Problem set 2

This problem set is due on October 6 (Friday) at 6pm. Drop your assignment into the drop-box located in front of my office door (Purnell 413). No late homework will be accepted.

I. Search and Unemployment

A. Two-sided model (DMP model)

1) In the DMP model, explain how wages are set through the Nash Bargaining process.

2) Suppose that there is technological change that reduces the cost of recruiting for firms. What are the equilibrium effects of this in the DMP model? (Determine how $j$, $Q$, $u$, $v$, $Y$, $w$, and total surplus change.)

3) Suppose that the government decides to give a subsidy $s$ to firm that hires a new worker. What are the equilibrium effects of this in the DMP model? (Determine how $j$, $Q$, $u$, $v$, $Y$, $w$, and total surplus change.)

4) Using the Keynesian DMP model, explain the Beveridge curve relationship.

5) Provide any (one or two) examples which cause Beveridge curve to shift to the right.

6) Show that, in the Keynesian DMP model, if the wage is judged to be inefficiently high, so that unemployment is inefficiently high, the government can pay a subsidy to firms that corrects the problem.

B. Efficiency wage model

Suppose that in the efficiency wage model, it becomes more difficult for the firm to distinguish high-ability workers from low-ability workers in the labor market. What effect does this have on $e(w)$ and the efficiency wage?

II. Growth Model

1) In the Maltusian model, suppose that the economy is hit by a negative shock. Using diagrams, determine the effects of this in the short-run (in transition) and in the long-run (in steady state) and explain your results.

2) In the Maltusian model, suppose that there is a technological advance that reduces death rates. Using diagrams, determine the effects of this in the long-run (in steady state) and explain your results.
3) Assume the typical economic environment in the Solow model we discussed in lectures. Regarding the technology, assume that \( Y = zK^\alpha N^{1-\alpha} \). Answer the following questions.

a) Using the law of motion of capital, find \( k' \).

b) Calculate the growth rate of per capita capital in transition (in the short-run).

c) In transition, what is the effect of an increase in \( z \) on the growth rate (of per capita capital)? Show your work.

d) In transition, what is the effect of a decrease in \( n \) on the growth rate (of per capita capital)? Show your work.

e) In steady state (in the long-run), what is the effect of an increase in \( z \) on \( k^* \)? Show your work.

f) In steady state, what is the effect of a decrease in \( n \) on \( k^* \)? Show your work.

g) Calculate the steady-state growth rates of aggregate output and per capita output, respectively.

h) Finally, using \( k^* \) you find in (e) and (f), find an equilibrium in the Solow model. (find \( y^*, c^*, i^*, r^*, w^* \).)

4) Suppose that we modify the Solow model by allowing long-run technological progress. That is, suppose that \( z = 1 \) for convenience, and that there is labor-augmenting technological progress, with a production function, \( Y = F(K, bN) \), where \( b \) denotes the number of units of ‘human capital’ per worker, and \( bN \) is ‘efficiency units’ of labor. Let \( b' \) denote future human capital per worker, and assume that \( b' = (1 + f)b \), where \( f \) is the growth rate in human capital.

a) Show that equilibrium has the property that \( k^{**} = K/bN \) is a constant. At what rate do aggregate variables and per capita variables grow, respectively, in the long run? Explain.

b) What is the effect of an increase in \( f \) on the growth rate of per capita variables?

5) In the Endogenous growth model, suppose that there are two countries. In the rich country, the representative consumer has \( H_R \) units of human capital, and TFP is \( z_R \). In the poor country, the representative consumer has \( H_P \) units of human capital, and TFP is \( z_P \). Assume that \( b \) and \( u \) are the same in the rich and poor countries, and that \( H_R > H_P \) and \( z_R > z_P \).

a) What are the levels of per capita income for both countries?

b) What are the growth rates of per capita income for both countries?

c) How is the gap in per capita income in the long run between the rich and poor countries? Compare this with the one in the Solow model.