This assignment focuses on a modified version of the entry game we discussed in the second lecture. I first describe the setup, then the calibration, and then the two exercises.

Entry Game Setup: The setup is the same except that the n^{th} potential entrant faces an entry cost

$$W\epsilon\left(\frac{n}{\bar{N}}\right)^{\zeta},$$

where W is the wage (the entry cost is in labor), $\epsilon > 0$ is a cost shifter, and $\bar{N} > 0$ and $\zeta \geq 0$ determine the curvature of the entry cost. Set the probability that the game ends after each entrant, ϕ, to be arbitrarily small (in practice, 0) so that the entry game never ends before potential entrants stop entering. The same equilibrium exists as before, in which each potential entrant enters if and only if the value of entering conditional on no future entry exceeds the entry cost.

Household Preferences: The household inelastically supplies labor $\bar{L}$ and its utility is $ln(C)$, where C is final good consumption, which is equal to final good output Y in equilibrium.

Calibration: Draw 1000 industries. The within-industry elasticity is $\gamma = 10.5$ and the across-industry elasticity is $\theta = 1.24$. Each firm's productivity z is drawn (after it pays the entry cost) from a Pareto distribution with pdf $\alpha z^{-\alpha-1}$, where the tail parameter is $\alpha = 6$. If a firm's productivity is below the 80^{th} percentile, then it is small and its productivity is the "average" as described in the lecture. Above the 80^{th} percentile, construct the grid for large firm productivities by creating an 11 point grid that is linear in log productivity between the 80^{th} percentile and the 99.99^{th} percentile. Then create a 10 point productivity grid by taking the "average" productivity within each interval as described in the lecture. The probability of being small is 0.8, and the probability of going to each of the 10 large firm productivity grid points is the probability of drawing a productivity in the interval over which that grid point was computed. Normalize probabilities so they sum to 1, i.e., divide all probabilities by 0.9999.

Use the following trick to calibrate the aggregate labor supply $\bar{L}$. Suppose $W^{-\theta}Y = 1$. Compute each industry equilibrium as if each of the wage and aggregate output is equal to 1. Compute the implied final good price by aggregating across industries, $\tilde{P}$. Find the wage by noting that $\tilde{P}W = 1$. Set final good output Y so that $W^{-\theta}Y = 1$. Finally, set $\bar{L}$ equal to aggregate labor used across industries by firms for production and entry costs.

Throughout all the exercises use the same ordered productivity draws in each industry. In other words, first draw a vector of 5000 potential productivities for each of the 1000 industries. Use the same vector for each exercise.

Exercise 1: Compute an aggregate equilibrium under two assumptions about entry costs:

a) The entry cost curvature is given by $\bar{N} = 1$ and $\zeta = 0$. The entry cost shifter is $\epsilon = 2 * 10^{-4} = 0.0002$.

b) The entry cost curvature is given by $\bar{N} = 1$ and $\zeta = 1$. The entry cost shifter is $\epsilon = 2 * 10^{-7} = 0.0000002$.

In each case, do the following. Compute in each industry the revenue share of the largest firm, the HHI (sum of squared revenue shares), the industry markup (the cost-weighted average markup), and the industry price. For $i \in \{0, 1, \ldots, 100\}$, compute the i^{th} percentile of the largest firm's revenue share S_i: for example, if $i = 34$, then compute the number S_{34} such that 340 out of 1000 industries have a largest firm revenue share less than or equal to S_{34}. Then, for $i \in \{0, 1, \ldots, 99\}$, compute the cost-weighted average largest firm revenue share, the cost-weighted average HHI, the cost-weighted average industry markup, and the cost-weighted average price in the industries with largest firm revenue shares between S_i and S_{i+1}. Plot each with i on the x-axis and the cost-weighted average variable on the y-axis. This plot is all you need to submit.

Exercise 2 (Killer Acquisitions): Modify the entry game as follows. In each industry, there is an initial large firm at the highest productivity grid point. When each potential entrant's turn arrives, **before** choosing whether to pay its entry cost (and so before drawing its productivity), the potential entrant encounters the initial large firm. The large firm makes a take-it-or-leave-it offer to acquire and kill the potential entrant. If the potential entrant accepts the offer, it receives the payment and does not pay its entry cost, and the game continues to the next potential entrant (with a higher entry cost if $\zeta > 0$). If the potential entrant rejects the offer, then it chooses whether to pay its entry cost, and the game continues. The large firm can of course choose to make an offer of 0.

a) What is the equilibrium with a free entry condition (entry cost curvature given by any $\bar{N}$ and $\zeta = 0$) or a fixed entry condition (entry cost curvature given by any $\bar{N} > 1$ and $\zeta = \infty$)? Don't compute it, just say what you think will happen in terms of killer acquisitions and why.

b) Suppose there is an initial large firm at the highest productivity grid point, and all other potential firms are small (this is common knowledge). Other than the productivity distribution, parameters are as in b) in exercise 1. Compute the aggregate equilibrium **without** the possibility of killer acquisitions. **Holding fixed** $\bar{L}$, compute the aggregate equilibrium with killer acquisitions. Now that $\bar{L}$ is fixed, you have to use the bisection algorithm to iterate over $W^{-\theta}Y$ until labor demand equals labor supply. Compute the average profits of the initial large firm, the average revenue share of the initial large firm, the average number of firms, and household welfare in the equilibria with and without killer acquistions. Submit these 8 numbers (4 for each equilibrium), as well as a brief intuition for the results.