Econ 591, Problem Set 1

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Due Wednesday, April 24 (or come talk to me)

Feel free to work in groups, but everyone should turn in his or her own problem set

Question 1

1. Consider the standard, static neoclassical AHM, where a household with *U(x, l)* produces output *Q = F (L, A)* with constant returns to scale. The household has an endowment *LE* of labor and *AE* of land (*x* is a vector which includes as one element the amount consumed of the same good that the household can produce). Suppose that the labor market is missing, but that there are competitive land and product markets. Show that the household maximizes profit.
2. Continuing the example from (1), suppose that we observe only *T*, which equals *A/(1+θ)*, where *θ* is a measure of unobserved land-augmenting quality. If there are perfect land markets, but no labor market, show that the *T* we observe is inversely related to *θ*. What are the consequences for a test of the “separation hypothesis” based on a regression of observed output (i.e., T) per hectare on owned hectares?
3. Enriching the set-up in part (1), suppose that preferences now depend on *x*, *l* and *h*, where *h* is a measure of the health of the household. Health is produced by consumption *x*, leisure *l*, and an exogenous endowment *η*. Suppose that there is no quality variation in land (*θ = 0)*.

a) Suppose that the production function is unchanged from (1), and that there are complete markets in labor, land and output. Does the household maximize profit?

b) Suppose that *Q = F (L, A, h)*, so that health has a direct effect on productivity. Show that the separation hypothesis fails.

Question 2: Empirical Project

Examining the separation hypothesis in Burkina Faso

1. Download the dataset burkina731.dta from Canvas. This data is a subset of the ICRISAT Burkina Faso dataset used in several papers on the syllabus. It includes input and output data on all the plots cultivated by the household heads (not other household members) in the sample.
2. In Burkina Faso, individuals (indexed by *i*) farm multiple plots simultaneously. Maintain the assumption that the allocation of factors of production across the various plots controlled by an individual is efficient, so that the separation hypothesis is true across these plots (that is, conditional on plot characteristics, output per hectare is equal on all plots cultivated by a particular individual at a given point in time). Consider the following regressions, where *Qvhtci* is the log of yield on plot *i* planted to crop *c* in year *t* by the head of household *h* in village *v*, *Xvhtci* are the observed characteristics of that plot, *λvhtc* is a household-year-crop fixed effect, and *λvtc* is a village-year-crop fixed effect

*Qvhtci = Xvhtciβ + λvtc + εvvhtci*

*Qvhtci = Xvhtciδ + λvhtc + εhvhtci*

1. **Suppose there were no measurement error in Q, unobserved variation in plot quality, or plot-specific risk (which can be considered a form of unobserved variation in plot quality). What would you expect the distribution of *εvvhtci* to look like? Suppose in addition that there were complete markets in the village. What would you expect the distribution of *εvvhtci* to look like? (Hint: you may find it useful to refer to section 4A of the Chris Udry article “Gender, Agricultural Production, and the Theory of the Household”, JPE 1996).**
2. Estimate the two equations, and construct the residuals. Use the kdensity command to estimate the density of the each of the two sets of residuals. Graph the two estimated densities on the same graph, and **test to see if you can reject the hypothesis that *εvvhtci* and *εhvhtci* are drawn from the same distribution. If we maintain the hypothesis that unobserved variation in plot quality and risk are the same across households as they are across households in the village, what does this result tell us about the separation hypothesis**?
3. Now examine the correlation between yield and other household characteristics. Estimate

*Qvhtci = Xvhtciγ + αZvhtci + λvtc + εvhtci*

where *Zvhtci* is your choice of either the log of the household size or the log of the total area cultivated by household head *h* on plots other than plot *i*. **Report the results and interpret your estimate of α**.