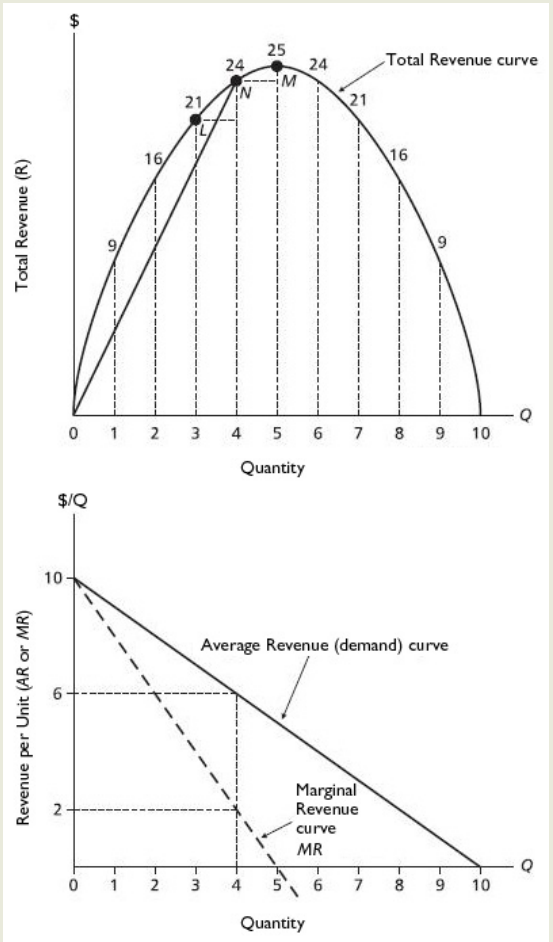
Total, average and marginal quantities (cont.)

Total, average, and marginal revenues

Quantity (Q)	Price or average revenue ($P = AR$)	Total revenue ($R = PQ$)	Marginal revenue (MR)
0	10	0	
			9
1	9	9	
			7
2	8	16	
			5
3	7	21	
			3
4	6	24	
			1
5	5	25	
			−1
6	4	24	
			−3
7	3	21	
			−5
8	2	16	
			−7
9	1	9	
			−9
10	0	0	

Total, average and marginal quantities (cont.)

The top graph shows the total revenue R, the bottom graph the average revenue AR and the marginal revenue MR. If $Q = 4$ then $R = 24$. The height of the AR curve equals the slope of the ON line on the top graph if $Q = 4$, that is $AR = R/Q = 24/4 = 6$. The height of the MR curve equals the slope of the total revenue curve. At $Q = 4$ we approximate it with the average of the two slopes of LN and NM.



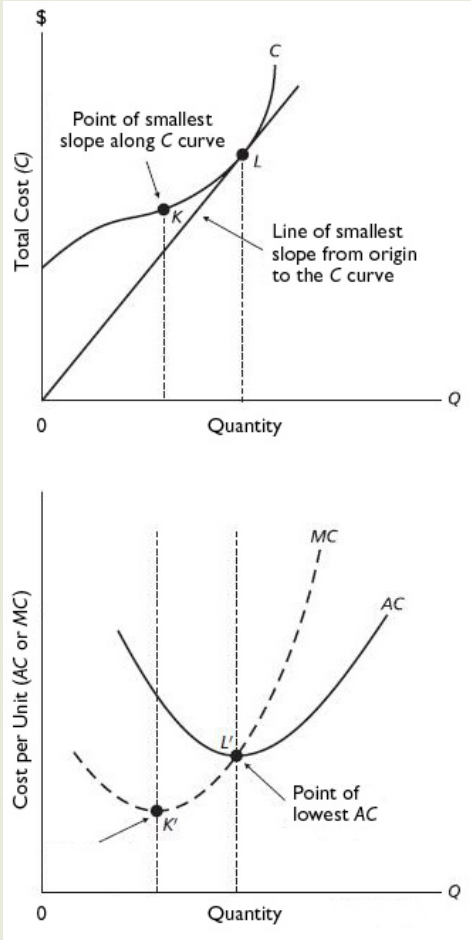
Total, average and marginal quantities (cont.)

Note

ATTENTION: total quantities (such as the total revenue on the upper part of the graph) should NEVER be depicted on the same graph with the average and marginal quantities (see bottom part of the graph)!!! Their measures are different. While the total units are measured in money (e.g. dollar) the average and marginal quantities are measured in dollar/unit.

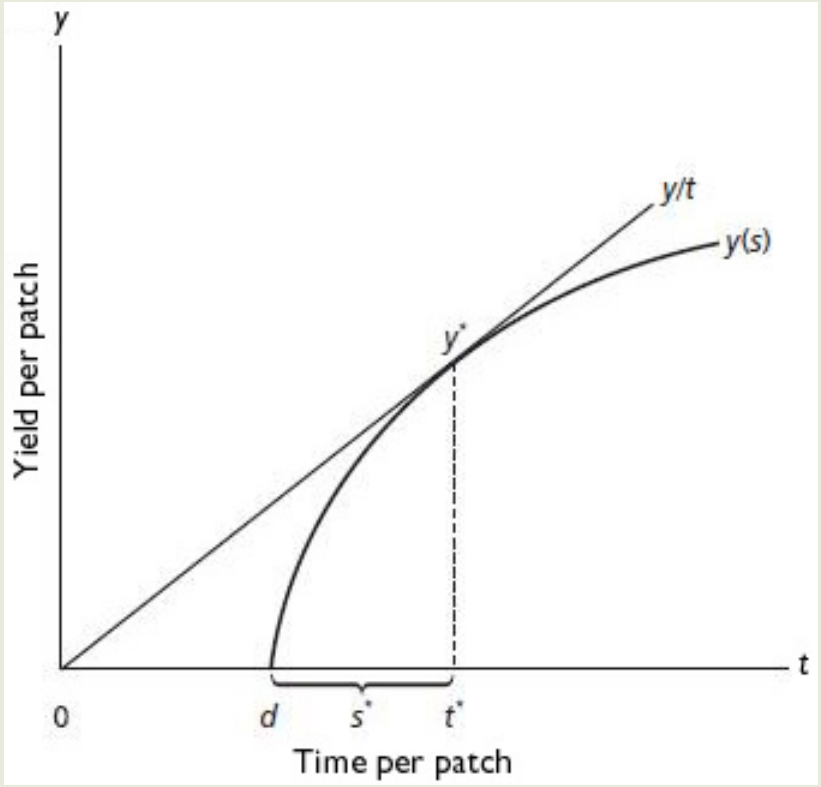
Total, average and marginal quantities (cont.)

The AC average cost function and MC marginal cost function can be deduced from C total cost function. At the quantity, where the slope of the total cost function is the smallest, the MC is minimal (K on the upper graph). Where the slope of the line drawn from the origin to the graph is the smallest, AC is minimal (L on the upper graph). Where AC is declining MC is below AC; where AC is increasing MC is above AC.



E.g. Foraging

The optimal stay time $s*$, at any single resource patch with yield, occurs when the marginal yield in the patch equals the average yield y/t taken over the entire period - dividing the yield per patch y by the overall time per patch t, where $t = d + s$.That is, the average time per patch includes not only the stay time s but the dead time d spent traveling from one patch to the next.



Discrete quantities

Note

If only discrete choices are possible, then the optimum quantity is where the marginal revenue is smaller than the marginal cost in the "next step", while the marginal revenue is larger than the marginal cost in the "earlier step".

Number of articles	Average salary gain (dollar)	Marginal salary gain (dollar)
1	543	543
5	295	191
10	227	153
15	194	120
20	174	109
25	160	100
30	149	93
35	150	49

Repeating the math

Let us assume that the relationship between x and y endogenous variables is described by $y = x^3 - 6x + x^2$ function. What are the x values where y is maximal/minimal? How large is y?

Relationship between the average and the marginal quantities

- The marginal value is the slope of the function of total quantity.
- The average value is the slope of the line drawn from the origin to the function of total quantity.

Statement

- *If total quantity is increasing the marginal quantity is positive. (frequent mistake!)*
- *If total quantity is decreasing the marginal quantity is negative.*
- *Where total quantity is minimal or maximal, marginal quantity is zero.*

Relationship between the average and the marginal quantities (cont.)

Statement

- *Where average quantity is decreasing, marginal quantity has to be under the average quantity.*
- *Where average quantity is increasing, marginal quantity has to be over the average quantity.*
- *Where average quantity is neither decreasing nor increasing (its minimal or maximal), marginal quantity equals average quantity.*