Written Exam for the M.Sc. in Economics 2011

International Trade and Investment
Final Exam/ Elective Course/ Master's Course
Winter 2011/2012
21. December 2011
Answer Key

3-hour closed book exam

- There are pages in this exam paper, including this instruction page
- You need to answer all THREE questions, so manage your time accordingly.
- If a question asks you to list three things, please underline the list with preceding numbers as exampled below.

  1. <u>Thing number 1</u>
  2. <u>Thing number 2</u>
  3. <u>Thing number 3</u>

- Make your math legible and easily followed, with the final answer boxed.
- Partial credit may be given.

Good Luck!

1. Denmark and Fatanastan are about to sign a free trade agreement (FTA), which would lower bilateral iceberg trade costs between the two countries. This FTA may or may not change

   i the number of goods/varieties PRODUCED by Danish firms and

   ii the number of goods/varieties AVAILABLE for purchase by Danish consumers.

   Discuss the predictions of each of the following models regarding (i) and (ii). If the number of goods/varieties changes, discuss the properties of the new and/or eliminated goods/varieties, relative to the old varieties. You do not need to derive any algebra, but you can always refer to algebra if it helps. Drawing figures may help. Do not assume Fatanastan has the same GDP as Denmark unless stated.

   (a) Dornbusch Fischer Samuelson 1977 with iceberg trade costs. A: (i) should decrease the number of Danish goods as the nontraded sector gets smaller. (ii) does not change.

   (b) Krugman 1980 two symmetric country model with a single differentiated sector and iceberg trade costs. A. (i) should stay the same. (ii) should stay the same.

   (c) Melitz 2003 two symmetric country model with a single sector. (i) should decrease as high cost (low productivity) firms are driven out. (ii) could increase or decrease depending on number of new importers.

2. An assumption of the HOV model is that tastes are homothetic. Let's relax that assumption by supposing the utility in country $j \in \{H, F\}$ for goods 1 and 2 is given by

$$U^j\left(d_1^j, d_2^j\right) = \left(d_1^j - \bar{d}_1\right)^{\beta_1}\left(d_2^j - \bar{d}_2\right)^{\beta_2}$$

   where $0 < \beta_i < 1$ and $\beta_1 + \beta_2 = 1$. The term $\bar{d}_i \geq 0$ is the minimum consumption amount of good i. Each good i is produced using capital and labor. Unit factor demands a_m^i are constant and sum to unity $(a_K^i + a_L^i = 1)$ and factor prices are equalized across countries and normalized to unity $(w = r = 1)$. Each country j has L^j workers who are each endowed with a single unit of labor and some capital k^j. We can denote the total capital endowment of country j as $K^j = k^j L^j$. Assume that each consumer's income $I^j = rk^j + w$ is large enough to afford at least $\bar{d}_i$ of each good i.

(a) Show that each consumer's demand for good i is

$$d_i^j = \bar{d}_i + \frac{\beta_i}{p_i}\left(I^j - \sum_{i'=1}^{2} p_{i'}\bar{d}_{i'}\right)$$

A:The consumer's Langrangian is

$$\left(d_1^j - \bar{d}_1\right)^{\beta_1}\left(d_2^j - \bar{d}_2\right)^{\beta_2} - \mu\left(\sum_i^2 p_i^j d_i^j - I^j\right)$$

with FOC

$$\begin{aligned}
[d_1^j] : \beta_1\left(d_1^j - \bar{d}_1\right)^{\beta_1 - 1}\left(d_2^j - \bar{d}_2\right)^{\beta_2} &= \mu p_1^j \\
[d_2^j] : \beta_2\left(d_1^j - \bar{d}_1\right)^{\beta_1}\left(d_2^j - \bar{d}_2\right)^{\beta_2 - 1} &= \mu p_2^j
\end{aligned}$$

With some algebra,

$$\left(\beta_1 + \beta_2\right)\left(d_1^j - \bar{d}_1\right)^{\beta_1}\left(d_2^j - \bar{d}_2\right)^{\beta_2} = \mu\sum_i^2\left(p_i^j d_i^j - p_i^j\bar{d}_i\right)$$

$$\left(I^j - \left(p_1^j\bar{d}_1 + p_2^j\bar{d}_2\right)\right)^{-1}\left(d_1^j - \bar{d}_1\right)^{\beta_1}\left(d_2^j - \bar{d}_2\right)^{\beta_2} = \mu$$

and plugging in:

$$\frac{\beta_i}{p_i}\left(I^j - \sum_{i'=1}^{2} p_{i'}\bar{d}_{i'}\right) = \left(d_i^j - \bar{d}_i\right)$$

(b) Explain why the free trade equilibrium price $p_i = 1\forall i$. A: For zero profit equilibrium, $p_i = a_K^i r + a_L^i w = 1$.

(c) Country $j's$ demand for good i can then be written as $D_i^j = L^j d_i^j = \Delta_i^j + \beta_i Y^j$, where $Y^j = L^j I^j$ is the GDP of country j. Write out Δ_i^j in terms of $L^j, \bar{d}_1, \bar{d}_2$ and β_i. What can you say about $\Delta_1^j + \Delta_2^j$? Under what conditions is $\Delta_1^j < \Delta_2^j$? A:

$$\begin{aligned}
L^j d_i^j &= L^j\bar{d}_i + L^j\frac{\beta_i}{p_i}\left(I^j - \sum_{i'=1}^{N} p_{i'}\bar{d}_{i'}\right) \\
D_i^j &= \left(L^j\bar{d}_i - \beta_i L^j\left(\bar{d}_1 + \bar{d}_2\right)\right) + \beta_i L^j I^j
\end{aligned}$$

$\Delta_1 + \Delta_2 = 0$. $\Delta_1 < 0 < \Delta_2$ when

$$\frac{\bar{d}_1}{\bar{d}_1 + \bar{d}_2} < \beta_1 \tag{1}$$

(d) Suppose good 1 is capital intensive ($a_K^1 > a_K^2$) and consumers *need* more of good 1 ($\Delta_1 > \Delta_2$). How does this affect the net exports of capital, as compared to the standard HOV setup (where $\bar{d}_i = 0 \forall i$)? A:

$$\begin{aligned} F_K^H &= K^H - AD^H \\ F_K^H &= K^H - a_K^1 \left(\Delta_1 + \beta_1 Y^H\right) - a_K^2 \left(\Delta_2 + \beta_2 Y^H\right) \\ &= K^H - \left(a_K^1 \Delta_1 + a_K^2 \Delta_2\right) - \left(a_K^1 \beta_1 + a_K^2 \beta_2\right) Y^H \end{aligned}$$

It lowers it: $(a_K^1 \Delta_1 + a_K^2 \Delta_2) > 0$. Countries will keep more capital in order to fullfill their minimum consumption requirements.

Table 1—Hypothesis Testing and Model Selection

Hypothesis	Description: Parameters (k_i)	Description: Equation	Likelihood: $\ln(L_i)$	Likelihood: Schwarz criterion	Mysteries: Endowment paradox	Mysteries: Missing trade	Goodness-of-fit: Weighted sign	Goodness-of-fit: $\rho(F, \hat{F})$
Endowment differences								
H_0: unmodified HOV theorem	(0)	(1)	−1,007	−1,007	−0.89	0.032	0.71	0.28
Technology differences								
T_1: neutral	δ_c (32)	(4)	−540	−632	−0.17	0.486	0.78	0.59
T_2: neutral and nonneutral	ϕ_f, δ_c, κ (41)	(6)	−520	−637	−0.22	0.506	0.76	0.63
Consumption differences								
C_1: investment/services/ nontrade.	β_c (32)	(7)	−915	−1,006	−0.63	0.052	0.73	0.35
C_2: Armington	α_c^* (24)	(11)	−439	−507	−0.42	3.057	0.87	0.55
Technology and consumption								
TC_1: $\delta_c = y_c/y_{US}$	(0)	(4)	−593	−593	−0.10	0.330	0.83	0.59
TC_2: $\delta_c = y_c/y_{US}$ and Armington	α_c^* (24)	(12)	−404	−473	0.18	2.226	0.93	0.67

3. Let's revisit Trefler (1995)'s results. Above is the table of his findings.

   (a) Briefly explain the weighted sign test. What would be a "perfect" result for HOV? How well do Trefler's results support the unmodified HOV theorem? A: The test finds the percent (in trade value) of whether actual net factor exports have the same sign as predicted net factor exporters. It is weighted by the factor's importance in world trade. Trefler's results are better than Bowen Leamer Sveikauskas but not over .75. The perfect result would be 1.

   (b) Briefly explain the Missing Trade Paradox. What would be a "perfect" result for HOV? How well do Trefler's results support the unmodified HOV theorem? A: There is not as much actual factor trade as predicted factor trade. The results are horrendous. The perfect result would be 1.

   (c) Briefly explain the Endowment Paradox. What would be a "perfect" result for HOV? How well do Trefler's results support the unmodified HOV theorem? Countries with high factor endowments have low trade. The results are only bad - endowments are highly negatively correlated. The perfect result would be 1.