ARE 150
Spring 2019 - Week 5
TA: Zachariah Rutledge

1. Labor demand:
    a. Deriving labor demand
    b. From theory to data: intermediate inputs, VASH, multistage production function, etc
2. Labor supply:
    2.1 Deriving labor supply
    2.2 In which sector to work? These models allow us to answer questions about aggregates
        - Lewis model: dual economy (two sectors)
        - Harris-Todaro: migration and urban unemployment
    2.3 Who moves out of agriculture?
    Mover-stayer model
3. Equilibrium: integrating labor demand and supply

Today: 2.3 and 3

MOVER-STAYER MODEL:

- Two sectors: agricultural and modern
- Both sectors are located in different places: rural vs urban
- Let Di=1 if individual chooses to stay in agricultural sector
- Individuals are heterogeneous in many aspects: skills, age, endowment of assets, social capital/networks.

If we assume that individuals maximize utility, we have that:

$$D_i = \begin{cases} 1 \; if \; U_A > U_M \\ 0 \; if \; U_A \leq U_M \end{cases}$$

Utility is not observable but we can approximate it with net income: income (Y)-cost(C). Thus,

$$D_i = \begin{cases} 1 \; if \; Y_A - C_A > Y_M - C_M \\ 0 \; if \; Y_A - C_A \leq Y_M - C_M \end{cases}$$

Since in this model we allow individuals to be heterogeneous, the net cost is going to depend on individual's characteristics.

<u>Income:</u>

Income depends on some characteristics that are observed by the researcher and other characteristics that are not observed (i.e. innate ability):

$$Y_{i,A} = \boldsymbol{f}(observable\ characteristics) + \varepsilon_{i,A}$$

$$Y_{i,M} = \boldsymbol{g}(observable\ characteristics) + \varepsilon_{i,M}$$

Examples of observable characteristics that are relevant:

- Education
- Xi: age, experiences, gender, family size, assets, land ownership, etc
- Networks-social capital specific to the sector

$$Y_{i,A} = \boldsymbol{f}\left(educ_i, X_i, net_{i,A}\right) + \varepsilon_{i,A}$$

$$Y_{i,M} = \boldsymbol{g}\left(educ_i, X_i, net_{i,M}\right) + \varepsilon_{i,M}$$

<u>Costs:</u>

The costs of staying (or moving) to one sector also depend on individual characteristics. For simplicity, we assume that the relevant characteristics are observed by the researcher.

$$C_{i,A} = C_{i,A}\left(X_i, net_{i,A}\right)$$

$$C_{i,M} = C_{i,M}\left(X_i, net_{i,M}\right)$$

Thus, the criteria to stay in agriculture becomes:

Di=1 (works in farm if)

$$Y_{i,A} - C_{i,A} > Y_{i,M} - C_{i,M}$$

$$f\left(educ_i, X_i, net_{i,A}\right) + \varepsilon_{i,A} - C_{i,A}\left(X_i, net_{i,A}\right) > g\left(educ_i, X_i, net_{i,M}\right) + \varepsilon_{i,M} - C_{i,M}\left(X_i, net_{i,M}\right)$$

<u>Empirical implications of the model</u>

Since we assume that the choice variable is discrete (i.e.1 if work in agriculture, 0 otherwise), empirically, we can approach this problem using a model of discrete choice where the objective is to estimate the probability that the individual stays in agriculture: Pr(Di=1)

$$\begin{aligned} Prob(D_i = 1) = Prob[&f\left(educ_i, X_i, net_{i,A}\right) + \varepsilon_{i,A} - C_{i,A}\left(X_i, net_{i,A}\right) \\ &> g\left(educ_i, X_i, net_{i,M}\right) + \varepsilon_{i,M} - C_{i,M}\left(X_i, net_{i,M}\right)] \end{aligned}$$

$$\begin{aligned} Prob(D_i = 1) = Prob\big[&f\left(educ_i, X_i, net_{i,A}\right) + \varepsilon_{i,A} - C_{i,A}\left(X_i, net_{i,A}\right) - g\left(educ_i, X_i, net_{i,M}\right) - \varepsilon_{i,M} \\ &+ C_{i,M}\left(X_i, net_{i,M}\right) > 0\big] \end{aligned}$$

$$\begin{aligned} Prob(D_i = 1) = Prob\Big[&\left[f\left(educ_i, X_i, net_{i,A}\right) - g\left(educ_i, X_i, net_{i,M}\right)\right] \\ &+ \left[C_{i,M}\left(X_i, net_{i,M}\right) - C_{i,A}\left(X_i, net_{i,A}\right)\right] + \left[\varepsilon_{i,A} - \varepsilon_{i,M}\right] > 0\Big] \end{aligned}$$

Consider an increase in education.

- Intuitively, what would be the effect of an increase in education on the probability of working in agriculture?
    - Note that education only affects f() and g().
    - So, to answer our question (given our model) we need to sign $\frac{df(.)}{deduc_i} - \frac{dg(.)}{deduc_i} >\leq 0??$
    - Discussion in class

<u>Testing the hypothesis</u>

How can we estimate the effect of education on the probability to work in agriculture?

In empirical estimation,

2.4 There are two different goals: prediction and causality.
2.5 Note: correlation is not causation

Three approaches two answer our research question:

- RCT:
- Natural experiment (also known as quasi-experiment)
- Use a model for discrete dependent variable (i.e. Logit or Probit) and control for all the relevant observable variables

EQUILIBRIUM AND IMMIGRATION

<u>Goal:</u> integrate concepts of labor supply and demand to understand how interconnected local labor markets interact and reach equilibria that are both seasonal and spatial.

- Seasonal: because the demand for farm labor in a given crop tends to be concentrated in only a few months of the year, usually around harvest.
- Spatial: because harvests happen at different times of year for different crops and in different regions.

These two features of agricultural labor markets are especially important in high-income countries since:

- farmers rely heavily on migrant workers to appear at the farm just when needed to harvest the crop, and
- many workers rely on follow-the-crop migration to piece together employment throughout the course of the year.

<u>How equilibrium in the presence of these two features is reached</u>:

- the interaction of labor supply and demand determines the equilibrium wage and employment in a given farm labor market at a given time of year.

- Follow-the-crop migration helps spread the total labor supply across crops and space.

<u>Exercise:</u> explain example in Chapter 4 Appendix.

Labor supply and demand in a farm labor market with only domestic workers can be expressed as:

$$LS_{dom} = \beta_0 + \beta_1 w_0$$

$$LD_0 = \alpha_0 - \alpha_1 w_0$$

Where α_0, α_1, β_0, β_1, and w_0 are all positive. Setting $LS_{dom} = LD_0$ and solving for w_0 gives $w_0 = \frac{(\alpha_0 - \beta_0)}{(\alpha_1 + \beta_1)}$, which is the wage that will prevail in the farm labor market when it is in equilibrium. Plugging w_0 back into the formula for either LS_{dom} or LD_0 allows you to solve for the amount of farm labor employed at the equilibrium.