

## Chapter 1 The World Economy

### QUESTION 1-1

The difference between GDP converted by the current and the PPP exchange rate can be illustrated with a simple example. Assume that Germany and Poland both produce every year a thousand machines (to remove oil remains) and five hundred pedicure treatments. Machines can be traded between both countries while pedicure treatments cannot be traded. Further assume that the current exchange rate is one euro for four Polish zloty, the hourly wage in Germany is 10 euro and the number of hours it takes to produce one machine or to give one pedicure treatment in both countries is given in the following table:

*Number of hours to produce one unit*

|                    | Germany | Poland |
|--------------------|---------|--------|
| Machine            | 10      | 20     |
| Pedicure treatment | 2       | 2      |

- If machine producers do not make any profit, what is the price of a machine in Germany (in euro) and in Poland (in zloty)?
- What is the hourly wage rate in Poland?
- If also pedicures do not make any profit, what is the price of a pedicure treatment in Germany (in euro) and in Poland (in zloty)?
- What is the GDP figure in Germany (in euro) and in Poland (in zloty)?
- What is the PPP exchange rate between the euro and the zloty?
- Convert the Polish GDP figure to euro with the current exchange rate and the PPP exchange rate. Explain the difference between these two figures.

### QUESTION 1-2

Trade statistics are not always reliable. It is a well-known fact that there is a discrepancy between figures on the value and number of products leaving a country and the figures on the value and number of products entering another country as reported by the national statistical agencies. The table below gives a striking example.

*Indonesian sawnwood exports to major trading partners in thousand m<sup>3</sup> according to Indonesian statistics (export) and statistics of importers (import)*

|          | 1998   |        |        | 1999   |        |        | 2000   |        |        |
|----------|--------|--------|--------|--------|--------|--------|--------|--------|--------|
|          | export | import | % diff | export | import | % diff | export | import | % diff |
| Japan    | 148    | 336    | 127    | 109    | 261    | 139    | 35     | 271    | 674    |
| China    | 52     | 317    | 510    | 77     | 580    | 653    | 20     | 931    | 4555   |
| Malaysia | 4      | 335    | 8275   | 7      | 289    | 4029   | 7      | 450    | 6329   |

*Source: Johnson (2002), 'Documenting the undocumented', Tropical Forest Update, vol. 12, no. 1.*

- Why do statistics on exports and imports differ between different national statistical agencies?
- What do you think is the main source of discrepancy in the case of Indonesian sawnwood?

### QUESTION 1-3

According to World Bank data China's GDP at market prices (in current US dollar) was \$10,355 billion in 2014. In that same year the GDP at market prices (in current US dollar) in the USA was \$17,419 billion.

- a. Your neighbour argues that China is the biggest economy in the world since 2014. Could she be right, or not? Explain why, or why not.

According to World Bank data the export of goods and services was 22.6 percent of GDP in China in 2014 and 23.1 percent of GDP in Guatemala in that same year.

- b. The same neighbour of question a argues that China is actually a more open economy than Guatemala in 2014. Could she be right this time, or not? Explain why, or why not.

#### QUESTION 1-4

Gross National Income (GNI); 2013, billion

| Country     | GNI, current US \$ | GNI PPP, current international \$ |
|-------------|--------------------|-----------------------------------|
| China       | 9,000              | ..                                |
| Netherlands | 850                | ..                                |

The table above is based on the World Development indicators and provides (rounded) information on total GNI in 2013 for two countries. As you can see, the table is incomplete since the 'PPP' data is missing.

- a. What does 'PPP' stand for? Briefly *explain* in words the difference between GNI in current US \$ and in PPP current international \$.
- b. The Worldbank uses the USA as the benchmark country for PPP corrections. As a consequence, the USA's GNI in current US \$ is the same as its GNI in PPP current international \$. Based on your knowledge of the development level of China and the Netherlands relative to the USA provide 'guesstimates' of the missing values in the GNI PPP, current international \$ column in the table. Carefully *explain* what you did.

#### QUESTION 1-5 (DATA)

The *ch01question05 data* Excel file provides World Bank data on GDP, GDP PPP, and population. The data is downloaded on 4 August 2017 and contains information for 2015 for all 'countries' identified by the United Nations (UN).

- a. How many 'countries' are identified by the UN? Are these all countries in the world?
- b. Calculate for how many countries information on GDP, GDP PPP, and population is available in the data file, or equivalently for how many countries this is missing. Calculate the total population in the UN world for which we have available information.
- c. Create a new 'world' of countries, by selecting only those countries for which information on GDP, GDP PPP *and* population is available. How many countries are included? What is the total population of the included countries? How 'representative' is this new 'world' for the actual world ?
- d. Rank the countries (from large to small) in terms of GDP, GDP PPP, and population. Determine the percent of the 185 country world total for each country and the cumulative percentage. What are the top three countries and their share of the world total for GDP, GDP PPP, and population? Which of these rankings provides the most accurate picture, according to you, of the 'power' of a nation. Why?
- e. Calculate the natural logarithm for all countries of GDP and GDP PPP. Create a scatterplot with  $\ln(GDP)$  on the horizontal axis and  $\ln(GDP\ PPP)$  on the vertical axis. Based on the scatterplot,

create a regression line. Does this regression line provide useful information? Explain why, or why not.

## Chapter 2 Globalization

### QUESTION 2-1

Please answer the brief review questions below.

- a. Which five main types of globalization debates can we distinguish?
- b. What grows faster since 1960: world income or world trade?
- c. Is it appropriate to compare the growth rates in question b? Explain why, or why not.
- d. On a per capita basis: is there a trend noticeable in the growth rates for income and trade?

### QUESTION 2-2

Briefly discuss the development of global income per capita over the past 2000 years and indicate if (using national average income per capita levels for comparison) global income inequality has been steady, rising, or falling over this period. Explain.

### QUESTION 2-3

What are two main ways to measure increased economic globalization? Briefly explain.

### QUESTION 2-4 (DATA)

The *ch02question04 data* Excel file provides World Bank data on exports of goods and services. The data is downloaded on 31 March 2017 and contains information for 2015, the most recent year for which information was available at the time of downloading. The World Bank identifies 217 different countries. The file contains information on:

- The exports of goods and services; % of GDP
  - The exports of goods and services; current USD, billion – source IMF Balance of Payments (BoP)
  - The exports of goods and services; current USD, billion – source World Bank and OECD
- a. Not all information is available for all countries. Determine the number of observations for each of the variables listed above.
  - b. Determine the number of countries for which none of the variables is available and the number of countries for which all of the variables are available. Is there a pattern according to you? Explain.
  - c. Is the information listed in the file the final information on exports of goods and services?
  - d. What are the 10 largest exporting countries in 2015 as a percent of GDP? What type of countries are these (regarding size, characteristics, and available information)?
  - e. What are the 10 largest exporting countries in 2015 in absolute terms according to the IMF? What type of countries are these (regarding size, characteristics, and available information)?

## Chapter 3 The Balance of Payments

### QUESTION 3-1

Imagine you work at the Statistical Bureau of Singapore and have to record the value changes in GDP, GNI, exports and imports. What value changes do you record when?

- A shipload of 1,000 trousers arrives from India that has cost the Singapore importer 5 Singapore dollars per piece. This shipload is immediately re-exported to the USA for 6 Singapore dollars per piece.
- A bundle of 1,000 trousers has been purchased from a Singapore producer for 5 Singapore dollars per piece. This bundle is exported to the USA for 6 Singapore dollars per piece.
- The same transaction is executed as in question a, but this time the Indian producer of trousers has to pay 1 Singapore dollar per trouser to a Singapore investor who has helped to establish the Indian trouser factory.
- An Indonesian nanny returns home after babysitting in Singapore for four months. She takes her total wage of 1,000 Singapore dollars with her.
- An Indonesian woman, married to a Singapore man, returns home and gives her parents 1,000 Singapore dollars.

### QUESTION 3-2

“If there is more money flowing into a country than there is flowing out, that country has a positive balance of payments; if, on the other hand, more money flows out than in, the balance of payments is negative.” Source: Wikipedia encyclopaedia, January 2006

([http://en.wikipedia.org/wiki/Balance\\_of\\_payments](http://en.wikipedia.org/wiki/Balance_of_payments)).

- Is the definition above correct? Explain.

In this book, we follow the accounting principle that this balance is equal to zero. In practice, different definitions for the balance of payments exist. They sometimes exclude reserve assets or short-term capital account transactions from the balance, such that imbalances are possible. Consider the following quote: “The US is able to attract funds from the rest of the world to finance its balance of payments deficit”.

- Explain the quote with the help of equation 3.9. What happens when the US is unable to attract funds from the rest of the world?

Suppose that the Chinese central bank publishes a report that blames expected balance of payments surplus reductions on lower trade tariffs (taxes on imports) and higher oil prices.

- Which Balance of Payments definition does the Chinese central bank probably use? Explain how tariff reductions and higher oil prices can contribute to a lower surplus.

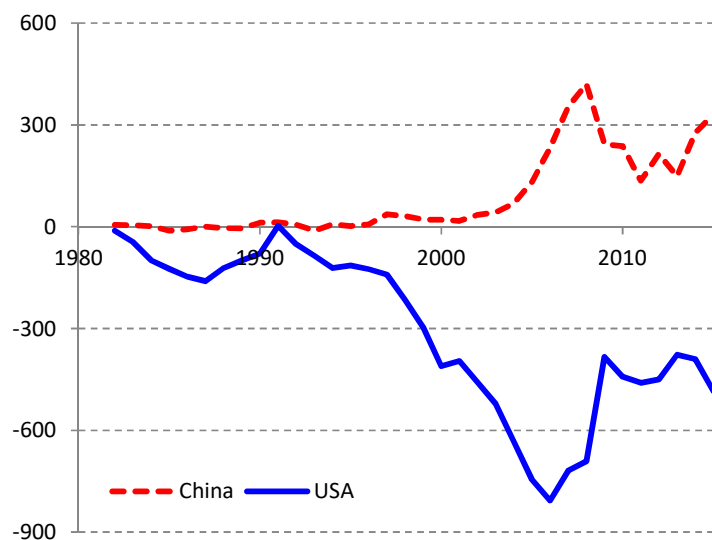
When a country has a deficit in its balance of payments, politicians and the press often portray this as a cause of major concern. This concern is groundless for two reasons: (1) there never is a deficit, and (2) it is not necessarily bad if there is a deficit.

- Explain for both reasons whether you agree or disagree.
- Can you explain why politicians and the press are often concerned?

**QUESTION 3-3**

The developments of the Chinese and US current account balance since 1990 are shown in the graph below. The current account is a flow variable. It represents the build-up of net foreign claims by an economy. Many US politicians blame China for their country's growing current account deficit and negative international investment position.

*Current account balance, USD billion*



Source: based on data from World Development Indicators online.

- Why do US politicians blame China for their deficit, while the Chinese current account surplus is initially fairly small compared to the US deficit?
- The current account balance is not exactly equal to changes in the international investment position. Can you explain why this is so?
- The Chinese and US economies both attract a lot of foreign direct investment (FDI). Does this represent a capital inflow or outflow?
- If the current account remains unchanged, which offsetting capital account transactions can occur to maintain a balance of payments (use Figure 3.3)?
- Suppose the US government wants to improve relations with China and does so by giving emergency assistance after a flooding of the Yangtze River. How does this affect the Chinese balance of payments?

**QUESTION 3-4**

Suppose that you live in the hermetically closed nation of North Korea. The economy has no outside economic links with the rest of the world. You save money in the bank and know that North Korean banks have the highest interest rates in the world.

- What do you know about the saving and investment relationship in North Korea?
- As a saver, do you favour capital mobility? Explain.

- c. Do you expect the relationship between saving and investment to change after capital market integration? What will happen to the North Korean current account? Explain.
- d. What impact does the Feldstein-Horioka puzzle have on your answer to question c?

### QUESTION 3-5 (DATA)

The *ch03question05 data* Excel file provides World Bank data on exports of goods and services. The data is downloaded on 31 March 2017 and focuses on 2015, the most recent year for which information was available at the time of downloading. The World Bank identifies 217 different countries. The file contains information on:

- The exports of goods and services; % of GDP
- The exports of goods and services; current USD, billion – source IMF Balance of Payments (BoP)
- The exports of goods and services; current USD, billion – source World Bank and OECD

We already used this information for a data question in Chapter 2. In this question we analyze the discrepancy in the exports of goods and services for the two data sources provided.

- a. Make a bubble-type scatter plot similar to Figure 1.3 of the book, this time of the export of goods and services in 2015 in billion current USD, with log-log scales, the IMF data on the horizontal axis, the WB-OECD data on the vertical axis, and the bubble size proportional to the IMF data. (to make this figure in Excel order the data in three columns with IMF data, WB-OECD data, and again IMF data; select the three columns and go to ‘insert’ – ‘other charts’ – ‘bubble’; you can now organize the graph to have log scales; you can get transparent bubbles by selecting the bubbles, double clicking, go to fill, select a colour, and select a percentage of transparency; you can determine the scales, and so on) What do you observe?
- b. For each country, determine the percentage deviation between the WB-OECD data and the IMF data, using the IMF data as the base.
- c. Which four countries have the largest negative deviation (in %) and which four countries have the largest positive deviation (in %)? How big are these deviations? What may be the reason?
- d. Determine the simple average percentage deviation. Is the number you find an adequate reflection of the relative deviation between the two data sources? Why, or why not?
- e. Calculate the simple average *absolute* percentage deviation. Is this a better indicator to your answer of question d? Why, or why not?
- f. Determine your answers to questions d and e using *weighted* averages, where you use the share of a country’s exports in total exports for the included countries as the relevant weight. Of the four numbers you have determined in questions d-f, what is the best indicator of the deviation between the two data sources? Why? Based on your answer, is the deviation between the two sources problematic, or not? Why?

## Chapter 4 Technology: the Classical Approach

### QUESTION 4-1

The table below gives the units of labour needed to produce one ship, one bicycle and one airplane in Russia and the European Union.

*Units of labour needed for the production of one unit*

|        | Ship | Bicycle | Airplane |
|--------|------|---------|----------|
| Russia | 200  | 50      | 500      |
| EU     | 100  | 30      | 200      |

- Which country has an absolute advantage in the production of ships, bicycles and airplanes?
- What is the EU's comparative advantage if we look only at ships and bicycles?
- What is the EU's comparative advantage if we look only at bicycles and airplanes?
- Can you infer from your calculations in b and c which product the EU will export for sure and which product it will surely not export?

### QUESTION 4-2

Some politicians and trade activists argue that developing countries should not participate in the global economy as their industries cannot compete with their Western counterparts. According to these observers, trade does not benefit the developing countries and will only result in the exploitation of the labour force. Let's analyse this argument in a simple Ricardian framework. Suppose there are only two countries, Indonesia and the USA, producing only two goods, clothes and machines. Labour is the only factor of production. The table below shows how many man-hours are needed in Indonesia and the USA to make one unit of clothes or one machine. Assume that 2,000 man-hours are available in the USA and 36,000 in Indonesia.

*Number of man-hours needed to produce one unit*

|         | Indonesia | USA |
|---------|-----------|-----|
| Clothes | 50        | 3   |
| Machine | 100       | 5   |

- Explain which country has a comparative advantage in which product.
- What is the autarky price of machines in Indonesia and the USA?
- Indicate exactly what range of prices for machines should be offered on international markets for both countries to profit from international trade. What will Indonesia and the USA import and export?
- Explain in a consistent graph with production possibility frontiers why both countries gain from trade when prices on the international markets are within the range you indicated for question c.

Some trade activists who think that developing countries are exploited on the international market may not be convinced by your arguments above. They claim that even in the Ricardian framework trade is based on unequal wages between developed and developing countries.

- Explain whether wages are unequal in the example of Indonesia and the USA. If both countries trade with each other, what is the maximum and minimum difference between the wage rate in Indonesia and the USA?



- f. Discuss whether abolishing trade is an effective instrument to raise Indonesian wages. Use the observations you made in your analysis above.

**QUESTION 4-3**

Three countries, Hungary, Bulgaria, and Czech Republic, have Ricardian technologies as listed in the table below and can produce two types of goods, namely butter and beer.

*Number of labor units required to produce one unit of output*

| Country        | Butter | Beer |
|----------------|--------|------|
| Hungary        | 2      | 4    |
| Bulgaria       | 3      | 7    |
| Czech Republic | 4      | 5    |

- Which country has an absolute advantage in the production of beer and which country in butter? Explain.
- The three countries start to trade with each other without any impediments whatsoever. Which country will export butter and which country will export beer (comparative advantage)? Explain.
- What happens to the country not mentioned in your answer to question b? Which good will it export? Your friend argues that it will lose from engaging in international trade for sure. Is she right? Explain.

**QUESTION 4-4**

Two countries, China and India, have Ricardian technologies as listed in the table below and can produce three types of goods, namely tea, rice, and pork.

*Number of labour units required to produce one unit of output*

|      | China | India |
|------|-------|-------|
| Tea  | 2     | 4     |
| Rice | 3     | 7     |
| Pork | 4     | 5     |

- Which country has an *absolute* advantage in the production of tea? Which country has an *absolute* advantage in the production of rice? Which country has an *absolute* advantage in the production of pork? Explain.
- The two countries start to trade with each other without any impediments whatsoever. Which country will produce and export *tea*? Which country will produce and export *rice*? Which country will produce and export *pork*? Be detailed in your answer and explain your reasoning carefully.

**QUESTION 4-5 (SIMULATION)**

Based on statistics of the labor force and wages in a large number of countries, the *ch04question05 simulation* Excel file models the world economy according to the assumptions of the Ricardian model. There is one factor of production (labour), there are two final goods (food and manufactures) and there are many countries (123 countries). We assume that consumers of every country want to spend half of their income on the consumption of food and half of their income on the consumption of manufactures.

The top part of the excel sheet “simulation1” gives you the exogenous variables for the different countries. The middle part gives the autarky price level, consumption and production. The lower part gives you the consumption, production and net exports when countries are allowed to trade. You can determine the world price of manufactures relative to food yourself in the column “total” (which gives you total world production, consumption and net exports). Excel sheet “simulation2” will only be used in the next question.

- a. What is the equilibrium price of manufactures relative to food  $p_m/p_f$  of simulation 1? How do you know this is the equilibrium price?
- b. What happens to the production of food and manufactures in most countries when they move from a situation of autarky to a situation of free trade?
- c. Explain whether most countries are better off or worse off by opening the borders to trade.
- d. Explain whether *all* countries in the simulation are better off by moving from a situation of autarky to a situation of trade.

Economists are sometimes blamed for focusing attention on large economies and neglecting small economies. The Ricardo simulation gives you a feel why economists may do this by comparing the international impact of changes for the US economy and the Albanian economy in excel sheet “simulation2”. This sheet looks similar to sheet “simulation1”. The only difference is that in the upper part of this sheet you are allowed to change the exogenous variables and in the lower part you can compare the differences between the trade equilibrium in simulation 1 and the trade equilibrium in simulation 2. Initially we assume that countries are allowed to trade and the world equilibrium is determined as in questions a-d. Next, we analyse the consequences of a jump in the fertility rate which increases the labor force by 25% and an improvement in productivity in the manufacturing sector of 50% in both Albania and the United States.

- e. Suppose for one reason or another the fertility rate goes up in Albania and the labor force increases by 25%. What are the consequences for Albania and the rest of the world?
- f. Assume instead that the labor force increases by 25% in the United States. What are the effects for the United States and the rest of the world?
- g. Now suppose instead that productivity in the Albanian manufacturing sector improves by 50%. What are the results for Albania and the rest of the world?
- h. Assume instead that productivity in the US manufacturing sector improves by 50%. What are the consequences for the US and the rest of the world?

## Chapter 5 Technology: the Neoclassical Approach

### QUESTION 5-1

Suppose there are two goods, buildings and necessities, in a neoclassical world with two factors of production, capital and labour. The production of necessities is relatively labour intensive.

*Draw a (big) Lerner diagram which is consistent with the provided information.*

*Explain how this can be used to show that there is a one-to-one correspondence between factor prices and final goods prices as long as both goods are produced.*

### QUESTION 5-2

Dwell produces desktop computers using high-skilled labourers (H) and low-skilled labourers (L) with constant returns to scale. To maximize profits, it wants to minimize its cost of production. Computers are relatively intensive in low-skilled labour production and Dwell is a price taker on the labour market. The market for computers is perfectly competitive.

- Draw a production isoquant for computers and an isocost line. Indicate in your graph the number of high-skilled workers and the number of low-skilled workers involved in the production process.

Dwell forecasts an increase in demand for its newest model and doubles its production.

- Draw the new situation in your graph of question a.
- What happens to the isocost line and production isoquant? Why? How many new labourers does Dwell hire?
- What impact does the production change have on Dwell's profitability?

### QUESTION 5-3

Dwell computers has just doubled production. It wants to maintain its production level when it is confronted with a wage increase for high skilled-labour.

- Draw the initial situation in a graph with a production isoquant and an isocost line. Indicate the change in the isocost line after the wage increase.
- What implications does this have for Dwell's production process of computers? What happens to Dwell's demand for high-skilled labour?

Dwell does some research and development and manages to improve its production process. As a consequence, producing computers after the innovation becomes more low-skilled labour intensive.

- Show in your graph the effect of this technological innovation. Does this alter the input mix of high- and low-skilled labour?
- What would be the consequences of this kind of technological development for wages of skilled and non-skilled workers?

**QUESTION 5-4**

The Russians and the Germans both like vodka and beer. Suppose that these are the only two products they consume and produce. Moreover, suppose that as a result of regulations vodka and beer initially cannot be traded between Russia and Germany. Beer is produced with the help of machines largely controlled by computers. Beer breweries are therefore capital intensive. The production process of vodka, on the other hand, is more traditional and therefore quite labour intensive. Because of its large population and lack of capital goods, the wage–rental ratio ( $w/r$ ) is initially lower in Russia than in Germany.

- a. Explain whether the relative price ratio of vodka in terms of beer ( $p_{vodka}/p_{beer}$ ) will be higher in Russia or in Germany in the initial situation (without trade).

Suppose that, after intensive international consultations, the regulations for vodka and beer are lifted, such that these goods can now be freely and costlessly exported and imported. In response, Russia starts to produce more vodka and less beer while Germany starts to produce more beer and less vodka. Russia exports vodka in exchange for beer.

- b. Once the two countries can trade, will the price ratio of vodka in terms of beer ( $p_{vodka}/p_{beer}$ ) be higher in Russia or in Germany?
- c. What will happen to the wage–rental ratio in Russia and Germany? Why?
- d. The trade liberalizations in Russia and Germany have not remained unchallenged. Explain which groups of people are likely to protest against the liberalizations.
- e. What can the politicians in Russia and Germany do in response to these protests?

**QUESTION 5-5**

We ask you to clarify the situation of Question 5-4 graphically. Assume that the unit value isoquant for beer is equal for Russia and Germany (it is the numéraire).

- a. Draw the unit value cost lines and unit value isoquants for both vodka and beer for both Russia and Germany in a situation of autarky.
- b. What will happen to the price of beer and vodka in both Russia and Germany if both countries start to trade?
- c. Draw the new unit value isoquants and unit value cost lines in the figure of question a in a situation in which Russia and Germany engage in international trade.
- d. What happens to the wage rates and rental rates in both countries?

**QUESTION 5-6 (SIMULATION)**

The *ch05question06 simulation* Excel file repeats the Lerner diagram drawn in figure 5.13. We have assumed initially that the capital intensity parameter for manufactures is 0.8 and for food 0.2. Moreover, the wage rate  $w$  and rental rate  $r$  are equal to:  $w = r = 0.2$ . The simulation allows you to change the wage rate and the rental rate.

- a. What is the capital intensive and what the labor intensive good in the simulation? Explain in two different ways.
- b. The Lerner diagram pictures the unit value isoquants of manufactures and food. Why is the production of manufactures and food not equal to unity?

- c. If you increase the wage rate, what happens to the prices of manufactures and food? What happens to the labor input and capital input? Explain.
- d. Fill in the table below by changing the wage rate in the simulation while keeping the rental rate equal to 0.2. Comment on the evolution of the final goods prices and factor inputs.

| Wage rate                  | 0.1 | 0.2 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.8 | 0.9 |
|----------------------------|-----|-----|-----|-----|-----|-----|-----|-----|-----|
| Price manufactures         |     |     |     |     |     |     |     |     |     |
| Price food                 |     |     |     |     |     |     |     |     |     |
| Labor input manufactures   |     |     |     |     |     |     |     |     |     |
| Capital input manufactures |     |     |     |     |     |     |     |     |     |

### QUESTION 5-7 (TECHNICAL)

Technical Note 5.1 solves the unit cost minimisation problem for a Cobb-Douglas production function. This functional form is easy to work with and gives simple solutions. There are, however, many other possible production functions. Consider, for example, the following Constant Elasticity of Substitution (CES) production function for Food:

$$F(K_f, L_f) = \left( \alpha_f K_f^{-\rho} + (1 - \alpha_f) L_f^{-\rho} \right)^{-1/\rho}$$

- a. Show that this production function also exhibits constant returns to scale by using the same procedure as in equation 5.4 of the book.
- b. Define the Lagrangean, as in Technical Note 5.1, and derive the first order conditions for unit cost minimisation using the CES production function above.
- c. Using your answer to question b, determine the optimal capital-labour ratio for the firm.
- d. Show that the optimal choice of labourers and capital for the production of one unit of food is:

$$K_f = \left( \frac{\alpha_f}{r} \right)^{1/(1+\rho)} \left( \alpha_f^{1/(1+\rho)} r^{\rho/(1+\rho)} + (1 - \alpha_f)^{1/(1+\rho)} w^{\rho/(1+\rho)} \right)^{1/\rho}$$

$$L_f = \left( \frac{1 - \alpha_f}{w} \right)^{1/(1+\rho)} \left( \alpha_f^{1/(1+\rho)} r^{\rho/(1+\rho)} + (1 - \alpha_f)^{1/(1+\rho)} w^{\rho/(1+\rho)} \right)^{1/\rho}$$

- e. What is the minimum cost of producing one unit of food?

## Chapter 6 Factor Abundance and Trade

### QUESTION 6-1

Armenia is a small country (changes in endowments do not result in price changes for factor inputs or final goods prices). Suppose that it produces two goods, Manufactures and Food. It produces these goods in a Heckscher-Ohlin world using high-skilled labour (H) and low skilled labour (L). Manufactures make relatively intensive use of H and Food is relatively L intensive. About 3 million Armenians are high-skilled, while 1 million people are low-skilled.

- Draw the situation described above in an Edgeworth box. Put the origin of Food in the Southwest corner and the origin of Manufactures in the Northeast corner. Measure high-skilled labour (H) on the horizontal axis and low-skilled labour (L) on the vertical axis. Draw the contract curve, one efficient point of production, and the isoquants of both goods through the chosen efficient production point.
- What indicates in the Edgeworth box the level of output of a good?
- How can you determine the production levels of rice and clothes in full employment equilibrium?

After the fall of the Soviet Union and the declaration of Armenian independence, the socio-economic situation in Armenia deteriorates rapidly. As a consequence, people are voting with their feet. Estimates show that two million people have emigrated from Armenia since independence. It is the best (high-skilled) people who are emigrating.

- Show the effects of the Armenian emigration in the Edgeworth box you have drawn in question a.
- What are the effects on the production of Manufactures and Food? What do we call this effect in theory?

### QUESTION 6-2

Suppose there are two countries (Cuba and India) in a neoclassical world with two factors of production (human capital and unskilled workers) able to produce two goods (merchandise and food). We will assume that the production of merchandise is relatively human capital intensive and that Cuba has 400 units of human capital and 800 units of unskilled workers while India has 300 units of human capital and 800 units of unskilled workers.

Draw a *production possibility frontier* for Cuba in international trade equilibrium *consistent* with the information above and illustrate clearly what happens in this diagram when the amount of human capital rises, *given that Cuba is a small country*. What happens to trade flows? Explain.

### QUESTION 6-3

Since Deng Xiaoping took over leadership of China in 1978, tariffs have decreased dramatically. In 2001, China even joined the WTO, sending a signal to the world that tariff reduction will continue in the future. The effects of the opening up of China to international trade are heavily debated within the media. Some commentators claim that trading with China is a good thing because products become cheaper. Others stress the negative effect it has on some Western sectors, such as the clothes industry.

Let's analyse the integration of China in the world economy with the Heckscher-Ohlin factor abundance model. Assume, to make things easy, that there are only two countries: China and the Western world (the

Western world is considered to be one country). China is relatively labour abundant and the Western world relatively capital abundant. Furthermore, assume that only two goods are consumed and produced in China and the Western world. These are clothes (produced relatively labour intensively) and computers (produced relatively capital intensively).

- a. Draw a consistent graph in which you indicate the autarky production and consumption points of China and the Western world with the help of production possibility frontiers and utility curves.
- b. Explain intuitively whether the relative price of clothes in the Western world is higher or lower compared to the relative price of clothes in China when both China and the Western world are in autarky. How can you see this price difference in your graph?
- c. Explain what will happen to the prices of clothes and computers in the Western world when the Western world and China start trading.
- d. What effect will this have on the consumption of clothes and computers and on the production of clothes and computers in the Western world? Indicate the new consumption and production point in the graph with the help of a budget line and a new utility curve (if your graph becomes messy, please draw a new graph).
- e. Is integration of China into the world economy a good thing for the Western world? Use the observations you made above in your analysis. Also comment on the distribution of welfare between industries and owners of production factors.

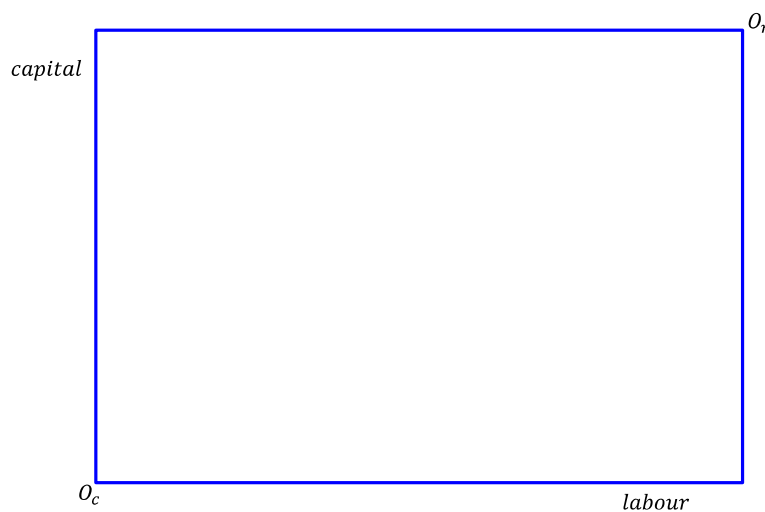
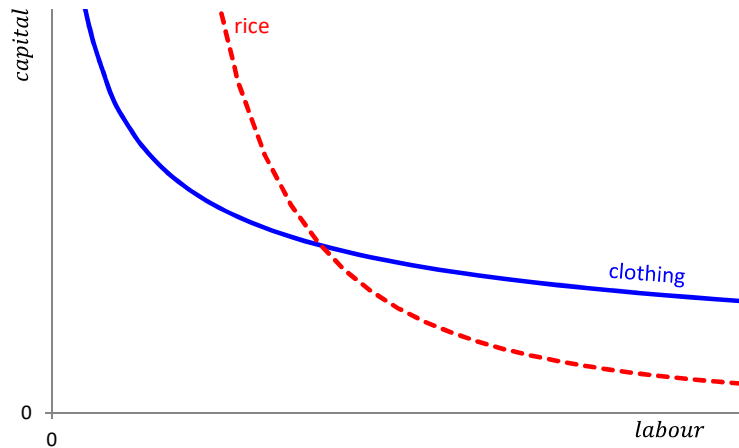
#### QUESTION 6-4

Equation 6.7 in the book shows the autarky wage-rental ratio and relative price ratio. Using this information and the analysis in chapter 6, determine the changes in (i) the wage-rental rate, (ii) the final goods price ratio, (iii) the welfare level, (iv) the production level of manufactures, and (v) the production level of food if:

- a. The capital stock  $K$  increases.
- b. The labour force  $L$  increases.
- c. The capital intensity of manufactures decreases.
- d. The share of income spent on manufactures increases.

#### QUESTION 6-5

Bangladesh is a developing country which ranks high in the top of unskilled-labour intensive manufacturing exporters. These exports consist mainly of textiles. The Multi-Fibre Agreement (MFA), which imposed all kinds of restrictions on world trade in textiles, was officially ended at the start of 2005. We will analyse its impact with the help of the graphs below. The top graph shows the unit value isoquants for both goods. The bottom graph is an Edgeworth Box.



- Use the top graph to determine the optimal production point in the Edgeworth box (bottom graph).
- What happens if the price of clothes increases as a result of the end of the Multi-Fibre agreement in 2005? Draw the new situation in both graphs.

In isolation, the MFA agreement would affect Bangladesh as you have analysed in question b. In addition, however, the labour force in Bangladesh has also expanded rapidly.

- Expand the Edgeworth Box and analyse the combined effect of a labour force increase with a price increase for clothing. How does this impact the production level of Rice?

#### QUESTION 6-6 (SIMULATION)

The *ch06question06 simulation* Excel file on the website contains two figures. The first figure shows the unit value isoquants of manufactures and food. The second figure shows the Edgeworth box. Assume that we have two factors of production, workers with at least college (C), and workers with at most a high school diploma (H). The two lines inside the Edgeworth box reflect the college educated - high school educated ratios in the production of manufactures and food. The intersection of these two lines is the point



of production. The simulation allows you to change the endowments, prices, and factor intensity parameters.

- Suppose Jews migrate from Russia to Israel. Also suppose that these migrants are, on average, better educated. Show the effect of the migration of Russian Jews into Israel.
- Suppose that Russia has the same factors of production, what does the Rybczynski proposition imply for Russian production?

The wages for high-educated workers increase somewhat in Israel due to changes in technology. There is a one-to-one relationship between wages and prices in our neo-classical framework.

- Simulate the effect of the wage increase for college educated workers (by changing final goods prices). What happens to production levels and why? Does the Rybczynski result always hold with price changes?
- Suppose that technological developments lead to a higher “college-educated labour intensity” in the production of manufactures. Change the correct parameter in the simulation. What happens to the production levels? Explain.

#### QUESTION 6-7 (TECHNICAL)

The CES production functions for manufactures and food are given below:

$$F = \left( \alpha_f K_f^{-\rho} + (1 - \alpha_f) L_f^{-\rho} \right)^{-1/\rho}; \quad M = \left( \alpha_m K_m^{-\rho} + (1 - \alpha_m) L_m^{-\rho} \right)^{-1/\rho}$$

- Determine the contract curve for these production functions.
- Compute the share of labourers active in manufacturing, analogous to equation (6.A4) in the technical notes.
- Determine the production level of manufactures (analogous to equation 6.A6).

## Chapter 7 Imperfect Competition

### QUESTION 7-1

Briefly answer or comment on the questions and remarks below.

- What is, according to you, the main consequence of market power for firms? Why?
- In an oligopolistic setting with Cournot competition we derived firm A's *reaction curve*. Give a short definition of this reaction curve.
- Why is firm A's iso-profit curve *horizontal* at the point of intersection with its reaction curve, while firm B's iso-profit curve is *vertical* at the point of intersection with its reaction curve in Figure 7-5?

### QUESTION 7-2

Briefly comment on this statement: "as explained in section 7.3 of the book, the main welfare impact of a rise in firm market power in a sector of the economy is the creation of a sub-optimal economic outcome in autarky because of the deviation between the marginal rate of transformation (MRT) and the marginal rate of substitution (MRS) in equilibrium." Hint: carefully look at equation 7-2.

### QUESTION 7-3

What are pro-competitive gains from trade? Briefly describe the main mechanism underlying these gains from trade under Cournot competition.

### QUESTION 7-4

The national electricity markets in the Nordic countries (Denmark, Finland, Norway, Sweden) used to be protected from foreign competition and dominated by one power company. At the end of the 20<sup>th</sup> century, far reaching reforms were introduced establishing one integrated electricity market. A common power exchange was established (Nord Pool), international transmission links were opened to other players and border tariffs were abolished. In the 21<sup>st</sup> century, the Nordic electricity market was opened up even more by establishing trading links with Poland and Germany. We analyze these developments using the imperfect competition framework of Markusen and concentrate on the Swedish electricity market.

- Illustrate the Swedish electricity market when there was only one power company in a graph with electricity on the vertical axis and 'other products' on the horizontal axis. Draw the production possibilities frontier and the utility curve for which consumers maximize their utility. Indicate clearly what amount of electricity is sold and for what price.
- Why can the Swedish monopolist charge an electricity price far above marginal cost? Is it fair to charge a price above marginal costs?
- Assume that Sweden first establishes an integrated electricity market with Norway. Draw the new situation in your figure of question a. What happens to the quantity of electricity produced and to electricity prices on the Swedish market?
- Explain who are the winners and who the losers from the integrated electricity market with Norway.
- What happens to your figure of question a if more countries enter the common electricity market? Is this an attractive development?

**QUESTION 7-5**

Let us analyse the gains and losses associated with the entry of the Norwegian electricity firm on the Swedish market more formally. Recall that there was initially only a Swedish monopoly producer on the Swedish electricity market. In the new situation a Norwegian firm is allowed to sell electricity in Sweden. Assume that Figure 7.2 in the book gives the demand for electricity in Sweden and the marginal revenue and cost curve for the Swedish monopolist in the initial situation.

- Copy Figure 7.2 of the book. What are the consumer surplus and producer surplus in a situation of monopoly?
- Indicate in the same figure a possible total quantity of electricity supplied and the associated price level if the Norwegian firm is allowed to compete on the Swedish market, assuming that there are no transport costs. What is the consumer surplus and producer surplus in this new situation?
- Who gains and who loses from the entry of the Norwegian firm? What are the pro-competitive gains from trade?

Assume now that the Norwegian firm faces positive transport costs when delivering electricity to the Swedish market. We assume that it is still profitable for the Norwegian firm to supply electricity to Swedish consumers.

- What is the quantity of electricity supplied and the associated price level if the Norwegian firm faces positive transport costs?
- Who gains and who loses from the entry of the Norwegian firm if there are positive transport costs? Explain whether the gains and losses are equal to the situation without transport costs.

**QUESTION 7-6 (SIMULATION)**

The *ch07question06 simulation* Excel file allows you to play with the reciprocal dumping model. There are two firms, A and B. In the reciprocal dumping model of chapter 9 it is assumed that both firms face the same marginal costs. The simulation is slightly more flexible in this respect as it allows for a difference in marginal costs. Firm A produces for the home market and firm B is situated abroad. Firm A therefore does not face transport costs while firm B does. Note that the transport costs are of the iceberg type.

- Why does firm B not offer its products on the home market even though its marginal production costs are lower?
- What options does firm B have to introduce its product on the home market of A?
- One of the options of firm B is to lobby for a road so that transport costs will decrease. What effect does a decrease in transport costs have on the quantities supplied and the price?
- Who gains and who loses from a decrease in transport costs?
- How does welfare of country A, of country B and total welfare change? Do you think building a road is attractive for the government of country A?

## Chapter 8 Intra-industry Trade

### QUESTION 8-1

*International trade flows in 2013 (US \$ billion, rounded)*

|  |        |       |
|--|--------|-------|
| World total export                                     | 18,000 |       |
| Sector 85 Electrical Electronic Equipment world export |        | 2,000 |
| China total export                                     | 2,200  |       |
| Sector 85 Electrical Electronic Equipment China export |        | 550   |
| China total import                                     | 2,000  |       |
| Sector 85 Electrical Electronic Equipment China import |        | 450   |

- What does the Grubel-Lloyd index measure? On the basis of the empirical information in the table above: calculate the Grubel-Lloyd index for sector 85 for China. Provide a suitable interpretation.
- What does the Balassa index measure? On the basis of the empirical information in the table above: calculate the Balassa index for sector 85 for China. Provide a suitable interpretation.
- In light of your answer to question a is the Balassa index you calculated in question b for sector 85 in China a good indicator or not? Provide a suitable interpretation.

### QUESTION 8-2

Chapter 8 introduces the Constant-Elasticity-of-Substitution (CES) utility function, which provided a breakthrough for intra-industry trade theory. Suppose that a consumer with this type of utility function (see equation 8-2) consumes three goods: coffee, tea and milk.

- Use a numerical example to show that if  $\rho = 1$  the consumer is indifferent to consuming three units of coffee or three units of a mix of the goods.
- Use a numerical example to show that if  $0 < \rho < 1$ , the consumer prefers to purchase a combination of goods.

For the rest of this question we assume that each good is consumed in the same quantity. Section 8.3 then rewrites the utility function to distinguish between a love-of-variety effect and a claim on real resources (see equation 8-3). Suppose that  $\rho = 0.5$  and assume that one unit of each good is consumed.

- Rewrite the utility function for coffee, tea, and milk to mimic equation (8-3). How large is the claim on real resources? How large is the love-of-variety effect?
- Use an example to illustrate how the love-of-variety effect represents a multiplier-like role in the utility function (use equation 8-3).

### QUESTION 8-3

"One definition of an economist is somebody who sees something happen in practice and wonders if it will work in theory."

- How does this joke relate to the theory of intra-industry trade?

Though the theory of intra-industry trade was an important breakthrough, much remains to be done. Several economists take issue with the parameter  $\varepsilon$  in the model.

- Give two reasons why economists might be concerned about this parameter.

The merits of globalisation are subject to fierce debates. One of the issues that anti-globalisation advocates raise is the perceived decrease in the number of varieties in the world. Everybody buys the same brands and shops at the same stores.

- c. What can the theory of intra-industry trade say about this issue?

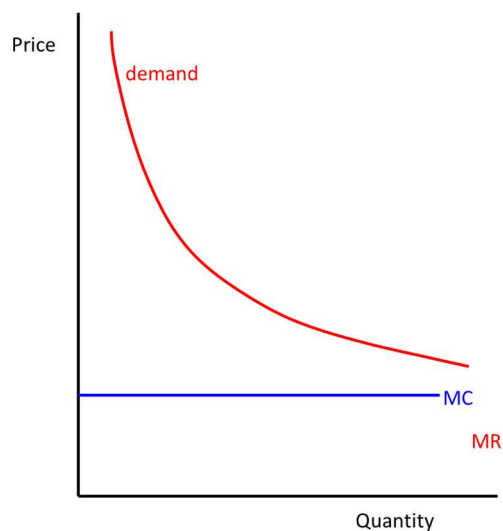
#### QUESTION 8-4

China and Australia both produce fireworks. The demand and supply structure in both economies is given by the Dixit-Stiglitz model, with an elasticity of substitution equal to 2 in both countries. Since continually firing the same crackers is quite boring, there is a love-of-variety effect for all consumers. The fireworks market is much larger in China than in Australia. In both countries the marginal labour input requirement is 1 and the fixed labour input per variety is 2.5. The Chinese labour employment in the fireworks industry is 10 million people. The Australian labour employment in the fireworks industry is 10 thousand people.

- How many varieties will be supplied to the Australian and Chinese market in the autarky equilibrium?
- How many varieties will be consumed in each country in the free trade equilibrium?
- Does international trade increase the production efficiency in the two countries? Does international trade increase output?
- What is the domestic market share of Australian producers if international trade is allowed?
- Who benefits and who loses from international trade in this model? Are the benefits equally shared between Australia and China?
- Describe how the Ethier interpretation would alter the analysis of international trade of fireworks. How does it affect the benefits of international trade, in comparison with the Krugman interpretation?

#### QUESTION 8-5

The graph below shows an iso-elastic demand function in the Dixit-Stiglitz monopolistic competition model. Answer the questions below using this graph.



- a. Make a clear and consistent graph on the basis of the figure above to:

- Illustrate how the optimal price and quantity is determined
  - Illustrate what happens if new firms enter the market
- b. How does Wilfred Ethier use this framework to explain intra-industry trade? In your answer, make sure you mention what type of intra-industry trade Ethier is focusing on.

**QUESTION 8-6 (DATA)**

The *ch08question06 data* Excel file on the website contains information for China on 2-digit sector 85 “Electrical, electronic equipment” regarding imports and exports from 1992 to 2013, as well as for 48 of its sub-sectors at the 4-digit level, such as sector 8502 “Electric generating sets and rotary converters” and sector 8522 “Parts, accessories of audio, video recording equipment.”

- a. Calculate the Grubel-Lloyd index for China’s sector 85 at the 2-digit level for all years. What is the average over the years 1992-2013? What is the maximum and what is the minimum?
- b. Calculate the Grubel-Lloyd index for each of China’s 4-digit subsectors for all years, as well as the average over the period. Which sub-sector has the highest average Grubel-Lloyd index and which sector has the lowest average Grubel-Lloyd index over the period? Comment on your findings.
- c. Calculate a 4-digit trade-weighted average Grubel-Lloyd index for 2-digit sector 85 based on the 4-digit subsector Grubel-Lloyd indices. What is the average, the minimum, and the maximum for the period as a whole? Compare with your answer to question a and explain.

## Chapter 9 Investment and Migration

### QUESTION 9-1

Briefly answer the questions below.

- Rank world income, world trade, and world FDI flows since 1970 in terms of (long-run) growth rate and volatility.
- Which parts of the world are most active in terms of outward- and inward FDI flows since 1970 if we distinguish between advanced, developing, and transition countries? What has been the main change in this distribution?
- What is the difference between greenfield FDI and cross-border M&As?

### QUESTION 9-2

Is multinational activity becoming more or less important since 1990? Briefly illustrate using some appropriate measures and comment on their suitability.

### QUESTION 9-3

- Are international migration flows today (since the year 2000) in *relative* terms larger or smaller than a century ago (the period 1870-1913) for Western Europe and the Western Offshoots? How about the direction of these flows?
- If we look to the future (up to 2050) and the continents (Asia, Africa, Latin America, Oceania, Europe, and North America): where do we expect large migration flows in absolute and relative terms? How about the direction of these flows? Why?
- Which regions of the world are most affected as source and destination of refugees?

### QUESTION 9-4 (DATA)

The *ch09question04 data* Excel file provides data on FDI flows in real 2014 billion USD for three groups of countries, namely developing countries, transition countries, and advanced countries.

- Create a figure for inward FDI flows for the world as a whole with time on the horizontal axis in the period 1970-2014. Make a second figure based on the same information, but this time use a log scale on the vertical axis. What do you observe? What is the advantage of the second figure?
- Make three separate graphs with inward FDI flows for the three groups of countries. In all cases use a logarithmic vertical scale. For developing and advanced countries use the whole period (1970-2014). For transition countries only use the period 1990-2014. What do you observe regarding growth rates? Why are you asked to make a graph for transition countries only from 1990 onwards?
- For each of the three groups of countries determine (i) the average annual FDI flow in the period 1995-1999, (ii) the average annual FDI flow in the period 2010-2014, and (iii) the ratio of FDI in 2010-2014 relative to 1995-1999 as an indication of relative growth in the period 1995-2014. Comment on your findings.

## Chapter 10 Trade Organizations and Policy

### QUESTION 10-1

'If economists ruled the world, there would be no need for a WTO'.

- a. Do you agree with the statement above? Explain.
- b. Throughout the book we illustrate the benefits of free trade. Yet international trade negotiations are still steeped in terms such as concessions received and granted. Can you explain why this is so?
- c. What is a beggar-thy-neighbour policy?
- d. How is this related to the set-up of international trade organizations after the second World War?
- e. On which three main principles is the GATT based?
- f. Two main exceptions are given for the non-discrimination principle. Can you explain why these have been created?
- g. Why did the successive trade rounds change their negotiating technique at the Kennedy Round?
- h. Why do international trade negotiations give particular attention to non-tariff barriers?
- i. What is the new protectionism?
- j. Which concerns gave rise to the foundation of UNCTAD?

### QUESTION 10-2

We investigate trade policy in this question from a purely neoclassical perspective.

- a. Draw a *partial equilibrium* diagram for Britain on the effects (for consumers, producers, and the government) of imposing a *tariff* on wheat (which is on net imported into Britain), on the assumption that *Britain is a large country* and is able to benefit in this framework from the fact that it is a large country. Explain.
- b. Briefly discuss and illustrate (for example using offer curves) why or how a trade policy which leads to a *partial equilibrium welfare gain* for Britain (for example if Britain imposes a tariff and is a large country) may be *reversed* in a general equilibrium framework.

### QUESTION 10-3

Suppose that Hong Kong is a small, open economy in a neoclassical world. It can produce two types of goods, machines and agricultural products, using two inputs, capital and labour. Assume that Hong Kong is relatively capital abundant. Hong Kong is currently engaged in free trade, but it is contemplating to impose a 50 percent import tariff.

Assume you are an advisor to the Hong Kong government. *Draw* a (big) consistent production possibility frontier illustrating *trade flows* under free trade and show what happens if an import tariff is imposed (general equilibrium framework). *Explain* to the government how imposing a tariff creates a welfare loss through a double distortion.

### QUESTION 10-4

The world has recently witnessed the rise of a new movement vehemently opposed to international bodies such as the World Bank, the IMF, and the WTO. This movement consists of many different groups of



people, usually opposing different elements of developments in the world economy. In view of this discontent, which apparently makes people so angry that they are willing to smash city centres, break windows, start fires, and fight with the police, it is good to discuss some of the issues raised by the protestors. For clarity, we focus the discussion on the WTO as it is the most important trade organization and was the first target of the demonstrators. Give your view on the claims below.

- The WTO is an undemocratic organization.
- The WTO promotes international trade that is bad for the environment.
- The WTO represents exclusively the interests of the developed nations and the multinationals.
- The WTO leads to the development of a monotone global culture that destroys the diversity of other cultures.
- The WTO promotes ‘unfair’ trade.
- The WTO policies increase global inequality.
- The WTO policy of free trade destroys jobs.

#### QUESTION 10-5

The European Union (EU) is considered to be a ‘large’ country in this question. In the 1980s Japanese producers began to export many cars to the EU. To protect their domestic car industries, the governments of the EU countries pushed for protective tariffs. We analyse the impact of these tariffs in a partial equilibrium framework.

- a. What makes a partial equilibrium analysis ‘partial’?
- b. Draw a partial equilibrium figure of the EU car market. Indicate clearly the volume of Japanese imports before and after the imposition of the tariff.
- c. Is the tariff welfare improving for the EU? Why, or why not?

The Japanese car manufacturers were not happy with the EU protection and started a lobbying process in Brussels to abolish the EU tariffs. These lobbying efforts were not completely successful, such that the tariffs are abolished in return for a ‘voluntary’ restriction of car exports to the EU.

- d. Why do the Japanese firms prefer the voluntary export restraints (VERs) to the tariffs?
- e. What is the tariff-equivalent import quota (or rather VER in this question) for Japan in your figure of question b?

#### QUESTION 10-6 (TECHNICAL)

Suppose the market for widgets in China has the following demand and supply schedules in  $(q, p)$ -space:

Demand:  $p = 10 - q$

Supply:  $p = 2 + q$

The free trade equilibrium price is  $p = 3$

- a. Determine the autarky equilibrium price and quantity of widgets in China and draw a consistent partial equilibrium graph depicting the free trade equilibrium in China. How much is imported?
- b. Suppose China is a *small* country in the market for widgets and introduces a tariff of 1 per unit of widgets imported into the country. Draw a *new* consistent partial equilibrium graph depicting the new

tariff-trade equilibrium in China. Illustrate and calculate the welfare consequences for (i) China producers, (ii) China consumers, (iii) China government, and (iv) China as a whole.

- c. How does your answer to question b change if China is a *large* country in the market for widgets; more specifically, if the world price falls by 0.5 as a result of the tariff of 1. Draw a *new* consistent partial equilibrium graph depicting the new tariff-trade equilibrium in China. Illustrate and calculate the welfare consequences for (i) China producers, (ii) China consumers, (iii) China government, and (iv) China as a whole.

#### QUESTION 10-7

Briefly discuss and illustrate (for example using offer curves) why or how a trade policy which leads to a partial equilibrium welfare gain for Britain (for example if Britain imposes a tariff and is a large country) may be reversed in a general equilibrium framework.

#### QUESTION 10-8 (SIMULATION)

The *ch10question10 simulation* Excel file on the website depicts the free trade equilibrium for Zombio, which produces coffee and tractors. In the simulation you can change the tariff rate on tractors, the share of income spent on tractors, the factor endowments, and the world price of tractors. The junta in charge wants to raise some revenue to pay the wages of its soldiers. Rather than imposing taxes on domestically produced goods, the government decides to raise import duties to 50 percent.

The simulation has the starting values:  $K = 2$ ,  $L = 7$ ,  $tariff = 0$ ,  $delta = 0.5$ . Note that some of the values have to be changed before you can answer the questions below.

- a. Simulate the policy change of the government. Which group in Zombio is benefiting from the policy and why? What is the total income cost (in terms of tractors) of the policy for Zombio?

The world market for tractors is booming. The increased demand from other countries increases the relative price of tractors by 20 percent.

- b. What does this mean for the terms of trade for Zombio?  
c. What happens to utility and income (in terms of tractors)? Why?

As a result of the high tariff rate the local tractor industry faces less competition from abroad, becomes corrupted, and through mismanagement loses half of Zombio's capital stock.

- d. Simulate the decline in the capital stock. Why does the volume of trade increase?

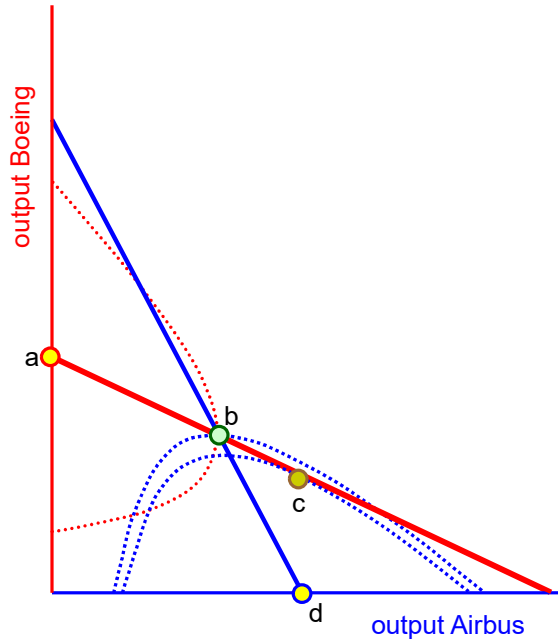
The junta has been talking about the benefits of the revolution for such a long time that the people of Zombio become thirsty for more coffee. They start to spend a larger share of their income on coffee than before.

- e. Change the correct simulation parameter to reflect the change in preferences. What happens to the volume of trade and why?

## Chapter 11 Strategic Trade Policy

### QUESTION 11-1

The rapid economic growth in China is accompanied by rapid growth in air travel, creating opportunities for Boeing (an American firm) and Airbus (a European firm) to sell their planes in China. We use the Cournot framework as in the Brander-Spencer model for our analysis. The figure below gives possible reaction curves and isoprofit curves for both Airbus and Boeing.



- Make clear for each of the different curves in Figure 1 if it is a reaction curve or an isoprofit curve and to which of the two firms it belongs. Where is the Nash equilibrium without government intervention? Explain.
- Suppose that the European Commission (EC) would like to give Airbus a strategic advantage in China. It therefore gives an optimal (total welfare-maximizing) subsidy for every airplane Airbus sells to China. What does the EC do and how does it affect the curves in your figure? Explain.

### QUESTION 11-2

We could also imagine that Airbus and Boeing (see question 11-1) are competing with each other in a Bertrand framework (price competition), rather than a Cournot framework (quantity competition). Again the European Commission wants to stimulate the sales of Airbus in China.

- Draw the reaction curves and some isoprofit curves for both Airbus and Boeing in a Bertrand framework. Put the price of an Airbus aircraft on the horizontal axis and the price of a Boeing aircraft on the vertical axis.
- Should the European Commission subsidize or tax the aircraft Airbus sells to China? Draw the new situation in the figure when the European Commission optimally employs the instrument. How does the price demanded for aircraft change for both Airbus and Boeing?
- What will the US government think of the EU policy?

- d. Explain whether the Cournot or Bertrand framework is more appropriate to analyse competition between Airbus and Boeing.

#### QUESTION 11-3

*Policies affecting rice production, consumption, and trade; selected countries, 2007-2013*

| Country     | Production |            |               | Consumption      |                   | Trade      |               |                |
|-------------|------------|------------|---------------|------------------|-------------------|------------|---------------|----------------|
|             | Fuel       | Irrigation | Price support | Price assistance | Rice distribution | Export ban | State trading | Export license |
| China       | yes        | no         | yes           | no               | no                | no         | yes           | no             |
| India       | yes        | yes        | yes           | yes              | yes               | yes        | yes           | no             |
| Indonesia   | no         | no         | yes           | yes              | yes               | no         | no            | yes            |
| Pakistan    | no         | yes        | no            | no               | no                | no         | yes           | no             |
| Philippines | no         | no         | yes           | yes              | yes               | no         | yes           | no             |
| Thailand    | no         | no         | yes           | no               | no                | no         | no            | no             |
| Vietnam     | no         | no         | yes           | no               | no                | yes        | yes           | no             |

Source: amended from USITC (2015): Rice: Global Competitiveness of the U.S. industry, publication number 4530.

Rice is extremely important for Asian countries. The above information is taken from USITC (2015). It depicts information on intervention in the domestic rice market for a range of Asian countries for eight different types of policies, grouped together in three categories (production, consumption, and trade). India, for example, uses 7 policies for its rice market, while Thailand uses only 1 policy.

Choose *one* of the 7 countries listed in the table and write a brief *essay* regarding the *economic and policy implications* of this country's intervention in the rice market relative to the eight other countries and possibly non-listed countries. Give brief associated *advice to the government* of your country regarding rice market intervention.

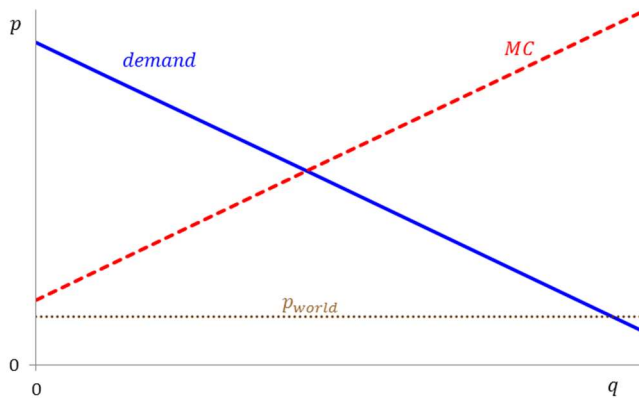
#### QUESTION 11-4

Wodgets are produced in Somewheria by one firm only under increasing returns to scale. You are an advisor to the government of Somewheria which wants to impose either a *tariff* on the imports of wodgets or an equivalent *quotum* (leading to the same quantity of imports as the tariff). What do you recommend to the government and why?

#### QUESTION 11-5

In the state of Alusia there is only one producer of olive oil. The producer is highly regarded by the government of Alusia because it has been producing olive oil for centuries using traditional methods which give the olive oil a typical Alusian taste. After a long period of autarky, the Alusian government decides to open the borders to international trade and allow its citizens to consume a larger variety of products. The government is, however, concerned about the consequences of this policy for the olive oil monopolist. The figure below gives the demand for olive oil in Alusia, the marginal cost curve of the monopolist, and the price of olive oil on the world markets.<sup>1</sup>

<sup>1</sup> Coming from non-Mediterranean countries we crudely assume that olive oil is a homogenous good.



- Indicate the autarky quantity supplied to the market and the price of olive oil in the figure above.
- What would be the production level of olive oil for the Alusian producer, the quantity imported, and the price of olive oil in Alusia under free trade?

The Alusian government is considering protecting the olive oil industry by either imposing a tariff or introducing an import quota on the imports of olive oil.

- Suppose that the government introduces a tariff such that the world price plus the tariff is below the competitive price and olive oil is produced domestically. Indicate the domestic production level, the import level, the price level, the consumer surplus, producer surplus and the government revenue for this tariff rate.
- Determine what quota the government should impose which leads to the same level of imports as in question c. Indicate the domestic production level, the import level, the price level, the consumer surplus, producer surplus and the government revenue for this import quota.
- Explain whether you recommend the Alusian government to introduce a tariff or an import quota.

#### QUESTION 11-6 (SIMULATION)

The *ch11question06 simulation* Excel file allows you to experiment with the Brander-Spencer model (Figure 11.9 in the book). Assume that firm A and firm B are Airbus and Boeing selling their aircraft to a third market, Southeast Asia. The US government contemplates giving an export subsidy to Boeing to improve its competitive position in Southeast Asia.

- What happens to the output and profit levels of Airbus and Boeing when the marginal cost of Boeing decreases? What happens to the output and profit levels if you increase the subsidy to Boeing by an equal amount, starting from the same initial situation? Compare both results and explain your observations.
- Fill in the table below.

| Subsidy firm B  | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|-----------------|---|---|---|---|---|---|---|---|---|
| Profit firm B   |   |   |   |   |   |   |   |   |   |
| Total subsidy B |   |   |   |   |   |   |   |   |   |

- At which subsidy level is the Brander-Spencer equilibrium reached? Explain.

- d. What will the European Commission think of the imposition of an optimal subsidy by the US government?
- e. What is the optimal subsidy level the European Commission could impose in response to the US subsidy?
- f. Compare the situation of no subsidies with the situation in which both governments have imposed their optimal subsidies. Did the policy of giving subsidies lead to a higher welfare in the US and the EU?
- g. What do consumers in the Southeast Asian market think of the subsidies given by both governments? Explain.

#### QUESTION 11-7 (SIMULATION)

Airbus and Boeing could also be in Bertrand competition on the Southeast Asian market. The *ch11question07 simulation* Excel file allows you to experiment with the Eaton-Grossman model (Figure 11.10 in the book). Again the US government considers to help Boeing to sell planes in Southeast Asia.

- a. What happens to the output and profit levels of Airbus and Boeing when the marginal cost of Boeing increases? What happens to the price and profit levels if you increase the export tax of Boeing by an equal amount, starting from the same initial situation? Compare both results and explain your observations.
- b. Fill in the table below.

| Tax firm B    | 0 | 1 | 2 | 3 | 4 | 5 | 6 | 7 | 8 |
|---------------|---|---|---|---|---|---|---|---|---|
| Profit firm B |   |   |   |   |   |   |   |   |   |
| Total tax B   |   |   |   |   |   |   |   |   |   |

- c. At which tax level is the Eaton-Grossman equilibrium reached?
- d. Do Airbus, Boeing, the European Commission, the US government and Southeast Asian consumers prefer the Eaton-Grossman equilibrium?
- e. What is the optimal response of the European Commission to the introduction of the US export tax? What is again the optimal of the US government to the action of the European Commission? Can this go on forever?

## Chapter 12 Regional Trade Agreements

### QUESTION 12-1

Briefly answer the following questions.

- What happened to the number of regional trade agreements (RTAs) since 1960?
- Which (type of) countries were initially (1960s to 1980s) more active in RTAs and which (type of) countries have become more active since the 1990s?
- What is shallow versus deep integration and how does it relate to the development of RTAs over time?

### QUESTION 12-2

The European Union has some minor grapefruit producers (mostly in Cyprus, Italy, and Greece) and imports most grapefruit from the USA. On all imports of grapefruit the European Union levies a common tariff. Recently, Turkey has expressed ambitions to conquer the European grapefruit market by planting many new grapefruit trees. These new farms are not yet as productive as their US counterparts (even when transport costs are taken into account) but will be cheaper once Turkey establishes a customs union with the European Union in agricultural products. Officials from the European Union worry about what will happen with the European grapefruit market and ask for your advice.

- Draw a partial equilibrium framework of the European grapefruit market. Draw the demand and supply of grapefruit within Europe and the supply curves of the USA and Turkey. Indicate clearly the price of grapefruit in Europe, European production and European imports of grapefruit.
- What happens to the imports, the production, and the price of grapefruit in Europe once it establishes a full customs union with Turkey?
- What are the welfare effects of a full customs union with Turkey for consumers, producers and the EU governments? What is the total welfare effect?
- If the European Union still wants to pursue a full customs union with Turkey, is there a loophole to increase welfare on the grapefruit market?

### QUESTION 12-3

Briefly answer the following questions.

- What are the European Union's (EU) four freedoms?
- Briefly describe the history of EU integration.
- What are two main challenges for the EU?

### QUESTION 12-4

Many papers have analysed the net welfare effect of regional trade agreements in a multi-country general equilibrium framework. Despite the analytical advances, however, the net welfare effect of regional trade agreements remains ambiguous. Two schools of economists have arisen. One school claims that regional trade agreements are likely to be more welfare enhancing. According to the other school, trade-diversion

is likely to dominate trade-creation in most situations. Their disagreement is mainly on the importance of transport costs.

- a. Explain how the results of the general equilibrium model of Krugman (see Section 12.6) change when transport costs are introduced.
- b. Which regional trade agreements will economists mention when they want to stress that regional trade agreements are likely to be welfare enhancing?
- c. Which regional trade agreements will economists name when they want to indicate that regional trade agreements are likely to deteriorate welfare?

#### QUESTION 12-5

Most countries move from a relatively shallow type of economic integration to deeper types of economic integration. The main text describes, for example, that the European Union started out as a preferential trade agreement in 1951, a customs union in 1968 and developed into a common market in 1993. Also for other regional trade agreements such a time line can be drawn. Search the Internet (or the main text) and do this for the regional trade agreements below.

- a. COMESA
- b. ASEAN
- c. EAEC
- d. CARICOM

#### QUESTION 12-6 (DATA)

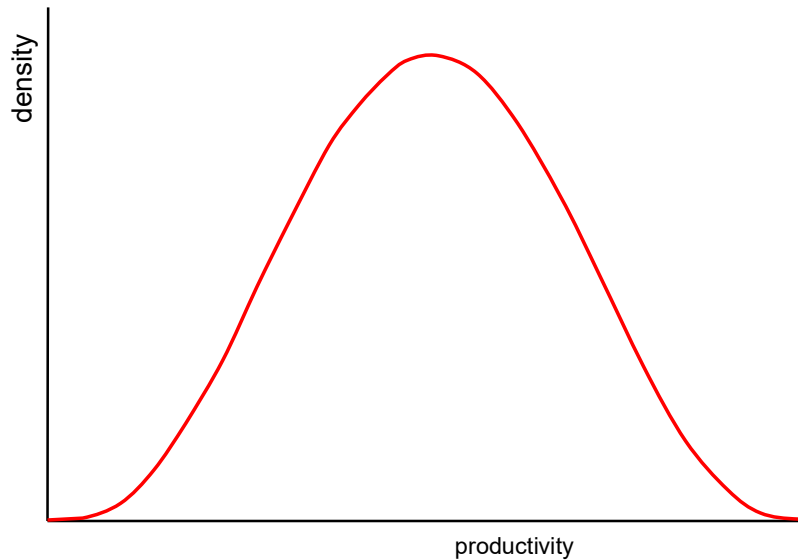
The *ch12question06 data* Excel file on the website contains daily (average) information on the price of Euros in US dollars and the price of British Pounds in US dollars since 2015. Some days are excluded because no trading took place. The ‘time’ column transfers the dates to a digital time line.

- a. Calculate the (implied average daily) price of British Pounds in Euros for all days.
- b. Create a scatter plot with ‘time’ on the horizontal axis and the value of the British Pound in Euros (calculated at question a) on the vertical axis; let the vertical axis range from 0 to 1.6 in steps of 0.2.
- c. Can you guess from your graph in question b when the Brexit referendum was held?
- d. Calculate the average absolute change in percent of the exchange rate.
- e. Plot the average absolute change in percent calculated in question d in the graph of question b; do this on a secondary vertical axis that ranges from 0 to 8 in steps of 1. What do you observe?



## Chapter 13 Heterogeneous Firms

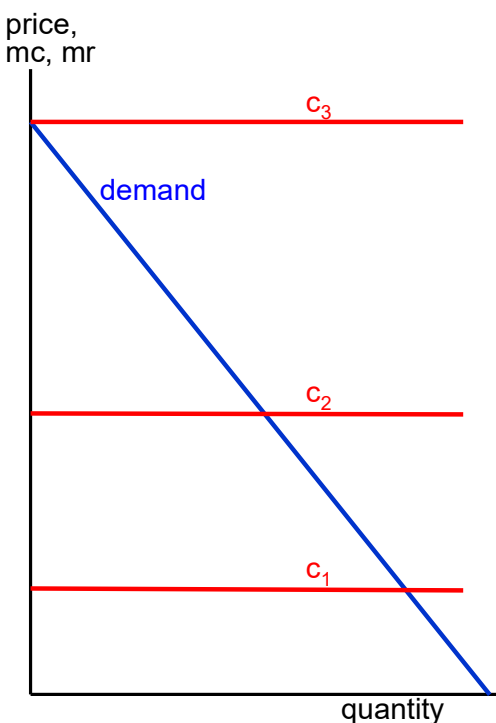
### QUESTION 13-1



The figure above shows a productivity distribution of firms in Somewheria.

- Briefly discuss how Melitz's model of firm heterogeneity under autarky and free trade identifies three types of firms under these different situations; illustrate these three firm types in a copy of the above figure with additional information.
- What are the additional gains from trade identified by Melitz? Relate your discussion to your copy of the figure.

## QUESTION 13-2



The figure above illustrates a demand schedule confronted by three types of firms, namely a firm with marginal cost level  $c_1$ ,  $c_2$ , and  $c_3$ .

- Make a (large) copy of the figure. Draw in the marginal revenue curve. For each of the three firms determine (*explain and draw in the figure*):
  - The quantity produced
  - The price charged
  - The operating profits received
- Explain* briefly how the information from question a can be useful for determining which firms are engaged in export activity and which firms are not.

## QUESTION 13-3 (TECHNICAL)

Suppose the economic conditions in *Mirandia* are perfectly described by the Melitz model of sections 13.4 to 13.6 and the ex ante productivity distribution function is *uniform* from 0 to 5. Moreover, assume that in autarky only 80 per cent of the entrepreneurs who invest in setting up a new firm actually succeed.

- What is the autarky cut-off productivity level?
- What is the ex ante average productivity? What is the ex post average productivity in autarky?

The government of *Mirandia* opens up international trade possibilities with *Marconia*. As a consequence, only 60 per cent of the entrepreneurs who invest in setting up a new firm actually succeed. Of the viable firms only one-third become exporters.

- What is the trade cut-off productivity level?
- What is the export cut-off productivity level?

- e. What is the ex post average productivity with trade?
- f. What is the average productivity for exporting firms?
- g. What do you consider the best indicator of the new source of gains from trade explained in this chapter using (a combination of) your answers to the questions above?

**QUESTION 13-4**

Suppose we repeat all parts of [Question 13-3](#) with the same basic information, but this time the ex ante distribution is symmetrically bell-shaped on the support from 0 to 5. Speculate how your answers to each sub-question changes. Explain.

**QUESTION 13-5**

In Box 13.4 it is stated that firm revenue makes a jump of size  $\varepsilon f_x$  at the export viability cut-off point. Explain in detail why.

**QUESTION 13-6**

Figure 13.4 depicts ‘exporter premia’. Apparently (without controls), exporting firms in general have about 33 per cent higher log value added per worker but only 3 per cent higher total factor productivity. Explain possible sources of this difference.

**QUESTION 13-7 (SIMULATION)**

The *ch13question07 simulation* Excel file on the website reproduces Figure 13-14 of the book on determining the range of firms which exits under trade, which produces for the domestic market, and which exports. We take the constants  $B$  and  $B_{tr}$  as given and focus on the impact of changes in the iceberg transport costs tau ( $\tau$ ).

- a. Increase the transport costs tau ( $\tau$ ) from 1.2 to 1.4. What changes in the figure? Explain why.
- b. Explain why there is no downward shift at the vertical axis if you increase tau ( $\tau$ ).
- c. What is the consequence, according to you, if we keep increasing the transport costs tau ( $\tau$ )? Explain.
- d. What is the consequence for your observation in question c for the assumption above to take the constants  $B$  and  $B_{tr}$  as given? More specifically, how do you think constant  $B_{tr}$  should adjust (relative to  $B$ ) as transport costs tau ( $\tau$ ) are rising without bound? Explain.

## Chapter 14      Multinational Firms

### QUESTION 14-1

Briefly answer the questions below.

- a. For *exporting* firms, briefly comment on the distribution of these firms regarding:
  - The number of products exported.
  - The number of countries exported to.
  - The value of exports.
- b. Do the same for importing firms.
- c. Briefly list three of Antras and Yeaple's six stylized facts.

### QUESTION 14-2

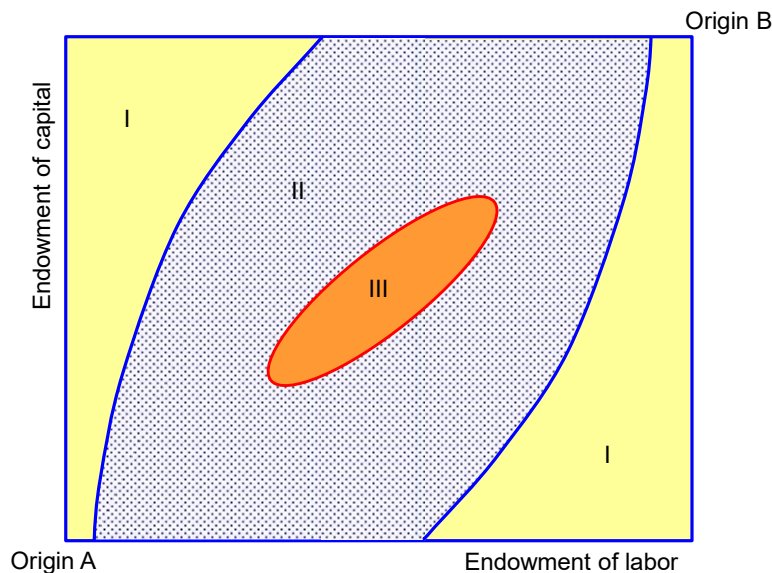
Several academics have wondered why a firm establishes a production plant abroad since this involves extra costs compared to home production (think, for example, of the cost of transferring people to a foreign country, of acquiring information, of overcoming language barriers, and of fighting cultural differences).

- a. What is required according to Dunning before firms establish or purchase production plants abroad? Describe all the conditions carefully.
- b. Give an example of every condition that is not mentioned in the main text.
- c. How are the conditions modelled in the multinational model of Markusen and Venables (see section 14.6)?
- d. Why do all conditions have to be satisfied before a firm becomes a multinational?

### QUESTION 14-3

The Markusen–Venables general equilibrium model on national and multinational firms explains how the distribution of endowments, that is (human) capital and labor, over two countries A and B and the economic size of these countries can help to explain why we have (i) only national firms, (ii) only multinational firms, or (iii) a mix of national and multinational firms. It analyzes both inter- and intra-industry trade.

The figure below identifies three areas, namely I, II, and III. Indicate which area belongs to (i), (ii), and (iii) mentioned above and explain why.

**QUESTION 14-4**

Chapter 14 first describes some empirical observations on the foreign direct investment flows between countries. The Markusen and Venables model (see Section 14.6) explains some of the most important empirical observations. This question reviews the empirical observations and their theoretical explanations.

- Are the FDI flows into the least developed nations large or small? What is the theoretical explanation for this in the Markusen and Venables model?
- Are the FDI flows into the developed nations large or small? What is the theoretical explanation for this in the Markusen and Venables model?
- What other factors could explain FDI flows between countries?

**QUESTION 14-5**

Imagine a machine manufacturer operating in East Germany. Before the fall of the Berlin Wall the manufacturer is only producing for the national market and prohibited from exporting to other countries. After the fall of the Berlin Wall, the manufacturer is allowed to sell machines to other countries. In contemplating how to deal with the new situation the manufacturer uses the model of Markusen and Venables. She wants to sell the machines in four countries with the following characteristics:

- West Germany is more advanced and capital abundant compared to East Germany. Because they are neighbouring countries, transport costs are low. Moreover, the German government provides a subsidy to East German firms establishing a plant in West Germany.
- Poland is also a neighbouring country with low transport costs. The Polish government does not provide a subsidy for the establishment of a plant. The level of development (measured by the endowment ratio) is more or less the same as in East Germany, but the Polish economy is considerably larger.

- As a result of newly introduced safety controls at the border, transport costs to the Czech Republic are very high. Like Poland, the Czech government does not provide a subsidy for the establishment of a new plant. East Germany and the Czech Republic are broadly equal in size and in level of development.
- Slovakia is not a neighbouring country, such that transport costs are high. The establishment costs for a plant are high due to a tax. Also Slovakia and East Germany have the same level of development, but the Slovakian economy is smaller than the East German economy.

The manufacturer has to decide if she should establish a plant in the other country or produce the machines in East Germany and export the products.

- a. At which node of the decision tree in Figure 11.11 is the manufacturer?
- b. Consider for each of the four countries if it is likely that the manufacturer establishes a new plant according to the Markusen and Venables model. In which country is the producer most likely to establish a plant and in which least likely?

#### QUESTION 14-6 (SIMULATION)

The *ch14question06 simulation* Excel file on the website reproduces part of Figure 14-15 of the book on determining the range of firms which exits under trade, which produces for the domestic market, which exports, and which becomes a (horizontal) multinational. Initially,  $B = 1$ ,  $f_{pl} = 1$ ,  $f_x = 1.2$ ,  $\varepsilon = 3$ , and  $\tau = 1.2$ . You can change these parameters in the yellow boxes of the simulation. We measure productivity as  $\varphi^{\varepsilon-1}$ . Consult the model in Chapter 14 regarding the meaning of the lines. You can enter a specific productivity value in the simulation and see the implied profits for three types of firms.

- a. Firm A has productivity 0.5. What type of firm is firm A? What are its total profits?
- b. Firm B has productivity 1.5. What type of firm is firm B? What are its total profits?
- c. Firm C has productivity 2.5. What type of firm is firm C? What are its total profits?
- d. Firm D has productivity 3.5. What type of firm is firm D? What are its total profits?
- e. What happens to the range of different types of firms if transport costs tau ( $\tau$ ) change to 1.4?
- f. Can you determine through trial-and-error (up to 3-decimals) at which value for transport costs tau ( $\tau$ ) the phenomenon described in question e occurs? Explain.

## Chapter 15 Offshoring and Supply Chains

### QUESTION 15-1

Briefly answer the following questions.

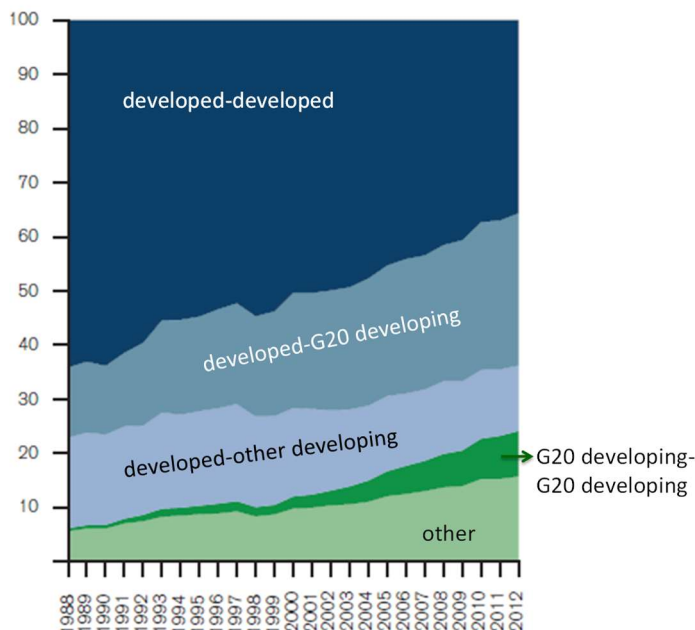
- What are global supply chains?
- What is an indicator for the rise of global supply chains if we look at trade data? Why?
- How are global supply chains related to offshoring?
- What are 'backward linkages' in trade flows?
- What are 'forward linkages' in trade flows?

### QUESTION 15-2

The figure below is taken from the *World Trade Report 2014*.

Briefly explain the connection of the figure with Global Value Chains and the two main issues that (according to you) the above figure illustrates, and why.

*Share of imports in parts and components, 1988-2012 (percent)*



### QUESTION 15-3

- Explain why a (detailed) Grubel-Lloyd index can be used as an indicator of supply chains?
- Which types of countries (in terms of income per capita) are most involved in global supply chains if we use the Grubel-Lloyd index as an indicator, and which type of countries are not?

**QUESTION 15-4 (DATA)**

The *ch15question04 data* Excel file contains some information from the OECD TiVA (Trade in Value Added) database for the years 1995 and 2011, partially illustrated in Figures 15.12-15-14 of the book.

More specifically, the file provides information on

- The backward linkages in 1995 and 2011 (in percent)
- The forward linkages in 1995 and 2011 (in percent)
- The size of trade flows in 1995 and 2011 (in USD billion)
- The country's weight in 1995 and 2011 (trade flows as percent of total trade; weights sum to 100)

In this question we focus attention on the evolution over time of backward and forward linkages separately, as well as of total linkages.

- a. Make a bubble diagram of the evolution of backward linkages from 1995 to 2011 for the individual countries; put the 1995 backward linkages on the horizontal axis and the 2011 backward linkages on the vertical axis; make the bubbles proportional to the size of trade flows in 1995. (to make this figure in Excel order the data in three columns with 1995 backward linkages, 2011 backward linkages, and the 1995 size of trade flows (or equivalently the 1995 weights); select the three columns and go to 'insert' – 'other charts' – 'bubble'; you can get transparent bubbles by selecting the bubbles, double clicking, go to fill, select a colour, and select a percentage of transparency; you can determine the scales, and so on). Make sure you include a diagonal line, such that observations above this line have rising backward linkages and observations below the line have falling backward linkages. What do you observe?
- b. For each country calculate the change (in percentage points, so not in relative terms) in backward linkages from 1995 to 2011. Which three countries have the highest increase? Which three countries have the highest decrease? What is the (simple) average increase? What is the trade-weighted average increase?
- c. Repeat question a for forward linkages.
- d. Repeat question b for forward linkages.
- e. Make a similar picture as in questions a and c, but this time put the change in backward linkages on the horizontal axis and the change in forward linkages on the vertical axis. What do you observe? Include a regression line in your analysis.

**QUESTION 15-5**

Donald Trump became president of the USA in 2017. During the campaign he focused on 'America First' and was particularly critical of Mexico and China.

Mexico: Trump wants to create a 'big wall' at the Mexican border to keep (illegal) immigrants out and argued that Mexico should pay for it. As possible sources of revenue, he threatens to raise an import tariff on Mexican goods of 35% and to tax Mexican remittances.

China: Trump argues that China is a currency manipulator – which results in a trade surplus. Trump threatens to impose an import tariff on Chinese goods of 45% in an effort to 'bring back' the jobs America 'lost' to China.

To provide some background information the figure below shows the export (panel a) and import (panel b) of American goods in total and relative to Mexico and China. Since the original data are in current



USD, the data are shown as a percentage of total average American trade  $(= (export + import)/2)$  in the relative year. Note that the scales in the two panels are the same and the total flows are depicted on the right-hand scales of the panels. For further guidance, the table below provides the percentages for the first and last year.

Figure q2; American exports (panel a) and imports (panel b), % of American trade

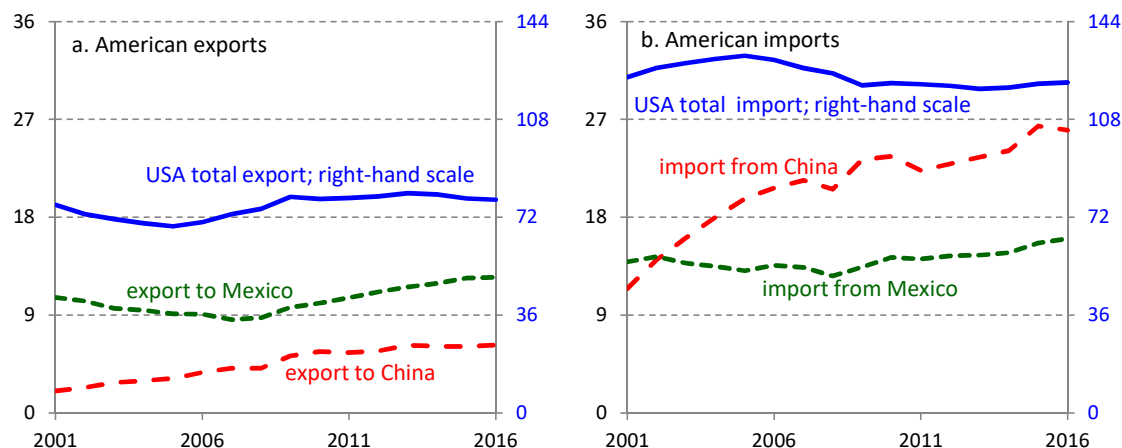


Table q2; American exports and imports 2001 and 2016, % of American trade

| year | export USA all | export to Mexico | export to China | import USA all | import fr Mexico | import fr China |
|------|----------------|------------------|-----------------|----------------|------------------|-----------------|
| 2001 | 77             | 11               | 2               | 123            | 14               | 11              |
| 2016 | 78             | 12               | 6               | 122            | 16               | 26              |

Using the information provided above and the knowledge you gained throughout the Growth and Development course, write a brief essay for an educated lay audience (such as readers of *The Economist*) arguing what might happen in the world (in particular in America, Mexico and China) if Trump tries to push through the announced measures above.

(answer questions on who gains or loses, how the above information plays a role, what other information we might need to properly address the issues raised, supply chains, migration flows, jobs in America, and so on)

## Chapter 16 Geography and Gravity

### QUESTION 16-1

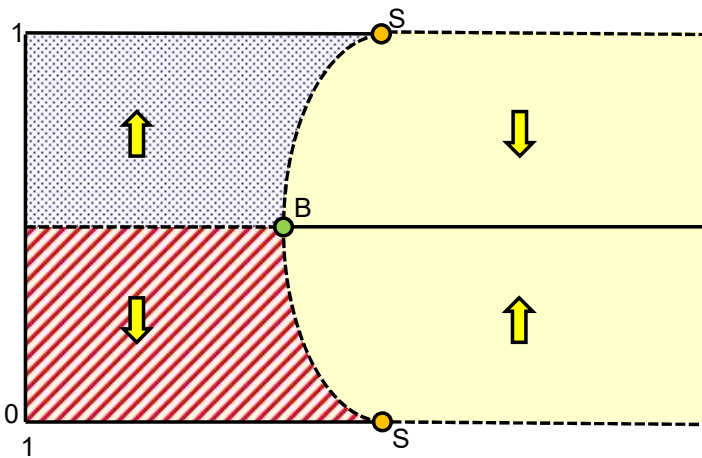
- What is 'hysteresis' or 'path-dependency', and what is its importance for geographical economics?
- What does this imply for empirical research?

The two-region geographical economics model predicts that manufacturing activity will spread over the two regions or agglomerate in one region depending on the size of three economic parameters:

- The (iceberg) transport cost ( $T$ )
  - The elasticity of substitution ( $\varepsilon$ )
  - The share of income spent on manufactures ( $\delta_m$ )
- Do high transport costs lead to spreading or agglomeration of manufacturing activity? Explain.
  - Does a high elasticity of substitution lead to spreading or agglomeration of manufacturing activity? Explain.
  - Does a high share of income spent on manufactures lead to spreading or agglomeration of manufacturing activity? Explain.

### QUESTION 16-2

*Geographical Economics model*



The figure above displays part of a diagram from the Geographical Economics model.

- What is the name of this diagram?
- Complete the diagram; what is on the axes?; what is the meaning of points B and S?
- What is the meaning of the arrows and why are some lines dashed?

### QUESTION 16-3

Occasionally, the Chinese government contemplates building a tunnel underneath the Bohai Sea, more or less from Dalian to Yantai, see the figure below.

*Proposed Dalian – Yantai tunnel*

Discuss the economic benefits to building a tunnel from Dalian to Yantai based on the Geographical Economics model. In particular:

- Which city / cities benefit most in relative terms? Why?
- Do you think Beijing–Tianjin benefits? Why?
- Do you think Shanghai benefits? Why?

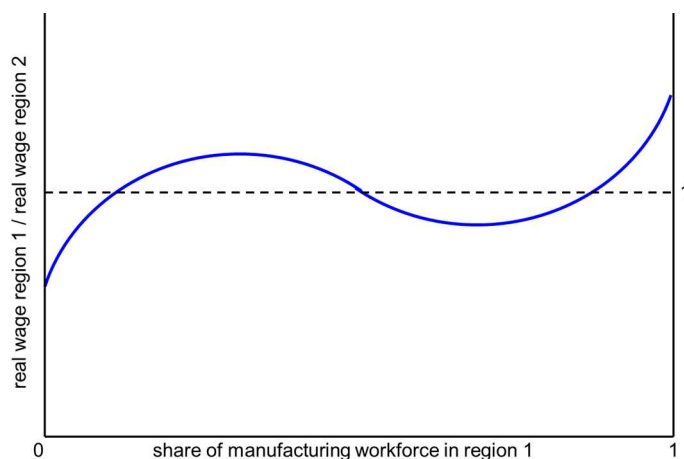
**QUESTION 16-4**

This question reviews the general structure of the geographical economics model.

- How do consumers decide how much to spend on food and manufacturing goods? What is the share of income they will spend on food?
- Does every consumer spend an equal share of income on food? Why?
- How do consumers decide on their consumption level for a particular variety of manufactures? What is the share of their income they will spend on one variety?
- Is the wage rate for farm workers necessarily equal between the two regions?
- Is the wage rate for manufacturing workers equal between the regions?

**QUESTION 16-5**

Chapter 16 discusses the geographical economics model using graphs such as the one shown below.



### Two-region base scenario

- What does the line in the figure represent?
- Identify the long-run equilibria in the figure. Explain.
- How can you derive from the figure if a long-run equilibrium is stable or unstable?
- Can you determine from the above figure if manufacturing activity will agglomerate in the long run?
- Draw a new figure, similar to the one above but based on a different parameter setting, in which the agglomeration of manufacturing firms is the only stable long-run equilibrium.
- Draw a new figure, similar to the one above but based on a different parameter setting, in which the spreading of manufacturing firms is the only stable long-run equilibrium.

### QUESTION 16-6 (SIMULATION)

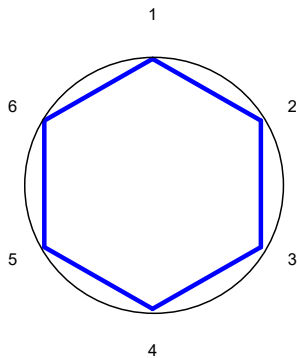
Chapter 14 analyses a two-region version of the geographical economics model. However, the approach holds quite generally if we identify an arbitrary number  $R$  of locations, as long as we specify the distances  $D_{rs}$  between all locations  $r$  and  $s$ , such that we can calculate  $T_{rs} = T^{D_{rs}}$  as the transport costs, and know the production level  $\phi_r$  of the immobile activity in each location  $r$ . The main advantage of the two-region model is that “space” is inherently neutral. Neither location is preferred by construction over the other location, because the distance between the two locations is the same, and hence so are the transport costs. Any endogenous location pattern, such as agglomeration or spreading, arising in the two-region model is therefore a consequence of the structure of the economic interactions between agents within the model, and not the result of a pre-imposed geographic structure favouring economic activity in some location.

The 'racetrack economy' identifies more regions in a neutral, clock-like space by using a simple geometry, in which the locations are evenly distributed in a circle with transportation only possible along the rim of that circle. Its structure is quite simple (see scenario 1 below). The  $R$  locations are equally and sequentially spaced around the circumference of a circle, with location  $R$  next to location 1, as in a clock. The distance between any two adjacent locations is 1, such that the transport costs between adjacent locations is  $T$ . The distance between any two arbitrary locations is the length of the shortest route along the circumference of the circle. We assume that food production is evenly distributed among all locations.

The *ch16question06 simulation* Excel file uses (initially) a six region racetrack economy. In the simulation you can change the transport costs and the initial distribution of manufacturing workers. After

pushing a button the simulation calculates the new long-run equilibrium distribution of manufacturing workers.

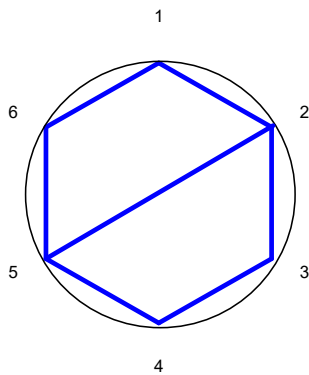
*Scenario 1*



First, assume that the six regions are distributed as in the standard racetrack economy, see scenario 1. The initial transport costs are  $T = 1.5$ . Assume that initially manufacturing workers are equally distributed among the six regions (you can fill in " $= 1/6$ " in the simulation).

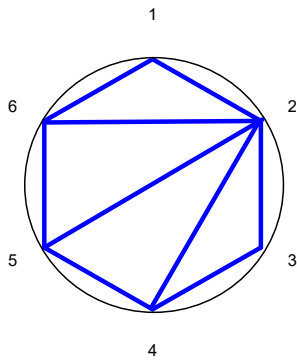
- Is the initial distribution a long-run equilibrium? Why?
- Experiment with small deviations in the initial distribution. Is the initial distribution a stable equilibrium according to you? Why?
- Increase the transport costs and then repeat your experiments of question b. How does this affect your results?

*Scenario 2*



The distribution network of scenario 1 can, of course, be changed. You can experiment with such changes below. Before we start, return the transport costs to their old level. Suppose that the transport system changes to the structure shown in scenario 2 in the simulation. This time regions 2 and 5 are connected with each other using a kind of "bridge", reducing the distance between them to one unit.

- Assume that the manufacturing workers are initially equally distributed among the six regions. What is the long-run equilibrium of scenario 2?
- Experiment with changes in the initial distribution of scenario 2. Is the long-run equilibrium of question d a stable equilibrium?

*Scenario 3*

Scenario 3, finally, assumes that region 2 is well connected to all other regions by multiple ‘bridges’.

- f. Assume again that the manufacturing workers are initially equally distributed among the six regions. What is the long-run equilibrium of scenario 3? Explain.

## Chapter 17 Growth and Competitiveness

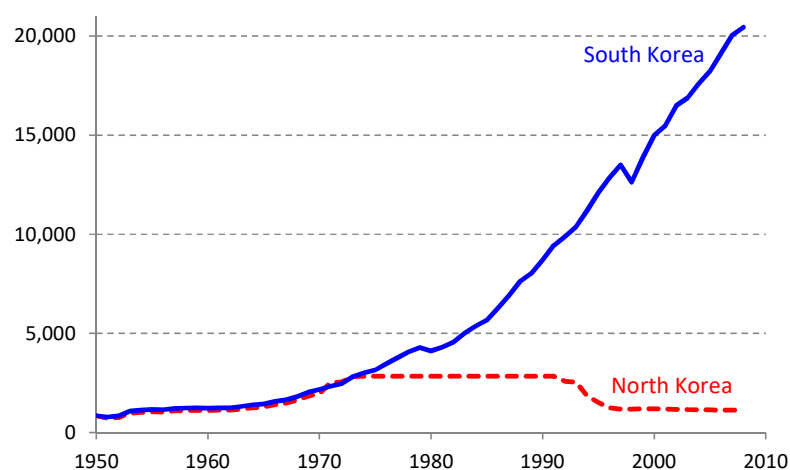
### QUESTION 17-1

Briefly answer the following questions.

- What is the main driving force for economic growth in the neoclassical (Solow) model?
- Briefly describe the role played by human capital in the growth model of section 17.4.
- How is the Ramsey model (section 17.5) different from the Solow model (section 17.3)?
- What is the main contribution of endogenous growth models?

### QUESTION 17-2

*Real income per capita in North and South Korea; 1950-2010 (Maddison Project)*



- What is / measures the Dupuit triangle?
- Explain how the Dupuit triangle can be useful to understand the differences in economic development observed for North Korea and South Korea (see the figure above) in relationship to trade costs.

### QUESTION 17-3

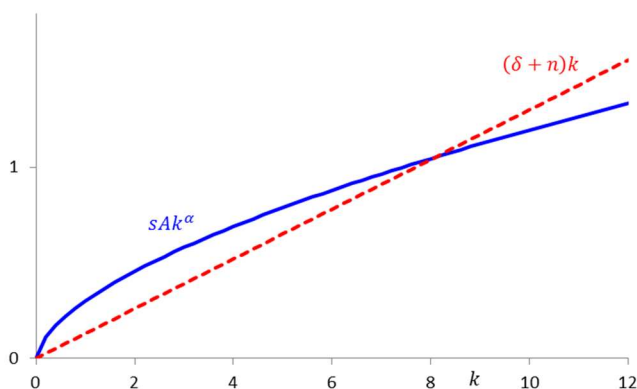
Briefly answer the following questions:

- What is total factor productivity?
- How important are the four inputs below for explaining income growth relative to TFP growth? (based on observations for about 70 countries in the period 1990-2014).
  - Labour quantity
  - Labour quality
  - ICT capital services
  - Non-ICT capital services
- Which three main drivers of economic growth does the Global Competitiveness Index (GCI) identify? How are these related to a country's development level?
- What is the relationship between GCI and international trade- and investment flows?

## QUESTION 17-4

Section 17.4 discusses the Solow model, which forms the starting point of economic growth theory. The central equation of the model is given by:  $sAk_t^\alpha = (\mu + n)k_t$ . This equation defines the steady-state equilibrium of the model.

- What is a steady-state equilibrium?
- What happens to output per capita if the capital-labour ratio is constant in the Solow model for a constant level of technology?



The graph above depicts the left-hand side and the right-hand side of the above inequality.

- What is measured on the vertical axis of the diagram?
- Draw the effect of an increase in the population growth rate  $n$  in the graph. What happens to the steady-state equilibrium and why?
- Draw the effect of an increase in the savings rate  $s$  in the graph. What happens to the steady-state equilibrium and why?

## QUESTION 17-5

Section 17.8 of the book discusses the structure and implications of the endogenous growth model.

- What is the main difference between this growth theory and that of Solow?
- What seems to be the key factor for a growing income per capita if you look at these two classes of growth models?

In the endogenous growth model, the rate of innovation in the economy is determined within the model. The explicit solution of a variant of this model is:  $1 + g = F/(1 + \theta)(F - L/\varepsilon)$ , where  $g$  is the rate of innovation,  $F$  is a parameter for the fixed cost of inventing a new variety,  $L$  is the labour force,  $\theta$  is the rate of time preference, and  $\varepsilon$  is the elasticity of substitution between varieties.

- Based on the equation above, determine what happens to the rate of innovation if:
  - $F$ , the fixed cost of inventing a new variety, increases
  - $L$ , the labour force, increases
  - $\theta$ , the rate of time preference, increases
- Based on your knowledge of the structure of the endogenous growth model, explain intuitively why each of the effects in question c arises.

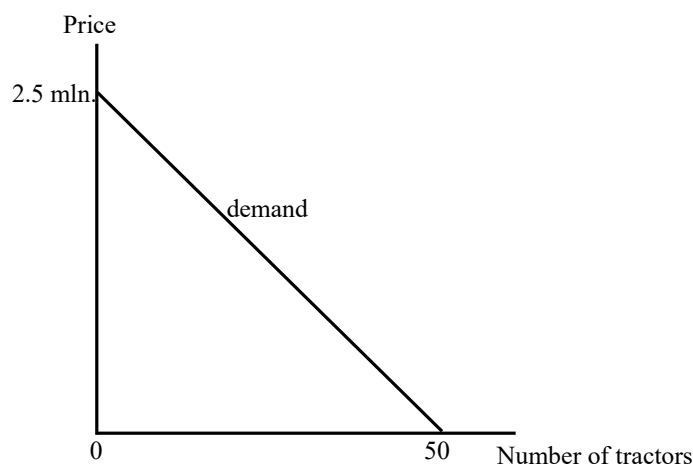


The United States government has launched a series of investigations into the abuse of market power by Microsoft, a producer of computer software. The company claims that its market power actually benefits its customers, as it is the best way to fulfill their needs.

- e. Explain how the endogenous growth model is related to the discussion of the Microsoft case.

#### QUESTION 17-6

An American tractor producer considers introducing a new type of tractor in Kenya. It costs 1 million Kenyan shilling to produce and transport one tractor to Kenya. However, before the tractor can be introduced the Kenyan dealer needs to stock spare parts and train new personnel to sell and repair the new machine. These fixed costs amount to 10 million Kenyan shilling. At the request of the American tractor producer, a consultant has estimated the demand curve for the new type of tractor in Kenya. The figure below shows this demand curve. Furthermore the consultant notes that Kenya is currently levying an import tariff of 20 per cent over the value of tractors (both production and transportation).



- If the fixed costs are ignored, what is the optimal price the American tractor producer will charge on the Kenyan market? Remember that the American producer is a monopolist.
- Indicate in the figure what the consumer surplus, producer surplus and government revenue is at this optimal price.
- Explain why the American tractor producer will not introduce the new tractor on the Kenyan market. What is the welfare loss for the Kenyan economy?
- How can the tractor producer convince the Kenyan government that action is needed? What kind of action should the tractor producer recommend?

#### QUESTION 17-7 (DATA)

The *ch17question07 data* Excel file on the website of the book provides information on income per capita, measured as GDP per capita corrected for PPP in constant 2011 international dollars, for 217 countries identified by the UN in the period 1990-2016.

- What does “..” mean in the data?

- b. Determine for how many countries information is available for all years 1990-2016. Organize the data for those countries from lowest to highest income per capita in 2016. The remaining questions are for these countries only.
- c. Which country has the highest income level per capita in 2016 and which has the lowest? What is the ratio of highest to lowest?
- d. Determine the ratio  $R$  of income per capita in 2016 and income per capita in 1990 for each country. Calculate the implied compounded growth rate over this period for each country in per cent as follows:  $100 \times \ln(R) / 26$ .
- e. How many countries have a negative growth rate? What do you notice about these countries?
- f. How many countries have a growth rate between 4 and 6 per cent? What do you notice about these countries?
- g. Which three countries have a growth rate above 6 per cent. What do you think is the cause of this high growth rate?