

ECON 815
Macroeconomic Theory
Winter Term 2011/12

Assignment 5

*Due: In class (DH 213) on **April 3rd** 2012*

No late submissions will be accepted
No group submissions will be accepted
No electronic submissions will be accepted

*Remarks: Write clearly and concisely. Devote some time to give the graphs, plots and tables a format easy to understand. Also the way you present your answers matter for the final grade. Even if a question is mainly analytical, **briefly** explain what you are doing, stressing the economic meaning of the various steps. Being able to convey your thoughts effectively is an asset also in real life.*

1 Varieties and Cournot Competition

Start from the benchmark version of the growth model with expanding varieties as described in class. Assume no population growth and suppose that agents have CEIS utility:

$$U = \int_0^{\infty} \frac{C(t)^{1-\theta} - 1}{1-\theta} e^{-\rho t} dt$$

The households' budget constraint is:

$$\dot{A} = rA + wL - C$$

where A stands for households assets.

The profits for the final good sector (competitive) firms are (X_j stands for the quantity of intermediate good j):

$$\pi = L^{1-\alpha} \sum_{j=1}^N \left[\sigma X_j - \frac{\phi}{2} X_j^2 \right] - wL - \sum_{j=1}^N p_j X_j$$

where $0 < \alpha < 1$, $\sigma > 1$ and $0 < \phi < 2$ are constants.

The intermediate good sector differs from the benchmark case. If innovations are being developed, there are always two new firms becoming active, which form a duopoly in the intermediate sector. These two oligopolists compete a-la Cournot and once they enter the intermediate sector they are going to keep their market power forever. The duopolists, denoted with j_1 and j_2 , provide the final good sector with the same variety j (that they have invented simultaneously.) Their marginal cost of production is still equal to 1.

Finally, rather than being equal to η , the cost of one innovation is now $\frac{\eta}{I}$, where $I = 2$ represents the number of oligopolists operating in each intermediate good market.

You can interpret this situation as one in which there are several identical entrepreneurs that apply for a free licence allowing them to innovate, with the competition bureau selecting randomly only two applicants. Once selected, the two innovators share the innovation costs equally between them, they start producing, but they cannot collude in the production stage.

1. How are intermediate inputs priced, and what is the quantity of each intermediate X_j ? (Consider only symmetric Nash equilibria.)
2. What is the free entry condition for the $R\&D$ firms and how is the rate of return determined?
3. What are the growth rates of N , X and total output Y along a BGP?
4. Is this economy efficient? If not, can you suggest a set of policies that could achieve the first best?

2 A Search Model in Discrete Time

Consider the standard search model in discrete time that we studied in class. Define the problem of an unemployed worker searching for a job in a labor market where job offers are distributed according to the CDF $F(w)$. Once a job and a worker are matched, the match might break down with an exogenous probability λ , in which case the worker becomes unemployed again.

1. Write the value functions for the unemployed and the employed worker.
2. Show graphically that the optimal policy for the unemployed is a reservation wage strategy.
3. Obtain the reservation wage equation for the agent in this case.
4. Compute and interpret $\frac{\partial w^R}{\partial \lambda}$.