PRODUCTION AND FIRMS – PART 2

SOME CONCEPTUAL DISTINCTIONS OF COSTS (P-R pp. 213-8)

1. ECONOMIC VERSUS ACCOUNTING COSTS
   Accounting costs include actual transactions – interest, IRS-formula depreciation, ...
   Purpose is descriptive – monitoring on behalf of shareholders etc.
   Economic costs are opportunity costs – purpose is to help decision-making, prescriptive
   1. A machine or building fully owned by a firm still has an opportunity cost
   2. Sunk costs (unavoidable commitments) are not opportunity costs
   The decision whether to make such a commitment should take its cost into consideration
   but once it is made, the cost is not relevant for subsequent decisions

2. FIXED VERSUS SUNK
   Fixed – Independent of the (positive) level of output, but can be avoided if produce zero
   Sunk – Independent of the level of output, and cannot be avoided even if produce zero
   Usually because of contractual commitments that must be honored
   Better labels would be “Fixed but not sunk” and “Fixed and sunk”

3. SHORT RUN VERSUS LONG RUN
   Different degree of variability of different inputs; longer time implies fewer costs are sunk
   Expository device - capital is fixed in short run, labor variable in short run
TWO INPUTS – COST MINIMIZATION (P-R pp. 226-32)

For any assigned output target level Q
Minimize \( wL + rK \) subject to \( F(K,L) = Q \)
Figure shows isoquant, and isocost lines
Slope of isoquant at each point
  = MRTS at that point
Expression for MRTS: \( \frac{MP_L}{MP_K} \)
Constant slope of isocost lines =
  \( \frac{w}{r} \) in numerical value

Condition for cost-min: MRTS = \( \frac{w}{r} \)
So \( \frac{MP_L}{MP_K} = \frac{w}{r} \), or \( \frac{MP_L}{w} = \frac{MP_K}{r} \), or \( \frac{w}{MP_L} = \frac{r}{MP_K} \)

Interpretation – To produce 1 more unit of output, need
  Either \( \frac{1}{MP_L} \) more labor at cost \( \frac{w}{MP_L} \)
  Or \( \frac{1}{MP_K} \) more capital at cost \( \frac{r}{MP_K} \)
or some mixture. When optimal choice made, these two must be equal, each = MC
If we solve cost-min by Lagrange’s method, will find Lagrange multiplier = MC

Example – Cobb-Douglas, \( Q = A K^\alpha L^\beta \). Remember MRTS = \( \frac{(\beta K)}{(\alpha L)} \)
So cost-min condition \( \frac{(\beta K)}{(\alpha L)} = \frac{w}{r} \), or \( \beta \frac{(rK)}{\alpha} = \alpha \frac{(wL)}{\beta} \), or \( \frac{rK}{\alpha} = \frac{wL}{\beta} \)
Empirical approximation for aggregate production function for whole economy has
  \( \alpha \approx 0.3, \ \beta \approx 0.7 \), so these are approx. shares of capital and labor in total income
COST FUNCTION $C(Q)$ (P-R pp. 232-5)

Can do the above calculation for each $Q$; this yields whole cost function $C(Q)$.
Short run (capital $K$ cannot be altered, its costs are sunk) versus long run (no costs sunk, $K$ and $L$ can both be chosen optimally).

In Figure, $K = K_2$ just happens to be optimal for producing $Q = Q_2$.
When $Q = Q_1$, would like smaller $K$ when $Q = Q_3$, would like larger $K$.
Inability to change $K$ in short run:
- Short run cost > long run cost in both those situations.

Hence SRTC lies above LRTC and SRAC lies above LRAC except for coinciding at $Q_2$. 
Example shown in Figure:
Most labels are standard, except SC = sunk cost
Subscript M stands for the AC-minimizing quantity
Note that $\text{SRQ}_M > Q_2$;
even in SR, there may be scale economies beyond $Q_2$
In long run, even more, because $K$ can be varied

More complex picture of this kind, showing points to the right of $\text{LRQ}_M$ also, is in P-R p. 239
However, they do not do a good job of distinguishing between fixed and sunk

A more complete picture is on the next page
GENERAL PICTURE OF ONE FIRM’S COST CURVES: NOTATION

TC = total cost
FC = fixed cost (does not vary as output Q varies but stays > 0)
FSC = fixed and sunk cost (unavoidable even if Q = 0)
FAC = fixed but avoidable (not sunk) cost (can be avoided if Q = 0)
TVC = total variable cost
TAC = total avoidable cost

TC = FC + TVC
FC = FSC + FAC
TC = FSC + TAC
TAC + FSC = TC = FC + TVC = FSC + FAC + TVC
TAC = TVC + FAC

AC = TC / Q = average cost (P-R call this “average total cost” ATC but that can be confusing)
AVC = TVC / Q = average variable cost
AAC = TAC / Q = average avoidable cost (AAC is P-R’s “average economic cost” on p. 270)

AAC = (TVC + FAC) / Q = AVC + FAC / Q (therefore AAC > AVC)
AC = AVC + FC / Q
AC = AAC + FSC / Q

MC = marginal cost, passes through the min of all of AC, AAC, AVC

S = short-run supply curve of a price-taking firm: coincides with MC above point of min AAC