LECTURE 8: PRICE-TAKING FIRMS

Today’s Topic: Price Rules, OK?

1. **A Competitive Market?** the meaning of competition, a price-taker’s revenue.

2. **Profit Maximisation and the Supply Curve:** a simple example, $MC$ and supply, shut-down decisions, long-run entry or exit.

3. **Competitive Supply Curves:** market supply with a fixed number of firms, supply with entry or exit, shifts in demand, upwards-sloping long-run supply?
CONDITIONS FOR COMPETITION

Today: how price is everything for a price-taking firm in a competitive market;
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Three conditions for perfect competition: many buyers and sellers in the market; goods or services offered for sale largely identical; and (dynamically) firms can freely enter or exit the market.

Examples.
THE COMPETITIVE FIRM’S REVENUE

A price-taking firm faces a perfectly elastic, horizontal demand curve, at price $P$. 
THE COMPETITIVE FIRM’S REVENUE

A price-taking firm faces a perfectly elastic, horizontal demand curve, at price $P$.

The firm can sell as much as it wishes at price $P$ or below, but nothing at higher prices.

The firm’s Total Revenue, $TR = P \cdot y$, at output $y/period$.

Its Average Revenue: $AR = \frac{TR}{y} = P$

Its Marginal Revenue: $MR = \frac{\Delta R}{\Delta y} = P$

Remember: the firm cannot affect $P$ by varying its output $y$. 
EXAMPLE OF PROFIT MAXIMISATION

<table>
<thead>
<tr>
<th>Output Quantity</th>
<th>Total Revenue</th>
<th>Total Cost</th>
<th>Profit ( \pi )</th>
<th>Marginal Revenue ( MR )</th>
<th>Marginal Cost ( MC )</th>
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(GKSM, Table 14.2, with output price $P = $20/unit.)

$TC$ rises disproportionately: Decreasing Returns to Scale DRTS, and hence rising $MC$. Why?
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\(TC\) rises disproportionately: Decreasing Returns to Scale (DRTS), and hence rising \(MC\). Why?

What is the profit-maximising level of output?
PROFIT-MAXIMISING GRAPHS

Total Costs and Revenues $  

Output y/hr
PROFIT-MAXIMISING GRAPHS

Output \( y/\text{hr} \)

Total Costs and Revenues $
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Output y/hr

Total Costs and Revenues $
PROFIT-MAXIMISING GRAPHS

Output $/hr

Total Costs and Revenues $

0 1 2 3 4 5 6 7 8

40 80 120 160
PROFIT-MAXIMISING GRAPHS

Output (y/hr)

Total Costs and Revenues ($)

TR
TC
π

Profit (π)
PROFIT-MAXIMISING GRAPHS

Output /hr

Total Costs and Revenues $:

\[ TR \quad TC \]

Marginal Cost and Revenue $/unit:

\[ MC \quad MR = AR = P \]

Output /hr

\[ \pi \]
EFFECTS OF A PRICE FALL

[Graph showing total costs and revenues with output in y/hr on the x-axis and total costs and revenues in $ on the y-axis.]

- TC: Total Costs
- TR₁: Total Revenues for output level 1
- π₁: Profit for output level 1
EFFECTS OF A PRICE FALL

Output $/hr vs Total Costs and Revenues $

- $TC$, $TR_1$, $TR_2$

- $\pi_1$
EFFECTS OF A PRICE FALL

Two effects of a price fall:
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But the $\pi$-maximising output $y^*$ is more easily seen on the $MC-MR$ plot.
Profit-maximising output $y^*$ when $MC(y^*) = MR$. 

$P = AR = MR$
**MC CURVE AND SUPPLY**

Profit-maximising output $y^*$ when $MC(y^*) = MR$.

For a price-taking firm, $MR = AR = $ price $P$, so as $P$ varies, read off the optimum $y^*$ from the level of output where the horizontal demand curve (price $P$) cuts the upwards-sloping $MC$ curve.
Profit-maximising output $y^*$ when $MC(y^*) = MR$.

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∴ $\pi$-maximising output $y^*$ when $P = MC(y^*)$ for a price-taking firm.
BOB’S BAGELS

Price & Costs, $/unit

Output y/hr

MC
ATC
AVC
BOB’S BAGELS

Price & Costs, $/unit

Output \( y/hr \)

\( MR = AR = P \)
The competitive firm’s supply curve is its $MC$ curve.
The competitive firm’s supply curve is its $MC$ curve. At price $P =$ $1.50, optimum output $y^* = 10$ units/hr, and profit $\pi = y^* \cdot (AR - ATC) = 10(1.5 - 1) = $5/hr.
ECONOMIC PROFITS: +VE & −VE

$\text{$/unit}$

$\text{MC}(y)$

$\text{AC}(y)$

$P_1$

$\text{AR}_1 = \text{MR}_1$

$y_1$

output/period
ECONOMIC PROFITS: +VE & −VE

Green rectangle = positive profit = \( y_1 \cdot (AR_1 - AC_1) \)

Red rectangle = negative profit: \( P_3 = AR_3 < AC_3 \).
SHUTDOWN IN THE SHORT RUN

The firm will make a loss (a negative profit) when the Average Revenue ($= P$) is less than $ATC$. 
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So long as \(P = AR > AVC\), the firm will operate in the short run: price (i.e. \(AR\)) is sufficient to cover Variable Costs, even if it does not also cover Fixed Costs.
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How long can it supply while $AVC < P = AR < ATC$? Depends.
SHORT-RUN SUPPLY CURVE

Price & Costs, $/unit

Output y/hr

MC

AVC

ATC
The competitive firm’s (Bob’s Bagels) short-run supply curve is its $MC$ curve above $AVC$. 
The competitive firm's (Bob's Bagels) long-run supply curve is its $MC$ curve above $ATC$. 
LONG-RUN ENTRY OR EXIT

In the longer run, $FC$ may be partly avoidable, and exit will occur if the firm incurs a long-run loss: $\text{Profit} = \text{Total Revenue} - \text{Total Costs} < 0$. 
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Average Profit = $AR – ATC$

$\therefore \text{ Exit when Average Profit} < 0$, when $AR = P < ATC$ in the long run.
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Recall: $TC$ includes the opportunity cost of capital used.
SUPPLY WITH NO ENTRY OR EXIT

The *Industry Supply Curve* $S$ is the horizontal sum of the supply curves $S_1, S_2, S_3, \ldots S_n$ of the $n$ individual price-taking firms:
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$$S = y_1 + y_2 + y_3 + \cdots + y_n$$

At price $P'$, how much will each firm offer to supply?
SUPPLY WITH ENTRY AND EXIT

Firms enter (if $\pi > 0$) or exit ($\pi < 0$).
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Positive profit ($AR = P_1 > ATC$) induces entry. Equilibrium price $P$ falls as supply shift right. The marginal firm’s profit falls to zero: $P_2 = MC = AC$
THE MARGINAL PRICE-TAKING FIRM

\[ MC(y) \]

\[ AC(y) \]

\[ P_1 \]

\[ P_2 \]

\[ AR_1 = D_1 = MR_1 \]

\[ AR_2 = D_2 = MR_2 \]

\[ y^* \]

\[ \text{output/period} \]

\[ \$/\text{unit} \]
THE MARGINAL PRICE-TAKING FIRM

The *marginal firm*: the first to exit if long-run price $P$ falls below $P_2$ (zero-profit). For this firm, new entrants have competed away any positive economic profits.
THE MARGINAL FIRM

Four things characterise this firm at equilibrium:
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2. the firm is **profit-maximising**
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4. $y^*$ is the Efficient Scale of production:
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\[ \therefore AR = MR = P_2 = MC = ATC \text{ at } y^* \]
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\[
\begin{align*}
\therefore \ AR &= MR = P_2 = MC = ATC \text{ at } y^* \\
\end{align*}
\]

Firms with lower costs will still have positive profits at \( P_2 \) and will operate above their Efficient Scales of Production.
A SHIFT IN DEMAND OVER TIME

From LR equilibrium, a shift in demand raises price (up the SR supply curve), which creates positive profits in the industry and larger quantity supplied.
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New firms enter, which shifts the SR supply to the right.

New equilibrium: price falls to minimum $AC$ on the LR supply curve.
DOES LONG-RUN SUPPLY SLOPE UP?

Yes:
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Yes: even in the long run some input factors might be limited in supply
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Yes: even in the long run some input factors might be limited in supply (examples? land, rare mineral inputs, environmental amenity and absorption ability) so prices rise with increased demand (and so the firm’s production costs). (This is industry DRTS.)

Firms’ costs vary: lower-cost firms might have limited capacity to supply, and the marginal firm is one with higher costs, making zero long-run profit at a market price which provides the lower-cost firms with positive profits.
SUMMARY

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4. Industry (or market) supply curves are horizontal (CRTS) or rising (DRTS).