

Written Exam for the M.Sc. in Economics Winter 2016–17

## **Advanced International Trade**

3-hour closed-book exam

February 21 2017

Please note that the language used in your exam paper must correspond to the language for which you registered during exam registration.

**This exam consists of 3 pages in total.**

NB: If you fall ill during the actual examination at Peter Bangsvej, you must contact an invigilator in order to be registered as having fallen ill. Then you submit a blank exam paper and leave the examination. When you arrive home, you must contact your GP and submit a medical report to the Faculty of Social Sciences no later than seven (7) days from the date of the exam.

## Problem 1:

Consider a world economy with  $C$  countries with one differentiated good industry in each country. Utility in country  $j$  is given by:

$$U^j = \sum_{i=1}^C N^i (c^{ij})^{(\sigma-1)/\sigma}, \quad \sigma > 1 \quad (1)$$

where  $c^{ij}$  denotes the total consumption of a given variety produced in country  $i$  and consumed in country  $j$ , while  $N^i$  is the number of symmetric varieties produced in country  $i$ . The budget constraint of country  $j$  is:

$$Y^j = \sum_{i=1}^C N^i p^{ij} c^{ij} \quad (2)$$

where  $Y^j$  is country  $j$ 's total income and  $p^{ij}$  is the price of a given variety produced in country  $i$  and consumed  $j$ .

Maximizing utility subject to the budget constraint leads to the following demand function:

$$c^{ij} = \left( \frac{p^{ij}}{P^j} \right)^{-\sigma} \frac{Y^j}{P^j} \quad (3)$$

where the price index is defined as:

$$P^j = \left( \sum_{i=1}^C N^i (p^{ij})^{1-\sigma} \right)^{1/(1-\sigma)} \quad (4)$$

It is costly to ship varieties across international borders. Assume  $p^{ij} = \tau^{ij} p^i$ , where  $\tau^{ii} = 1$  and  $\tau^{ij} \geq 1$  for  $i \neq j$ . Following Krugman (1980) assume also that firm output is fixed. In this case, country  $i$ 's GDP is equal to  $Y^i = N^i p^i \bar{y}$ , where  $\bar{y}$  denotes the fixed output of firms.

1. Show that exports from country  $i$  to country  $j$  may be expressed as:

$$X^{ij} = \frac{Y^i Y^j}{p^i \bar{y}} \left( \frac{\tau^{ij} p^i}{P^j} \right)^{(1-\sigma)} \quad (5)$$

2. Suppose Europe signs a trade agreement with Canada that lowers the trade costs between the two. How are exports from the US to Canada affected by this trade agreement?
3. Trade costs are very hard to quantify. Assuming uniform trade costs,  $\tau$ , a student of international trade argues that the term  $\mu = \tau^{\sigma-1}$  can be inferred from data on trade flows and domestic sales using the following expression:

$$\mu = \left( \frac{X^{ii} X^{jj}}{X^{ij} X^{ji}} \right)^{1/2}$$

Is the student correct?

## Problem 2:

Consider a small open Heckscher-Ohlin economy producing two goods,  $x$  and  $y$ , using low-skilled and high-skilled workers,  $L$  and  $H$ . Let  $a_{fg}$  denote the optimal input choice of factor  $f$  when producing one unit of good  $g$ , and assume the  $x$ -good is relatively skill-intensive, i.e.,  $a_{Hx}/a_{Lx} > a_{Hy}/a_{Ly}$ . Production involves a continuum of tasks,  $i \in [0, 1]$ , that are performed by low-skilled workers. To simplify the analysis, high-skilled workers do not undertake any tasks in production. Firms can undertake tasks at home or abroad through offshoring. Assume domestic low-skilled wages are greater than foreign wages,  $w_L > w_L^*$ . Assume also that firms need to hire  $\beta(1 + i) \geq 1$  foreign workers to perform task  $i$  at the offshore location. Let  $I$  denote the marginal task which is defined as:

$$w_L = w_L^* \beta(1 + I)$$

1. Show that the cost of producing one unit is:

$$c_j = w_L a_{Lj} \Omega(I) + w_H a_{Hj}$$

Provide a definition and interpretation of  $\Omega(I)$ .

2. Suppose the technology for offshoring improves which leads to a decline in  $\beta$ . How are factor prices affected by this change in offshoring costs?
3. Suppose the decline in offshoring costs leads the home country to specialize in the production of good  $x$ . Write down the factor-market clearing conditions. Are factor prices uniquely determined by product prices in this case?
4. Consider an additional improvement in the technology of offshoring. How are factor prices affected by an additional fall in  $\beta$  when the home country is only producing  $x$ ? Hint: Differentiating the ratio of  $a_{Lx}/a_{Hx}$  implies:

$$\sigma_x(\hat{w}_H - \hat{w}_L - \hat{\Omega}) = \frac{dI}{1 - I}$$

where  $\sigma_x$  is the elasticity of substitution between low and high-skilled workers in the production of good  $x$ .

## Problem 3:

Answer True or False to each of the statements below. Briefly explain your answer.

1. An empirical study of Chinese firms concludes that exporters are less productive than non-exporters. This is consistent with the predictions of Melitz (2003).
2. In Eaton and Kortum (2002), the gains from trade are higher if a country's productivity distribution is more dispersed.
3. In a Specific Factors model with two goods and three factors, an increase in a factor endowment will increase the output of the industry using it intensively, and decrease the output of the other industry.
4. Krugman (1979) predicts that firms set the same price before and after opening up to international trade.