Perfect competition: Industry supply curves

Microeconomics

Industry supply curves

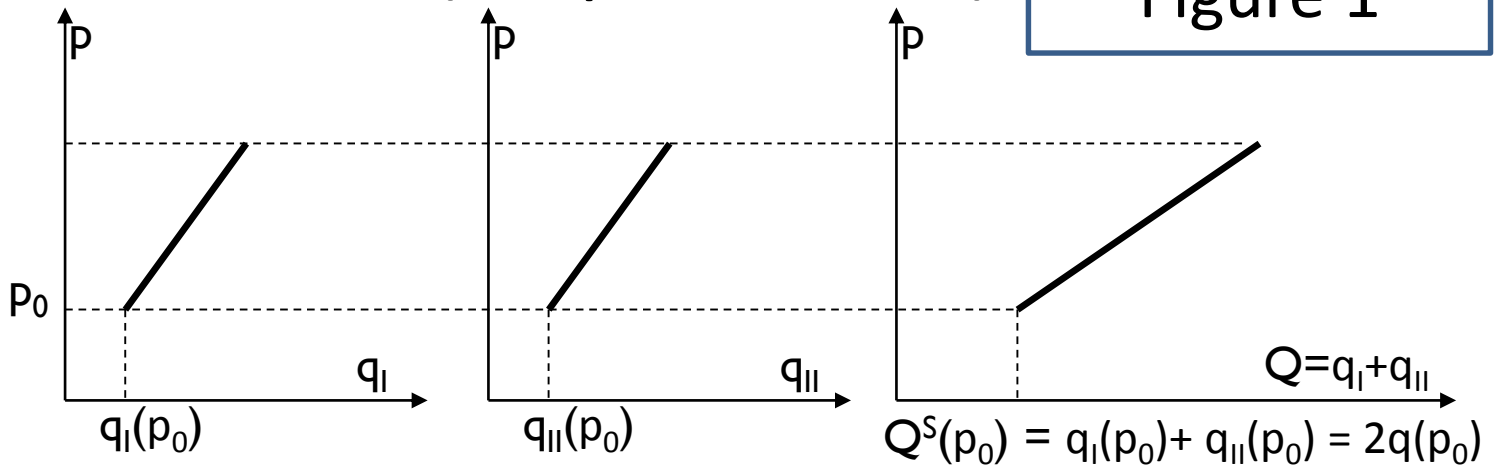
- A competitive industry comprises many firms. In the short run two things are fixed: the quantity of fixed factors used by each firm, and the number of firms in the industry.
- In the long run, each firm can vary all its factors of production, but the number of firms can also change through entry and exit from the industry.

If all firms were identical…

- If all firms had the same cost function (the same (perfect) information about the available technologies, equally advantageous locations etc.) the total quantity supplied would be the quantity supplied by one firm multiplied by the number of firms.
- Since the demand curve facing the firm is also the same (horizontal at the market price), the individual supply curves would be identical.

Aggregating the supply curves (simplified case)

Figure 1



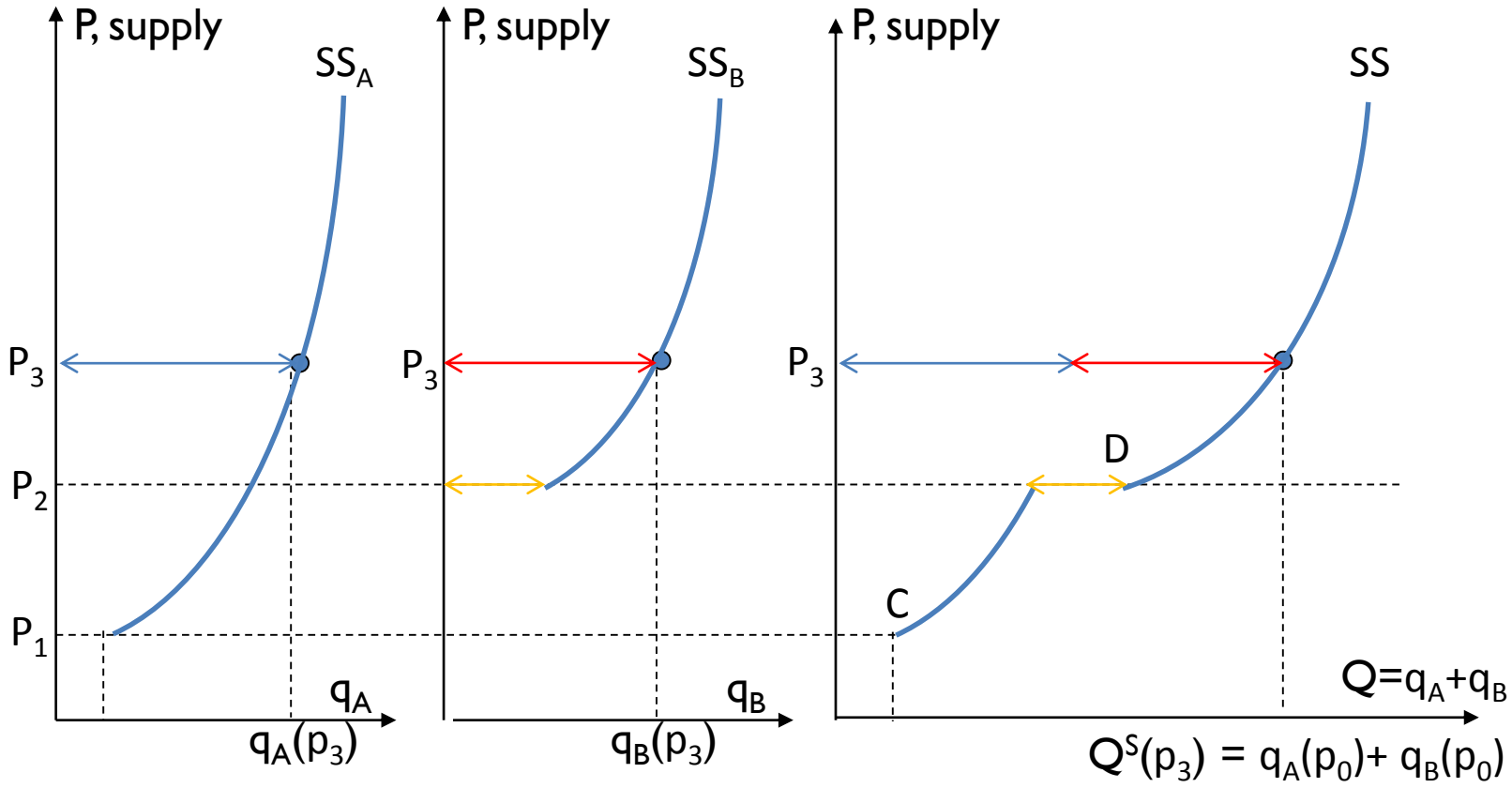
- The industry supply curve is obtained by adding at each price the quantity supplied by each firm in the industry.
- If more firms enter the industry, the market supply curve will become flatter (the equilibrium market price will decrease); if firms exit the industry, the market supply curve will become steeper. (Since firms are relatively small and a large number of them are in the industry – if only one of them enters (exits) the market the change in the market price will not be significant.)

Perfect competition in the long run (simplified case)

- If there are no barriers to entry, each firm will realize zero economic profit in the long run. (All firms would be at their break-even points: LAC(q*)=LMC(q*)=P*.)
- The number of firms in the industry: n=Q/q, where Q is the equilibrium quantity ($Q^* = Q^S(p^*) = Q^D(p^*)$).
- If the firms in the industry realized positive economic profits, other firms would enter the market, driving the market price down.
- If the firms in the industry realized negative economic profits, some firms would exit and the market price would rise making the remaining firms more profitable.

If firms are different…

- The industry supply curve *SS* shows the total quantity supplied at each price by all firms. With only two firms **A** and **B** figure 2 (on the next slide) shows how at each price such as P_3 we add $q_A(P_3)$ and $q_B(P_3)$ to obtain Q on the industry supply curve.
- Since firms have different shutdown prices or entry and exit prices, the industry supply curve can have step jumps at points such as ***C*** and ***D*** where an extra firm starts production.
- However, with many firms in the industry, each trivial relative to the industry as a whole, the step jumps in the industry supply curve when another starts production are so small that we can effectively think of the upward-sloping industry supply curve as smooth.



Aggregating the supply curves (firms are different)

Figure 2

In the short run (different firms)

- In the short run, the number of firms in the industry is given. Suppose there are two firms, **A** and **B**. Each firm's short run supply curve is the part of its *SMC* curve above the shutdown price.
- In figure 2, firm **A** has a lower shutdown price than firm **B**. Firm **A** has a lower *SAVC* curve. It may have a better location or better technical know-how. Each firm's supply curve is horizontal at the shutdown price. At a lower price, no output is supplied.

Constructing the industry supply curve

- At each price, the industry supply Q is the sum of q_A, the supply of firm **A**, and q_B, the supply of firm **B**.
- Thus if P_3 is the price:

$$Q(P_3) = q_A(P_3) + q_B(P_3)$$

- The industry supply curve is the horizontal sum of the separate supply curves.

Discontinuities

- The industry supply curve is discontinuous at the price P_1. Between P_1 and P_2 only the lower-cost firm **A** is producing. At P_2 firm **B** starts to produce as well.
- With many firms, each with a different shutdown price, there are many tiny discontinuities as we move up the industry supply curve. Since each firm in a competitive industry is trivial relative to the total, the industry supply curve is effectively smooth.

The long-run industry supply curve

- Figure 2 may also be used to derive the long-run industry supply curve. For each firm the individual supply curve is the part of its *LMC* curve above its entry and exit price.
- Unlike the short run, the number of firms in the industry is no longer fixed. Existing firms can leave the industry, and new firms can enter.
- Instead of horizontally aggregating at each price the quantities supplied by the existing firms in the industry, we must horizontally aggregate the quantities supplied by existing firms *and firms that might potentially enter the industry*.

In the long run

- Suppose that SS_A, SS_B and SS in figure 2 are long-run supply curves. At a price below P_2 firm **B** is not in the industry in the long run.
- At prices above P_2 firm **B** is in the industry.
- As the market price rises, total industry supply rises in the long run not just because each existing firm moves up its long-run supply curve, but also because new firms join the industry.

The number of firms

- Conversely, at low prices, high-cost firms lose money and leave the industry. Entry and exit in the long run are analogous to shutdown in the short run.
- In the long run, entry and exit affect the number of producing firms whose output is horizontally aggregated to get the industry supply.
- In the short run, the number of firms in the industry is given, but some are producing while others are temporarily shut down. Again, the industry supply curve is the horizontal sum of those outputs produced at the given market price.

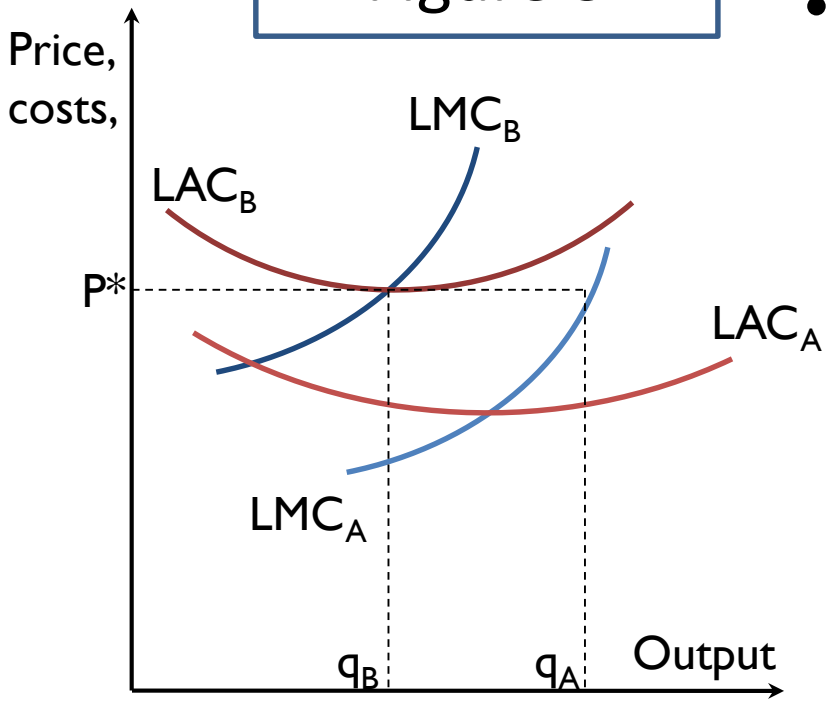
Long run and short run compared

- The long-run supply curve is flatter than its short-run counterpart. Each firm can vary its factors more appropriately in the long run and has a flatter supply curve.
- Moreover, higher prices attract extra firms into the industry. Industry output rises by more than the extra output supplied by the firms already in the industry.

- Conversely, if the price falls, firms initially move down their (relatively steep) short-run supply curves. If short-run average variable costs are covered, firms may not reduce output very much.
- In the long run each firm reduces output further since all factors of production can now be varied. In addition some firms exit the industry since they are no longer covering long-run average costs.
- A price cut reduces industry output by more in the long run than in the short run.

The marginal firm in the industry

Figure 3



- Suppose firms have different cost curves. Firm **A**, the lowest-cost firm in the industry, has long-run average costs LAC_A and marginal costs LMC_A. Firm **B** faces much higher costs LAC_B and LMC_B. Other firms have intermediate costs.

- At the price P^* firm **A** produces q_A and makes profits. Firm **B** produces q_B and just breaks even. Firm **B** is the marginal firm, the highest-cost producer that can remain in the industry in the long run.

The marginal firm

- Suppose there are many firms, each making the same product for sale at some price but having slightly different cost curves.
- Figure 3 shows cost curves for a low-cost firm **A** and a high-cost firm **B**. Some firms have costs lying between **A** and **B**, others have even higher costs than **B**.

The survival of the fittest

- The long run is the period in which adjustment – both inputs and number of firms – is complete. There is no more entry and exit.
- Suppose the long-run price is P^* in figure 3. The low-cost firm **A** makes q_A and earns profits, since P* exceeds LAC_A at the output q_A. Slightly higher-cost firms are making slightly less profit. Firm **B** is the last firm that can survive in the industry.

The marginal firm and the marginal firm waiting to enter the industry

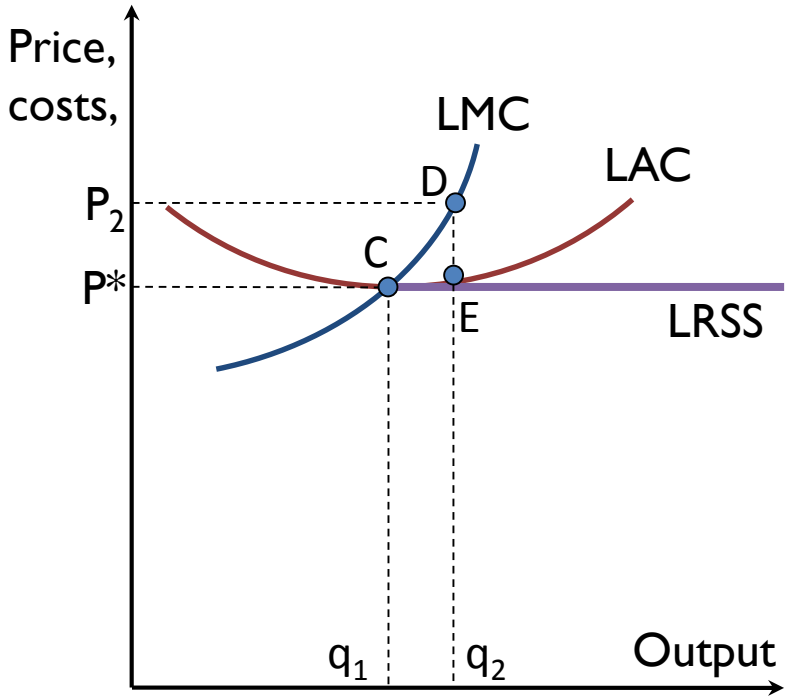
- The **marginal firm** in an industry just breaks even.
- All firms with higher costs than firm **B** cannot compete in the industry at a long-run price *P**.
- If a potential entrant has an *LAC* curve whose lowest point is only slightly above *P**, it is the **marginal firm waiting to enter the industry**.
- If anything makes *P** rise a little, this marginal firm can enter.

A horizontal long-run industry supply curve

- Each firm has a rising LMC curve, and thus a rising long-run supply curve. The industry supply curve is a bit flatter. Higher prices not merely induce existing firms to produce more, but also induce new firms to enter.
- In the extreme case, the industry long-run supply curve is horizontal if all existing firms and potential entrants have identical cost curves (see Figure 4 on the next slide).
- Below P^* no firm wants to supply. It takes a price P^* to induce each individual firm to make q_1.

The horizontal long-run industry supply curve

Figure 4



- When all existing firms and potential entrants have identical costs, industry output can be expanded without offering a price higher than *P**. The long-run industry supply curve is the horizontal line *LRSS* at *P**

- Industry output can be indefinitely expanded at this price by increasing the number of firms that each produce q_1.

Why is the *LRSS* horizontal?

- At a price P_2 above P^*, each firm makes q_2 and earns supernormal profits. Point ***D*** is above point ***E***.
- Since potential entrants face the same cost curves, new firms flood into the industry. The industry supply curve is horizontal at the long run at P^*.
- It is not necessary to bribe existing firms to move up their individual supply curves. Industry output is expanded by the entry of new firms alone.
- Figure 4 shows the long-run industry supply curve *LRSS*, horizontal at the price P^*

Rising long-run industry supply curves

- There are two reasons why a rising long-run industry supply curve is much more likely than a horizontal long-run supply curve for a competitive industry.
- First, it is unlikely that every firm and potential firm in the industry has identical cost curves.

- Second, even if all firms face the same cost curves, we draw a cost curve for given technology and given input prices.
- Although each small firm affects neither output prices nor input prices, collective expansion of output by all firms may bid up input prices.
- It then needs a higher output price to induce industry output to rise. In general, the long-run industry supply curve slopes up.