

Queen's University  
Department of Economics  
ECON 222  
Macroeconomic Theory I  
Winter Term 2007/08

Sections A and B  
Midterm Examination  
15th February 2008

Please read all questions carefully. Record your answers in the answer booklet provided. You are encouraged to draw diagrams to support your answers. Please label the axis and lines or curves on your diagrams.

The exam has two parts. Marks will be awarded also on the basis of the logical arguments given to support your answers.

Part A consists of long questions. Do **TWO** of the *three* questions. Each question is worth 40 marks for a total of 80 marks.

Part B consists of short questions. Do **TWO** of the *three* questions. Each question is worth 10 marks for a total of 20 marks.

The exam is **80 minutes** long. Budget your time carefully. Hand calculators (non programmable) are permitted for this exam. Upon completion of your exam, only hand in the answer booklet clearly labeled with your student number and class section. Any cheating attempt will be sanctioned with the toughest possible punishment.

**PART A:** Long Questions.

Answer any **TWO** of the following *three* questions. Each question is worth 40 marks for a total of 80 marks.

**Question A.1: Equilibrium in the Labor Market (40 Marks)**

Consider the effects of the German reunification on the German labor market. We start with the East and West Germany being two economies separated by the Berlin Wall: there are no economic transactions between the two Countries and people cannot migrate.

Part 1) West Germany.

Assume that labor demand is equal to  $N_W^D(\omega) = \left(\frac{1}{\omega}\right)^2$ , and that labor supply is equal to  $N_W^S(\omega) = \omega^2$ .

a) What are the equilibrium level of employment and the wage rate that clears the labor market if  $N_W^D(\omega)$  and  $N_W^S(\omega)$  are the aggregate labor demand and supply (expressed in millions)?

b) Suppose now that  $\bar{N}_W^D(\omega) = 2\left(\frac{1}{\omega}\right)^2$  is the labor demand for a single firm, and that there are  $\frac{1}{2}$  (million) identical firms in the economy. How much is the aggregate labor demand?

c) Similarly, assume now that  $\bar{N}_W^S(\omega) = \omega^2$  represents the individual labor supply. How much is the aggregate labor supply, when there are 1 (million) people supplying labor in the economy?

d) Compute the equilibrium level of employment and the wage rate that clears the labor market when the aggregate labor demand and supply are the ones obtained in points b) and c).

Part 2) East Germany.

e) Firms are less productive in the East, that is the labor demand for a single firm is now equal to  $\bar{N}_E^D(\omega) = \frac{1}{2}\left(\frac{1}{\omega}\right)^2$ . There are  $\frac{1}{8}$  (million) firms in the economy. How much is the aggregate labor demand?

f) Assume that in the East the individual labor supply is equal to that in the West, that is  $\bar{N}_E^S(\omega) = \omega^2$ . Assume also that there are 1 (million) people supplying labor in East Germany. How much is the aggregate labor supply?

g) Compute the equilibrium level of employment and the wage rate that clears the labor market when the aggregate labor demand and supply are the ones obtained in points e) and f).

Part 3) Germany Reunified.

Consider what happens after 1990, that is after the fall of the Berlin Wall. Namely, now there is only one labor market for the reunified Germany (people can migrate freely, without costs). Moreover, the total number of firms demanding labor and people supplying it do not change after the reunification. Also their characteristics stay the same.

h) Compute the equilibrium level of employment and the wage rate that clears the labor market in the reunified Germany.

i) What is the unemployment rate? Compare your findings to the results in parts 1 and 2.

Part 4) The response of Germany to shocks.

There is a shock that hits Germany and reduces the Total Factor Productivity. As a consequence, labor demand falls for both firms located in the East and in the West. The shock reduces the labor demand by 50%.

j) Consider the effect of the shock on the labor market equilibrium of the reunified Germany.

k) What would have happened had the East and the West stayed separated?

### Question A.2: Accounting for GDP (40 Marks)

Suppose that Canada has two companies, Bombardier, which is an airplane manufacturer, and Air Canada, which is a commercial airliner. Bombardier sells some of the airplanes it builds to Air Canada, and the rest to the Canadian residents, whereas Air Canada provides flight services for Canadian residents. Canada also has a Federal Government, which collects taxes from the two companies and builds pyramids. The following table summarizes the transaction for each company and the Federal Government for the year 2007.

<b>Bombardier</b>	
Wages paid to Bombardier employees	\$120
Taxes paid to government	35
Revenue received from sales of airplanes	
Airplanes sold to public	80
Airplanes sold to Air Canada	100
Inventory	25
<b>Air Canada</b>	
Wages paid to Air Canada employees	\$80
Taxes paid to government	50
Airplanes purchased from Bombardier	100
Revenue from sales of flight tickets	240
Depreciation of airplanes	15
<b>Federal Government</b>	
Construction of pyramids (wages paid)	\$100
Tax revenue collected	85

Table 1: Question A.2

- a) Show that the three approaches to national income accounting are equivalent, using this example. **Be sure to give your reasoning for each calculation. No marks will be given for numbers without accompanying explanation!**
- b) Suppose that the entire Bombardier's inventory stock was accumulated from 2006, how would this affect GDP in 2007 for each of the three approaches to national income accounting?
- c) Suppose that Air Canada sells half of its flight tickets to customers from the U.S. Using the expenditure approach and the original information from part (a), show how this additional information can affect the measure of GDP and GNP in Canada.
- d) Exploiting the results from part (a) and (c), show how the economy's private saving is used in three different ways relying on the uses-of-savings identity.

### Question A.3: Firms' desired capital stocks and capital stock allocations (40 Marks)

Suppose there are two firms in the economy with the following production functions.

$$Y_1 = A_1 K_1^{0.3} N_1^{0.7}, \quad Y_2 = A_2 K_2^{0.3}$$

where  $Y_1$  and  $Y_2$  are outputs,  $A_1$  and  $A_2$  are total factor productivities, and  $K_1$  and  $K_2$  are capital stocks for firms 1 and 2, respectively.  $N_1$  is the labour used in firm 1's production process. Assume that  $A_1 = 15$  and  $A_2 = 150$ , and there are  $N = 100$  units of labour in the economy that are available, and can be allocated freely across firms. Also, assume that the real interest rate is  $r = 5\%$ , capital depreciates at rate  $d = 10\%$ , and the price of capital is  $p_k = \$100$

- a) Compute the user costs of capital for both firms.
- b) Assume that both firms maximize their profits: find firm 1 and 2's desired capital stocks  $K_1^*$  and  $K_2^*$ . If the capital stocks for firms 1 and 2 are known at the beginning of the year, how are the desired capital stocks related to the gross investment by the firms during year 2008?
- c) If the capital stock in the economy is  $K = 20$ , where  $K$  can be freely allocated across firms, i.e.  $K = K_1 + K_2$ . How would the economy allocate capital  $K$  across the two firms? What would the allocation of capital be if  $K = 40$ ? (Hint: To answer this question, think in terms of the rates of return on capital for the two firms in order to formulate a condition such that the society can get as much benefit as possible from the capital allocation choice, given that the society can allocate capital freely between the two firms.)

**PART B: Short Questions.**

Answer any **TWO** of the following *three* questions. Each question is worth 10 marks for a total of 20 marks. *Answers without any explanations will receive zero marks.*

**Question B.1: (10 Marks)**

Consider a closed economy (say North Korea) that has full-employment output of 5000. Government purchases are 1000. Desired consumption and desired investment are given by

$$\begin{aligned}C^d &= 3000 - 2000r + 0.1Y \\I^d &= 1000 - 4000r\end{aligned}$$

where  $Y$  is output and  $r$  is the real interest rate. How much is the real interest rate that clears the good market?

**Question B.2: (10 Marks)**

You have the following data for an economy: the Working Age Population ( $WAP$ ) is equal to 50 million people; 5 million of them are not in the labour force ( $N$ ); the employment rate is 70%. Compute:

- a) How many people are in the labour force ( $LF$ )?
- b) How many of them are employed ( $E$ )?
- c) What is the participation rate ( $PR$ )?

**Question B.3: (10 Marks)**

Suppose a Country has the production function  $Y = AK^{0.25}N^{0.75}$ . The following table shows the macroeconomic data for 2005 and 2006:

- a) By how much did Total Factor Productivity ( $A$ ) grow between 2005 and 2006?
- b) If TFP remains constant from 2006 to 2007 and the labour force increases from 75 to 80, how large will the capital stock need to be to produce output of 2200 in 2007?

	2005	2006
$Y$	2000	2100
$K$	1700	1795
$N$	70	75

Table 2: Question B.3