THEORY OF THE FIRM – BASIC QUESTIONS

WHAT IS A FIRM?

Orthodox view

Firm is production technology: Output = F(Inputs)
Buys inputs, produces and sells output
Owner chooses quantities to maximize profit

New view – Studies internal organization of firm
based on hierarchies and commands, not markets
Island of central planning in a sea of markets
Choice of market versus hierarchy depends on

1. Is relationship occasional or recurring?
2. Is there product-specific investment?
3. Is quality of product, effort etc. observable?

Firm is complex of "principal-agent" relationships
Owners (or shareholders) and managers
Managers and workers (many levels)
These relationships work via incentives, monitoring,
explicit and implicit contracts, career concerns ...

Some principal-agent issues later; more in ECO 307
Old view still useful in characterizing
firm's relationships with rest of economy
(output supply and input demand functions)

TIME ASPECTS OF PRODUCTION

1. STOCKS AND FLOWS

Production is a flow – quantity per period (month, year ...)
    Costs and profits should also be flows ($ per period)
Some inputs are also flows – used up when used
    Raw materials, labor services
Other inputs are stocks – machines, land ...
    Relevant input price is not their whole purchase cost
    but that of using their services for the period
Actual or "imputed" cost of renting services:
    interest plus depreciation

2. SLOW ADJUSTMENT

Not possible to adjust inputs optimally every instant
    Contracts with suppliers, laws against firing workers ...
     costs "sunk" – not avoidable by producing less or zero
Distinction – fixed versus sunk
    Fixed: $C(0) = 0$ but as $Q \downarrow 0$, $\lim C(Q) > 0$
    Sunk: $C(0) > 0$
Longer timespan of analysis $\Rightarrow$ fewer costs sunk
    Long run – no sunk costs (Free entry and exit)
    Short run – some costs sunk
      Marshallian convention – capital sunk, labor variable
    Very short run – All costs sunk, output supply fixed

PRODUCTION FUNCTIONS

Read this in conjunction with the "graphics" handout.

Output = F(Inputs), Technological data, exogenous

$Q = F(K, L)$

Examples: Cobb-Douglas: $Q = K^{\alpha}\ L^{\beta}$

Constant elasticity of subst'n: with $\beta < 1$ and $\gamma > 0$,

$Q = [\,a\,K^{\beta} + b\,L^{\beta}\,]^{\gamma/\beta}$

Similar to utility functions, but cardinal –
scale of output has physical significance

Marginal products $\partial Q/\partial K$, $\partial F/\partial K$, F_K

Diminishing marg. prod.s: $\partial^2 Q/\partial K^2 < 0$, $\partial^2 Q/\partial L^2 < 0$

Average products Q/K, Q/L

Diminishing returns to each factor: $Q/K\ \downarrow$ as $K\ \uparrow$

Returns to scale: For $s > 1$,

if $F(sK, sL) > s\ F(K, L)$, increasing returns to scale

if $=$, constant; if $<$, diminishing

Examples:

Cobb-Douglas: $(s\,K)^{\alpha}\,(sL)^{\beta} = s^{\alpha+\beta}\,K^{\alpha}\,L^{\beta}$

Returns to scale depend on $\alpha + \beta$:

incr. if > 1, constant if $= 1$, decr. if < 1

CES: $[\,a\,(sK)^{\beta} + b\,(sL)^{\beta}\,]^{\gamma/\beta} = s^{\gamma}\ [\,a\,K^{\beta} + b\,L^{\beta}\,]^{\gamma/\beta}$

Returns to scale depend on γ

incr. if > 1, const. if $= 1$, decr. if < 1

Returns to scale in production and average cost linked

Increasing returns to scale imply decreasing AC etc.

Returns to scale can be first increasing, then decreasing

(leads to U-shaped cost curves)

Isoquant - Locus of (L, K) such that $F(L, K) =$ constant

Marginal Rate of Technical Substitution:

$$MRTS_{KL} = - \left. \frac{dK}{dL} \right|_{Q=\text{const}} = \frac{\partial Q / \partial L}{\partial Q / \partial K}$$

Diminishing MRTS, serves as SOC for firm's input-cost-min.

Will show (also ECO 102) that cost-min implies

$$MRTS_{KL} = w \,/\, r$$

w is the wage rate and r the price of using (renting) capital.

Input substitution: as $w/r \uparrow$, $K/L \uparrow$ along isoquant

Elasticity of this function is elasticity of substitution

Using Precept Week 3 work for CES utility function

$$MRTS_{KL} = \frac{b}{a} \left(\frac{L}{K} \right)^{\beta - 1}$$

$$\frac{K}{L} = \left(\frac{a}{b} \right)^{1/(1-\beta)} \left(\frac{w}{r} \right)^{1/(1-\beta)}$$

so elasticity of substitution $\sigma = 1/(1 - \beta)$.