

Course: Foundations of Economics

Lecture 4: Costs and Production

Lecturer: Jamshid Normatov

Learning goals

- *Production theory*
- *Total physical product, average product, marginal product per labor*
- *Costs*
- *Fixed vs variable costs*
- *Total cost, average cost, marginal cost*



Source: www.dreamstime.com, royalty free photos

The Short-run Theory of Production

Short-run theory of production

- Profits and the aims of the firm
 - traditional and alternative theories of the firm
- Long-run and short-run production:
 - fixed and variable factors of production

- The law of diminishing returns

When increasing amounts of a variable factor are used with a given amount of a fixed factor, there will come a point when each extra unit of the variable factor will produce less extra output than the previous unit.

Short-run theory of production

- The short-run production function:
 - total physical product (TPP)
 - average physical product (APP)
 - ✦ $APP = TPP/Q_V$
 - marginal physical product (MPP)
 - ✦ $MPP = \Delta TPP/\Delta Q_V$

Wheat production per year from a particular farm (tonnes)

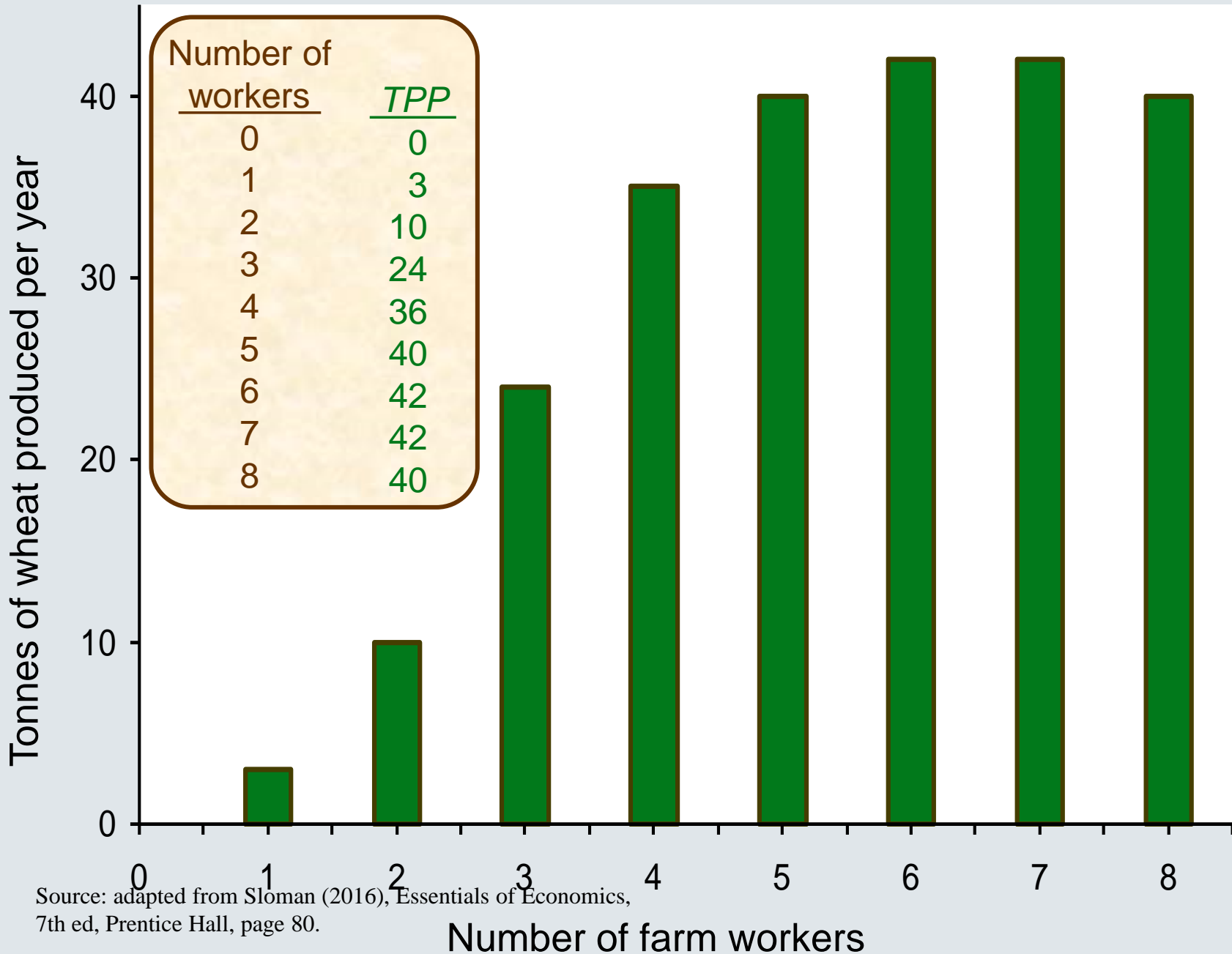
	Number of Workers (<i>Lb</i>)	<i>TPP</i>	<i>APP</i> (= TPP/Lb)	<i>MPP</i> (= $\Delta TPP/\Delta Lb$)
(a)	0	0	—	
				3
	1	3	3	
				7
	2	10	5	
(b)				14
	3	24	8	
				12
(c)	4	36	9	
				4
	5	40	8	
				2
	6	42	7	
(d)				0
	7	42	6	
				-2
	8	40	5	

Source: adapted from Sloman (2016), *Essentials of Economics*, 7th ed, Prentice Hall, page 80.

Short-run theory of production

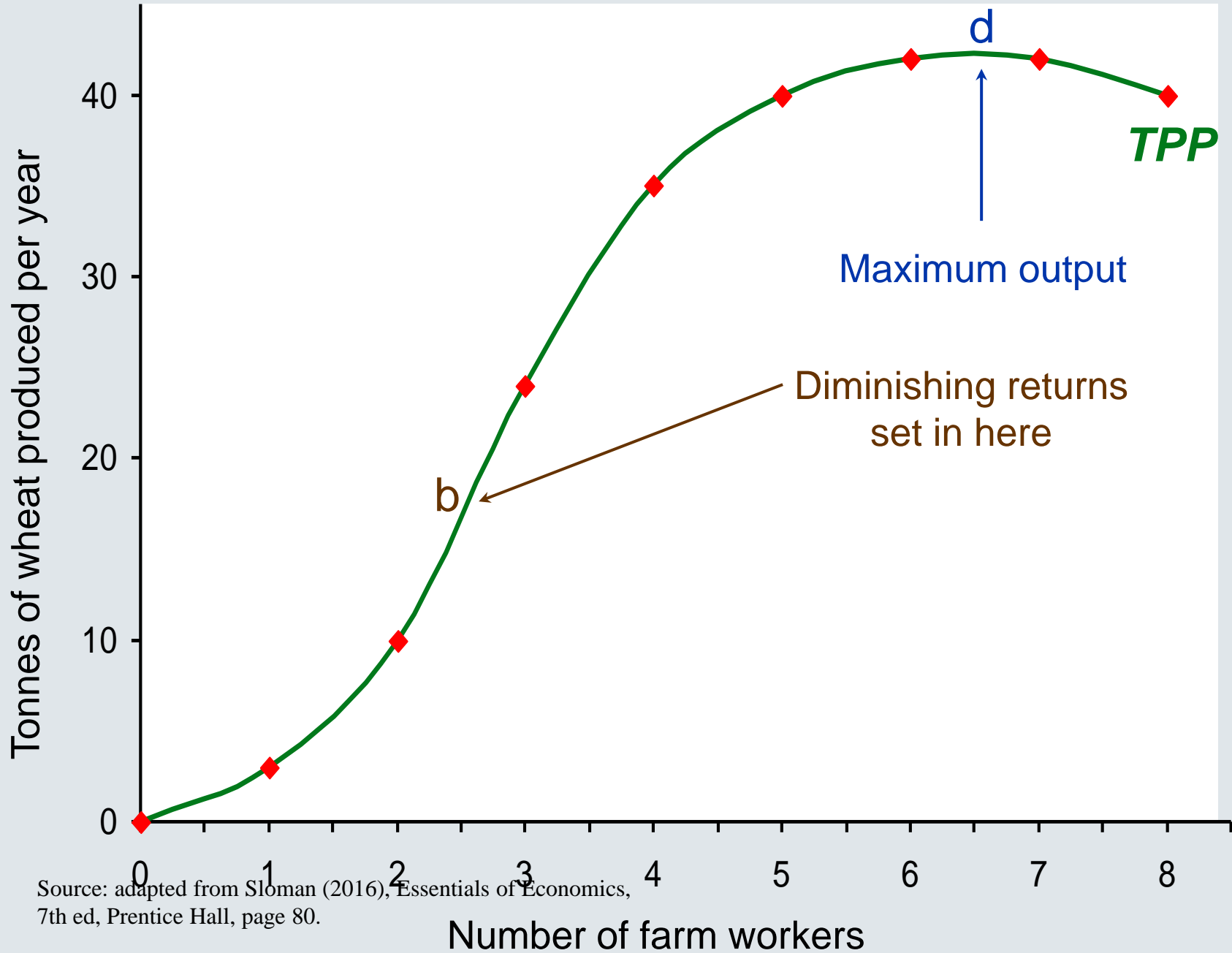
- The short-run production function:
 - total physical product (TPP)
 - average physical product (APP)
 - ✦ $APP = TPP/Q_V$
 - marginal physical product (MPP)
 - ✦ $MPP = \Delta TPP/\Delta Q_V$
 - graphical relationship between TPP , APP and MPP

Wheat production per year from a particular farm

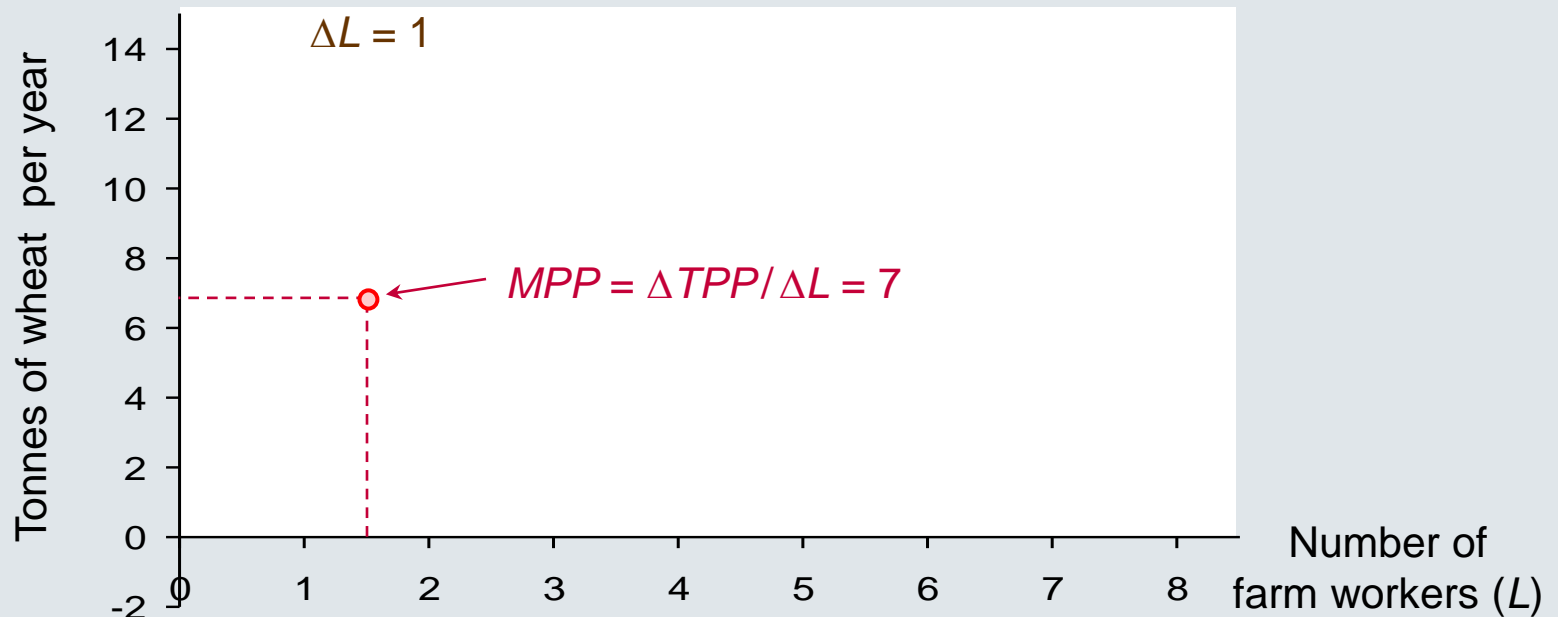
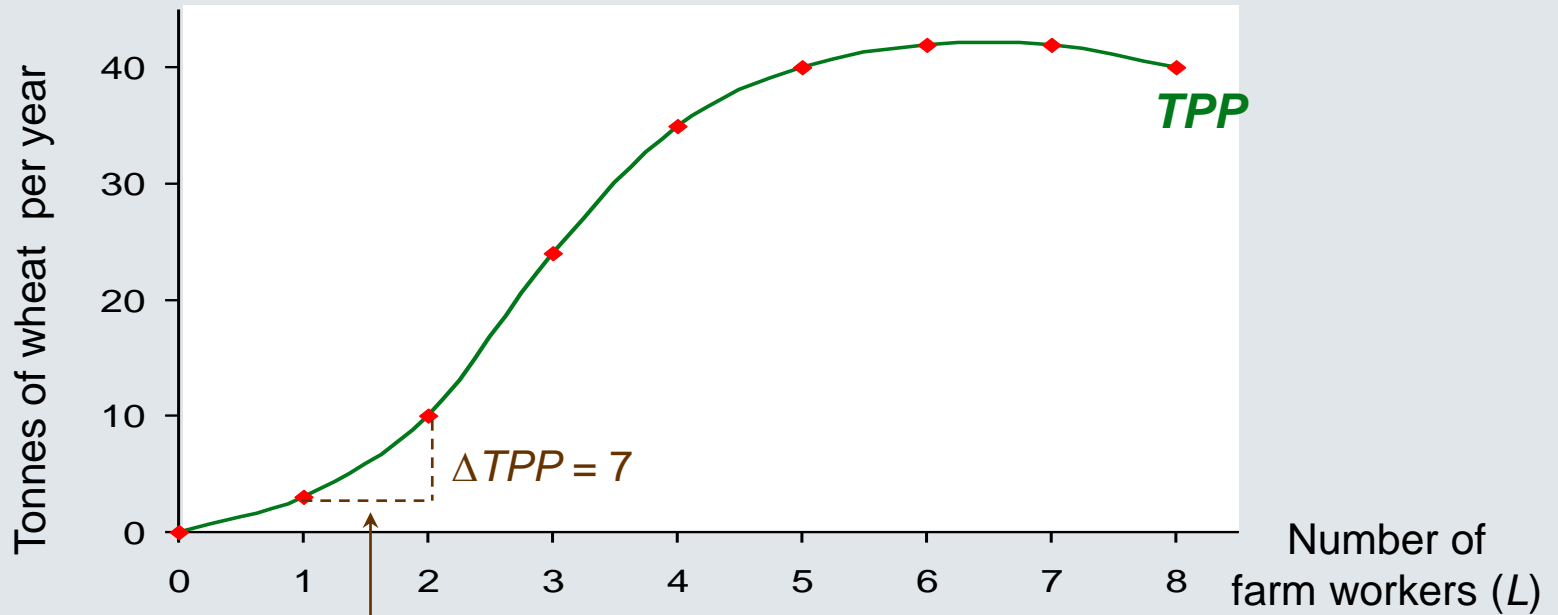


Source: adapted from Sloman (2016), Essentials of Economics, 7th ed, Prentice Hall, page 80.

Wheat production per year from a particular farm

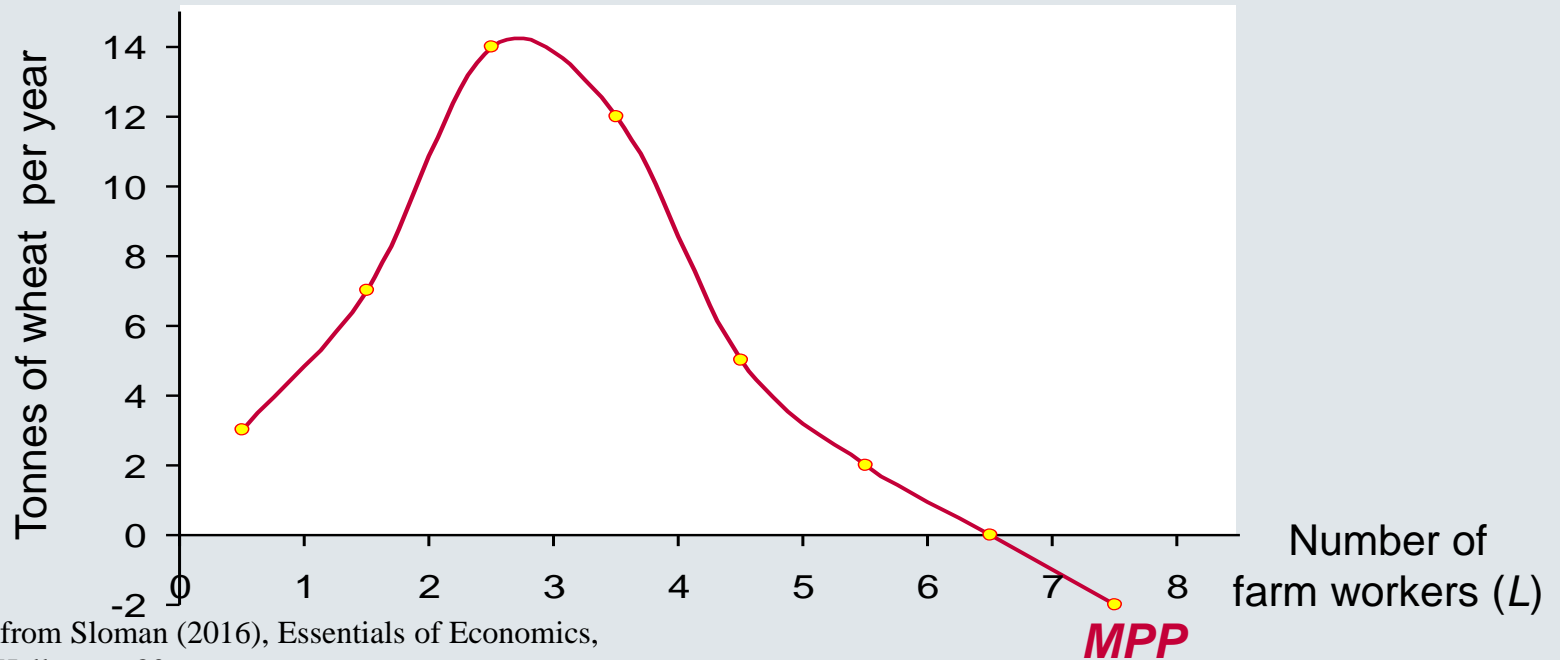
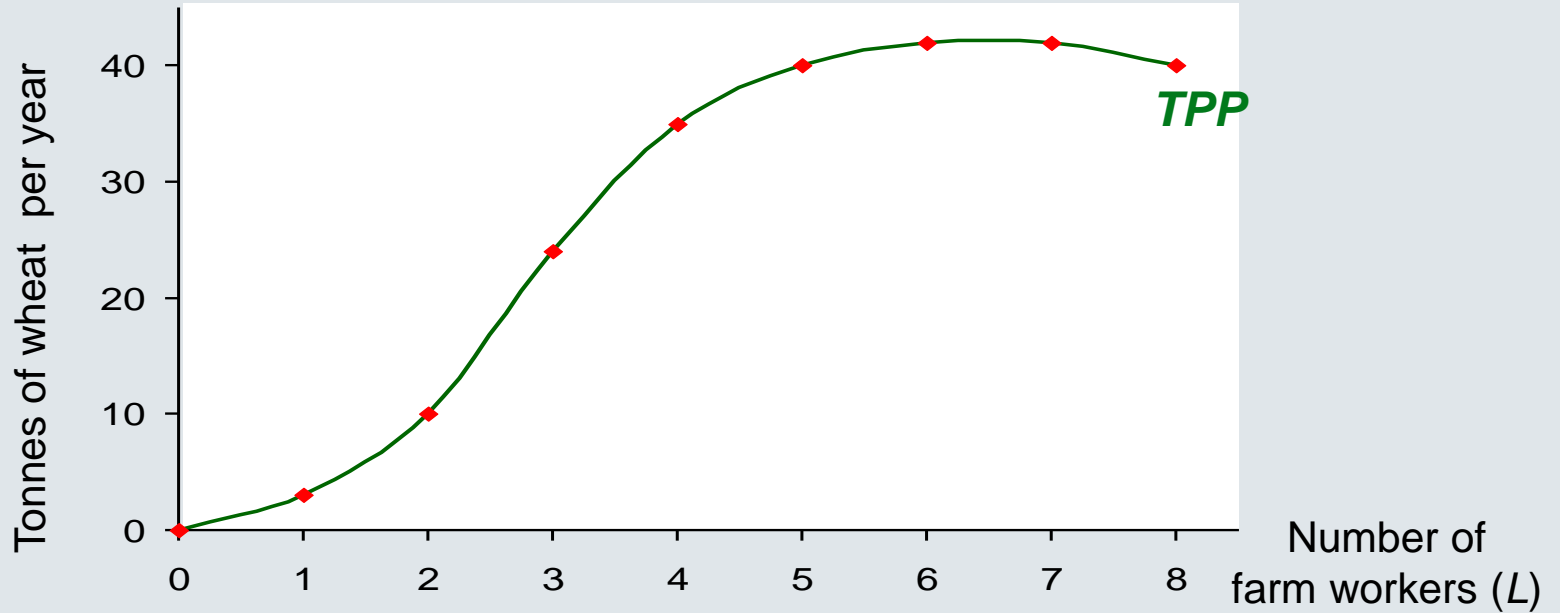


Wheat production per year from a particular farm

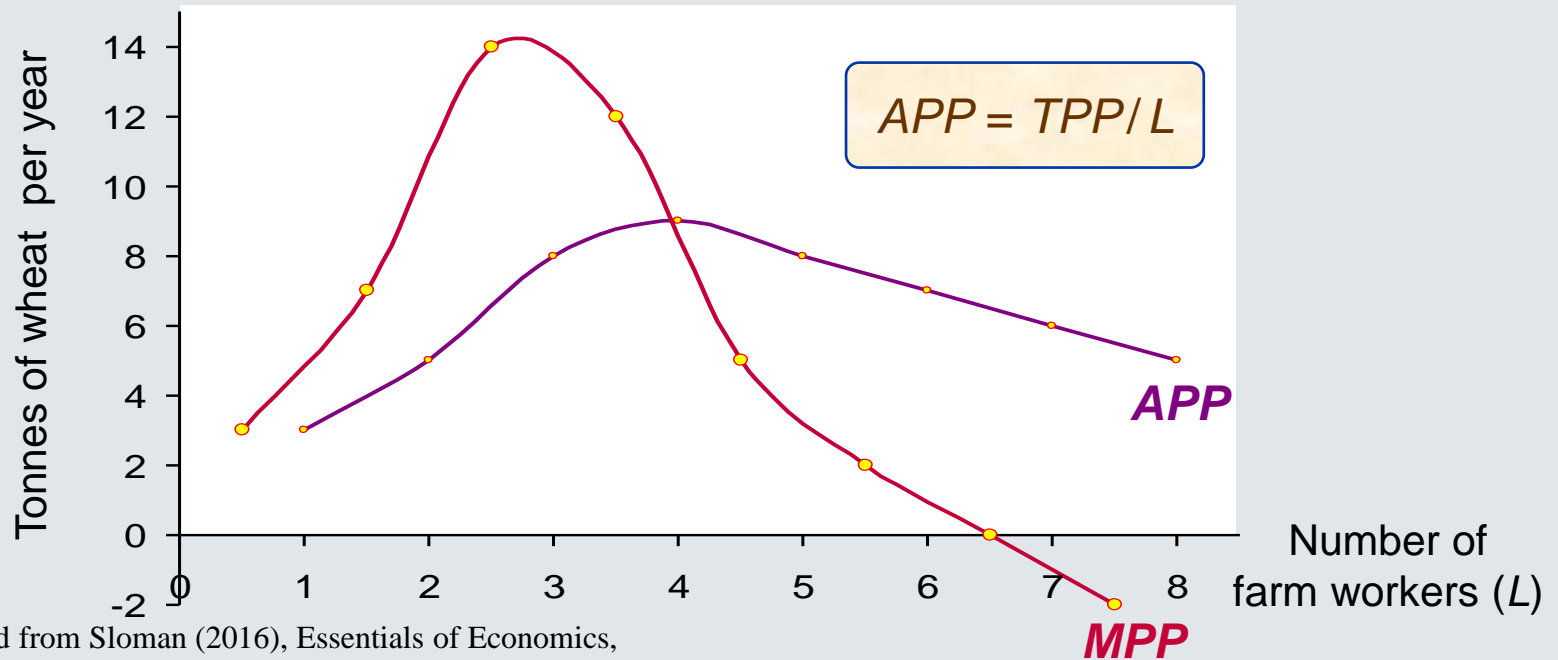
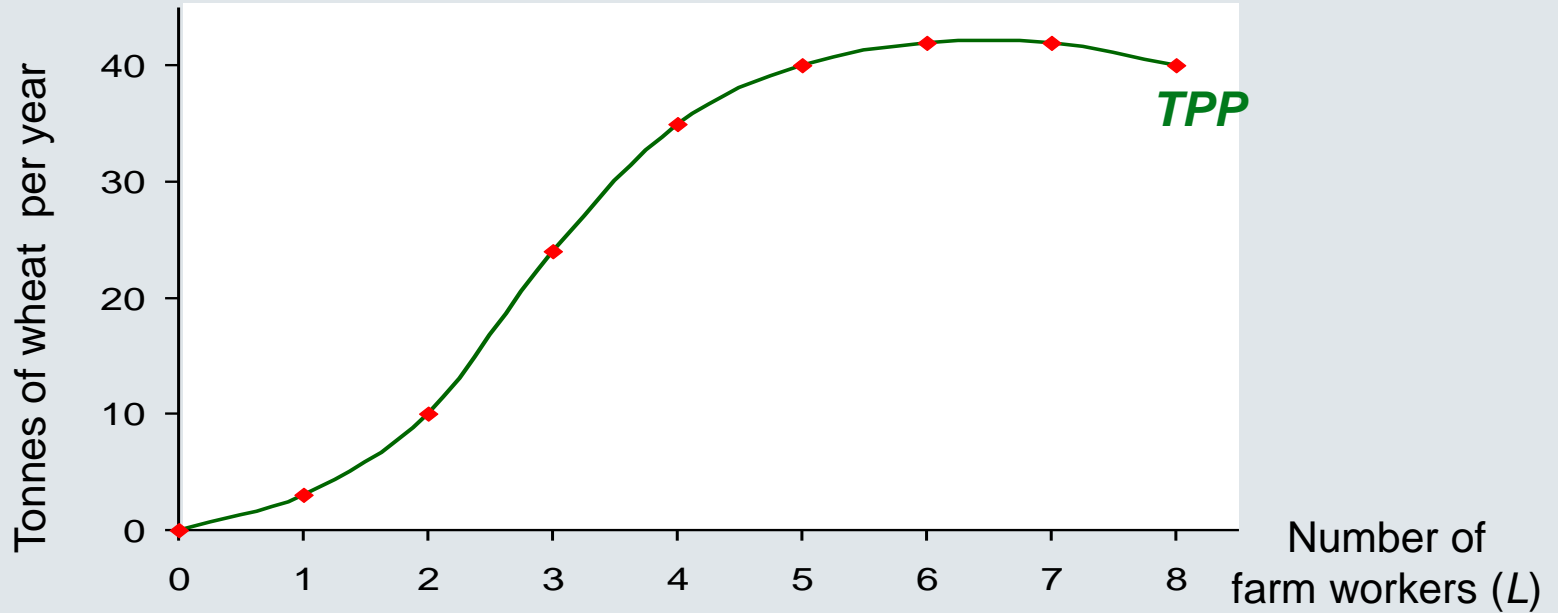


Source: adapted from Sloman (2016), Essentials of Economics, 7th ed, Prentice Hall, page 80.

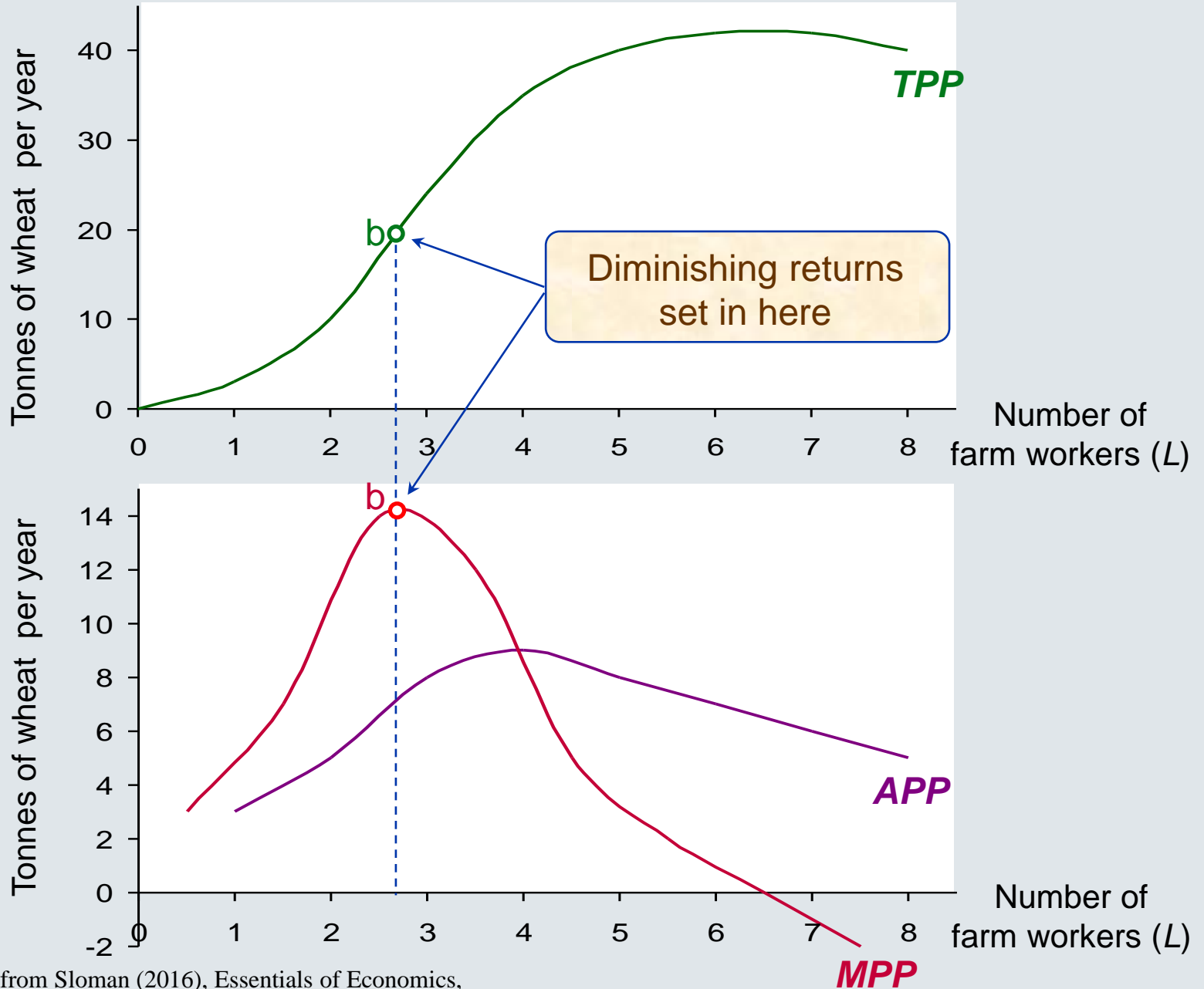
Wheat production per year from a particular farm



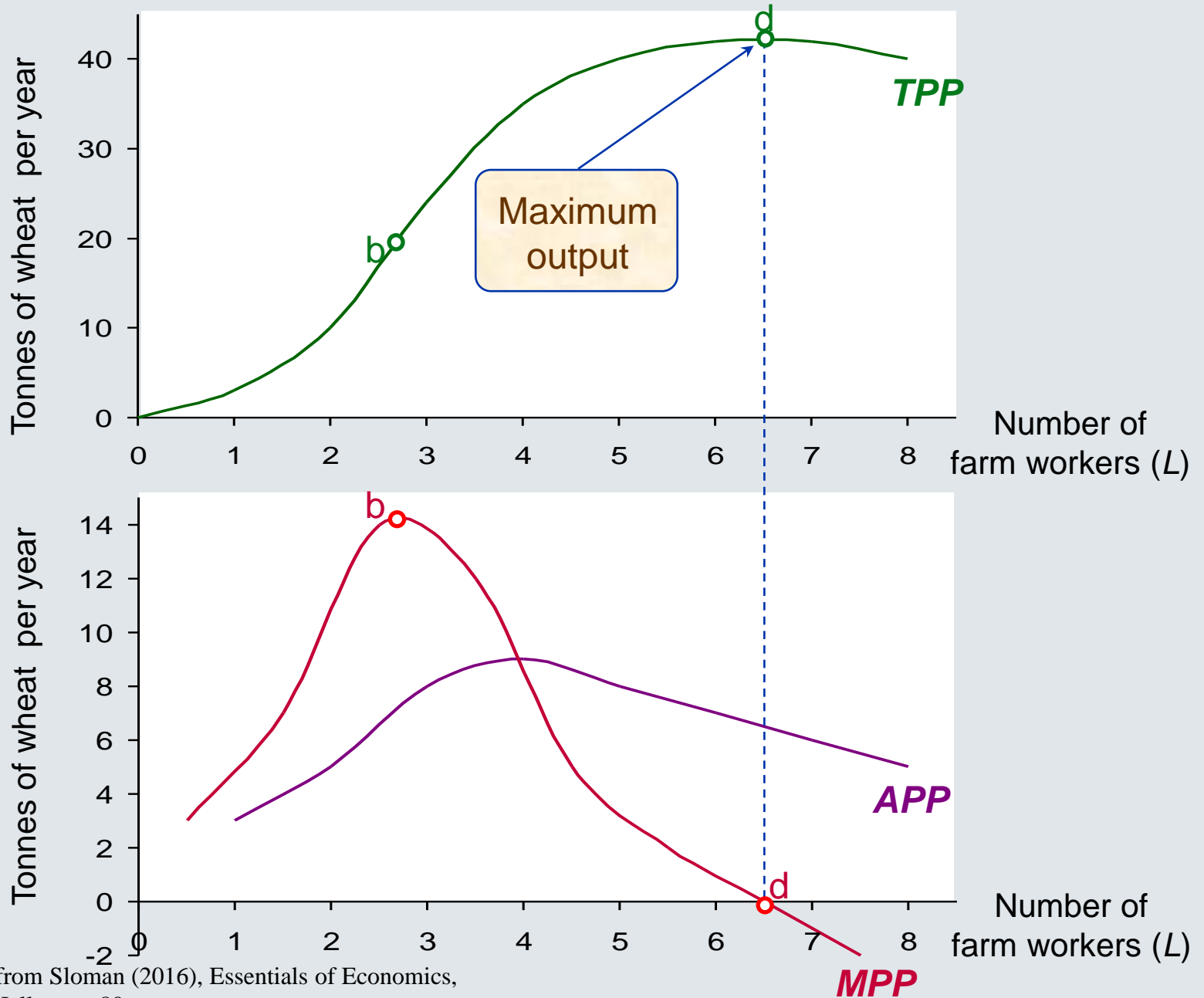
Wheat production per year from a particular farm



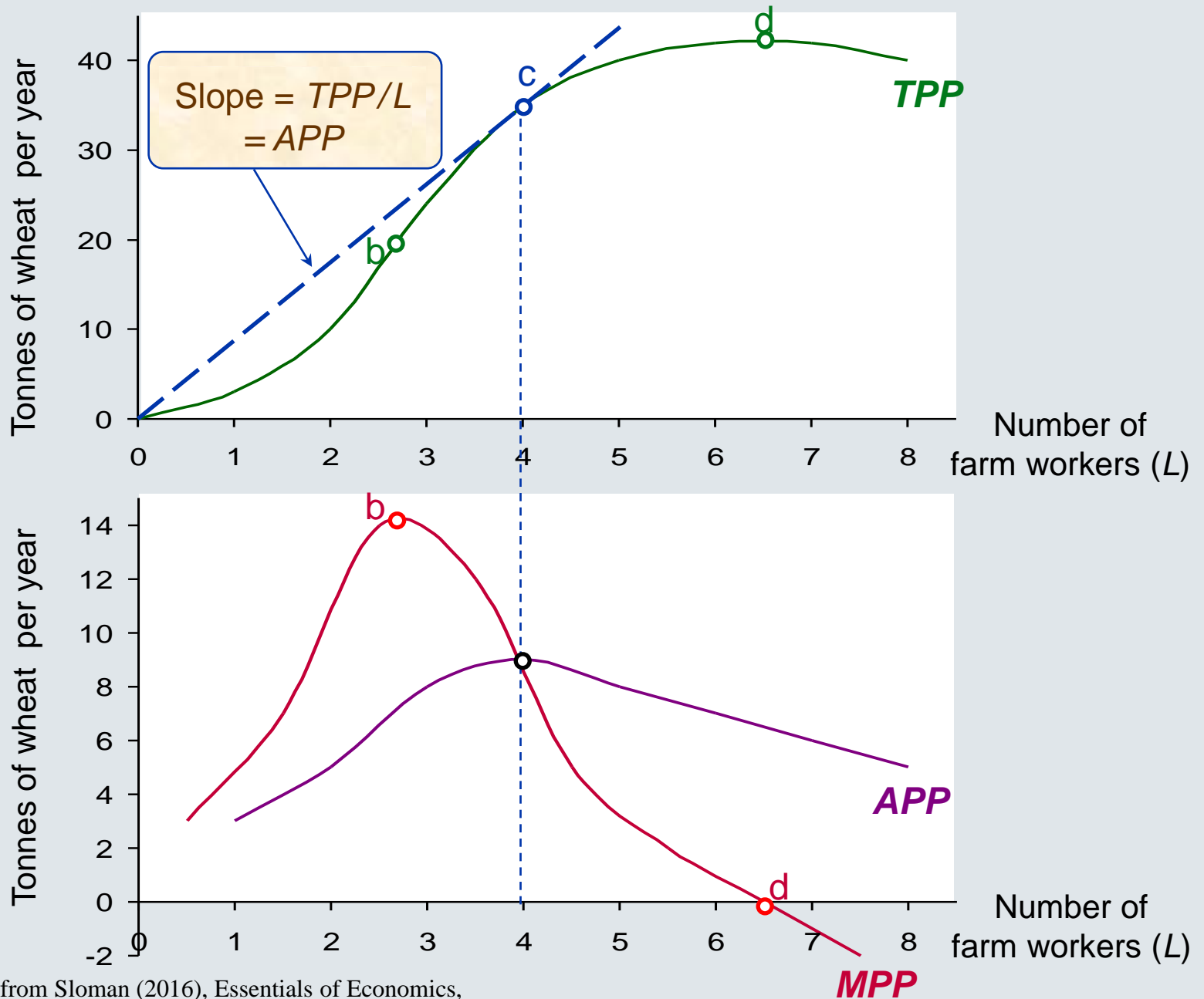
Wheat production per year from a particular farm



Wheat production per year from a particular farm



Wheat production per year from a particular farm

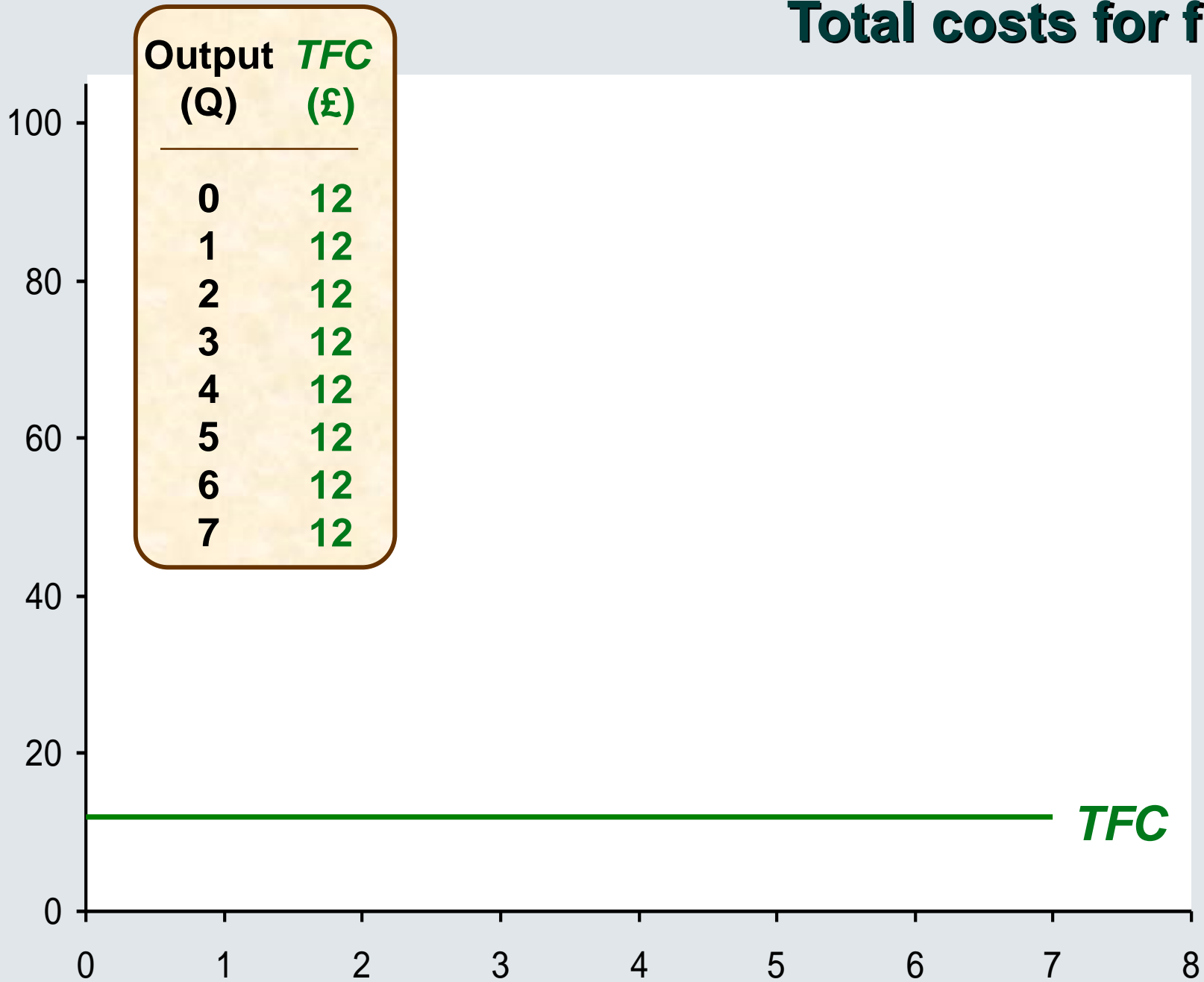


Short-run Costs

Short-run costs

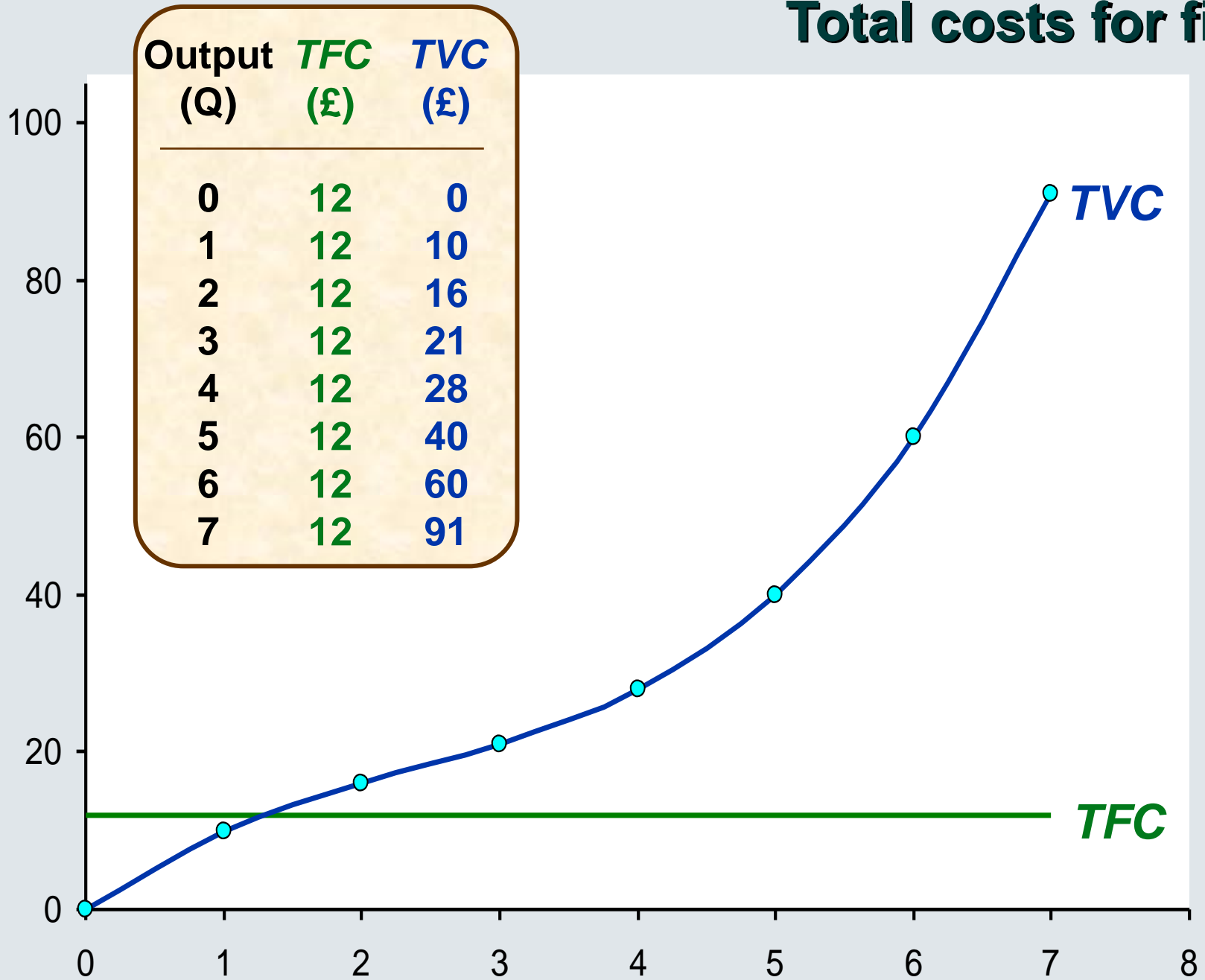
- Measuring costs of production: opportunity costs
 - explicit costs
 - implicit costs
- Fixed costs and variable costs
- Total costs
 - total fixed cost (TFC)
 - total variable cost (TVC)
 - total cost ($TC = TFC + TVC$)

Total costs for firm X



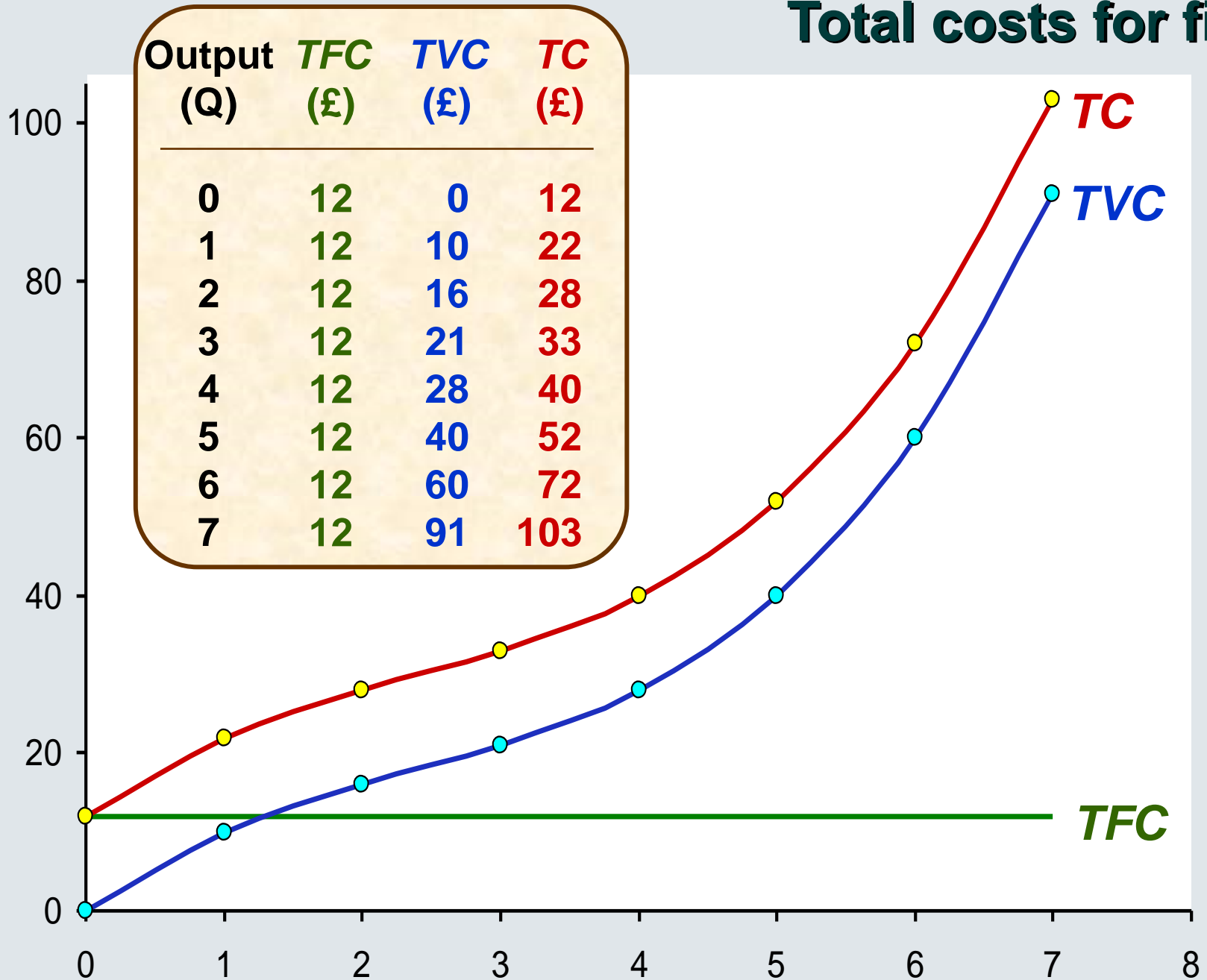
Source: Sloman (2016), Essentials of Economics, 7th ed,
Prentice Hall, page 80.

Total costs for firm X

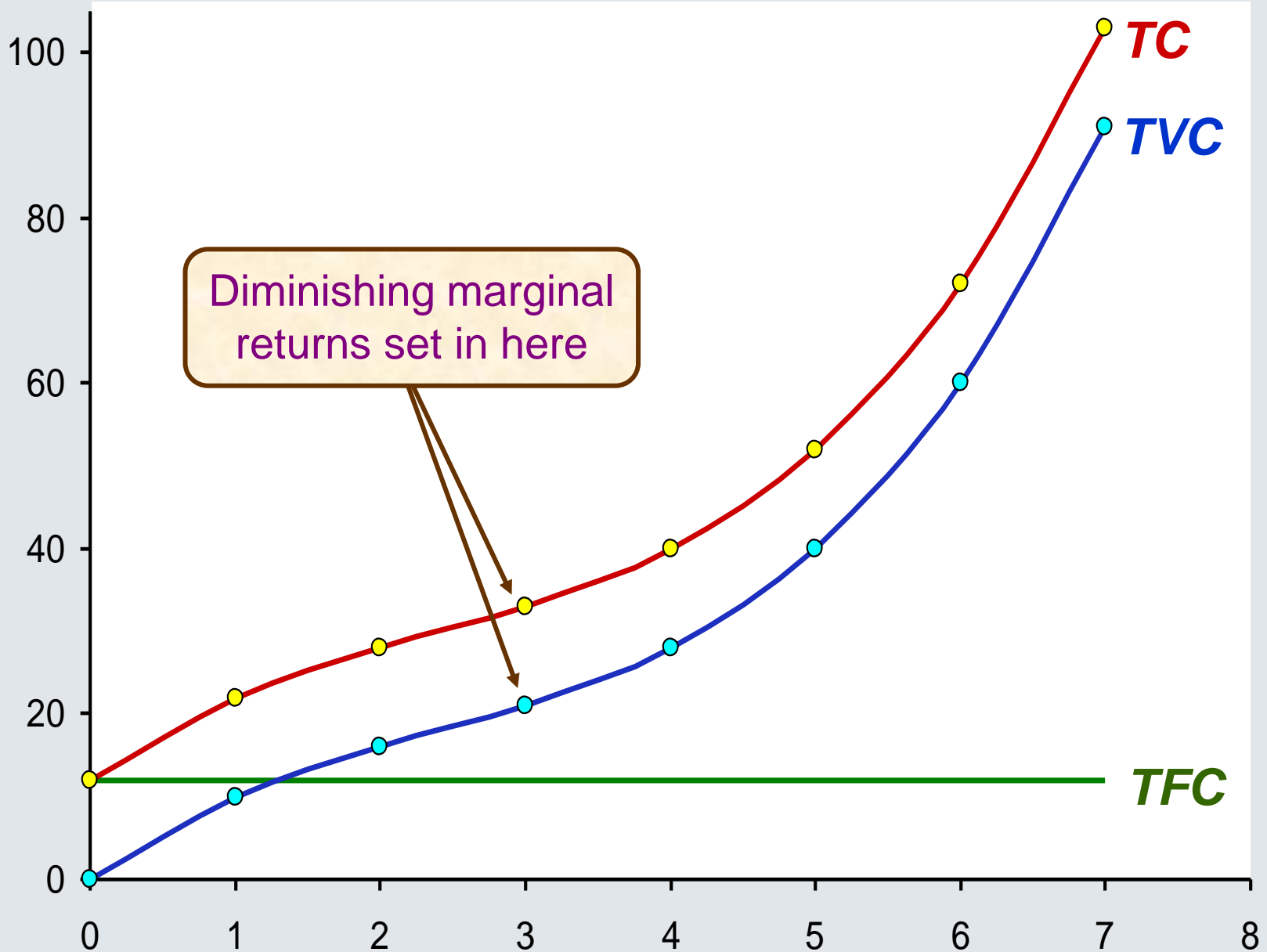


Source: Sloman (2016), Essentials of Economics, 7th ed,
Prentice Hall, page 80.

Total costs for firm X



Total costs for firm X

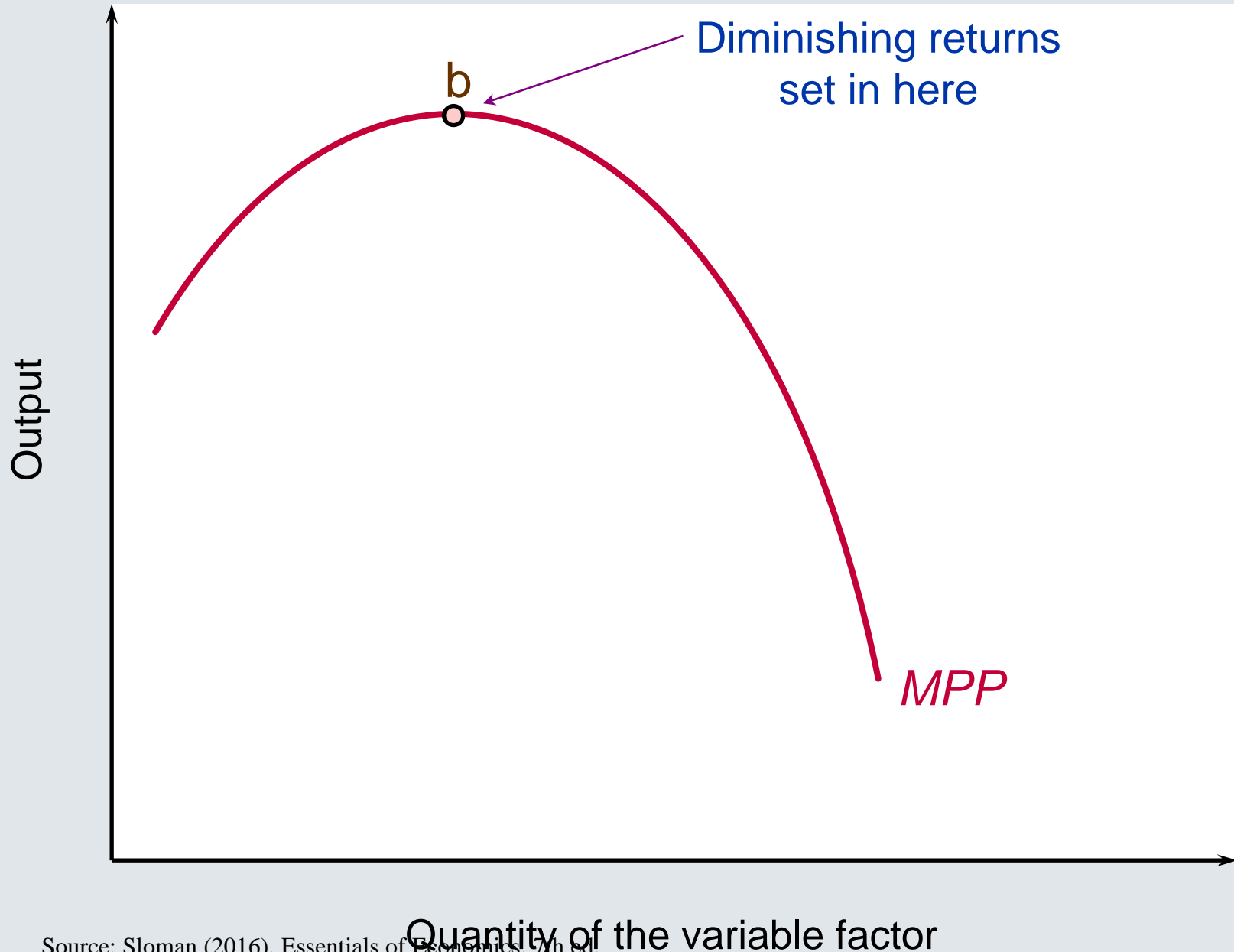


Source: Sloman (2016), Essentials of Economics, 7th ed, Prentice Hall, page 80.

Short-run costs

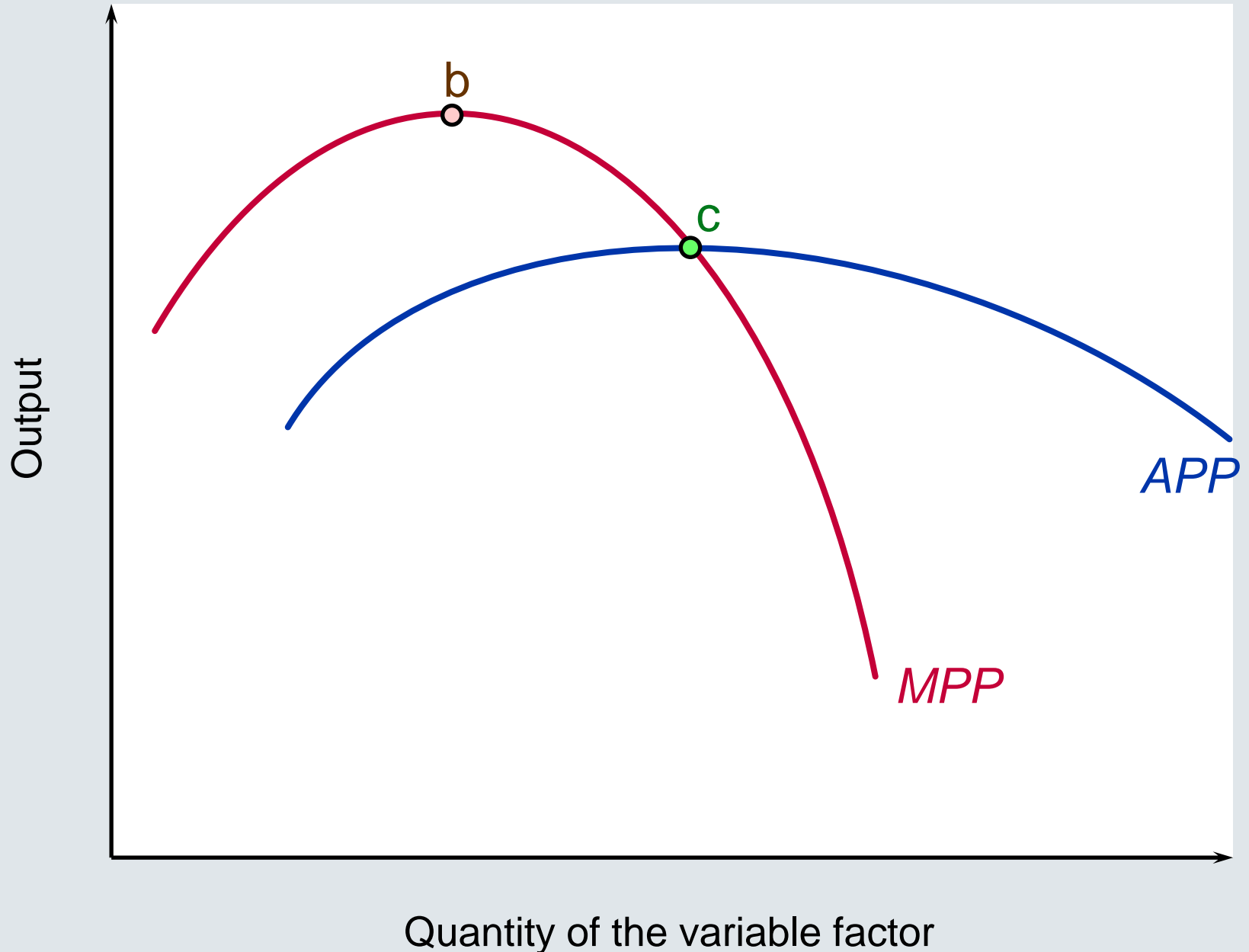
- Marginal cost
 - marginal cost (MC) and the law of diminishing returns

Average and marginal physical product

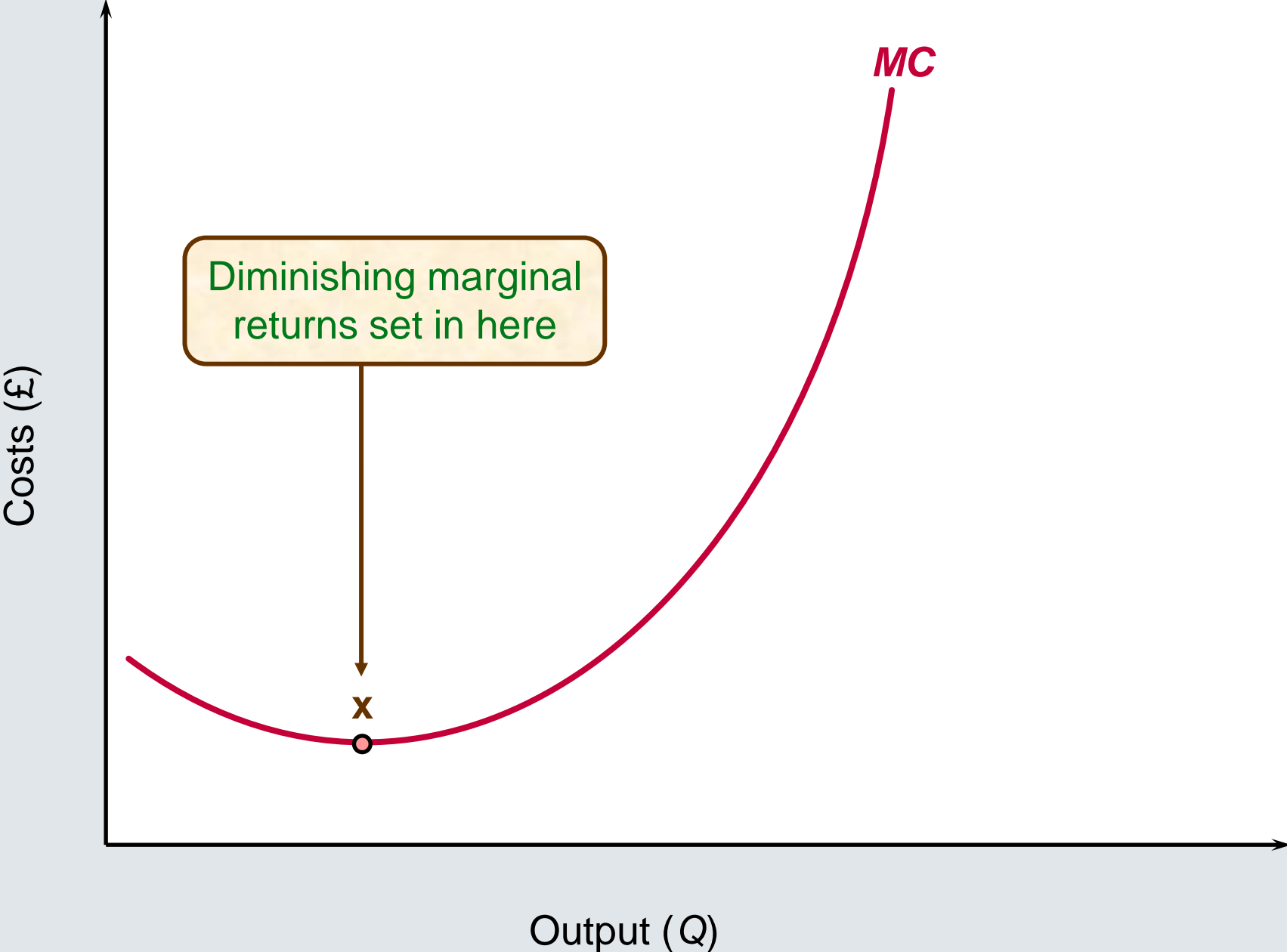


Source: Sloman (2016), Essentials of Economics, 7th ed, Prentice Hall, page 80.

Average and marginal physical product



Marginal cost

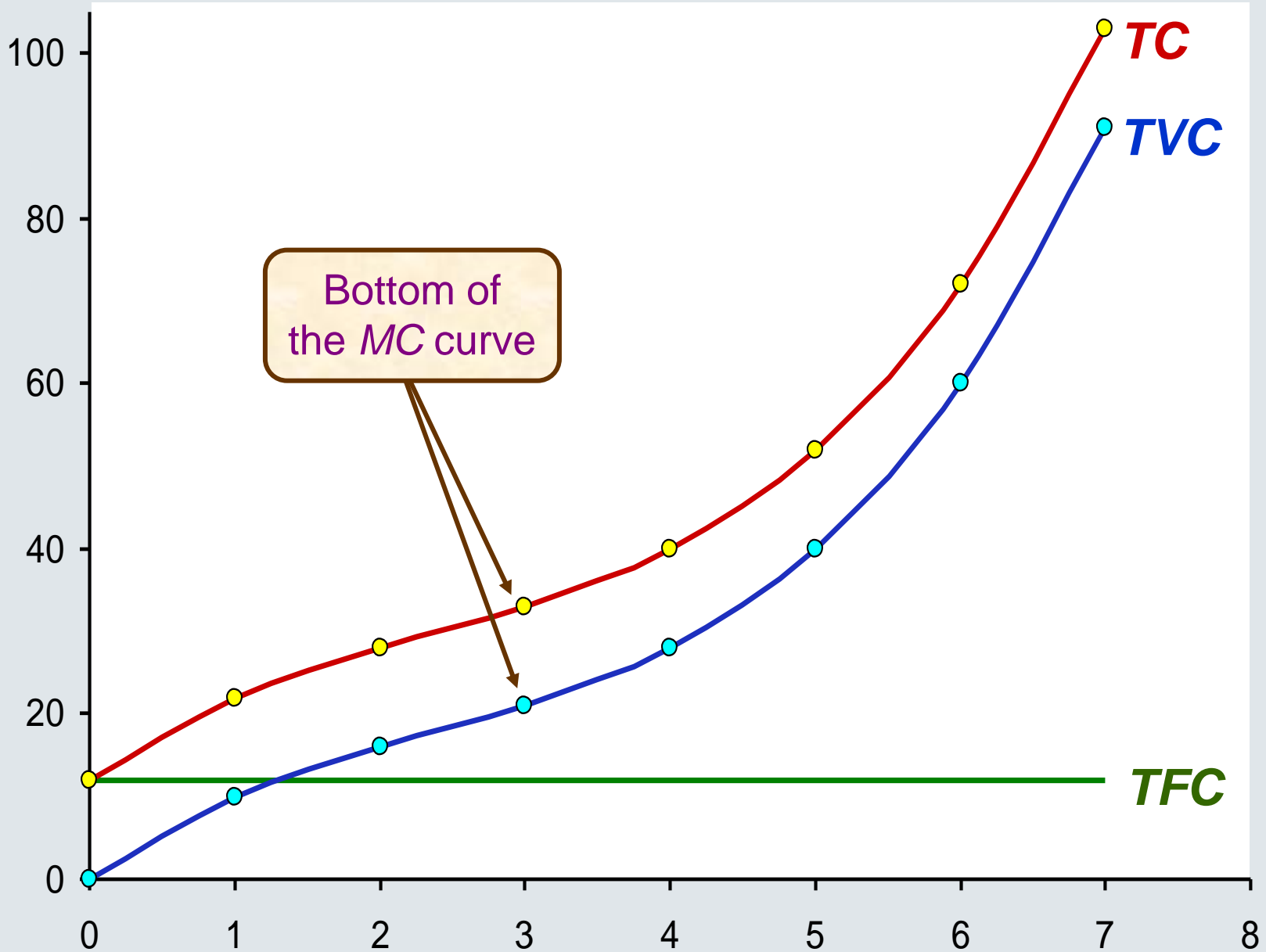


Source: Sloman (2016), Essentials of Economics, 7th ed, Prentice Hall, page 80.

Short-run costs

- Marginal cost
 - marginal cost (MC) and the law of diminishing returns
 - the relationship between the marginal and total cost curves

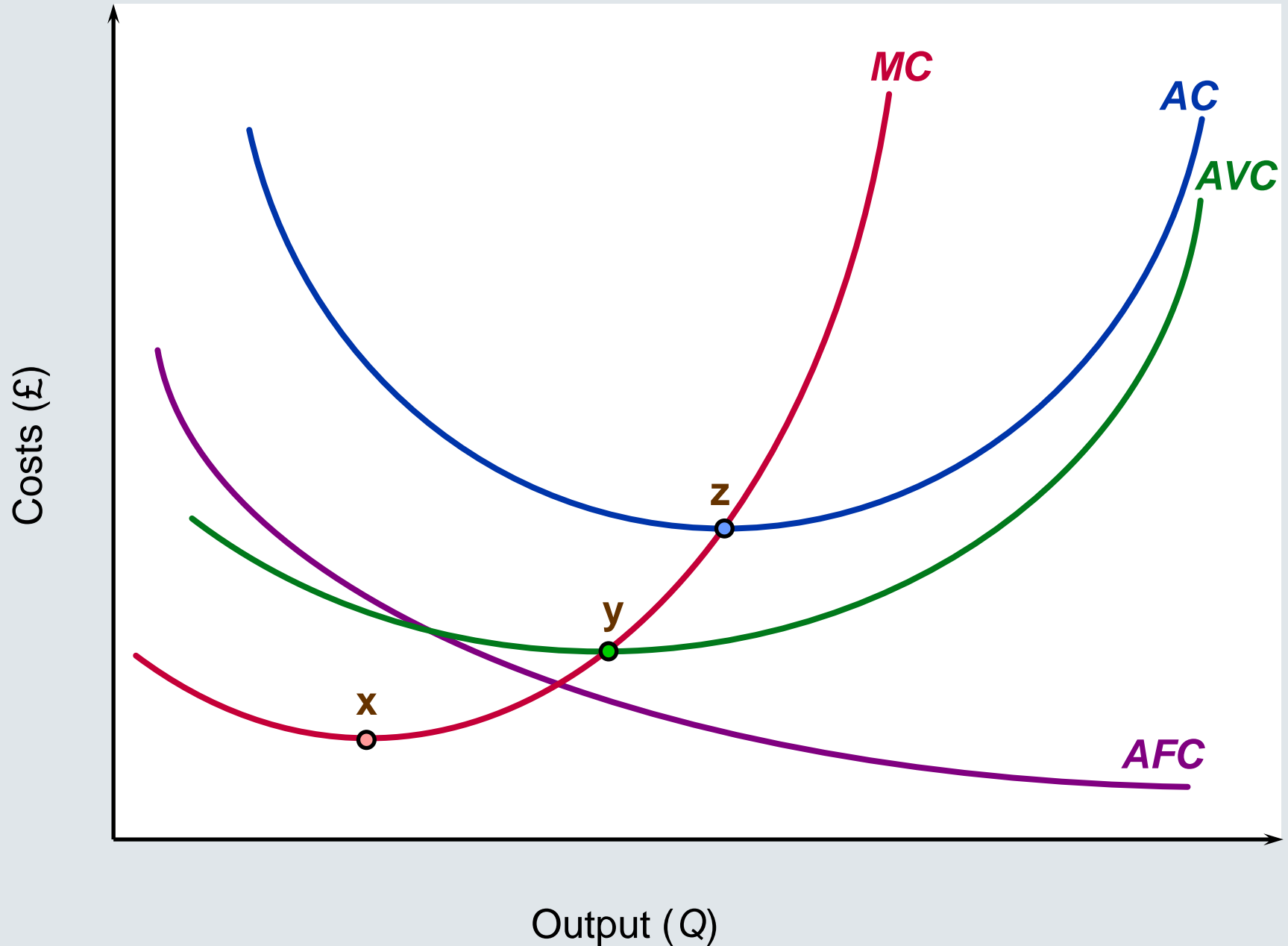
Total costs for firm X



Short-run costs

- **Marginal cost**
 - marginal cost (MC) and the law of diminishing returns
 - the relationship between the marginal and total cost curves
- **Average cost**
 - average fixed cost (AFC)
 - average variable cost (AVC)
 - average (total) cost (AC)
 - relationship between AC and MC

Average and marginal costs



How firms produce in the long-run?

Long-run theory of production

- All factors variable in long run
- The scale of production:
 - constant returns to scale
 - increasing returns to scale
 - decreasing returns to scale

Short-run and long-run increases in output

Short run			Long run		
Input 1	Input 2	Output	Input 1	Input 2	Output
3	1	25	1	1	15
3	2	45	2	2	35
3	3	60	3	3	60
3	4	70	4	4	90
3	5	75	5	5	125

Long-run theory of production

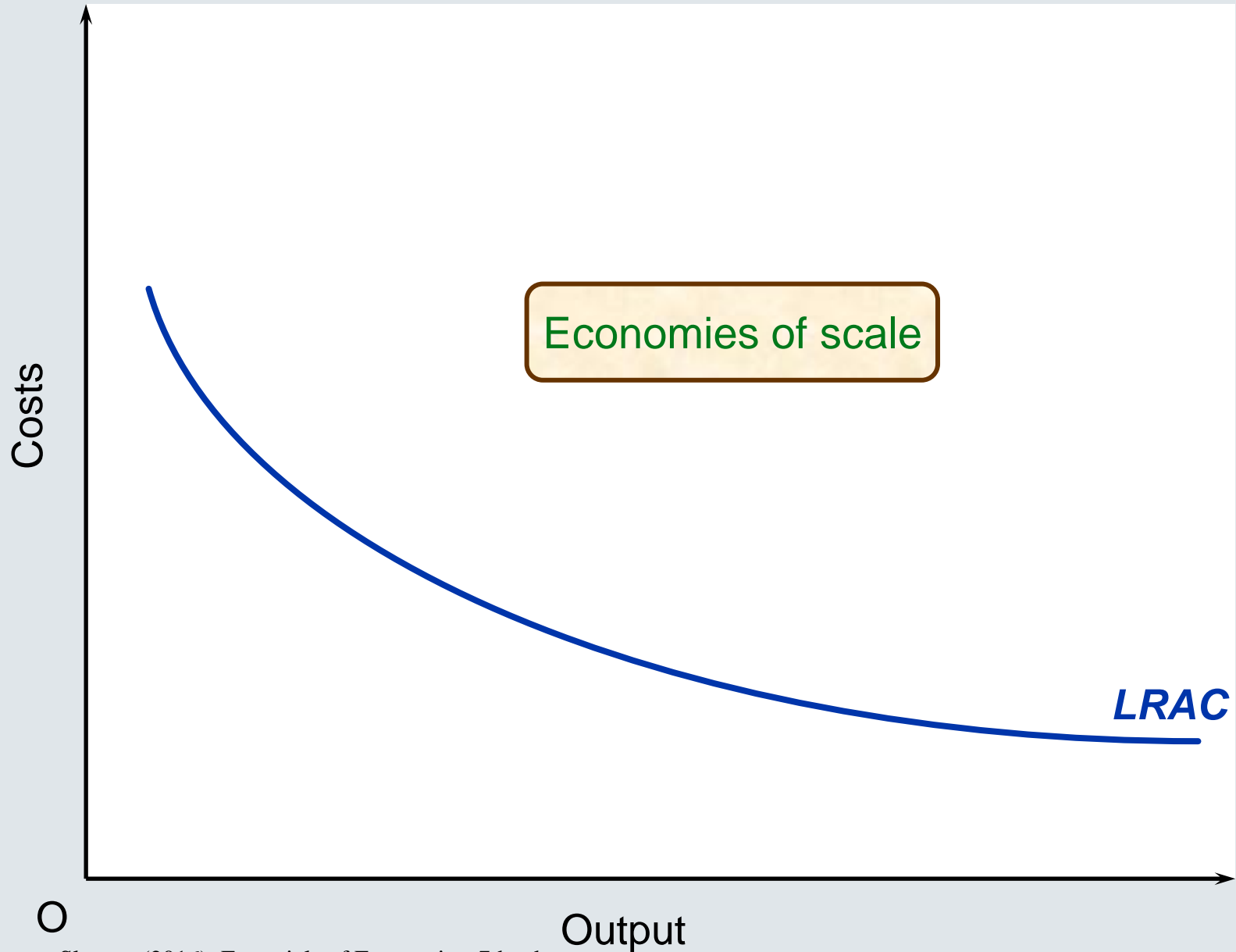
- Economies of scale
 - specialisation and division of labour
 - indivisibilities
 - container principle
 - greater efficiency of large machines
 - by-products
 - multi-stage production
 - organisational and administrative economies
 - financial economies
 - economies of scope

Long-run Costs

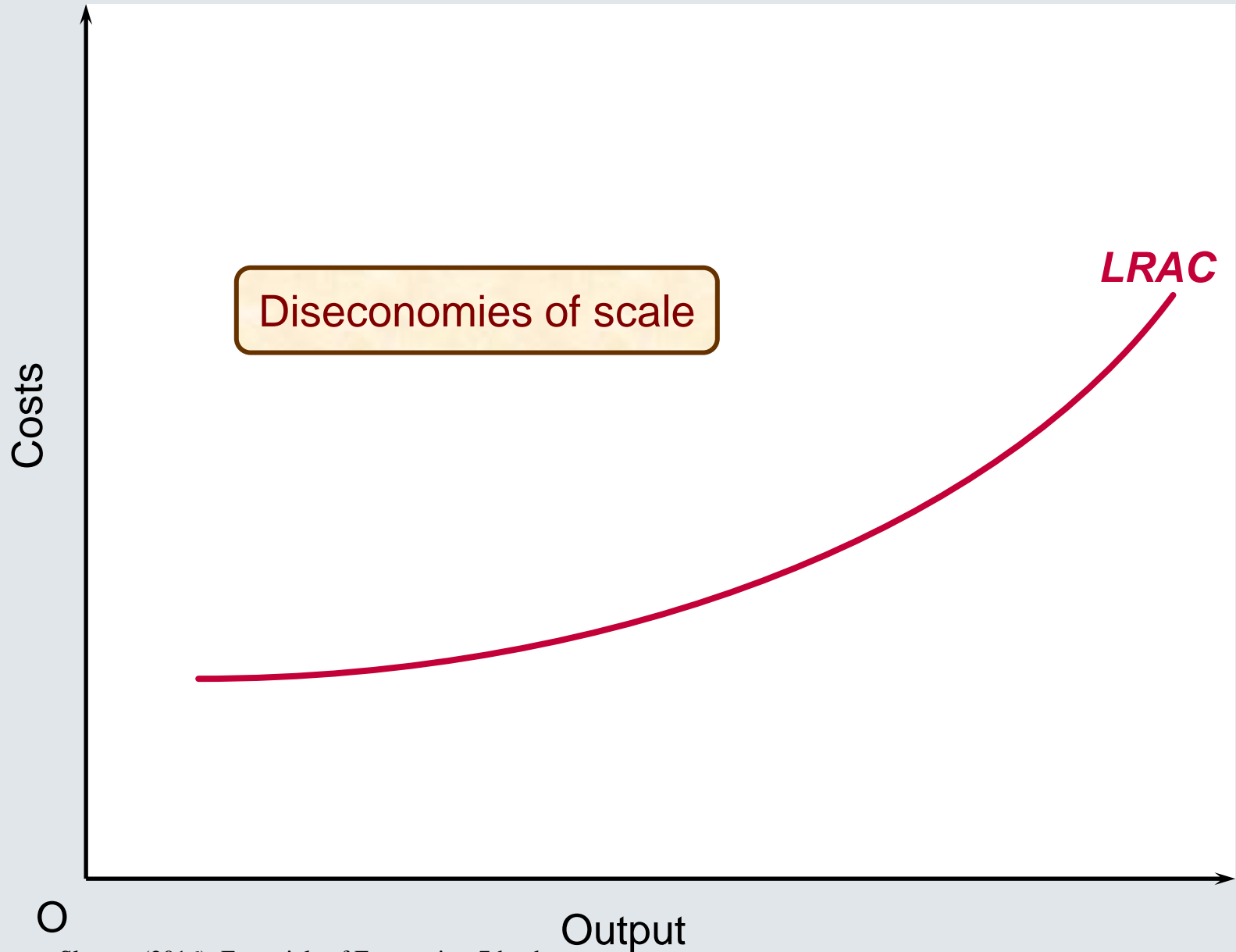
Long-run costs

- Long-run average costs
 - shape of the *LRAC* curve
 - assumptions behind the curve

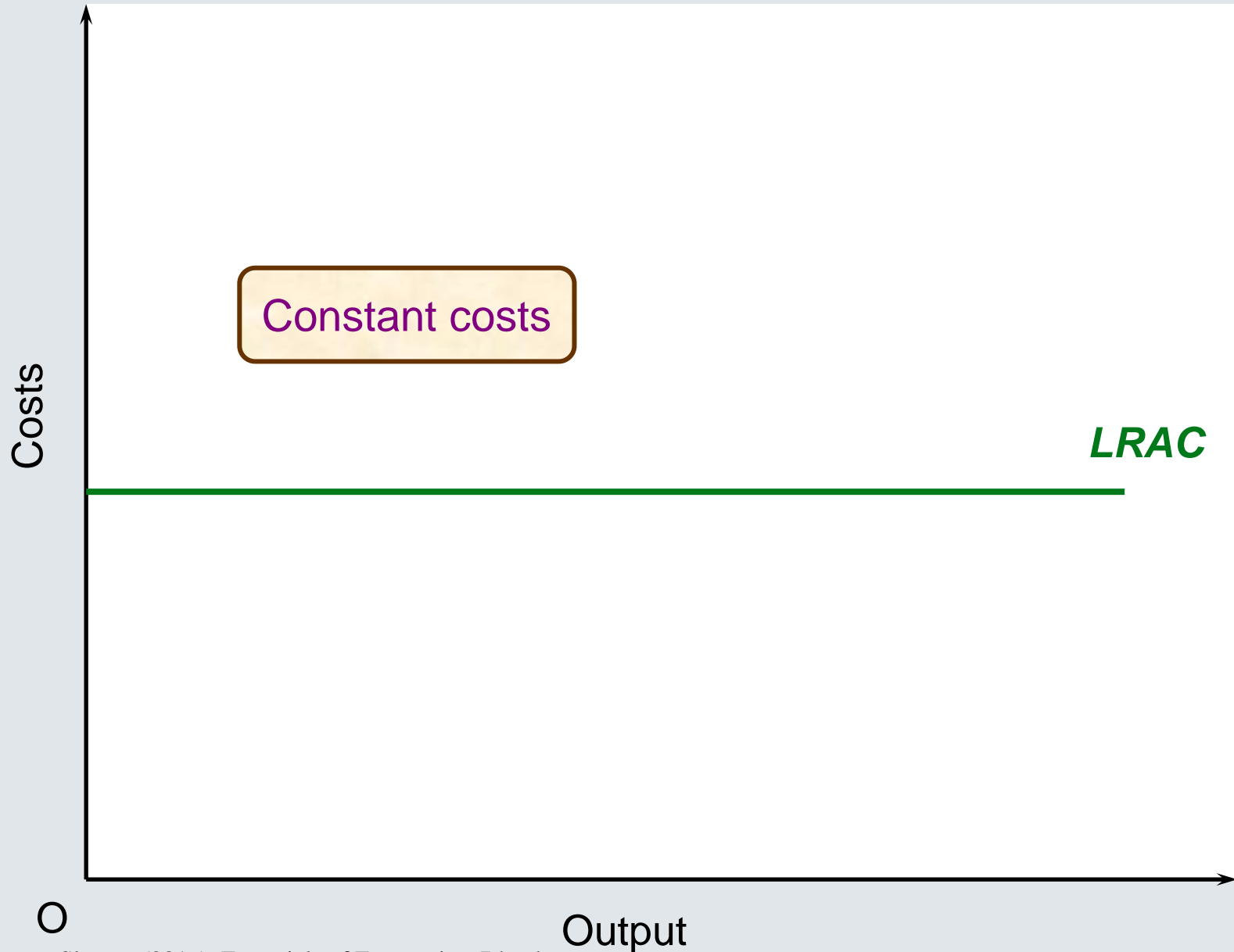
Alternative long-run average cost curves



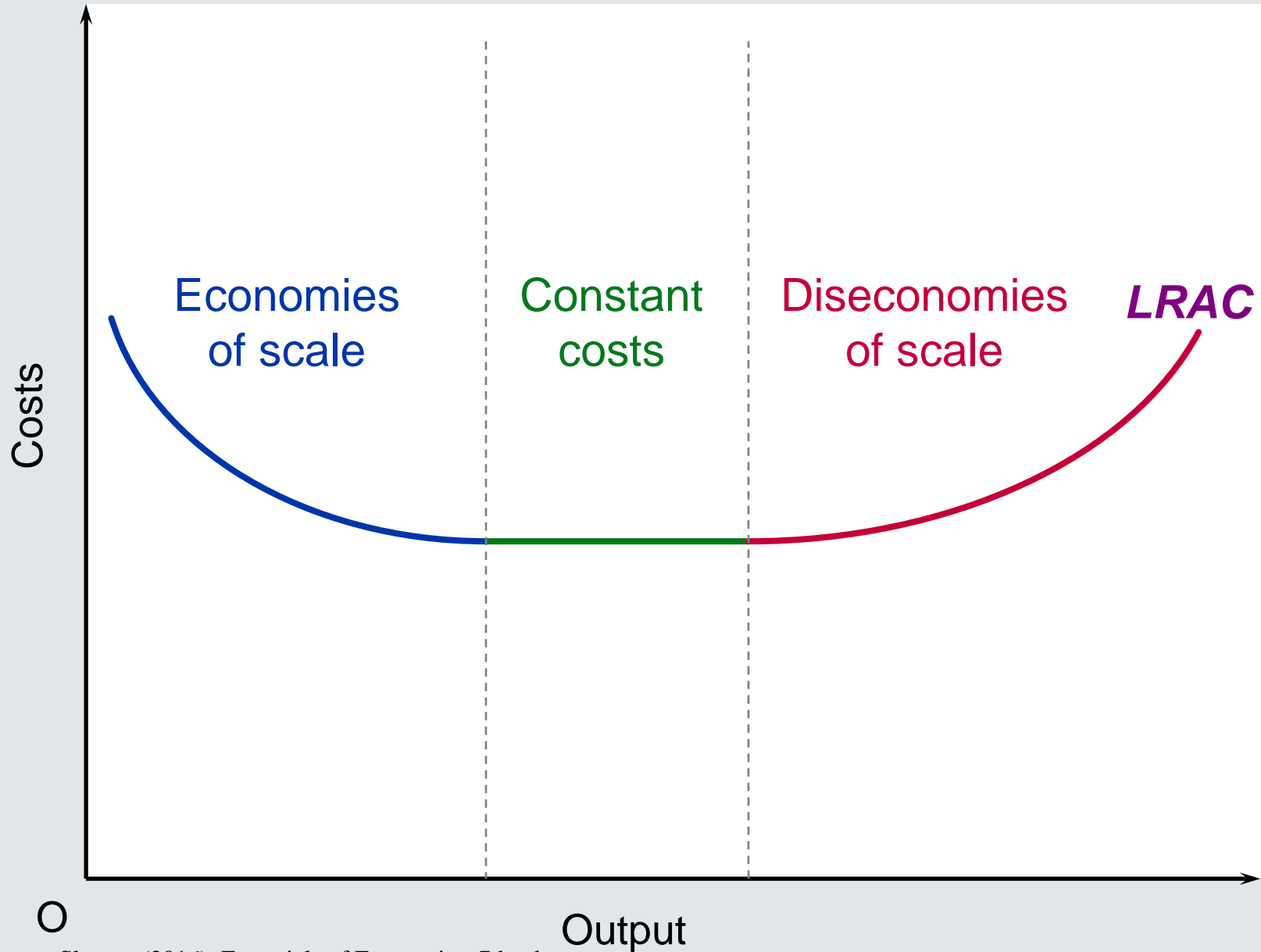
Alternative long-run average cost curves



Alternative long-run average cost curves



A typical long-run average cost curve



REFERENCES

- John Sloman, (2016), Essentials of Economics, 7th ed, Prentice Hall.
- Irvin B. Tucker, (2018), Survey of Economics, 10th ed, Cengage learning.
- Karl Case, Ray Fair, (2004), Principles of Economics, 7/e, Prentice Hall Business Publishing.