Review Notes – Production, Technology and Profit Maximization

- The Production Function.
  - $Y = f(L, K, N, E)$ – what does this mean?
  - Graphically
  - What is the production set?

- Isoquants
  - Definition given $Y^* = f(L, K)$: Shows all combinations of L and K that give output $Y^*$.
  - What are some examples of isoquants?
  - Assumptions about production
    - Free Disposal or Monotonic Technology
    - Convexity of isoquants
    - Why do these assumptions make sense?
  - Other Definitions
    - Marginal Product of the any input equals?
    - Technical Rate of Substitution? Slope of the isoquant curve and equals what?
    - Short-run vs. Long-run in production
    - Returns to Scale
      - Constant Returns to Scale
      - Decreasing Returns to Scale
      - Increasing Returns to Scale
      - What is the difference between returns to scale and diminishing returns?

- Profit Maximization
  - Definitions
    - Total Revenue
    - Total Costs
      - Which costs are included?
    - Profit
      - Economic profit vs. accounting profit
  - Types of Inputs
    - Variable inputs
    - Fixed inputs
    - Quasi-fixed inputs
  - Short-run profit maximization
    - Assume 2 inputs, one variable (L) and one fixed (K)
    - Firm problem is to max profit ($\pi$) subject to $Y = f(L, K)$ with K fixed
      - $\pi = Pf(L, K) - wL - rK$
      - What is an isoprofit curve?
        - $Y = \pi/P + wL/P + rK/P$
• What does the isoprofit look like graphically?
• How many isoprofit curves are there?
• What is its slope and intercept?
• What is the slope of the production function in the short–run?
• Maximizing profit requires that the isoprofit be tangent to the production function. Why?
  • In other words => MP_L = w/P
  • What happens to input usage when P, L, MP_L change in the short-run? Graphically? Mathematically?

- Long-run profit maximization
  • Maximizing profit requires that the isoprofit be tangent to the production function for both inputs. Why?
  • In other words both conditions must hold simultaneously
    • MP_L = w/P
    • MP_K = r/P
    • Or MP_L/w = MP_K/r
    • Or w/MP_L = r/MP_K
    • Make sure you know how to interpret both conditions, how they work, how they are similar, how they are different.
    • L* = f(P,w,r); K* = f(P,w,r) are the factor demand curves. What are these? Where do they come from?
    • What are inverse factor demand curves?
  • What does profit maximization imply about returns to scale?
  • Revealed profitability
    • What’s that?
    • Definition/equations – WARP – Weak Axiom of Revealed Profitability
    • Implications of WARP with respect to:
      • Firm Supply of the Product
      • Firm Demand for the inputs
    • How can one use WARP to derive production functions?
  • What does profit maximization imply about costs?