Econ 233, Problem set 2
Externalities in a Market Economy
(due in class on Monday, February 25)

When externalities are present, resource allocation in a market economy is not efficient. In analyzing the transition from a centrally planned to a market economy, it is essential that we understand the effects of such imperfections. This exercise gives you some practice in modeling and analyzing the effects of externalities.

Consider a macroeconomic model similar to the one we discussed in class. Suppose that there is a mass of agents and that the size of the mass is scaled to 1. Each agent can produce one coconut but consumes only coconuts produced by another agent. Thus, after producing a coconut, each agent needs to trade his or her coconut with another agent. The probability of making a trade is P. The cost of producing a coconut is c_i for agent i. The costs are distributed uniformly across agents on the interval (0,10). For example, there are exactly 0.75 agents with the cost of production less than 7.5. (Recall that for uniform distributions $U(a, b)$, the probability that U is less than x is equal to $\frac{x-a}{b-a}$). Agents choose to produce a coconut if the expected value of completing a trade exceeds the cost of producing, i.e. if $Py > c_i$, where y is the value of a coconut and is assumed to be equal to 5.

a) Suppose that the probability of finding a trading partner P is equal to $\frac{1}{2}$. What is the level of aggregate output Y? (Recall that the aggregate output $Y = y * \#$ of agents with $c_i < P(Y)y$.)

b) Suppose now that the probability of making a trade depends on the level of aggregate output. The exact relationship is as follows:

$$P(Y) = \frac{Y}{Y+1}$$

Are there externalities in this economy? Are there multiple equilibria?

c) Suppose that the relationship between aggregate output and the probability of making a trade is as follows:

$$P(Y) = \frac{Y - \frac{1}{5}}{Y}$$

Are there externalities in this economy? Are there multiple equilibria? Calculate them.

d) Suppose that the relationship between aggregate output and the probability of making a trade is as follows:

$$P(Y) = \frac{1}{Y}$$

What type of externalities are present in this economy? Can you think of an example in which this type of externality is likely to arise?