McPeak
Lecture 9
PAI 723

Competitive firms and markets.

Recall the conditions for a perfectly competitive market.

1) The good is homogenous
2) Large numbers of buyers and sellers/ freedom of entry and exit
3) Perfect information by both buyers and sellers
4) No transaction costs

Firms are price takers in both input and output markets.

[That is to say, a firm can set a selling price higher than the market price or offer to pay less for inputs than the market price, but nobody will buy their product or sell them inputs if they do so]

Profit maximization.

Profit = Revenue – costs.

Questions to be asked when considering profit maximization:

1) Should I produce at all?
2) If so, how much should I produce?

To begin with, let us focus on the case when we should produce an amount larger than zero, and then later consider what would lead the firm to be better off producing zero.

I am going to also assume now that we are in the long run, and we will introduce short run issues later.

I should produce to the point where profit is maximized.

Show graph, with derivatives.

May not know the shape, but you could think of this shape coming from experimentation.

At the peak of the curve, marginal profit equals zero (increasing to the left of the maximum, decreasing to the right of the maximum).

Since we know that ∏(q)=R(q)-C(q),[1] we can think of the marginal representation of this as:

M∏=MR-MC, or $\frac{\Delta\pi}{\Delta q} = \frac{\Delta R}{\Delta q} - \frac{\Delta C}{\Delta q}$

We can elaborate on this expression a bit since we know that ∏=R-C can also be expressed as

$\pi(x) = p * f(x) - C(x) \;\; with\; q = f(x)$

With x as an input or a set of inputs.

We can see that each additional unit of q (represented here by f(x)) generates an additional revenue of size p.

So in fact, MR =$\frac{\Delta R}{\Delta q}$ = p.

The competitive firm will produce at output level q' where MC(q')=p.

Since p = MR (and assuming p is greater than or equal to AC(q') as we will see in a moment)
M∏=0 where MR=MC, and with MC=p, we have p=MC.

Show graph.

[1] If C is noted, this is also called TC in other places in the notes. C for cost is another way of stating Total Cost; C=TC.

If we want, we can also think of profit per unit.
In this case it is equal to AR-AC.
Average Revenue is $\frac{R}{q} = \frac{p*f(x)}{q} = \frac{p*q}{q} = p$
So p-AC(q') is profit per unit.
If we sell q' units our total profit is q*(p-AC(q')), which is q*average profit per unit.

What if price is not greater than average cost?

Long run production level decision. Consider the point q' where MC(q')=p. If this point is above AC(q'), then the firm stays in production. If not, shut down (q'=0).

Note that p is both MR and AR if that helps.

Show graph

Now consider the same type of decision, but consider the example of a short run setting where fixed costs exist.

$\prod(q)=R(q)-VC(q)-FC$.

Find q' where p=MC(q'), noting that this is where

$$p = \frac{\Delta TC}{\Delta q} = \frac{\Delta VC}{\Delta q}$$

If at this point variable costs are greater than revenue, then shut down. It is already bad, producing makes it worse.

If variable costs are less than revenue, then stay open and produce. You will at least be eating into your losses, if not earning positive profit.

Show graph

The value of p is given by the market.

If when I determine a quantity level q' that sets MC(q')=p, p is below AVC(q') – note not the AC(q') curve – then I should not produce anything.

Set q=0 and hope for better times in the future. The short run shut down rule. I am better off paying fixed cost and producing zero than I am producing more than zero since I am making things worse than π =-FC.

If when I choose the quantity level q' that sets MC(q')=p, the price p is above AVC(q') then I should produce q'. I will minimizing loss / maximizing profit at this point: π >-FC

The competitive firm's short run supply curve is the marginal cost curve above the average variable cost. There is a discontinuity / jump / gap.

Show graph.

The market supply curve is the horizontal sum of all the individual firms supply curves. Supply goes up as selling price increases due to a mix of firms entering the market and firms already in the market supplying more.
[show derivation]

Think about supply shifts when input costs go up.

Show graph.

Supply slopes up due to the diminishing marginal returns to an input in this short run context, which is why the marginal cost curve is upward sloping.

The competitive firm's long run supply curve is the marginal cost curve above the average cost. There is still a discontinuity / jump / gap.

Show graph.

In the long run, there is no fixed cost / variable cost distinction, so the diminishing marginal returns explanation for the upward sloping curve is not going to hold.

The long run market supply curve is flat with p=AC=MC for all values of q if and only if:

1) Firms can freely enter and exit
2) Firms are identical
3) Input prices are constant

What would make entry limited? Production requires a limited resource. Government regulations. Entry is costly. This makes it slope up.

Table 8.1 Average Annual Entry and Exit Rates in Selected U.S. Industries, 1989–1996.

Industry	Entry Rate, %	Exit Rate, %
Total economy	10	8
Agriculture, hunting, forestry, and fishing	11	8
Construction	11	9
Services	10	8
Mining and quarrying	8	9
Total manufacturing	8	7
Textile products, leather, and footwear	12	12
Wood products	10	9
Paper products, printing, and publishing	8	8
Food products, beverages, and tobacco	8	7
Chemical, rubber, plastics, and fuel products	8	6
Electricity, gas, and water supply	4	3

Source: Calculations based on data from the OECD Firm-Level Data Project, www.oecd.org, as of 2005.

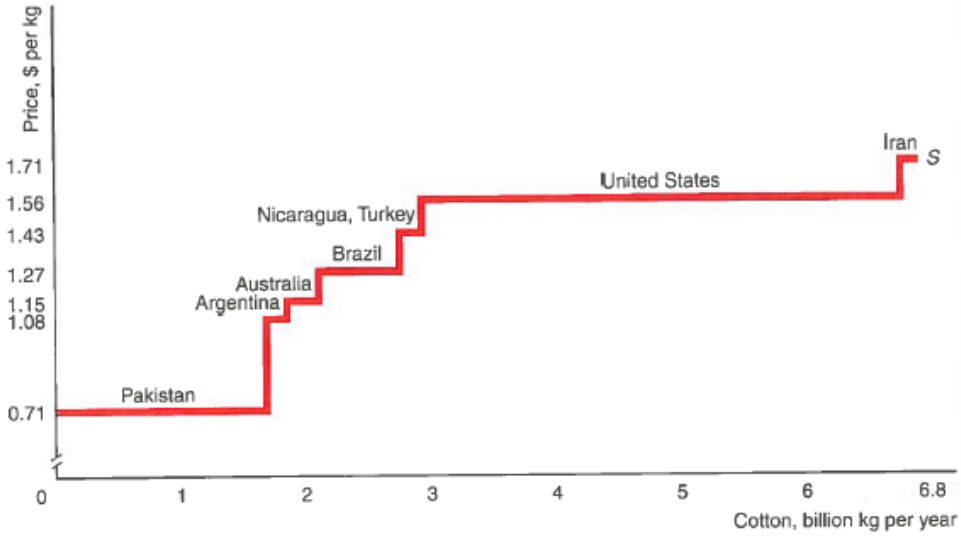
What would make firms not be identical? Location, production and regulation environment, climate. This makes it slope up.

Application

Upward-Sloping Long-Run Supply Curve for Cotton

Many countries produce cotton. Production costs differ among countries because of differences in the quality of land, rainfall, costs of irrigation, costs of labor, and other factors.

The length of each step-like segment of the long-run supply curve of cotton in the graph is the quantity produced by the labeled country. The amount that the low-cost countries can produce must be limited, or we would not observe production by the higher-cost countries.



The height of each segment of the supply curve is the typical minimum average cost of production in that country. The average cost of production in Pakistan is less than half that in Iran. The supply curve has a step-like appearance because we are using an average of the estimated average cost in each country, which is a single number. If we knew the individual firms' supply curves in each of these countries, the market supply curve would have a smoother shape.

As the market price rises, the number of countries producing rises. At market prices below $1.08 per kilogram, only Pakistan produces. If the market price is below $1.50, the United States and Iran do not produce. If the price increases to $1.56, the United States supplies a large amount of cotton. In this range of the supply curve, supply is very elastic. For Iran to produce, the price has to rise to $1.71. Price increases in that range result in only a relatively small increase in supply. Thus, the supply curve is relatively inelastic at prices above $1.56.

What would make input prices vary across firms? If there are only a few firms who use the input (jet engine example) increased demand by competitors should drive up the price of the input (compared to the receptionist example). If there is something about the scale of production allowing different technologies to be used (PC is output, floppy disc is input example), then we can have decreasing input cost as quantity expands.

Competitive firms earn zero economic profit in the long run.

If firms are earning higher than average return to capital, other firms will move in, bringing down the price, bringing down the firm's profit.

In 2020, private equity continued to provide a strong return on investment, with a median annualized return of 12.3% over a 10-year period.\
https://www.investmentcouncil.org/

If firms are earning less than the average return to capital, some firms will drop out and reallocate capital to a more attractive sector, bringing price up.

If a firm does not maximize profit, they will be losing money and be driven from business.

Summary:

A profit maximizing firm must then choose the level of quantity it produces in a way that:

Uses inputs in a technologically efficient fashion (production function).

Uses an input mix that is selected to minimize the cost of producing q (isoquant / isocost)

Compares the marginal cost of producing at that level to the marginal revenue of producing at that level (profit maximization)