Industrial Economics – Sotiris Georganas
R&D Problem set

Problem 1

Good morning Minister Egghead! In our glorious country Nopatentistan we got a problem, our companies are not doing enough research. Some economists believe it is because we are not giving them good enough incentives. They propose we start awarding patents to people who invent useful things.

Assume that there is a continuum of scientists, a fraction q of whom do research for fun, while 1-q do it for the money.
A quick survey revealed that scientist ability α is distributed uniformly in [0, 0.5] and that the probability of a scientist creating a useful invention in a given year is a function of scientist ability α and effort *e* with the following form:

$\pi(\alpha)=2\alpha e$, where effort in [0,1]

Scientists who work for fun, always have effort e=1, while scientists who do it for the money have utility

$U(e)=R-2e^2$, where R is the expected revenue from their patents

An innovation that is patented yields €1 per period for the scientist. Assume scientists are risk neutral and there is no discounting.

The timing of the game is:
t=0 the government chooses patent lenght L in [0,2], meaning the patent expires in L years
t=1 scientists choose their effort (they can only invent things the first year)
t=2 people sit back and enjoy their inventions
t=3 the world ends

a) What is the optimal choice of effort of a money loving scientist depending on his ability and L?

b) Assume you want to maximize the country's happiness. People care about GDP denoted by *y* but dislike patents. Depending on the number of patented φ and unpatented inventions χ the GDP for a given period is

$y=\varphi+4\chi$ (why do unpatented inventions promote growth more?)
Your total utility is then $U(L,y)=3y-L^2$

What is the optimal patent length L? (If you are having trouble, assume all scientists have the same ability α=0.5)

c) How does the optimal patent length L depend on q and the average ability? Looking at the real world, is patent length longer in countries that do a lot of R&D?

d) Will the government want to keep its patent policy in t=2? (time inconsistency)