Intermediate Microeconomics

Chapter 10
The Price-Taking Firm

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Price-taking firm

- Optimal profit-maximizing production (see chapter 7) is where marginal cost equals marginal revenue
- *Price-taking firm* = firm that chooses its actions under the assumption that it cannot influence the price of prices of the output that it sells or the inputs that it buys
  - most firms are price-takers
  - need to know only the supply and demand curves
  - easy to analyze

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Two rules for profit maximization

- When the firm acts as a price taker, both its marginal revenue *and* average revenue equal the price that it takes as given
- *Marginal output rule*: If a firm does not shut down, then it should produce output at a level where the price (marginal revenue) is equal to marginal cost
- *Shut-down rule*: If for every choice of output level the price (firm's average revenue) is less that its average cost, then the firm should shut down

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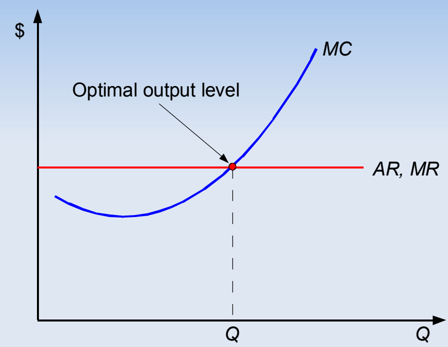
Marginal revenue rule



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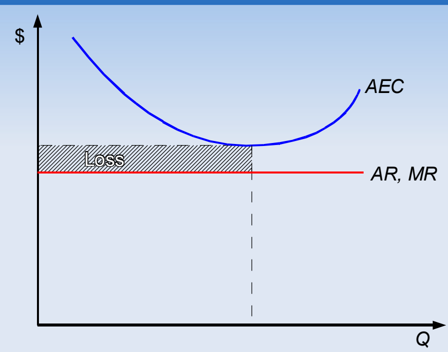
Shut-down rule



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Firm's supply

- Firm's production decision depends on the time horizon:
  - in the short run, some factors are fixed ⇒ supply decision is based on short-run marginal cost and revenue
  - in the long run, all factors are variable ⇒ supply decision is based on long-run marginal cost and revenue

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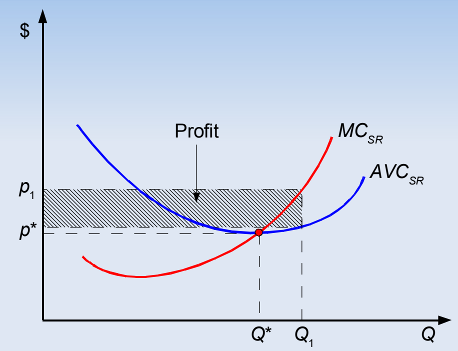
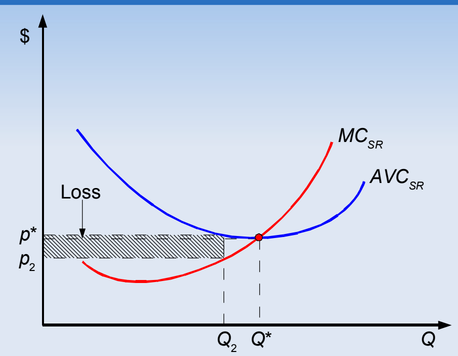
Production decision if price > p*



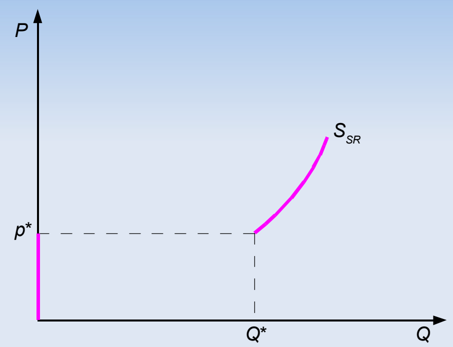
Production decision if price < p*



Short-run supply curve

- At any price above p*, the optimal output level is given by the marginal revenue rule: produce at the level at which MC = MR, hence MC = price
- At any price below p*, the shut-down rule becomes binding and thus the optimal output level is zero (firm out of business)
- Finally, the short-run supply curve consists of two parts:
  - vertical line at zero, for any price below p*
  - the part of the MC_{SR} curve above p*

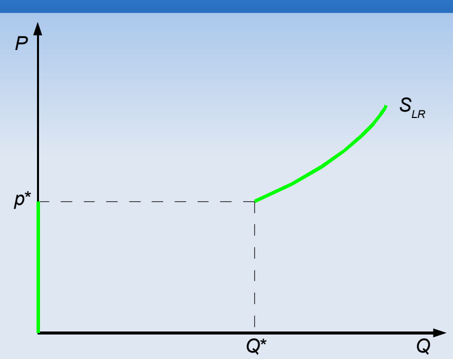
Short-run supply curve



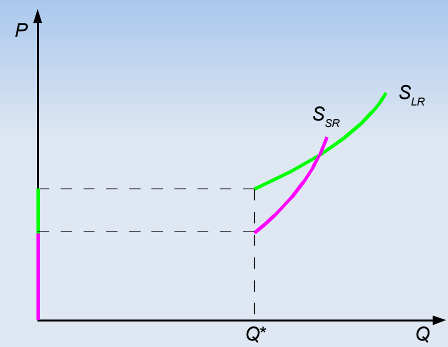
Long-run supply curve

- We can use the same logic to derive the long-run supply curve
- The difference is that now we use the long-run marginal and average cost
- The long-run supply curve consists, again, of two parts:
  - vertical line at zero, for any price below p*
  - the part of the MC_{LR} curve above p*

Long-run supply curve



Long-run vs short-run supply curve



Factor demand

- *Derived demand* = a firm's demand for an input is known as derived demand because it depends on (is derived from) the demand for the firms output
- Again, we need to consider the short run and the long run separately
- The same logic as before can be applied to factor markets

Short-run factor hiring rule

- The firm should hire an input just up to the amount at which the marginal benefit to the firm is equal to the marginal cost
- *Marginal revenue product* (*MRP*) = change in revenue due to the sale of the additional output contributed by the hiring one more unit of a factor

$$MRP_f = MPP_f \times MR_f = MPP_f \times p$$

- Marginal factor cost (*MFC*) = price of input (*w*)

⇒ *Rule*: hire factor until $MRP_f = MFC_f$

Are the rules consistent?

- *Short-run production rule*: $MC = p$
- But: remember that $MC = MFC / MPP$ (chapter 9) $\Rightarrow MFC = MPP \times p$
- *Short-run factor hiring rule*: $MRP = MFC$
- But: $MRP = MPP \times p \Rightarrow MFC = MPP \times p$
- Hence, both laws actually give the same relationship, just in different forms

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Short-run factor demand

- A firm that is a price-taker in both the factor market and the output market maximizes its profit by hiring a factor up to the point at which $MPP \times p = w$
- Then, the short-run derived (factor) demand curve for a firm that is a price taker in the market for the variable input coincides with the firm's marginal revenue product curve for that factor
- Downward slope because of the *output effect*: a higher input price leads to lower output and hence less of the input being demanded

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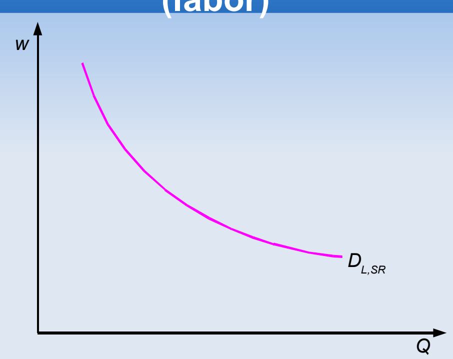
Short-run derived demand curve (labor)



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Long-run factor demand

- In the long run, all factors are variable
- In this case, an increase in the price of a factor has both an output effect (similar to the income effect) *and* a factor substitution effect
- *Factor substitution effect* = reduction in the quantity demanded of an input that results from the firm's substituting away from a factor when it's price rises
- The factor substitution effect is *always* negative, but the output effect can be positive or negative (compare to chapter 4!)

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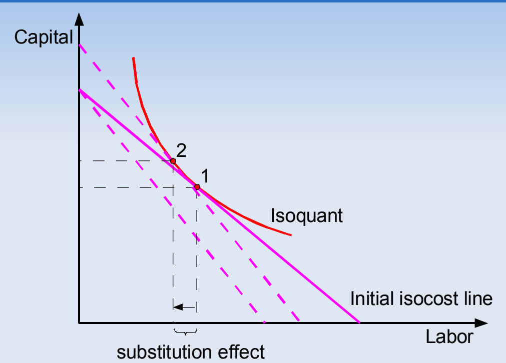
Substitution effect of wage increase



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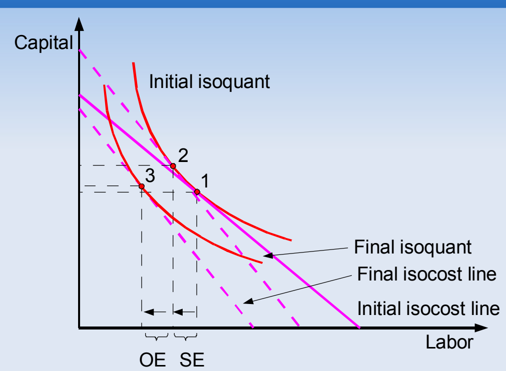
Effects of wage increase



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Long-run factor hiring rule

- The short-run factor hiring rule has to hold for all factors now (since they are all variable)
- In particular:

$$MPP_L \times p = w$$

$$MPP_K \times p = r$$

- This leads to the *same condition that we had for cost minimization*!

$$\frac{MPP_L}{MPP_K} = \frac{w}{r}$$

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