Modeling Supply

Short Course on CGE Modeling, University of the South Pacific

John Gilbert

Professor
Department of Economics and Finance
Jon M. Huntsman School of Business
Utah State University
jgilbert@usu.edu

July 23-27, 2012

UtahStateUniversity
JON M. HUNTSMAN
SCHOOL OF BUSINESS

- Now that we have modeled the firm's production decision, we will complete a basic model of supply.

- We will consider two cases. In the first we will assume that all factors of production are mobile between economic activities.

- Next we will show how exception handling can be used to introduce specific factors.

Session Outline

1. The long-run production problem
2. Building the model in GAMS
3. Extending to allow specific factors

GDP Maximization

- Consider the problem of maximizing the value of total output (GDP), at given prices, subject to the constraints imposed by resource limitations.
- This sounds like a social planning problem and may in fact be viewed as such, it is not necessary to do so. When there are no factor market distortions, factor endowments are fixed, and competition prevails, the market maximizes the value of output at given output prices.
- We will start with the two factor, two good case.
- Both factors are assumed to be mobile.

Formal Problem

The problem can be written:

$$\max \quad \mathscr{L} = p_1 q_1(K_1, L_1) + p_2 q_2(K_2, L_2) + \lambda[\bar{K} - K_1 - K_2] + \mu[\bar{L} - L_1 - L_2]$$

The first order conditions are:

$$\partial \mathscr{L}/\partial K_1 = p_1 \partial q_1/\partial K_1 - \lambda = 0$$
$$\partial \mathscr{L}/\partial L_1 = p_1 \partial q_1/\partial L_1 - \mu = 0$$
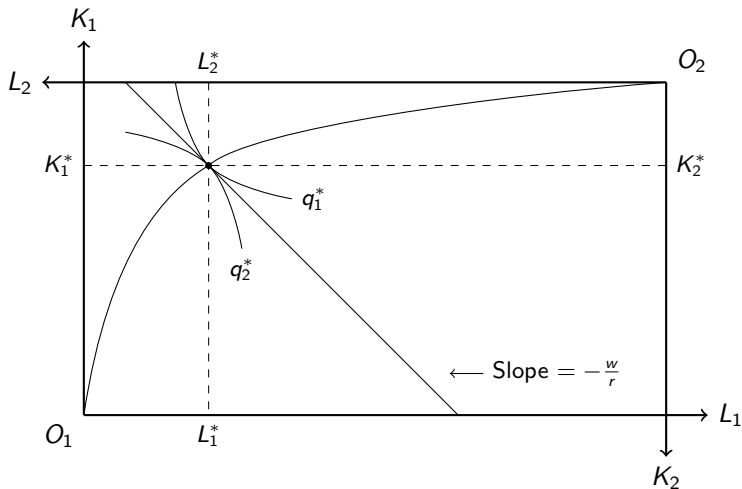$$\partial \mathscr{L}/\partial K_2 = p_2 \partial q_2/\partial K_2 - \lambda = 0$$
$$\partial \mathscr{L}/\partial L_2 = p_2 \partial q_2/\partial L_2 - \mu = 0$$
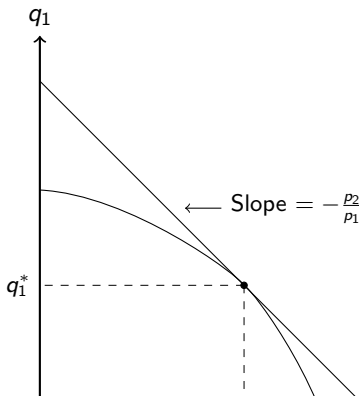$$\partial \mathscr{L}/\partial \lambda = \bar{K} - K_1 - K_2 = 0$$
$$\partial \mathscr{L}/\partial \mu = \bar{L} - L_1 - L_2 = 0$$

- Under competitive conditions, the shadow values on the resource constraints are factor prices.
- Hence, at an optimum, each factor price is equal to the value of the marginal product of that factor in each industry.
- Also at an optimum, resources are fully utilized.

Geometric Interpretation

Geometric Interpretation