International Trade
Sample Exam

Armando Näf

Universität Bern

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Setup

You have **90 minutes** to complete the exam. This is a **closed book** exam. You are allowed to use a non-programmable calculator and an english-german dictionary. The maximum number of points you can obtain are **100 points**. Answers must be written with blue or black ink, answers written with pencil will not be marked. Any sign of fraud will be rewarded with the grade 1, or in severe cases with expulsion from the department. If you have any questions during the exam please contact the examiner with as little disruption as possible. Respect the other exam takers. Carefully read through the questions and write all the answers in the allocated space. There will be extra paper distributed to take notes, which **will not be marked**. Make sure that your answers are understandable and have a clear structure. **Always read the entire question.** Good Luck!

Exercise 1

Note: Full points will only be given if all the right answers per question are given. If only false options are chosen then this answer will be rewarded with **minus points**. Check the **correct** answer(s).

1. Consider the two-country Heckscher-Ohlin model. Let Home be capital abundant and Foreign be labour abundant. The two countries engage in trade. Preferences are the same in both countries. If Home imposes an import tariff, then at Home.
   - ☑ The return to capital will decrease and the wage will increase
   - ☐ Both the return to capital and the wage will increase
   - ☐ The return to capital will increase and the labor wage will decrease
   - ☐ Both the return to capital and the wage will decrease

Exercise 1

Note: Full points will only be given if all the right answers per question are given. If only false options are chosen then this answer will be rewarded with **minus points**. Check the **correct** answer(s).

2. The expression "Dutch disease" describes a situation in which
   - ☑ Growth of one exportables sector hurts other export sectors
   - ☐ Growth in a large exportables sector decreases welfare of a country because the terms of trade deteriorate
   - ☐ Trade decrease welfare of a country because it leads to environmental damage
   - ☐ A decrease in the oil price lowers welfare of an oil exporting country

Exercise 1

Note: Full points will only be given if all the right answers per question are given. If only false options are chosen then this answer will be rewarded with **minus points**. Check the **correct** answer(s).

3. Increasing a tariff ...
   - ☐ ... Always increases government revenue
   - ☐ ... Increases imports.
   - ☑ ... Tends to benefit the domestic (import-competing) producers
   - ☐ None of the above

Exercise 2

Note: Explain briefly what is meant by the following (1-2 sentences are enough)

a) Comparative advantage

- The term comparative advantage refers to how much of a good a country needs to forego in order to produce another good. If country A has to forego less of production X in order to produce good Y than B, than A has a a comparative advantage over country B in the production of X.
- I.e. $\frac{\alpha_x^A}{\alpha_y^A} < \frac{\alpha_x^B}{\alpha_y^B}$, where α_i^j is the production cost for good i in country j.

Exercise 2

Note: Explain briefly what is meant by the following (1-2 sentences are enough)

b) Stolper-Samuelson Theorem

- An increase in the relative price of good X, $(\frac{p_x}{p_y})$, will raise the real return of the factor used intensively in the X-sector, and lower the real return of the factor used intensively in the other sector.
- Example: Suppose there are two goods, manufactured goods and food, where the former uses capital, and the ladder labour, intensively. The Stolpe-Samuelson theorem says that an increase in the relative price of manufactured good will result in a higher return an capital and lower wages.

Exercise 2

Note: Explain briefly what is meant by the following (1-2 sentences are enough)

c) Factor abundance and factor intensity

- Factor i is abundant relative to factor j if the country's world share of factor i is greater than its world share of j.
- In an economy with two countries and two goods this is equivalent of saying that country A is labour abundant if $\frac{L^A}{K^A} > \frac{L^B}{K^B}$
- Factor i has a higher intensity in the production of good X than in the production of good Y if relatively more of factor i is used to produce good X.
- In an economy with two input factors $\{i, j\}$ the production of good X is said to be more intensive in i if $\left(\frac{i}{j}\right)_X > \left(\frac{i}{j}\right)_Y$.

Exercise 2

Note: Explain briefly what is meant by the following (1-2 sentences are enough)

d) Specifc production factor

- A specific production factor is an input factor that is used exclusively in the production of one sector.

Exercise 3

Note: Consider the Ricardian model with two countries (Home and Foreign) and two goods (food and clothing). Units of labor needed to produce one unit of clothing and food respectively are given by $a_{LC} = 3$ and $a_{LF} = 1$ for the home country and by $a^*_{LC} = 4$ and $a^*_{LF} = 2$ for the foreign country.

a) Determine absolute and comparative advantage.

- **Absolute advantage:** $a_{LC} < a^*_{LC}$, $a_{LF} < a^*_{LF}$. Thus home has an absolute advantage in both the production of clothing as well as food.
- **Comparative advantage:** $\frac{a_{LC}}{a_{LF}} > \frac{a^*_{LC}}{a^*_{LF}}$. Thus home has a comparative advantage in the production of food.

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a) Is it possible that trade between the two countries occurs at a price $\frac{P_C}{P_F} = 1$? Explain.

- *No!* If both countries have a positive demand for clothing and food than the relative price of clothing is 3 at home and 2 in the foreign country. Thus, on the world market the price must be $3 > \frac{P_C}{P_F} > 2$.
- To explain this assume that the consumers have diminishing returns then MRS=MRT and hence both countries are consuming at an interior point. Then both countries would export food and there was no equilibrium.
- Same argument would go through with constant marginal returns but than you would need to take cases.

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c) Is it possible that wages in the foreign country are higher than in the home country? Explain.

- suppose you have diminishing marginal returns to make sure that we are at an interior point. Then home is producing food and foreign is producing clothing due to comparative advantages.
- Due to competition it must hold that $p_F = w \cdot 1$ and $p_C = w^* \cdot 4$.
- Therefore $\frac{w}{w^*} = \frac{p_F}{p_C} \frac{4}{1} > 1$, because $3 > \frac{P_C}{P_F} > 2$. Thus, wage in the home country must be higher.

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d) Is it possible that the two countries trade with each other, and both countries produce both goods? Explain.
   - In order that a country produces both goods it must be that the marginal rate of transformation is equal to the price ratio.
   - However, since both countries have a different MRT it can't be that they are producing both goods, as both countries are facing the same price ratio.

Exercise 4

Consider the specific factors model. There is a country (call it Iceland) that can produce two goods: Fish (F) and Wool (W). Sheep farms are the specific factor used for wool production, and fish boats are the specific factor used for fish production. Labor is used to produce both goods. Note: You may, but do not have to, draw graphs to explain your answers.

a) Suppose Iceland engages in trade with the rest of the world and is too small to affect world prices. A volcano eruption destroys many sheep farms in Iceland. Explain how this affects the welfare of each group in Iceland (workers, owners of sheep farms, owners of fish boats).

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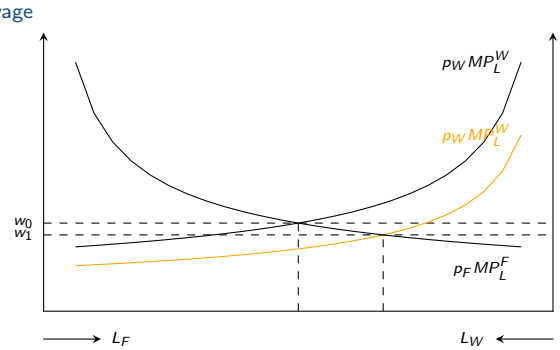

A decrease in the number of sheep farms implies that the labour productivity of workers in the sheep farm goes down.

This will push down wages.

the return of a sheep farm will increase: $r = p_W MP_S^W$ and the return on fish boats will also increases since more people work on a boat. Welfare decreases for workers and increases for fish boats and farm owners.

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b) Iceland is an importer of wool and an exporter of fish. The Icelandic parliament discusses whether or not to adopt a tariff on the imports of wool. Explain how the welfare of each group in Iceland will be affected by such a tariff. Will production in Iceland change if the tariff is introduced?

Exercise 4

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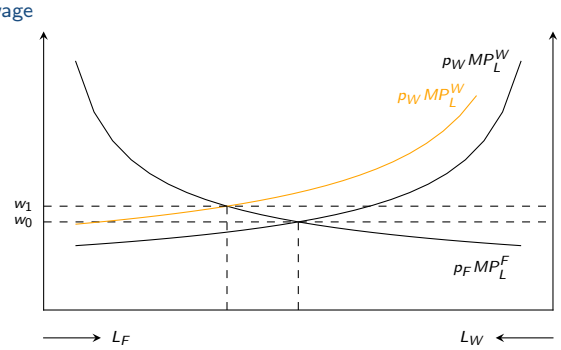


The tariff will increase the price of wool.

This will push up nominal wages (but the effect on real wages is unclear)

$r_W = p_W MP_W$ increases because per sheep farm there are now more workers employed. $r_F = p_F MP_F$ decreases, since workers are switching to the wool industry. Thus farm owners are better off and boat owners lose out. The effect on workers is unclear since nominal wage and prices both increase.

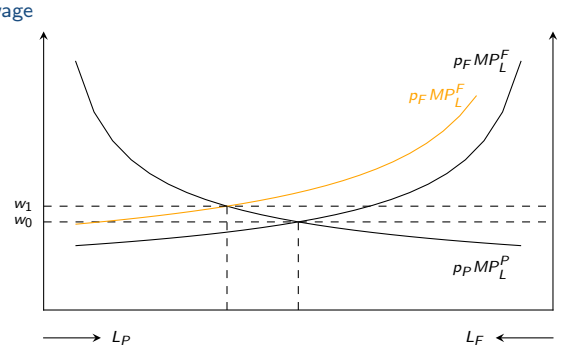
Exercise 5

One of the main export products of Switzerland are pharmaceutical drugs ("Medikamente").

a) In the context of the Ricardian model, what would be the reason for the comparative advantage of Switzerland in pharmaceuticals production? And in the context of the Heckscher-Ohlin model?
   - In the Ricardian model, comparative advantage is due to different technologies across countries. Thus Switzerland would be an exporter of drugs because production technology in the pharmaceutical sector is relatively more advanced than the technology in other industries compared to different countries.
   - In the Heckscher-Ohlin model, comparative advantage comes from differences in factor endowments across countries. In this case Switzerland is relatively more endowed with the factor that is used intensively in the pharmaceutical sector compared to other countries.

Exercise 5

b) Financial services are another important export product of Switzerland. Arguing within the specific-factors model, explain how an increase in the world price of financial services will affect the pharmaceuticals industry.



Price increases, which pushes up the value for workers in the financial sector

Financial sector will be able to pay a higher wage and thus employ some of the pharmaceutical industry.

This wil make workers in the pharmaceutical sector more productive but overall the industry output decreases.

Exercise 5

Suppose the production of pharmaceuticals requires capital as an input, which is a footloose production factor.

c) What is a footloose factor?

- A footloose factor is able to move freely across boarders. I.e. the world is in competition for this input factor.

Exercise 5

Suppose the production of pharmaceuticals requires capital as an input, which is a footloose production factor.

d) The wage level in Switzerland is high compared to other countries. In the context of the footloose factor model, explain why Switzerland may nevertheless be attractive for the production of pharmaceuticals.

- Switzerland may have a technology that requires little labour and little capital. The consequence would be that due to competition, Switzerland can pay a large capital rent and is thus able to attract the footlose factor.

Exercise 6

Setup

Suppose a country can produce two goods, food and clothing. Labor is used for both goods, while capital is the specific factor used for clothing production and land is the specific factor used for food production. Output of clothing is denoted by Q_C and output of food is denoted by Q_F. L_C and L_F denote the amount of labor used for clothing and food production respectively. The total amount of labor available in the country is L, such that $L_C + L_F = L$. K and T denote the amounts of capital and land available in the country. The production functions are Cobb-Douglas production functions given by:

$$Q_C = \sqrt{L_C}\sqrt{K} \tag{1}$$

$$Q_F = \sqrt{L_F}\sqrt{T} \tag{2}$$

a) Show that the marginal product of labour in each sector is decreasing in the amount of labour per specific factor in that sector?

Exercise 6

a) Show that the marginal product of labour in each sector is decreasing in the amount of labour per specific factor in that sector?

- marginal product of labour for each sector is given by:

$$\text{MP}_L^C = \frac{\partial Q_C}{\partial L} = \frac{1}{2}\sqrt{\frac{K}{L_C}}$$

$$\text{MP}_L^F = \frac{\partial Q_F}{\partial L} = \frac{1}{2}\sqrt{\frac{T}{L_F}}$$

- Taking second derivatives we show it's decreasing in L:

$$\frac{\partial \text{MP}_L^C}{\partial L} = \frac{\partial^2 Q_C}{\partial L^2} = -\frac{1}{4}\sqrt{\frac{K}{L_C}}\frac{1}{L_C} < 0$$

$$\frac{\partial \text{MP}_L^F}{\partial L} = \frac{\partial^2 Q_F}{\partial L^2} = -\frac{1}{4}\sqrt{\frac{T}{L_F}}\frac{1}{L_F} < 0$$

Exercise 6

b) Show that the marginal product of each specific factor is increasing in the amount of labour per specific factor?

- marginal product of each specific factor is given by:

$$\text{MP}_K^C = \frac{\partial Q_C}{\partial K} = \frac{1}{2}\sqrt{\frac{L_C}{K}}$$

$$\text{MP}_T^F = \frac{\partial Q_F}{\partial T} = \frac{1}{2}\sqrt{\frac{L_F}{T}}$$

- Taking cross derivatives we show the marginal products are increasing in L:

$$\frac{\partial \text{MP}_K^C =}{\partial L} = \frac{\partial^2 Q_C}{\partial K \partial L} = \frac{1}{4}\sqrt{\frac{1}{K \cdot L_C}} > 0$$

$$\frac{\partial \text{MP}_T^F}{\partial L} = \frac{\partial^2 Q_F}{\partial T \partial L} = \frac{1}{4}\sqrt{\frac{1}{T \cdot L_F}} > 0$$

Exercise 6

c) Show that an increase in the relative world price of clothing ($\frac{P_C}{P_F}$) leads to a shift away from food into clothing production (i.e. show that $\frac{L_C}{L_F}$ is increasing in $\frac{P_C}{P_F}$)?

- from perfect competition we know that each factor is paid the value of its marginal product:

$$w_C = \frac{\partial Q_C}{\partial L} \cdot P_C$$
$$w_F = \frac{\partial Q_F}{\partial L} \cdot P_F$$

- From perfect labor mobility we know that the wage must be equal across sectors: $w_C = w_F$.

$$\frac{\partial Q_C}{\partial L} \cdot P_C = \frac{\partial Q_F}{\partial L} \cdot P_F$$
$$\frac{\frac{\partial Q_F}{\partial L}}{\frac{\partial Q_C}{\partial L}} = \frac{P_C}{P_F}$$

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- Plugging in the results we have obtained for the marginal product we find:

$$\frac{\frac{\partial Q_F}{\partial L}}{\frac{\partial Q_C}{\partial L}} = \frac{P_C}{P_F}$$

$$\sqrt{\frac{T}{K}}\sqrt{\frac{L_C}{L_F}} = \frac{P_C}{P_F}$$

$$\frac{L_C}{L_F} = \left(\frac{P_C}{P_F}\right)^2 \frac{K}{T}$$

- We immediately see that $\frac{L_C}{L_F}$ is increasing in $\frac{P_C}{P_F}$. We can show this formally:

$$\frac{\partial \frac{L_C}{L_F}}{\partial \frac{P_C}{P_F}} = 2\frac{P_C}{P_F}\frac{K}{T} > 0$$

Exercise 6

d) Show that an increase in land leads to a shift of labour away from clothing into food production (i.e. show that $\frac{L_C}{L_F}$ is decreasing in T)?

- In question c) we have derived an expression for $\frac{L_C}{L_F}$:

$$\frac{L_C}{L_F} = \left(\frac{P_C}{P_F}\right)^2 \frac{K}{T}$$

- If we take the derivative of this expression with respect to T we find the following:

$$\frac{\partial \frac{L_C}{L_F}}{\partial T} = -\left(\frac{P_C}{P_F}\right)^2 \frac{K}{T^2} < 0$$

- Thus we have shown that $\frac{L_C}{L_F}$ is decreasing in T.

Exercise 7

Comment shortly on the following statements:

a) In the Heckscher-Ohlin model, if countries are very similar in every respect (preferences, technology, endowment) then they will not trade much with each other.
   - This statement is correct.
   - Small differences in the Heckscher-Ohlin model will imply that countries are producing almost the same under autarky and thus have very similar autarky prices.
   - If they open up to trade, the prices will adjust a little bit but because they are similar they will not fully specialise in one output good but rather move production a little bit to what they have a comparative advantage in.
   - Since both are still producing almost the same there will be very little trade between these two countries.

Exercise 7

Comment shortly on the following statements:

b) The larger the number of sectors a country has an absolute advantage in, the greater its gains from trade.

- This statement is wrong.
- The absolute advantages that a country has are not the determinants of the gains from trade.
- What is relevant are the sectors the country has a comparative advantage in. By definition the number of sectors a country has a comparative advantage in compared to a trade partner is equal for both countries.
- Thus, what matters for the gains from trade is not the numbers of sectors they have an absolute advantage in, but rather by how much these countries are different from each other.