Economic Development Midterm, 2001

Your examination contains two questions. Answer every part in each question. Total time is 2 hours. A good allocation is 1 hour and 10 minutes to [1] and 50 minutes to [2]. Try to keep your answers brief and to the point.

Total Points: 24 + 15 + 6 (extra credit).

[1] **(24 points, 6 points each)** Illustrate the following possibilities. I expect a briefly exposited, simple model. If you try to go on in excessive detail, you will run out of time, so avoid this.

1. Show why increased roundaboutness in production is akin to increased productivity.

2. Show why the relationship between nonlabor income inequality and labor income inequality depends on whether there is monopsony or competition in labor markets.

3. Show why an excise tax on output in the Murphy-Shleifer-Vishny model (with no wage premium) may give rise to multiple equilibria.

4. Show (diagrammatically) why a land reform in the Dasgupta-Ray model might simultaneously raise output and lower employment.

[2] **(15 points)** There is a continuum of invididuals on the interval \([0, N]\), each of whom faces a zero-one decision to evade one unit of taxes. A tax evader emits a suspicious signal with probability one, such as filing an inconsistent tax return. A nonevader still emits a suspicious signal with probability \(p\), where \(0 \leq p \leq 1\). [Notice that the total number of suspicious signals emitted by the society will be deterministic, because of the continuum assumption.]

A risk-neutral profit-maximizing government (unable to commit to an audit structure) will form a rational expectation of the number of evaders \((n)\), and decide how much resources to spend on audits. In an audit, proof of guilt — if any — must be obtained; assume this takes one unit of resources. Thus the amount of resources spent on audits equals the number of cases audited; call this \(a\). There is a monetary cost function of resources, which is given by the function \((1/2)a^2\). Each guilty evader must pay a fine of \(F > 0\). If guilt is not established the evader goes free.

(a) **(3 points)** Set up the government’s maximizing problem under some expectation that a fraction \(n\) of the population are evading. Prove that the chances that an evader will be audited are given by

\[
d \equiv \text{the lower value of} \frac{nF}{n + p(N - n))^2} \text{ and } 1,
\]

where \(n\) is the expected measure of evaders.

(b) **(3 points)** Using the results from part (a), draw graphs to show how the probability of detection for an evader changes with the total number of evaders \(n\). Pay particular attention
to (and discuss) the two extreme cases in which $p = 0$ and $p = 1$, as well as some typical intermediate case in which $0 < p < 1$. [Recall: $p$ is the exogenous probability with which a suspicious signal is emitted by an innocent person.]

Now suppose that evader $i$’s payoff from nonevasion is zero, and his payoff from evasion is

$$a(i) - dF,$$

where $d$, you will remember, is the probability of detection (chosen as above) and $F$ is the (exogenous) fine. Assume that $a(i)$ is continuous and strictly decreasing in $i$, with $a(0) > F$ and $a(N) = 0$.

(c) (3 points) Prove that if $p = 1$ (so that both the guilty and the innocent look ex ante the same), then the equilibrium number of evaders is uniquely determined. Determine this equilibrium diagrammatically, using the information you have from part (b).

(d) (3 points) Show that if $p = 0$, multiple equilibria are possible. Again, you will have to use the graph derived in part (b).

(e) (3 points) Informally discuss: why does the value of $p$ matter? Why do complementarities appear when $p = 0$ or sufficiently low, but not when $p = 1$?