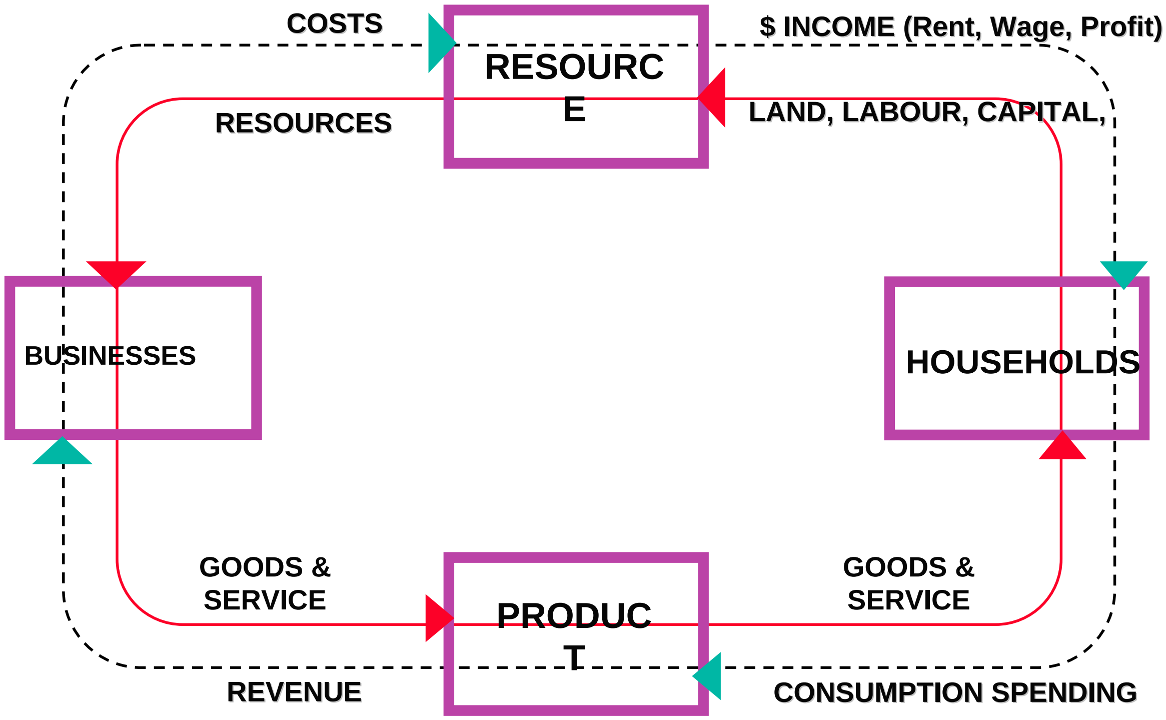

In Product Markets

On the sellers' side we assumed:

Perfect competition
Monopolistic competition
Oligopoly
Monopoly

On the buyers' side we assumed "perfect competition" i.e., a large number of buyers.

In Resource Markets

We will assume perfect competition and imperfect competition on both the buyers' and sellers' side of the market

THE DEMAND FOR RESOURCES

We want to determine equilibrium price and quantity for the factors of production:

Labour: Wage
Land: Rent
Capital: “rate of return”
Entrepreneur: Profit

Demand for factors is a “derived demand”

Warning: We will distinguish between competitive output markets (the firm faces a horizontal demand) and competitive input markets (the firm faces a horizontal supply curve of the input).

TABLE 11-1 (11th ed.)

Units of Resource	Total Product	Marginal Physical Product (MP)	Product Price	Total Revenue	Marginal Revenue Product (MRP)
0	0		$2	$ 0	
		7			$ 14
1	7		$2	14	
		6			12
2	13		$2	26	
		5			10
3	18		$2	36	
		4			8
4	22		$2	44	
		3			6
5	25		$2	50	
		2			4
6	27		$2	54	
		1			2
7	28		$2	56	

Marginal physical product (called MPP or MP) falls because of the law of diminishing returns to the fixed factor. The law "takes hold" immediately.

Marginal Revenue Product depends on:

- Marginal physical product
- Product Price

Here we assume firm sells in a perfectly competitive market (it sells all it wants at $2/unit).

Profit maximizing rule: hire each unit of input that adds more to revenue than it does to cost, or, up to the point where

Marginal Resource Cost (MRC) = Marginal Revenue Product (MRP)

MRC = the addition to total cost of the last unit hired.

NOTE: THIS IS EQIVALENT TO THE MC = MR RULE

MRC = MRP

Assume MRC = Wage

MRP = MP x Product Price

Profit maximization: Wage = MP x Product Price

or (Wage/MP) = Product Price

But (Wage/MP) is the marginal cost of the last unit using only labour (assuming wage is constant for all units hired)

Product Price is MR (assumes a perfectly competitive output market).

Thus MC = MR

Now assume the firm sells into an imperfectly competitive market (i.e., it must cut price to sell more).

TABLE 11-2 (11th ed)

Units of Resource	Total Product	Marginal Physical Product (MP)	Product Price	Total Revenue	Marginal Revenue Product (MRP)
0	0		$2.80	$ 0	
		7			$ 18.20
1	7		$2.60	18.20	
		6			13.00
2	13		$2.40	31.20	
		5			8.40
3	18		$2.20	39.60	
		4			4.40
4	22		$2.00	44.00	
		3			2.25
5	25		$1.85	46.25	
		2			1.00
6	27		$1.75	47.25	
		1			-1.05
7	28		$1.65	46.20	

Note error in text

DETERMINANTS OF RESOURCE DEMAND: (things that shift the demand). Note demand will shift when the MRP shifts. MRP = MPP x Price of the product.

- Changes in Product Demand (price of the final product changes)
    - Anything that changes demand for the final product will have an effect on the equilibrium price of the product.
- Productivity Changes (MPP changes)
    - Quantities of other factors (i.e., other inputs)
    - Quality of other inputs (e.g., technological change)
    - Quality of the input under review
- Prices of other resources (we can't predict the net effect)
    - Substitution effect: As the price of capital goes down, the firm substitutes capital for labour.
    - Output effect: As the price of capital goes down, more capital is used, this increases the MPP of labour, so more labour is demanded.
    - Net effect

ELASTICITY OF RESOURCE DEMAND

$$E_{rd} = \frac{(\text{\% change in resource quantity})}{(\text{\% change in resource price})}$$

E_{rd} is influenced by:

- Rate of MP decline
- Ease of resource substitutability
- Elasticity of product demand
- Ratio of resource cost to total cost

LEAST COST RULE

When the firm is buying the input in a perfectly competitive market (i.e., it can buy as much as it wants at the going price), the least cost rule is:

$$\frac{MPP_{labour}}{P_{labour}} = \frac{MPP_{capital}}{P_{capital}}$$ ......for all inputs

PROFIT MAXIMIZATION RULE

Use all inputs up to the point where their cost at the margin equals the additional revenue they generate.

$P_{labour} = MRP_{labour}$ so $\frac{MRP_{labour}}{P_{labour}} = 1$

Here P_{labour} is a constant value.

The equation must hold for all inputs:

$$\frac{MRP_{labour}}{P_{labour}} = \frac{MRP_{capital}}{P_{capital}} = 1$$

BUT BE CAREFUL!

When the input market is not perfectly competitive, the firm must pay more to get more units of the input. In other words, the marginal cost of each unit of, say, labour is not the wage because wages are going up as the firm hires more workers. This will become clear next week.

TABLE 11-5

LABOUR (Price = Pℓ = $8/unit)						CAPITAL (Price = Pk = $12/unit)					
Q	TP	MPP	MPP/Pℓ	TR	MRP	Q	TP	MPP	MPP/Pk	TR	MRP
0	0			$0		0	0			$0	
		12	1.50		$24			13	1.08		$26
1	12			24		1	13			26	
		10	1.25		20			9	.75		18
2	22			44		2	22			44	
		6	.75		12			6	.50		12
3	28			56		3	28			56	
		5	.63		10			4	.33		8
4	33			66		4	32			64	
		4	.50		8			3	.25		6
5	37			74		5	35			70	
		3	.38		6			2	.17		4
6	40			80		6	37			74	
		2	.25		4			1	.08		2
7	42			84		7	38			76	

BIG ASSUMPTION: The productivity of each resource is independent of the quantity employed of the other.

- If the goal were to produce 50 units as cheaply as possible, what combination of capital and labour would be employed?
- If the goal were to maximize profit, how many units of capital and labour would be employed?

Cost Minimization

Labour P_ℓ = $8				Capital P_k = $12			
Q	TP	MPP	MPP/$	Q	TP	MPP	MPP/$
0	0	0	0.00	0	0	0	0.00
1	12	12	1.50	1	13	13	1.08
2	22	10	1.25	2	22	9	0.75
3	28	6	0.75	3	28	6	0.50
4	33	5	0.63	4	32	4	0.33
5	37	4	0.50	5	35	3	0.25
6	40	3	0.38	6	37	2	0.17
7	42	2	0.25	7	38	1	0.08

Minimize cost of 50 units:

Is 50 units profit maximizing level of output?

NO!

MRP(labour)/P(labour) = 12/8, must be = 1
MRP(capital)/P(capital) = 18/12, must be = 1

Labour (Price = $8)					Capital (Price = $12)				
Q	TP	MPP	TR	MRP	Q	TP	MPP	TR	MRP
0	0	0	$0	$0	0	0	0	$0	$0
1	12	12	24	24	1	13	13	26	26
2	22	10	44	20	2	22	9	44	18
3	28	6	56	12	3	28	6	56	12
4	33	5	66	10	4	32	4	64	8
5	37	4	74	8	5	35	3	70	6
6	40	3	80	6	6	37	2	74	4
7	42	2	84	4	7	38	1	76	2

Profit maximization reached with 5 units of labour and 3 of capital, total production = 37 + 28 = 65.

Is this the least cost method of producing 65 units of output?

Labour				Capital			
Q	TP	MPP	MPP/$	Q	TP	MPP	MPP/$
0	0	0	0.00	0	0	0	0.00
1	12	12	1.50	1	13	13	1.08
2	22	10	1.25	2	22	9	0.75
3	28	6	0.75	3	28	6	0.50
4	33	5	0.63	4	32	4	0.33
5	37	4	0.50	5	35	3	0.25
6	40	3	0.38	6	37	2	0.17
7	42	2	0.25	7	38	1	0.08

Profit maximization always implies cost minimization of the given level of output:

Profit maximization requires:

$$\frac{MRP_{labour}}{P_{labour}} = \frac{MRP_{capital}}{P_{capital}} = 1$$

It follows that:

$$\frac{MRP_{labour}}{P_{labour}} = \frac{MRP_{capital}}{P_{capital}}$$

It follows that:

$$\frac{MPP_{labour} * P_{product}}{P_{labour}} = \frac{MPP_{capital} * P_{product}}{P_{capital}}$$

Divide both sides by the product price

$$\frac{MPP_{labour}}{P_{labour}} = \frac{MPP_{capital}}{P_{capital}}$$

which is the cost minimization rule.

THE MARGINAL PRODUCTIVITY THEORY OF INCOME DISTRIBUTION

- Since individuals' productivity differs for a number of reasons (some of which the individual can influence such as education, ambition, etc., and some of which the individual has little control over, such as intelligence, physical attributes, etc.) the market **guarantees** an unequal distribution of income.

  Some view this as a failure of the market.

- Imperfect input markets