Slovak University of Agriculture in Nitra

# INTERNATIONAL AGRICULTURAL ECONOMICS

**Ján Pokrivčák** et al.

Nitra **2017**

Ján Pokrivčák et al.

# International Agricultural Economics

Nitra 2017

**International Agricultural Economics**

**Authors:**

**Pokrivčák Ján** AQ - 8.69
Slovak University of Agriculture in Nitra, Slovak Republic
**Eva Judinová** AQ - 5.19
Slovak University of Agriculture in Nitra, Slovak Republic
**Ema Lazorčáková** AQ - 2.39
Slovak University of Agriculture in Nitra, Slovak Republic
**Fred Ruppel** AQ - 6.53
Eastern Kentucky University, Richmond, USA
**Zdenko Štefanides** AQ -2.74
VÚB Bank, Slovak Republic

**Reviewers:**

**Jozef Gálik**
National Agricultural and Food Centre, Slovak Republic
**Roman Serenčéš**
Slovak University of Agriculture in Nitra, Slovak Republic

**Book editor:**

**Eva Judinová**
Slovak University of Agriculture in Nitra, Slovak Republic

Approved by rector of the Slovak University of Agriculture in Nitra
as a online book on November 28, 2017.

ISBN 978-80-552-1757-4

Supported by the project
of the Ministry of Education, Science, Research and Sport of the Slovak Republic
No. 030SPU-4/2015 “International Agrarian Economics”

# CONTENT

# Part I
# Microeconomics

# Chapter 1 THEORY OF CONSUMER BEHAVIOUR

Basic element of demand theory is an individual consumer or a household. The demand theory attempts to explain consumer behaviour related to purchasing goods and services in the markets. The purchase decisions of a consumer (or a household) are influenced by consumer's preferences and budget constraint. There are some combinations of goods that are preferred to others, but not every wanted combination of goods is achievable with limited resources. Some combinations of goods consumers cannot purchase because of their limited resources. The aim of a rational consumer is to select the best combination of goods from all affordable combinations.

## 1.1 Preferences and utility

There are two key components of consumer choice: consumer preferences and budget constraint. Firstly, we discuss preferences. To do so, we need to define basic terms.

Set of all alternatives (combinations of goods or bundles of goods) consumer can choose from without considering the budget and prices is called the *consumption set*, $X$. Some combinations of goods in the consumption set consumer can afford to buy, while others are non-affordable for the consumer. Each good is measured in non-negative units (kg, pieces, seconds, …), and we assume that there is a finite number ($n$) of different goods. A specific choice of goods from the set $X$ is known as *consumption bundle* (combination of goods). In mathematical terms, a consumption bundle is a vector denoted by $\boldsymbol{a}, \boldsymbol{b}, \dots, \boldsymbol{z}$. The consumption bundle contains different quantities of each of the $n$ goods, $\boldsymbol{x} = (x_1, x_2, \dots, x_n)$. For example, consumption bundle $\boldsymbol{x}$ = (7 apples, 3 pears, 1 banana, 4 oranges, 3 kofolas), where $n = 5$ types of goods. Preferences are assumed to be independent of income and prices.

Consumers are considered rational, and preferences of rational consumers must satisfy the following axioms:

*Axiom 1: Axiom of completeness* (*preferences are complete*)

Preferences of a consumer are complete if the consumer is able to rank (compare) all consumption bundles. Formally, for comparison of consumption bundles we use the binary *preference relation*, $\succsim$[1], which is defined as *at least as good as*. The fact that consumption bundle $\boldsymbol{a}$ is at least as good as $\boldsymbol{b}$ can be denoted by $\boldsymbol{a} \succsim \boldsymbol{b}$. Consumer is always able to decide whether $\boldsymbol{a}$ is at least as good as $\boldsymbol{b}$ or $\boldsymbol{b}$ is at least as good as $\boldsymbol{a}$, formally written, *either* $\boldsymbol{a} \succsim \boldsymbol{b}$ *or* $\boldsymbol{b} \succsim \boldsymbol{a}$.

*Axiom 2: Axiom of transitivity*

For any three consumption bundles $\boldsymbol{a}$, $\boldsymbol{b}$, and $\boldsymbol{c}$ holds that *if* $\boldsymbol{a} \succsim \boldsymbol{b}$ *and* $\boldsymbol{b} \succsim \boldsymbol{c}$, *then* $\boldsymbol{a} \succsim \boldsymbol{c}$. Transitivity means that we assume the consumers have a rational structure of their preferences.

*Axiom 3: Axiom of continuity*

This is an axiom stating that if $\boldsymbol{a}$ is preferred to $\boldsymbol{b}$, then other bundles very close to $\boldsymbol{a}$ are also preferred to $\boldsymbol{b}$.

*Axiom 4: Axiom of non-satiation*

Axiom of non-satiation says that more of a good is preferred to less. In this context, the demand theory focuses on *goods* rather than on *bads*. Bad is for example a pollution for which it holds that the more pollution the worse. For the goods, it applies that the more goods the better.

---

[1] There are two other relations used to describe consumer preferences, *strict preference* ($\succ$) and *indifference* ($\sim$). It applies that $\boldsymbol{a}$ is strictly preferred to $\boldsymbol{b}$, or $\boldsymbol{a} \succ \boldsymbol{b}$, if and only if $\boldsymbol{a} \succsim \boldsymbol{b}$ but not $\boldsymbol{b} \succsim \boldsymbol{a}$. Indifference is defined as $\boldsymbol{a} \succsim \boldsymbol{b}$ and at the same time $\boldsymbol{b} \succsim \boldsymbol{a}$; it means that the consumer is indifferent between these two bundles, i.e. both are equally good for him.

*Axiom 5: Axiom of convexity*

This axiom states that balanced bundles (averages) are preferred to extreme bundles. For example, let us assume that the consumer is indifferent between two bundles, $\boldsymbol{a} \sim \boldsymbol{b}$ (Figure 1.1). Bundle $\boldsymbol{b}$ contains a plenty of good 1 and a little of good 2, while bundle $\boldsymbol{a}$ contains a lot of good 2 and a little of good 1. Any convex combination[2] of $\boldsymbol{a}$ and $\boldsymbol{b}$ (e.g. $\boldsymbol{v}$) contains a more balanced combination of both goods than bundles $\boldsymbol{a}$ and $\boldsymbol{b}$. The axiom 5 states that most consumers prefer balanced bundles to extreme ones.

*Axiom 6: Axiom of monotonicity*

Axiom 6 says that consumption bundle $\boldsymbol{a}$ that contains at least as the same amount of all products as bundle $\boldsymbol{b}$ is at least as good as bundle $\boldsymbol{b}$. This axiom implies that indifference curves are always downward sloping (for the goods).

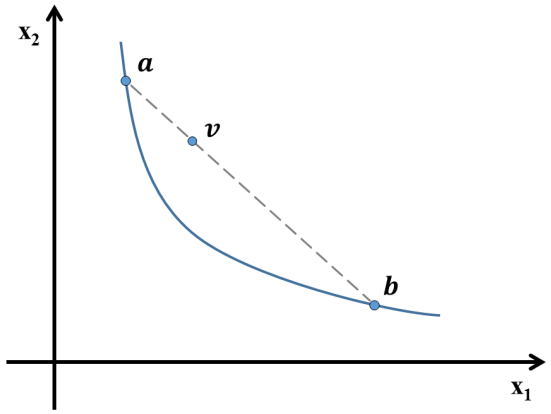



**Figure 1.1** Preferences satisfying axioms 1-5

### 1.1.1 Utility function

Theory of preferences is built axiomatically. We assume that preferences of rational consumers satisfy axioms that are generally acceptable. From axioms, we can derive the whole system of preferences of the consumer. To succinctly summarise all information contained in preference relations, the economists use a mathematically convenient instrument called the *utility function*. The mathematical function is a utility function that represents consumer's preferences if it holds

$$U(\boldsymbol{a}) \geq U(\boldsymbol{b}) \text{ if and only if } \boldsymbol{a} \succsim \boldsymbol{b}, \tag{1.1}$$

This means that a utility function represents consumer's preferences if it assigns higher number to preferred bundles. For example, if $U(\boldsymbol{b}) = 20$ and $U(\boldsymbol{a}) = 60$ than $\boldsymbol{a}$ is preferred to $\boldsymbol{b}$.

Historically, *utility* ($U$) referred to the amount of satisfaction (or happiness) gained from consuming goods or services. Nowadays, it is agreed that happiness or satisfaction is not measurable easily. However, utility function is a convenient mathematical tool in consumer economics.

The level of utility received by consumer is influenced by the quantity of goods consumed. Thus, generally a utility function is expressed by the equation

$$U(\boldsymbol{x}) = U(x_1, x_2, \dots, x_n), \tag{1.2}$$

where $U$ is the total utility gained by a consumer consuming $n$ number of goods, and $x_1, x_2, \dots, x_n$ are the quantities of each good consumed. Real-valued utility function exists for every consumer preferences that satisfy at least axiom of completeness, transitivity and continuity. Economists (and mathematicians) often like to work with utility function that is smooth, i.e. it is differentiable. Therefore, we often assume that utility function is smooth and differentiable (in many cases even twice differentiable).

Let us assume that consumer's utility is a function of only one good's $i$ quantity, $U(x_i)$. Then, the relationship between quantity of good consumed and the utility level consumer gains (holding the quantities of all other goods constant) is shown by a *total utility curve*, Figure 1.2.

---

[2] Any convex combination of two vectors lies on the line segment between these vectors, and for all coefficients holds that they are non-negative and sum to 1. If $\boldsymbol{a}$ and $\boldsymbol{b}$ applies that $\boldsymbol{a} \neq \boldsymbol{b}$ and $\boldsymbol{a} \sim \boldsymbol{b}$, relation $t\boldsymbol{b} + (t - \alpha)\boldsymbol{a} = \boldsymbol{v}$ then defines any convex combination ($\boldsymbol{v}$) of $\boldsymbol{a}$ and $\boldsymbol{b}$ for all $t \in (0,1)$.

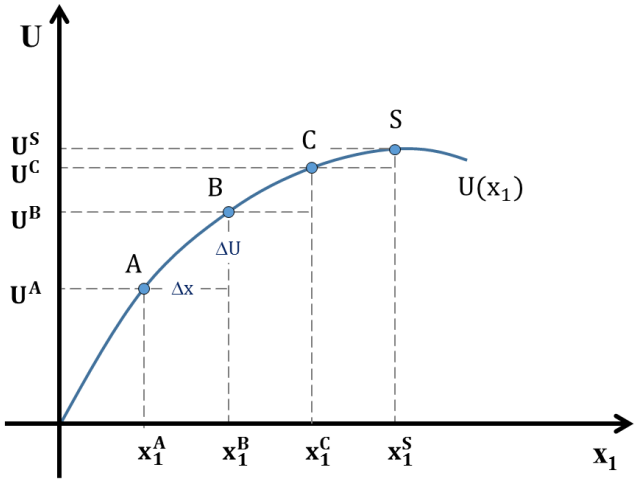



**Figure 1.2** An example of total utility curve

At first, the utility curve is upward sloping. It means that utility is increasing with an increase in good's quantity. *Point of saturation*, S, at quantity $x_i^S$ represents the highest level of utility consumer can achieve consuming good $i$. After this point the utility curve is downward sloping, an increase in consumption leads to a decrease in utility. The good changes to the bad. For example, when eating pizza, more slices is better than less, but when certain number of slices of pizza has already been consumed, additional slice of pizza eaten brings us harm rather than benefit. Obviously, rational consumer who has self-control would never consume more than the amount of $x_i^S$.

The additional utility that consumer gains from consuming one more unit of good $i$ (technically speaking infinitesimally small additional unit) is called the *marginal utility of good* $i$,

$$MU_i = \frac{dU(x_i)}{dx_i}. \tag{1.3}$$

Mathematically, marginal utility is a first-order derivative of utility function with respect to quantity of good consumed, and it measures the slope of total utility curve. If the total utility is a function of more than one good, marginal utility is a partial derivative of total utility function with respect to quantity of good consumed:

$$MU_{\boldsymbol{x}} = \frac{\partial U(\boldsymbol{x})}{\partial x_i} \tag{1.4}$$

### 1.1.2 Indifference curve

Let us consider a set of consumption bundles for which consumer is indifferent. For example, consumer is indifferent between bundles $\boldsymbol{a}$ and $\boldsymbol{b}$ and $\boldsymbol{c}$ and $\boldsymbol{d}$. Mathematically, $\boldsymbol{a} \sim \boldsymbol{b} \sim \boldsymbol{c} \sim \boldsymbol{d}$, or in terms of utility function $U(\boldsymbol{a}) = U(\boldsymbol{b}) = U(\boldsymbol{c}) = U(\boldsymbol{d})$. More generally, $U(\boldsymbol{x_i}) = k$ represents indifference curve, where $\boldsymbol{x_i}$ stands for different consumption bundles indexed by $i$, and $k$ is a constant. *Indifference curve* ($IC$) is a graphical representation of indifference. A set of indifference curves representing different levels of utility (different $k$) is called an *indifference map*.

Figure 1.3 illustrates the indifference map of a consumer consuming two goods, where the utility function is denoted by $U(x_1, x_2)$. Each consumption bundle that brings the consumer equal level of utility lies on the same indifference curve. Indifference curves of rational consumers satisfy the following properties:

1. *Any consumption bundle is allocated on an indifference curve.* This property is derived from the axiom of completeness.
2. *Indifference curves from the same indifference map cannot cross*. If they would cross, the axiom of transitivity would be violated.
3. *A higher indifference curve represents a higher level of utility.* Axiom of non-satiation states that more of a good is preferred to less. On a higher indifference curve, we can find consumption bundles containing more of goods than on a lower indifference curve. Therefore, consumer gains greater level of utility from bundles on a higher indifference curve.

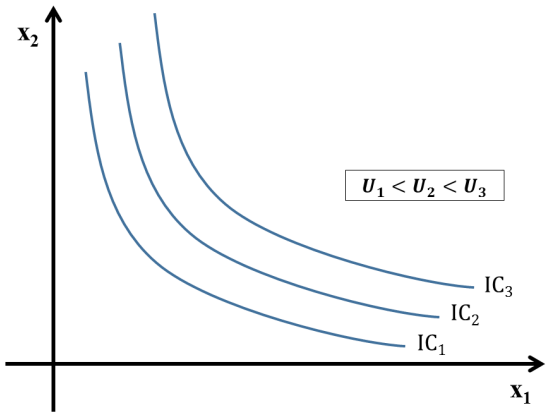



**Figure 1.3** Indifference map

4. *Indifference curves' slope is downward to the right.* The absolute value of the slope of the indifference curve at certain bundle is called the *marginal rate of substitution* ($MRS$) of good 2 for good 1. $MRS$ is a rate at which the consumer is willing to give up units of good 2 ($x_2$) to gain additional unit of good 1 ($x_1$) while maintaining the same level of utility, formally:

$$MRS = \left|-\frac{dx_2}{dx_1}\right| \tag{1.5}$$

Accordingly, the fourth indifference curve property tells us that to be able to preserve the same level of utility, consumer has to give up some amount of one good to get more of another good.

By moving along the indifference curve, the increase in consumer's total utility gained by consuming more of one good must be equal to the loss in utility in consuming less of the other good. This means that the change in utility must be zero. The small changes in quantity of both goods are written as $dx_1$ and $dx_2$, and thus:

$$\frac{\partial U(x_1,x_2)}{\partial x_1} dx_1 + \frac{\partial U(x_1,x_2)}{\partial x_2} dx_2 = 0 \tag{1.6}$$

Hereof,

$$-\frac{dx_2}{dx_1} = \frac{\frac{\partial U(x_1,x_2)}{\partial x_1}}{\frac{\partial U(x_1,x_2)}{\partial x_2}} = \frac{MU_1}{MU_2}. \tag{1.7}$$

By substituting of equation (1.5) into (1.7) we can conclude that $MRS$ between two goods depends on their marginal utilities:

$$MRS = \left|-\frac{dx_2}{dx_1}\right| = \frac{MU_1}{MU_2} \tag{1.8}$$

5. *As we move downward and to the right along the indifference curve, it becomes less steep.* With regard to the convexity axiom (axiom 5), the more of a good the consumer has, the more of this good he/she is willing to give up to obtain additional unit of other good. In result, slope of the indifference curve is diminishing. This property of indifference curve is referred to as the *principle of diminishing marginal rate of substitution*, Figure 1.4.

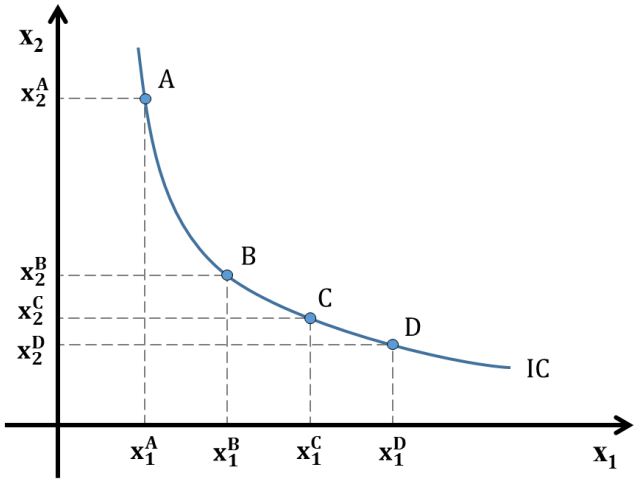



**Figure 1.4** Exhibition of the principle of diminishing marginal rate of substitution of the indifference curve

We can summarise that an indifference curve is satisfying all five axioms of consumer preferences.

## Exercise

1. Silvia likes to drink mint tea in the evening. Her utility function is $U(mt) = 5mt - mt^2$, where $mt$ represents the number of mint tea cups.
What is Silvia's level of utility in case she drinks one, two or three cups and also when she drinks no tea? Derive the equation for the marginal utility and calculate its value.
2. Martin spends monthly money on beer $(b)$ and cigarettes $(c)$. His utility function is $U(b,c) = 2b + 5b^2 - c^3$. Determine the $MRS$ equation. In case Martin has no budget limitation a level of utility he would like to gain is 8, compute the value of $MRS$ in point where Martin consumes 10 units of beer this month.
3. Let's assume Elena consumes apples $(a)$ and peaches $(p)$, and utility she derives from consuming these goods is defined by following equation: $U(a,p) = a.p$. Elena wants to achieve utility level equal 24. Any combination of these fruits that brings Elena the desired utility is found on an indifference curve given by the equation $24 = a.p$. If Elena consumes different amounts of apples (1, 4, 6, 12), how many peaches can she have maintaining utility 24? Graph an indifference curve for Elena's choices and calculate the $MRS$ at every known point (consumption bundle) on the indifference curve. Interpret the results.

*Solution*

1. We calculate the level of utility Silvia is gaining from consuming different amounts of tea using the utility equation. Then, by applying relation (1.3), we can determine the level of Silvia's marginal utility of mint tea, and calculate its exact value:

$$MU_{mt} = \frac{dU(mt)}{d\,mt} = \frac{d(5mt - mt^2)}{d\,mt} = 5 - 2mt.$$

Calculated values of total and marginal utility are shown in Table 1.1.

**Table 1.1** Total and marginal utility levels

| Cups of mint tea | $U(mt)$ | $MU_{mt}$ |
|---|---|---|
| 0 | 0 | – |
| 1 | 3 | 3 |
| 2 | 4 | 1 |
| 3 | 3 | -1 |

Important characteristic of marginal utility is that it is decreasing with an increase in consumption. The more of good's quantity is consumed, the smaller is the additional utility gained. After certain level of consumption marginal utility becomes even negative. According the results in Table 1.1 we can see that Silvia's wellbeing is at first increasing as she drinks more mint tea. The second cup of tea brings her the highest level of utility. If she drinks the third cup of tea, her utility falls. The reasons are various. For instance, because of her needs are already satisfied the third cup feels tasteless, or it is possible that the mint caused her a heartburn. The relationship between the total and marginal utility is shown in Figure 1.5

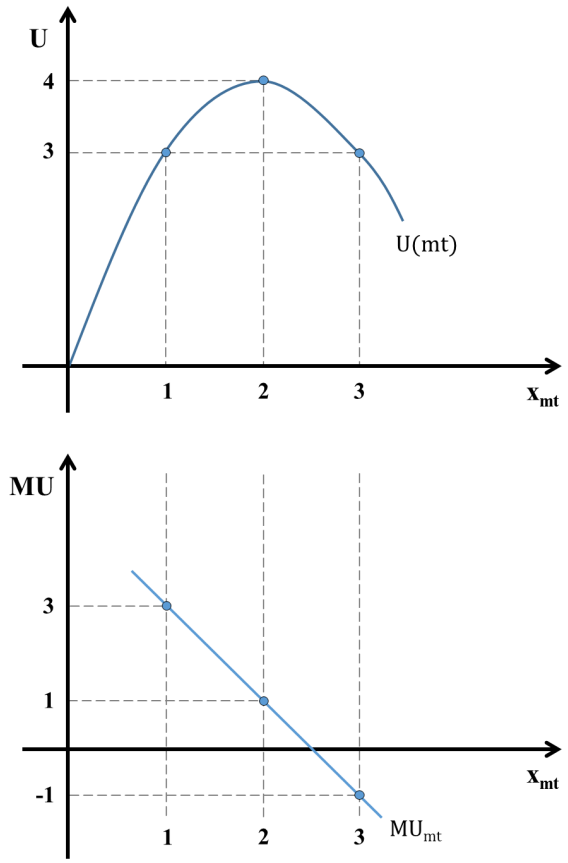



**Figure 1.5** Relationship of total and marginal utility curve

2. Consumer's total utility is here defined as a function of two goods' quantity. It means that we have to compute marginal utility as a partial derivative of total utility function with respect to quantity of each good consumed:

$$MU_b = \frac{\partial U(b,c)}{\partial b} = \frac{\partial(2b+5b^2-c^3)}{\partial b} = 2 + 10b$$
$$MU_c = \frac{\partial U(b,c)}{\partial c} = \frac{\partial(2b+5b^2-c^3)}{\partial c} = -3c^2.$$

Substituting into equation (1.8) gives us the equation of Martin's indifference curve's slope,

$$MRS = \frac{MU_b}{MU_c} = \left|\frac{2+10b}{-3c^2}\right|.$$

To calculate the value of $MRS$ we need to know which quantity of both goods Martin consumes. If his monthly consumption of beer is 10 units, what is the number of cigarettes he will consume?

$$8 = 2 \cdot 10 + 5 \cdot 10^2 - c^3$$
$$c^3 = 512$$
$$c = 8$$

Consumption bundle of Martin includes 10 units of beer and 8 units of cigarettes. At this point, the value of $MRS$ would be $MRS = \left|\frac{2+10b}{-3c^2}\right| = \frac{25}{24}$.

3. Elena's indifference curve is given by equation $U(a,p) = 24 = a.p$. For every number of apples, we use the equation to determine the amount of peaches Elena can consume maintaining utility level 24, Table 1.2. Then we draw Elena's indifference curve, Figure 1.6

**Table 1.2** Amounts of goods consumed

| a | $p_2$ |
|---|---|
| 1 | 24 |
| 4 | 6 |
| 8 | 3 |
| 12 | 2 |

Next, we formally determine the indifference curve's slope at each consumption bundle on the indifference curve: $\frac{MU_a}{MU_p} = \frac{p}{a}$. Now we can calculate the values of $MRS$.

At point A, $MRS$ has a value of $24/1 = 24$. At point B it is $MRS = 3/2$, C ($MRS = 3/8$), D ($MRS = 1/6$). We see how the value of slope along the indifference curve is diminishing. At point A, Elena has a lot of peaches and a small number of apples. She would be willing to give up up to six peaches to get 1 more apple. But the more apples she would have, the less amount of peaches she would be willing to give up to get an additional piece of apple.

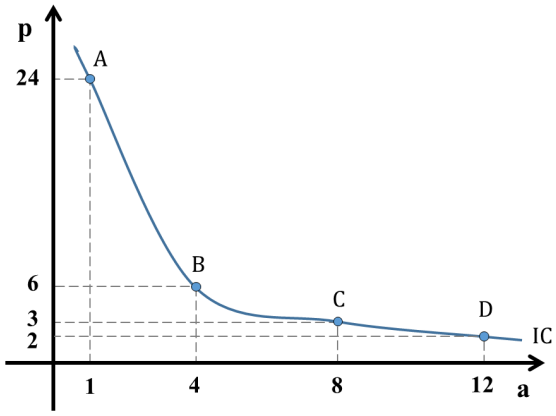



**Figure 1.6** Elena's indifference curve

## 1.2 Budget constraint

The consumer's choice is limited by his/her income ($y$) and prices of goods or services. Prices are determined by markets. There is a market for each good. If purchasing $x_i$ units of good $i$ at price $p_i$, the consumer's expenditures are $p_i x_i$, hence, the consumer needs an income in the amount of $p_i x_i \leq y$ to pay for the units purchased. In general, for all goods the consumer would purchase applies that $p_1 x_1 + p_2 x_2 + \ldots + p_n x_n \leq y$. In vector's notation $\boldsymbol{p}.\boldsymbol{x} < y$. Basically, it means that the consumer has to have a sufficient income for purchasing bundles of goods.

The set of consumption bundles consumer is able to purchase given his/her income and prices is called the *feasible consumption set*. In a simple two-good case, these bundles are located on or under the *budget line* ($BL$), as it is depicted in Figure 1.7. Any combination of two goods above the $BL$ is not feasible. In the case of two goods, the budget line can be expressed mathematically as $p_1 x_1 + p_2 x_2 = y$, meaning that expenditures on goods 1 and 2 equal to the consumer's income. By rearranging we get

$$x_2 = \frac{y}{p_2} - \frac{p_1}{p_2} x_1, \tag{1.9}$$

where $p_1$ and $p_2$ are prices of the two goods. The prices are nominal, measured in currency units as for instance euros or dollars per unit of the good. Consumer income is also nominal and measured in currency units. The distance of budget line from the origin represents the level of consumer income. The further away the budget line is from the origin the greater is the level of income of the consumer.

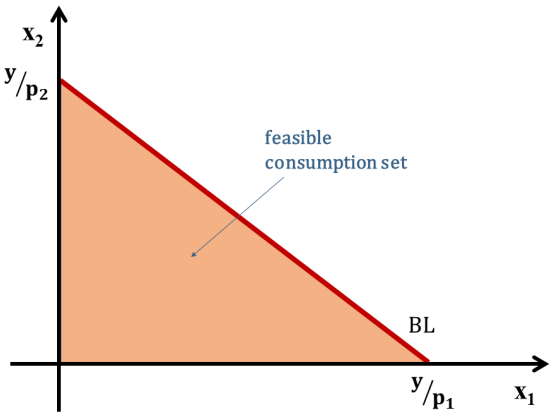



**Figure 1.7** Budget line and the feasible consumption set

The points of intersection of the budget line with the axes represent the maximum amount of goods that can be purchased at given prices and from the given income. For example, if the consumer spends all his/her income on good 2, the amount of good 2 he/she can afford to purchase is $x_2 = y/p_2$ because $p_1 \cdot 0 + p_2 x_2 = y$.

As we can see in equation (1.9), the slope of the budget line is defined as a ratio of goods' prices, $-(p_1/p_2)$. Absolute value of budget line slope's is called the *marginal rate of substitution in exchange* ($MRSE$), and it represents how many units of good 2 consumer has to give up in order to be able to purchase an additional unit of good 1 without changing his/her expenditure,

$$MRSE = \left| -\frac{dx_2}{dx_1} \right| = \left| -\frac{p_1}{p_2} \right|. \tag{1.10}$$

**Changes in the budget line**

The budget line changes when prices or income change. An increase in income shifts the budget line further away from the origin (intercept increases) while the slope remains unchanged. Hence, an increase in income causes a parallel shift of the budget line to the right as depicted by the blue line in Figure 1.8. If consumer income decreases, the intercept lowers and the line shifts to the left.

What happens when price of a good changes while prices of other goods and income remain fixed? In case of two goods, a rise of $p_1$, when $p_2$ stays constant, increases the slope of the budget line; the slope becomes steeper (Figure 1.9). Good 1 becomes more expensive relative to good 2. Algebraically, if $p_{11} < p_{12}$, then $(y/p_{11}) > (y/p_{12})$ and $(p_{11}/p_2) < (p_{12}/p_2)$ and vice versa. Here $p_{11}$ is the initial price of good 1 and $p_{12}$ is the new changed price.

Next, an increase in $p_2$, when $p_1$ held constant, lowers the vertical intercept of the budget line and causes its slope to be flatter. This case is represented by the red budget line in Figure 1.9. Algebraically, if $p_{21} < p_{22}$, then $(y/p_{21}) > (y/p_{22})$ and $(p_1/p_{21}) < (p_1/p_{22})$ and vice versa. Here $p_{21}$ is the initial price of good 2 and $p_{22}$ is the new changed price.

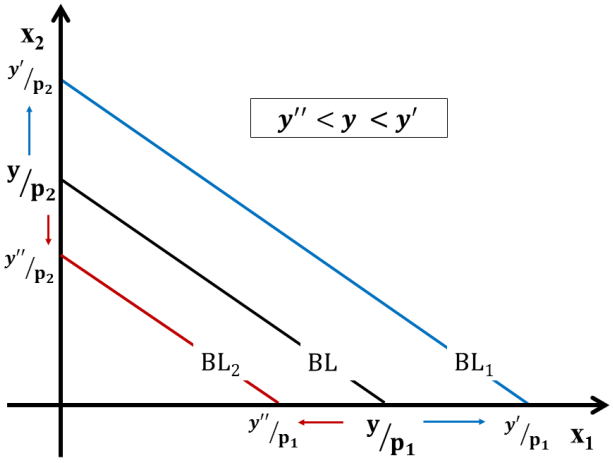



**Figure 1.8** Shifts of the budget line due to income changes

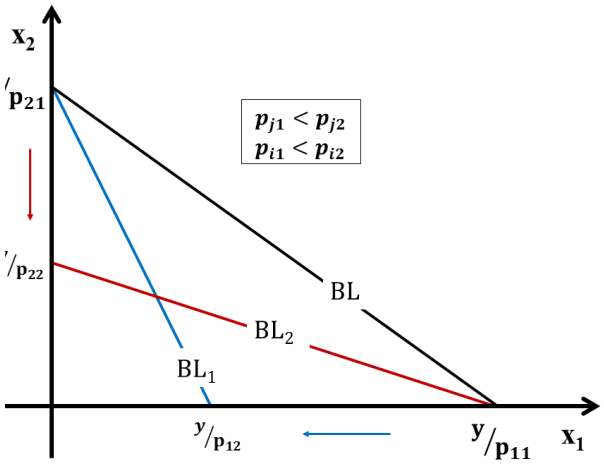



**Figure 1.9** Changes in the slope of the budge line due to changes in goods prices

Now, let us consider both $p_1$ and $p_2$ change. Suppose both prices would rise by the same percentage, $k.p_1x_1 + k.p_2x_2 = y$. From the previous equation we get that $p_1x_1 + p_2x_2 = y/k$, which shows us that an increase in both prices by $k$ percent has the same impact as a decrease in consumer income by $k$ percent; the budget line shifts to the left. Here, the slope of the line stays the same because $(-\frac{k.p_1}{k.p_2}) = (-\frac{p_1}{p_2})$. If both prices change by different percentage, the budget line slope changes and with it the vertical and horizontal intercept too, $(-\frac{k_1p_1}{k_2p_2}) = (-\frac{k_1}{k_2} \cdot \frac{p_1}{p_2})$.

In reality, we sometimes experience impacts of inflation. In this situation, the prices of all goods and income go up. But not only prices of goods are affected by the inflation, the wages are affected too. Then, the following applies: $k.p_1x_1 + k.p_2x_2 = k.y$. When we divide $k$ out of the equation, we get the initial budget line. The conclusion is that an inflation does not shift or rotate the budget line if all prices as well as income increases by the same percentage.

Finally, let us impose a specific tax on a good consumer wants to purchase. Specific tax (or quantity tax) is defined as tax per unit of a good. The tax $(t)$ changes the price of taxed good to $p_1 + t$ and therefore, the budget line is steeper. Algebraically, $x_2 = \frac{y}{p_2} - \frac{(p_1+t)}{p_2}x_1$. Accordingly, tax imposed on good 2 causes the slope to become flatter.

Exercise

In her free time, Miriam likes to go to music concerts ($c$) and dance clubs ($d$). Her monthly income she is willing to spend on her hobbies is €100. An average price of a concert ticket ($p_c$) is €40 and average club entrance fee ($p_d$) is €10.
Compared to June, the club entrance fee in July has doubled. How would the increase in price affect the budget line of Miriam? And what would happen if in July the prices stay the same, but Miriam's income increases to €120?

*Solution*
From information listed above, Miriam's budget line is given by equation $100 = 40c + 10d$. If the price $p_d$ doubles, the equation changes to $100 = 40c + \mathbf{20}d$. We already know that a price change causes the budget line's slope change. Graphically, we can see the situation in Figure 1.10a. Now, for every number of times Miriam goes to dance in July, she cannot afford to go to concerts as often as the month before.
On the other hand, eventual change in Miriam's income level does not affect the budget line's slope, it leads to a shift of the budget line. An income increase causes the budget line to shift to the right, Figure 1.10b. The new budget line equation is $\mathbf{120} = 40c + 10d$, and we see that for every number of times Miriam goes to dance in July, she even can afford to go to concerts more often as in June.

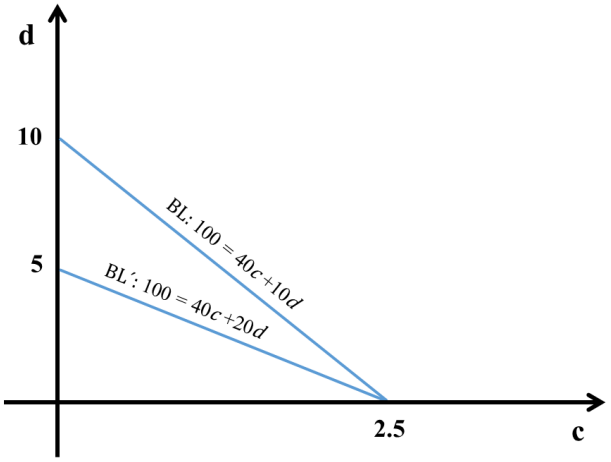



**Figure 1.10a** Effect of increase in $p_d$

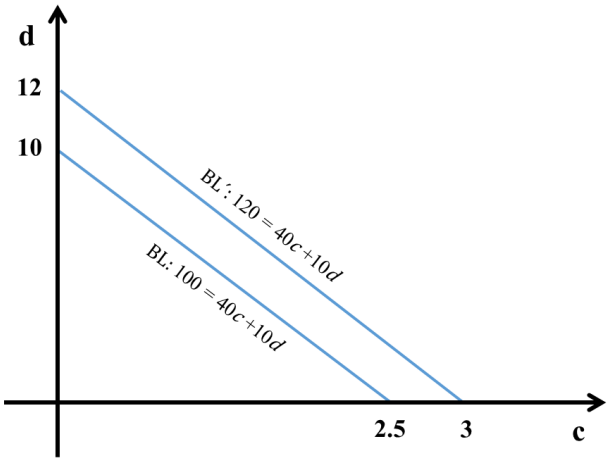



**Figure 1.10b** Effect of increase in Miriam's income

## 1.3 Consumer's optimal choice

What is the aim of a rational consumer? We assume that it is to choose the best possible combination of goods (the most preferred bundle) while satisfying the budget constraint. In other words, the objective of the consumer is to maximise utility given the prices of goods and the consumer income. The problem of the consumer's choice can be mathematically written as follows:

$$max\ U(\boldsymbol{x}) \text{ subject to } \boldsymbol{p}.\boldsymbol{x} \leq y \quad \text{for } (\boldsymbol{p}, y) \geq 0 \tag{1.11}$$

In the case of just two goods, the maximisation problem takes the following form:

$$max\ U(x_1, x_2) \quad s.t.\ p_1x_1 + p_2x_2 \leq\ y \tag{1.12}$$

By solving the problem mathematically, we get consumer's optimal consumption bundle $\boldsymbol{x}^*$ that contains the $x_1^*$ amount of good 1 and $x_2^*$ amount of good 2. By choosing the bundle $\boldsymbol{x}^*$ consumer receives the greatest possible level of utility from all feasible consumption bundles; mathematically, $U(\boldsymbol{x}^*) > U(\boldsymbol{x})$ for all $\boldsymbol{x}$ from the feasible set. Graphically, it is the point, where the budget line just touches (is tangent to) the highest possible indifference curve, Figure 1.11. At that point, the slope of the indifference curve ($MRS$) equals the slope of the budget line ($MRSE$):

$$MRS = MRSE \tag{1.13}$$

$$\frac{MU_1}{MU_2} = \frac{p_1}{p_2} \tag{1.13.1}$$

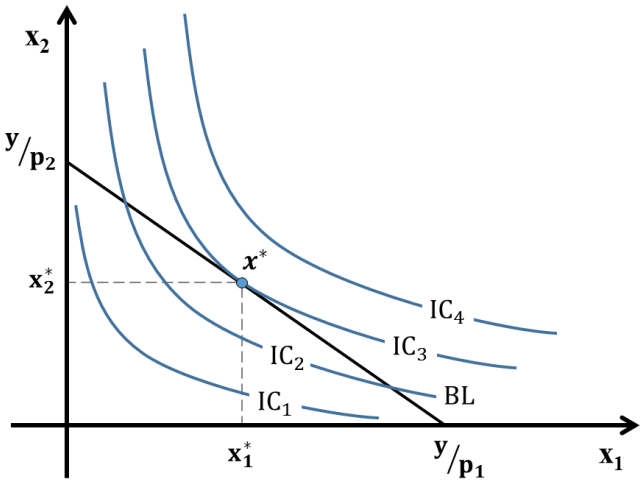



**Figure 1.11** Consumer's optimal choice

### Solving consumer optimisation problem by Lagrangian method

Lagrangian method converts constrained optimisation problem into unconstrained optimisation. Let the utility function be $U(x_1, x_2)$ and the budget constraint is $p_1x_1 + p_2x_2 \leq y$. Then, the Lagrangian maximisation problem has the following form

$$max\ £ = U(x_1, x_2) - \lambda(p_1x_1 + p_2x_2 - y), \tag{1.14}$$

where $\lambda$ represents the Lagrangian multiplier and £ is the Lagrangian function.

To solve this unconstrained optimisation problem, we take first derivatives of the Lagrangian function £ with respect to all decision variables $x_1$, $x_2$, $\lambda$ and set them equal to zero:

$$\frac{\partial £}{\partial x_1} = \frac{\partial U(x_1,x_2)}{\partial x_1} - \lambda.p_1 = 0, \tag{1.15}$$

$$\frac{\partial £}{\partial x_2} = \frac{\partial U(x_1,x_2)}{\partial x_2} - \lambda . p_2 = 0, \tag{1.16}$$

$$\frac{\partial £}{\partial \lambda} = p_1 x_1 + p_2 x_2 - y = 0. \tag{1.17}$$

Next, we solve equations (1.15) – (1.17) for $x_1$, $x_2$ and $\lambda$. From equations (1.15) and (1.16) we express the Lagrangian multiplier, and then we rearrange the equation (1.17),

$$\frac{\partial U(x_1,x_2)}{\partial x_1} \cdot \frac{1}{p_1} = \lambda \text{ and } \frac{\partial U(x_1,x_2)}{\partial x_2} \cdot \frac{1}{p_2} = \lambda,$$

and from that

$$\frac{\partial U(x_1,x_2)/\partial x_1}{\partial U(x_1,x_2)/\partial x_2} = \frac{MU_1}{MU_2} = \frac{p_1}{p_2} \tag{1.18}$$

$$p_1 x_1 + p_2 x_2 = y. \tag{1.19}$$

Equation (1.18) is analogue to (1.13.1). By solving the system of equations (1.18) and (1.19) we get optimal quantities of goods 1 and 2 for the consumer.

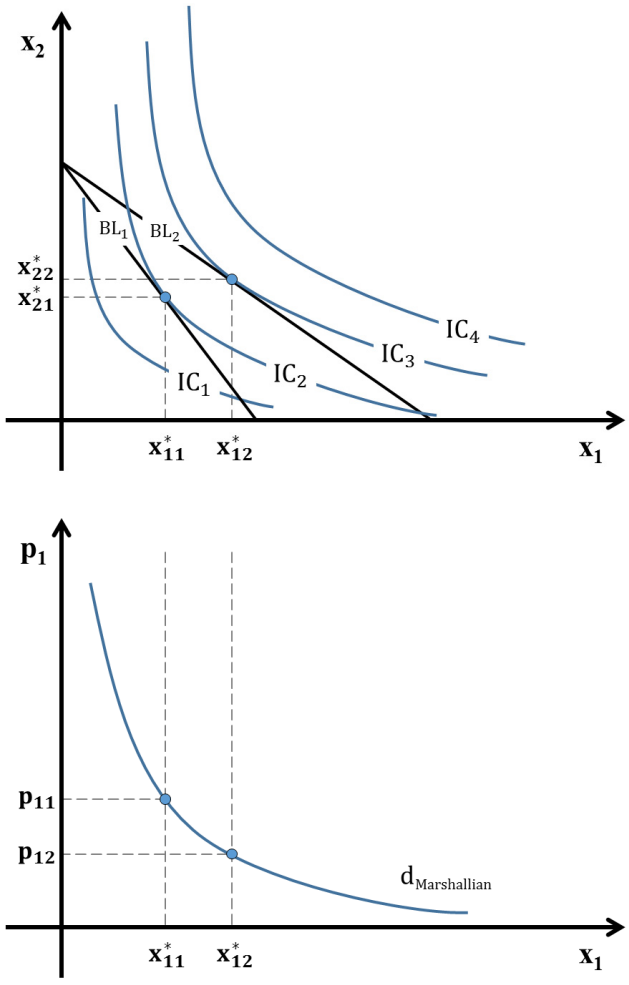



**Figure 1.12** Derivation of Marshallian demand curve

For any given vector of prices, $\boldsymbol{p}$, and income, $y$, we can find a unique solution of the "consumer problem"; formally, consumer's optimal choice can be defined as vector

$$\boldsymbol{x}^* = f(\boldsymbol{p}, y) \tag{1.20}$$

or as

$$x^* = x_i(\boldsymbol{p}, y) \quad \text{for } i = 1, 2, \ldots, n. \tag{1.20.1}$$

In case of two goods, the optimal choice of the consumer is ${x_1}^* = x_1(p_1, p_2, y)$ and ${x_2}^* = x_2(p_1, p_2, y)$. Optimal quantity of good 1 is the function of prices of goods 1 and 2 and income (and preferences reflected in utility function). These above functions for $n$ goods or just two goods that are the outcome of maximisation utility subject to budget constraint are known as *Marshallian demand functions* or ordinary demand functions. The graph of the ordinary demand function is denoted in Figure 1.12. To get the ordinary demand function for good 1 we keep price of good 2 and income fixed and alter price of good 1, which affects the budget line.

## Exercise

Every day, Emma goes to a university coffee bar and buys coffee ($x_1$) or cappuccino ($x_2$). She spends weekly €28 on these two goods. Suppose that her indifference curve is defined as $U(x_1, x_2) = \sqrt[3]{x_1^2}.\sqrt[2]{x_2} = x_1^{\frac{2}{3}}x_2^{\frac{1}{2}}$ and the budget line is $2x_1 + 3x_2 = 28$. What would be the optimal choice for Emma, or in other words, how much of each beverage should she buy?

*Solution*

We solve this problem with the two known approaches, at first, we use the condition of equal slopes of the budget line and indifference curve using equation (1.13), and afterwards the method of Lagrangian multipliers.

Using the first method we get the following $MU_1 = \frac{2}{3}x_1^{-\frac{1}{3}} \cdot x_2^{\frac{1}{2}}$ and $MU_2 = x_1^{\frac{2}{3}} \cdot \frac{1}{2}x_2^{-\frac{1}{2}}$, and therefore,

$$\frac{MU_1}{MU_2} = \frac{\frac{2}{3}x_1^{-\frac{1}{3}} \cdot x_2^{\frac{1}{2}}}{x_1^{\frac{2}{3}} \cdot \frac{1}{2}x_2^{-\frac{1}{2}}} = \frac{\frac{2}{3}x_1^{-\frac{1}{3}} \cdot x_2^{\frac{1}{2}}}{\frac{1}{2}x_2^{-\frac{1}{2}} \cdot x_1^{\frac{2}{3}}} = \frac{4}{3}x_1^{-1}x_2^{1} = \frac{4x_2}{3x_1} = \frac{p_1}{p_2} = \frac{2}{3}.$$

We obtained a relation between goods Emma decides to purchase, $\frac{4x_2}{3x_1} = \frac{2}{3}$, which solves for

$$x_1 = 2x_2. \qquad \text{(E.1.1)}$$

To find out the exact amounts of coffee and cappuccino Emma should purchase, we substitute this relation into the budget line equation, then we have $2(2x_2) + 3x_2 = 7x_2 = 28$ and from that $x_2 = 4$. Using the equation (E.1.1) we get that if $x_2 = 4$, then $x_1 = 8$. Emma should buy weekly 8 coffees and 4 cappuccinos.

Next, we solve Emma's problem with help of Lagrangian multipliers. The maximisation problem is written as

$$max\ £ = \sqrt[3]{x_1^2}.\sqrt[2]{x_2} - \lambda(2x_1 + 3x_2 - 28).$$

The first-order conditions for a maximum of £ are:

$$\frac{\partial £}{\partial x_1} = \frac{2}{3}x_1^{-\frac{1}{3}} \cdot x_2^{\frac{1}{2}} - \lambda.2 = 0,$$
$$\frac{\partial £}{\partial x_2} = \frac{1}{2}x_2^{-\frac{1}{2}} \cdot x_1^{\frac{2}{3}} - \lambda.3 = 0,$$
$$\frac{\partial £}{\partial \lambda} = 2x_1 + 3x_2 - 28 = 0. \qquad \text{(E.1.2)}$$

We solve the first two equations for $\lambda$,

$$\frac{2}{6}x_1^{-\frac{1}{3}} \cdot x_2^{\frac{1}{2}} = \lambda,$$
$$\frac{1}{6}x_2^{-\frac{1}{2}} \cdot x_1^{\frac{2}{3}} = \lambda,$$

and from that

$$\frac{2}{6}x_1^{-\frac{1}{3}} \cdot x_2^{\frac{1}{2}} = \frac{1}{6}x_2^{-\frac{1}{2}} \cdot x_1^{\frac{2}{3}}$$
$$x_1 = 2x_2.$$

Substituting into the equation (E.1.2) and solving for $x_2$ we get $2(2x_2) + 3x_2 - 28 = 0$. From that $x_2 = 4$ and $x_1 = 8$. It has to be the same result as we got by using the first method solved above.

## 1.4 Properties of consumer demand

### Relative prices and real income

In real life prices are denominated in euros, dollars or Slovak crowns (existed before Slovakia adopted euro). These prices are called nominal prices. In previous section we learned, that not nominal prices are important for consumers but relative prices. Consumer behaviour is not determined by nominal prices but by relative prices, which show how the price of good $i$ relates to prices of other goods. The same holds for income. Consumers do not care (some might care as some consumers in Slovakia stubbornly use Slovak crowns when talking about prices rather than euros which is official legal tender) whether their income is denominated in euros or dollars, but they are certainly interested in purchasing power of their income, how much goods and services their income buys. There are therefore nominal incomes and real incomes.

[3]Real income reflects consumer's purchasing power. It represents number of units of a good the consumer can purchase from his/her income. If $y$ is the consumer income, then $y/p_i$ is the real income measured in units of good $i$ purchased:

$$\frac{y}{p_i} = \frac{€}{€/\text{unit } i} = \text{units of } i \tag{1.21}$$

The relative price of good $i$ in terms of good $j$ can be explained as number of good $j$'s units that a consumer has to give up to acquire one unit of good $i$. It is a ratio of these two good's prices:

$$\frac{p_i}{p_j} = \frac{€/\text{unit}_i}{€/\text{unit}_j} = \frac{€}{\text{unit}_i} \cdot \frac{\text{unit}_j}{€} = \frac{\text{unit}_j}{\text{unit}_i} \tag{1.22}$$

### Income and substitution effects of price change

An important characteristic of consumer behaviour is the inverse relationship between quantity demanded and own price of the good. Consumers want to buy more at a lower price. The inverse quantity-price relation can be explained by substitution and income effects. When the price of good 1 ($p_1$) declines, the slope of the budget line decreases; $BL_2$ is the new budget line. The consumer will change his/her optimal consumption bundle from $\boldsymbol{a}$ to $\boldsymbol{b}$. The quantity difference between $\boldsymbol{a}$ and $\boldsymbol{b}$ is called *the total effect* ($TE$) *of price change*.

Total effect can be decomposed into a substitution and income effects, which is graphically illustrated in Figure 1.13. Here, the Hicksian decomposition technic is used. It is also possible to use a slightly different Slutsky decomposition.

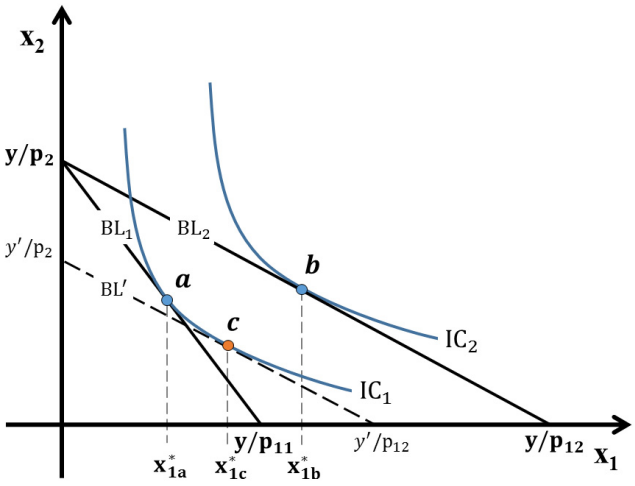



**Figure 1.13** Decomposition of the total effect of price change for a superior (normal) good

[3] Jehle, G.A. – Reny, P.J. 2011. Advanced microeconomic theory. Pearson. 672 p. ISBN: 978-0-273-73191-7

The *substitution effect* ($SE$) exists because good 1 becomes relatively cheaper compared to other goods as $p_1$ declines and other prices remain constant. Consumer substitutes the relatively cheaper good 1 for relatively more expensive good 2. For example, when price of bananas declines and price of pineapples remains constant, many consumers would buy more of bananas rather than pineapples. The $SE$ is always negative as price and quantity of good purchased react inversely.

Graphically, $SE$ is depicted as the movement from consumption bundle $\boldsymbol{a}$ to $\boldsymbol{c}$. Bundles $\boldsymbol{a}$ and $\boldsymbol{c}$ are on the same indifference curve, hence, the consumer is indifferent between bundles $\boldsymbol{a}$ and $\boldsymbol{c}$, but chooses $\boldsymbol{a}$ when he/she faces relative price $p_{11}/p_2$ and $\boldsymbol{c}$ when he/she faces relative price $p_{12}/p_2$. Bundles should bring consumer the same level of utility. Bundle $\boldsymbol{c}$ lies on budget line $BL'$, which is parallel to the budget line $BL_2$, what makes sure that the consumer faces new relative price $p_{12}/p_2$. Furthermore, $BL_2$ is constructed in such a way that it is tangent to the original indifference curve $IC_1$, which means that the consumer is equally well off as before the price change. The difference between $\boldsymbol{a}$ and $\boldsymbol{c}$ is only due to the change of the relative price. Decline of the relative price of good 1 always leads to increase of the quantity demanded for good 1, *ceteris paribus*. Move from $\boldsymbol{a}$ and $\boldsymbol{c}$ is therefore due to the change of the relative prices, but this is not the end of the story.

Decline of the price of good 1 makes consumer better off. Purchasing original quantity of good 1 now requires less money. This saved income can be used to buy more of a good 1 or good 2. Consumer is richer because of the price decline, which is reflected in the shift of the budget line form $BL'$ to $BL_2$. Increase of good's 1 quantity from $x_1^*$ to $x_{12}$, represented by movement from bundle $\boldsymbol{c}$ to $\boldsymbol{b}$, represents the *income effect* ($IE$). As the price and quantity are negatively correlated, the income effect of a price change in Figure 1.13 is negative, $\bar{IE}$ . The income effect is negative for *superior goods*. $IE$ for *inferior goods* is positive, $\overset{+}{IE}$ . Superior or normal goods are goods that are consumed more when consumer income increases, while inferior goods are consumed less by the consumer whose income increased. Majority of goods are normal goods, but there are also inferior goods. Public transportation is an example of inferior good. When income of people goes up they use less public transportation and switch to private cars and creating traffic jams in cities. Poor infrastructure is another reason for traffic jams.

For most goods applies that $\bar{SE} > \overset{+/-}{IE}$ and therefore, for such goods, $TE$ is negative as it is depicted in Figure 1.13. Here, the consumption of good 1 benefits from a fall in price because of both substitution and income effects. Because of the fall of the price of good 1 the quantity demanded increases ( $\bar{TE}$ ). Total effect is decomposed into substitution and income effect, which means that because of the decline of price of good 1 relative to good 2 the quantity demanded for good 1 increases ( $\bar{SE}$ ) and because the consumer is richer with the decline of price of good 1, the demand for good 1 increases ( $\bar{IE}$ ).

At extreme, however, the income effect could outweigh the substitution effect, $\bar{SE} < \bar{IE}$ . In such case, a rise in price would cause an increase in quantity demanded of the good, and the consumer's demand curve would have a positive slope. This situation is referred to as the *Giffen's paradox* and it is only related to inferior goods. Suppose, the price of an inferior good with large share on consumer's expenditures grows. Then, real income of consumer falls vastly and so does the purchasing power. Under such condition, the consumer has to cut back on other more expensive goods and buy more of the inferior good. Nevertheless, in reality, such situation is rare. Hereafter, we will proceed with the analysis of consumer behaviour for goods with negative substitution effect.

Because of the inverse quantity-price relation (resulting from negative $TE$), a negative sloped demand curve can be derived as we already showed in Figure 1.12. This *individual consumer demand* can be defined as quantities of goods a consumer is willing and able to purchase at the different price of goods, holding other demand determining factors constant (*ceteris paribus*).

# Chapter 2 THEORY OF THE FIRM

In previous chapters, we dealt with the consumer behaviour and demand side of the market. In this and following chapters we will study the supply side of the market and behaviour of firms. A firm is an entity created for some purpose, mainly to produce or trade goods and services. The goal of the firm is to maximise profit. There are other goals of firms like maximising market-share, maximising sales or insuring good conditions for workers, but the firms that do not maximise profit do not survive in the long-run. The firm acquires inputs (labour, land, capital, entrepreneurship) which are used to produce outputs (goods and services). Inputs are obtained on input markets (land market, labour market, …). The firm's costs of an output produced are expenditures on purchasing inputs that allow to produce that level of output. Output is sold on a product market. The firm's revenue is the value of sales of outputs. Profit is the difference between total revenues and total costs and represents the income of owners of the firm.

## 2.1 Production

The firm can choose different combinations of inputs to produce a specific level of output or outputs. For example, firms in developed countries use a lot of capital while less workers and vice versa in developing countries. The mathematical representation of firm's production process is a *production function*

$$q = f(\boldsymbol{z}), \tag{2.1}$$

where $q$ is the maximum output a firm can produce using specific quantities of different inputs $\boldsymbol{z} = (z_1, z_2, \dots, z_n)$. It is assumed that $q \geq 0$ and $\boldsymbol{z} \geq 0$. For example, five tonnes of wheat are produced with one hectare of land, two weeks of labour work and twenty-two hours of tractor/combine harvester work. The partial derivative of a production function is called the *marginal product*. Marginal product of input $i$ ($MP_i$), where $i \in (1,2, \dots, n)$, is defined as

$$MP_i = \frac{\partial q(\boldsymbol{z})}{\partial z_i}. \tag{2.2}$$

Marginal product of input $i$ (for example marginal product of labour) is the rate at which output changes when use of input $i$ increases by a small amount (normally one unit) while other inputs remain unchanged. For instance, when a new worker is hired, production of chairs increases by 100 per month.

In the production theory, another relevant variable is firm's *average product* of input $i$ ($AP_i$), which is defined as total output per unit of input $i$. For example, Kia produces annually 10,000 cars per worker.

$$AP_i = \frac{q(\boldsymbol{z})}{z_i} \tag{2.3}$$

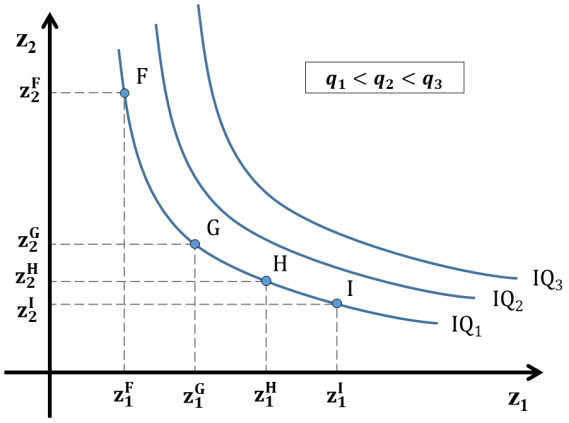



**Figure 2.1** Isoquant map

The set of different quantities of inputs that allow the firm to produce a fixed amount of output is known as an *isoquant* ($IQ$), Figure 2.1. This is a concept analogue to indifference curves in consumer theory. The isoquant is sloping downward and to the right, and the absolute value of the slope of the isoquant is called the *marginal rate of technical substitution* ($MRTS$). This is equivalent to $MRS$ in theory of consumer choice. $MRTS$ is a rate at which the firm can substitute one input for another without changing the level of output; formally, it is defined as follows:

$$MRTS_{12} = \left|-\frac{dz_2}{dz_1}\right| \tag{2.4}$$

$MRTS$ diminishes (the slope of the isoquant, which is measured by the slope of the tangent line to the isoquant, gets smaller, tangent line becomes flatter) as we move down and to the left along the isoquant. By moving along the isoquant, the increase in output gained by employing more of input 1 must be equal to the loss in output by employing less of the input 2 in two-input case. Therefore, for the isoquant applies

$$\frac{\partial q(z_1,z_2)}{\partial z_1} dz_1 + \frac{\partial q(z_1,z_2)}{\partial z_2} dz_2 = 0, \tag{2.5}$$

and thus, $MRTS$ is equal to the ratio of marginal products of employed inputs:

$$MRTS = \left|-\frac{dz_2}{dz_1}\right| = \frac{MP_1}{MP_2} \tag{2.6}$$

## Production in the short-run and long-run

In microeconomics, production process is classified as short-run and long-run. The *long-run* is defined as the shortest period in which the firm can alter quantities of all its inputs. In other words, all inputs in the long-run are variable. On the other hand, in the *short-run*, there are some inputs that the firm cannot vary. Such inputs are referred to as *fixed inputs*, e.g. tax write-offs, rent, energy cost, number of employees, etc.

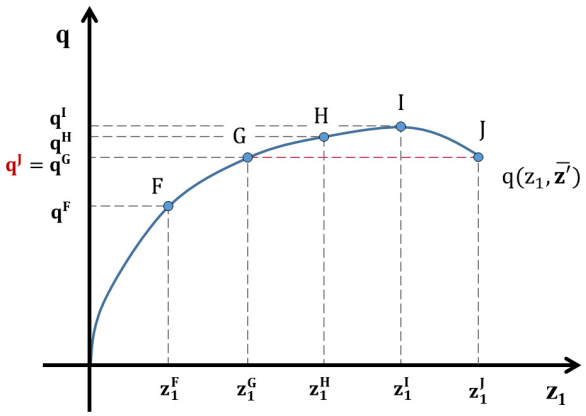



**Figure 2.2.** Example of production function with one variable input

Let us suppose that one input is variable, other inputs ($\bar{z}'$) are fixed in the short-run. Other inputs are mathematically denoted as a vector (bold). Such production function is graphically depicted in Figure 2.2 and it is mathematically expressed as $q(z_1, \bar{z}')$. This is a one-output, one-input model because only one input can be altered. Starting from origin, increasing variable input leads to higher output. The production function is increasing. After the quantity of output reaches the level of $q^I$, increasing input starts to have a negative effect on output. Using more than $z_1^I$ units of variable input, total output decreases and the firm's marginal product becomes negative.

The production function in Figure 2.2 is concave[4]. Increasing variable input leads to higher output, but the rise of output gets smaller and smaller as input use increases. In other words, marginal product is diminishing. This relationship is referred to as the *law of diminishing marginal returns*. It has to be noted that the law of diminishing marginal returns takes effect after certain level of variable inputs is reached, before that level of variable input is achieved the law of diminishing returns might not apply. Malthusian trap is a famous example of diminishing marginal returns. British economist Malthus stated that increasing population on the Earth will result in famine as the Earth with its fixed land and water resources will not be able to feed ever increasing number of people. The reason is that putting more variable inputs like labour or fertiliser to fixed amount of land will create after some point diminishing returns. Because of that,

[4] Graphically, a function is convex if every line segment connecting two points on its graph does not lie below the graph at any point. Accordingly, a function is concave if the line segment connecting two points on its graph does not lie above the graph at any point. See: Osborne, M.J. Mathematical methods for economic theory. Retrieved from <https://mjo.osborne.economics.utoronto.ca/index.php/tutorial/index/1/cv1/t>

Malthus economics is often called as dismal science. However, due to technological progress, land is able to produce more and more food and still be able to feed all the mankind.

Let us now vary quantities of all inputs. For the purpose of illustration, we consider just two inputs. What holds for two inputs holds for $n$ inputs too. The possibility to change quantities of all inputs implies that we consider a long-run production process because all inputs are variable and there is no fixed input. If all inputs are increased by $k$ percent and output also increases by $k$ percent we have *constant returns to scale*. *Increasing (decreasing) returns to scale* occur when increasing all inputs by $k$ percent leads to increase of output by more (less) than $k$ percent. Mathematically, constant returns to scale are defined as $q(k.\boldsymbol{z}) = k.q(\boldsymbol{z})$, while increasing returns to scale happen when $q(k.\boldsymbol{z}) > k.q(\boldsymbol{z})$; and for decreasing returns to scale holds that $q(k.\boldsymbol{z}) < k.q(\boldsymbol{z})$.

The returns to scale is an important characteristic of production processes. Under increasing returns to scale there is a cost advantage of the large-scale production[5]. Decreasing returns to scale lead to small scale of production. For significant degree of economy of scale, there is a tendency to create a natural monopoly (examples are distribution of gas or oil, national post office, …).

### Technological progress

Production function is not fixed. It changes over time. Technological progress causes the production function to shift outward. This means that the same amount of input(s) leads to higher output. Science and technology help firms and nations to produce more from the same amount of inputs, this is referred to as *increasing efficiency of production*.

An example of production function affected by technological progress is depicted in Figure 2.3. In consequence of technological progress, the production function shifts upward. Impact of technological progress on isoquants can be observed by their downward movement (see Figures 2.4a-c). The shifts display that from the same level of inputs, a higher level of output can be produced; or accordingly, the same level of output can be produced from lesser amount of inputs.

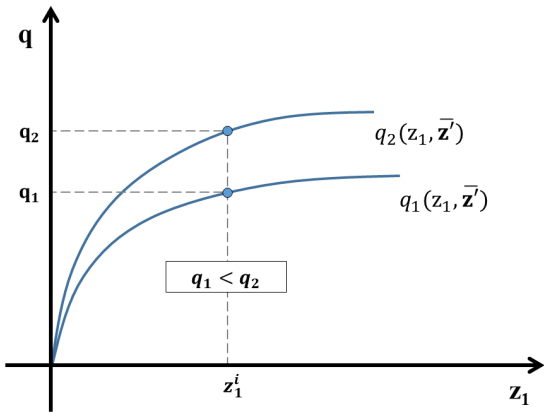



**Figure 2.3** Effect of technological progress on production

Economists define three types of technological progress according its effect on $MRTS$: neutral, labour-augmenting and capital- augmenting technological progress. Let us consider a production function defined as $q = f(z_L, z_K)$, where $z_L$ is quantity of labour and $z_K$ is quantity of capital used to create the maximum output $q$. In case of neutral technological progress, the isoquant moves downward without changing its slope as it is shown in Figure 2.4a. *Capital–augmenting* technological progress causes the isoquant to become flatter, which implies that the marginal rate of technological substitution of labour for capital ($MRTS_{L,K} = \frac{MP_L}{MP_K}$) is smaller than before (Figure 2.4b). This type of progress can, for example, be the result of employing new technically advanced production equipment or new (more effective) software, which increases the marginal product of capital faster than the marginal product of labour. On the other hand, *labour–augmenting* technological progress can be the result of increase in labour skill level in consequence of additional education and training of the workforce or other factors. Here, the marginal

[5] More information at What are large scale production? What are its motives? Retrieved from <http://accountlearning.com/what-are-large-scale-production-what-are-its-motives/>

product of labour grows faster relative to the marginal product of capital. The isoquant is under these conditions steeper than before, Figure 2.4c.

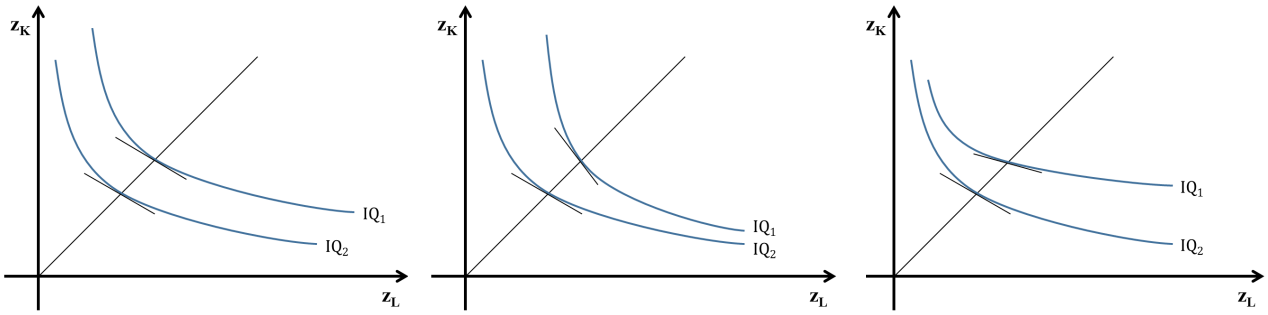



**Figure 2.4a-c** Effects of different types of technological progress

## Exercise

1. Let us suppose that a farmer has 100 hectares of cornfields. He is not able to change the area of land he owns or the number of workers employed; he produces in the short-run. At first, the land was not cultivated, which brought him the yield of 4 tonnes per hectare. The farmer had the option to increase yields by using fertilisers. After applying one unit of fertilisers, the yield was 4.7 tonnes per hectare. An additional unit of fertilisers increased the output to 5.5 tonnes per hectare, a third unit to 6 and the fourth to 6.2. Graphically display farm's total and marginal product.
2. To explain production processes, economists sometimes use a form of production function known as the *Cobb-Douglas production function.* Cobb-Douglas production function is formally defined as $q(z_1, z_2) = Az_1^{\alpha} z_2^{\beta}$, where $\alpha$ and $\beta$ measure the output's response to changes in level of inputs employed. Define the relation between $\alpha$, $\beta$ and returns to scale.
3. The production function of a firm is $q(z_1, z_2) = 3z_1^2 z_2^2$. Firm's plan is to increase all production inputs five times. Define the nature of its returns to scale.

*Solution*

1. The farm from exercise 1 produces in the short-run. Fertilisers ($z_{\text{fe}}$) are the variable production input; other inputs are fixed ($\overline{\boldsymbol{z}'}$). At first, we draw the curve of total product of the corn producing farm, Figure 2.5. We can see that the more fertiliser is being applied, the greater is the total production of corn. Now we calculate the marginal product.

**Table 2.1** Levels of total and marginal product

| Amount of fertiliser (units) | Total product (t) | Marginal product (t) |
|---|---|---|
| 0 | 400 | – |
| 1 | 470 | 70 |
| 2 | 550 | 80 |
| 3 | 600 | 50 |
| 4 | 620 | 20 |

From results displayed in Table 2.1 is clear that by applying more fertilisers, at first, the additional corn production grows; the marginal product curve rises. However, when the quantity of variable input exceeds 2 units (in the concave region of total production curve, in the upper part of Figure 2.5), the farm experiences diminishing marginal returns; the marginal product curve falls.

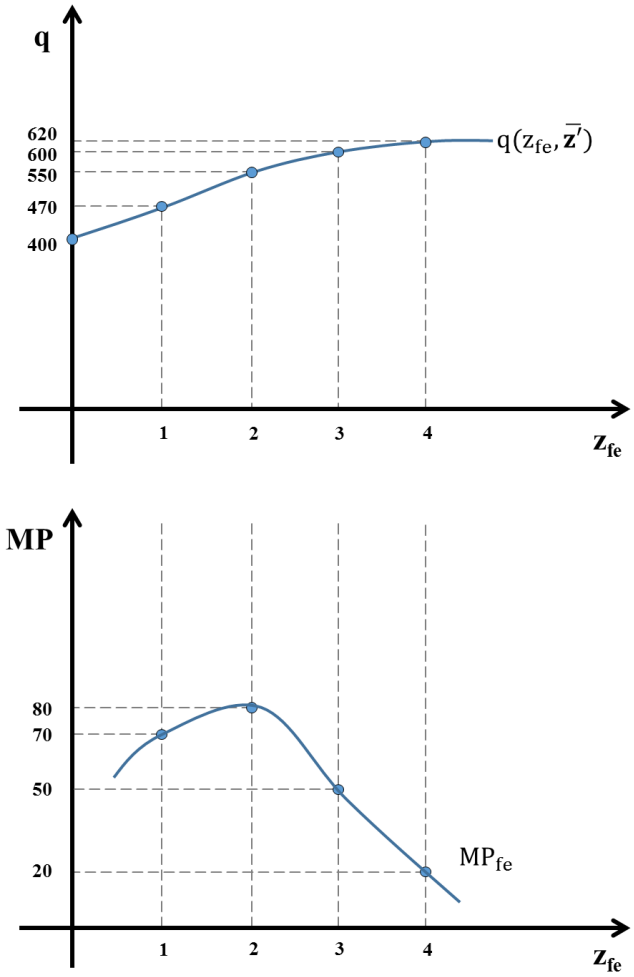



**Figure 2.5** Manifestation of the law of diminishing marginal returns

Note: Exercise 1 is only an example, but the law of diminishing marginal returns can also be reflected in reality. One of the methods farmers can use to increase crop yields is the so-called intensive farming. Its base is a usage of excessive amount of chemical fertilisers, and the result is a growing additional production gained. Research shows, however, that intensive farming affects the environment negatively.[6] Moreover, it is impossible to keep on the increasing crop yields using growing amounts of fertilisers, other inputs and technology being constant. Too much added fertilisers would burn out the crop, which would cause no additional output to be acquired or, in extreme case, the total production could decline.

2. Our goal is to define the relation between $\alpha$, $\beta$ and returns to scale. Returns to scale show how much the production output changes if the inputs change proportionately. Let us suppose that the firm decides to increase each input $k$ times. Then, the level of output increases as follows: $A(k.z_1)^{\alpha}(k.z_2)^{\beta} = k^{\alpha+\beta}Az_1^{\alpha}z_2^{\beta} = k^{\alpha+\beta}\big(q(z_1, z_2)\big)$. If the sum of $\alpha$ and $\beta$ is equal one, the output scales up by the same coefficient as inputs, which refers to the constant returns to scale; $\alpha + \beta > 1$ gives increasing returns to scale and $\alpha + \beta < 1$ decreasing returns to scale.

3. To identify the nature of returns to scale, we calculate the response of output to an increase in production inputs: $3(5z_1)^2(5z_2)^2 = 5^4 \cdot 3z_1^2z_2^2 = 5^4\big(q(z_1, z_2)\big)$. Calculated relation shows that output rose more than 5 times (by $5^4$), hence, the production function exhibits increasing returns to scale.

[6] This example is based on Pillai, M. 2016. An overview of the advantages and disadvantages of intensive farming. Retrieved from <http://www.buzzle.com/articles/advantages-and-disadvantages-for-intensive-farming.html/>

## 2.2 Cost

Expenditure of a firm for acquiring inputs needed to produce given output is firm's cost. Let us denote the output to be produced by $q$. Output $q$ can be produced with different methods, i.e. with different combinations of inputs, which is graphically represented by an isoquant. Profit-maximising firm will choose a production method (combination of inputs) that allows to achieve production $q$ at minimal cost. In other words, the profit-maximising firm will minimise expenditures on inputs subject to achieving output $q$. The cost of the firm therefore depends on the output level $q$, availability of production methods (technology) and on the prices of inputs. Let us denote input vector, $\boldsymbol{z} = (z_1, z_2, \dots, z_n)$, and input prices as $\boldsymbol{w} = (w_1, w_2, \dots, w_n)$. Mathematically the cost minimisation problem for profit-maximising firm can be stated as follows:

$$c(\boldsymbol{w}, q) = \min \boldsymbol{w}.\boldsymbol{z}, \quad \text{s.t. } q(\boldsymbol{z}) = q \tag{2.7}$$

The solution to the cost-minimisation problem is a vector of inputs, $\boldsymbol{z}(\boldsymbol{w}, q)$, which is $z_1(w_1, w_2, \dots, w_n, q), z_2(w_1, w_2, \dots, w_n, q), \dots, z_n(w_1, w_2, \dots, w_n, q)$. The cost function represents the minimal cost of producing $q$ units of output at input prices $\boldsymbol{w}$:

$$c(\boldsymbol{w}, q) = \boldsymbol{w}.\boldsymbol{z}(\boldsymbol{w}, q) \tag{2.8}$$

In two-input case, the cost function is defined as $c(w_1, w_2, q) = w_1 z_1 + w_2 z_2$, where $w_1$ and $w_2$ are prices of input 1 and input 2, and $z_1$ and $z_2$ are amounts of inputs 1 and 2 respectively. $z_1$ and $z_2$ are solution to the cost minimising problem:

$$\min w_1 z_1 + w_2 z_2, \quad \text{s.t. } q(z_1, z_2) = q \tag{2.9}$$

The Lagrangian function of the minimisation problem has the following form,

$$min\ £ = (w_1 z_1 + w_2 z_2) + \lambda(q(z_1, z_2) - q).$$

To solve this unconstrained optimisation problem, we take first derivatives of the Lagrangian function (£) with respect to all decision variables ($z_1$, $z_2$, $\lambda$) and set them equal to zero:

$$\frac{\partial £}{\partial z_1} = w_1 - \lambda \frac{\partial (q(z_1, z_2) - q)}{\partial z_1} = 0,$$
$$\frac{\partial £}{\partial z_2} = w_2 - \lambda \frac{\partial (q(z_1, z_2) - q)}{\partial z_2} = 0,$$
$$\frac{\partial £}{\partial \lambda} = q(z_1, z_2) - q = 0.$$

Solving the set of equations, we get

$$\frac{\partial q(z_1, z_2)/\partial z_1}{\partial q(z_1, z_2)/\partial z_2} = \frac{MP_1}{MP_2} = \frac{w_1}{w_2}, \tag{2.10}$$

which means that marginal rate of technical substitution between two inputs (the ratio of marginal products) is equal to the ratio of their prices.

Marginal rate of technical substitution between two inputs is the slope of the isoquant, while the price ratio is the slope of the so called *isocost line, IC*. Every point on an isocost represents a combination of inputs employed at the same cost. To get the isocost line we set the cost arbitrarily to $c$, then for the isocost applies $w_1 z_1 + w_2 z_2 = c$. After rearranging, we get $z_2 = \frac{c}{w_2} - \frac{w_1}{w_2} z_1$; from that, the slope of an isocost line is defined as a ratio of input prices, $-(w_1/w_2)$.

Graphically, to reach the minimal cost of producing output $q$, we need to find a point on the isoquant that has the lowest possible isocost line associated with it. Such situation is depicted in Figure 2.6. As we can see, to produce the output at minimal cost, it is necessary to employ $z_1^*$ and $z_2^*$ amounts of inputs. The costs are minimised for production of given output $q$ at the point where isoquant associated with level of production $q$ is tangent to the lowest isocost line.

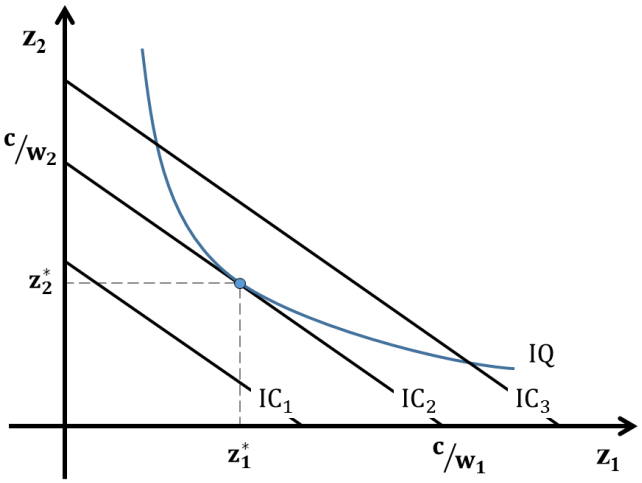



**Figure 2.6** The cost minimisation

## Exercise

The farm near Nitra is growing cherry tomatoes. The farm has its own energy source, and the temperature and watering are controlled by a computer. Another type of capital the farm uses are the buildings and the greenhouse. The harvesting of exclusively ripe tomatoes is done by the farm staff. Let us suppose that farm's production possibilities are represented by an isoquant, $q(z_L, z_K) = (z_L z_K)^{\frac{1}{2}}$, where $z_L$ is the number of staff employed, and $z_K$ is the number of capital units used. The daily wage is €24, and the price of capital is 6 euro per day. The cost function has then the following form: $c = 24z_L + 6z_K$. Calculate the amount of inputs the farm should employ to minimise its production cost to produce the $q = 10$ tonnes of cherry tomatoes.

*Solution*

Farm's cost minimisation problem can be defined as: $\min 24z_L + 6z_K$ s.t. $10 = (z_L z_K)^{\frac{1}{2}}$. The solution can be find with help of Lagrangian function: $\min £ = 24z_L + 6z_K - \lambda(z_L^{\frac{1}{2}} z_K^{\frac{1}{2}} - 10)$. Now, we define the first-order conditions for £ minimisation:

$$\frac{\partial £}{\partial z_L} = 24 - \lambda \frac{1}{2} z_L^{-\frac{1}{2}} \cdot z_K^{\frac{1}{2}} = 0,$$
$$\frac{\partial £}{\partial z_K} = 6 - \lambda z_L^{\frac{1}{2}} \cdot \frac{1}{2} z_K^{-\frac{1}{2}} = 0,$$
$$\frac{\partial £}{\partial \lambda} = z_L^{\frac{1}{2}} z_K^{\frac{1}{2}} - 10 = 0. \qquad \text{(E.2.1)}$$

Next, we solve the equations for $z_L$, $z_K$ and $\lambda$: $\frac{24 \cdot 2}{z_L^{-\frac{1}{2}} \cdot z_K^{\frac{1}{2}}} = \lambda$ and $\frac{6 \cdot 2}{z_L^{\frac{1}{2}} \cdot z_K^{-\frac{1}{2}}} = \lambda$. As $\lambda = \lambda$, we can write that $\frac{24 \cdot 2}{z_L^{-\frac{1}{2}} \cdot z_K^{\frac{1}{2}}} = \frac{6 \cdot 2}{z_L^{\frac{1}{2}} \cdot z_K^{-\frac{1}{2}}}$. Thus,

$$z_K = 4z_L. \qquad \text{(E.2.2)}$$

Now, we substitute equation (E.2.2) into (E.2.1): $10 = z_L^{\frac{1}{2}}(4z_L)^{\frac{1}{2}} = z_L^{\frac{1}{2}} \cdot 2z_L^{\frac{1}{2}} = 2z_L$. From that we get the solution for farm's cost minimisation problem, $z_L = 5$, and substituting it into the equation (E.2.2), $z_K = 20$. We calculated that to be able to produce 10 tonnes of cherry tomatoes, the farm has to employ 5 workers and use 20 units of capital.

### 2.2.1 Cost curves

In the short-run, some costs are fixed because they are incurred whether the firm produces some output or not. For instance, the firm pays the same mortgage or rent irrespective of the level of production. Variable costs, on the other hand, depend on the level of output. With rising production, variable costs increase while fixed costs remain unchanged. Total cost, $c(q)$, or sometimes denoted as $TC(q)$, is the sum of variable cost, $VC(q)$ and fixed cost, $FC$:

$$c(q) = TC(q) = VC(q) + FC \tag{2.11}$$

Figure 2.7 depicts an example of short-run total cost curve. The total cost curve is graphically a vertical summation of variable cost curve and fixed cost curve. Note, that when firm produces zero output total cost equal to fixed cost.

Producers are not only concerned with total costs of production but also with per-unit (average) costs. Average total cost, $ATC(q)$, is the sum of average variable cost, $AVC(q)$, and average fixed cost, $AFC(q)$:

$$ATC(q) = \frac{c(q)}{q} = \frac{VC(q)}{q} + \frac{FC}{q} = AVC(q) + AFC(q) \tag{2.12}$$

The rate at which the total cost changes with respect to a change in output represents the *marginal cost* denoted by $MC(q)$. In other words, marginal cost shows what is the change in total cost, if the firm changes output by one unit (infinitesimal amount when derivatives are used):

$$MC(q) = \frac{\partial c(q)}{\partial q} = \frac{\partial VC(q)}{\partial q} \tag{2.13}$$

Because $FC$ is constant and the first derivative of a constant is zero, marginal cost is the first derivative of total cost with respect to output as well as the first derivative of variable cost with respect to output. Both marginal and average cost curves can be derived from the total cost curve.

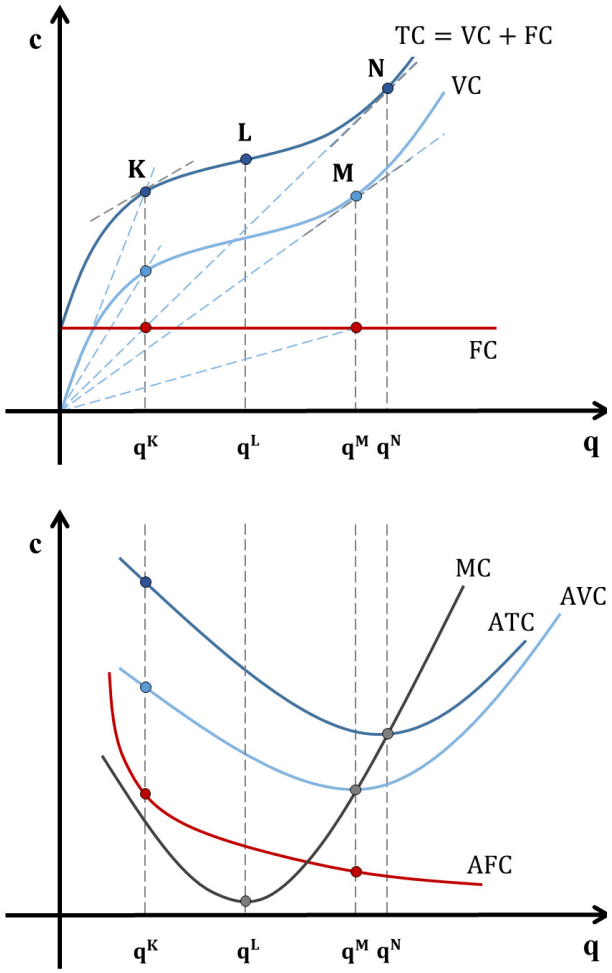



**Figure 2.7** Short-run total and average cost curve

Marginal cost is the slope of total cost curve (or the variable cost curve as these two curves only differ by a constant $FC$) at that point. At point L (Figure 2.7) the slope of $TC$ is the lowest, therefore, as the firm produces $q^L$ level of output, the marginal cost is minimal. This means that up to $q^L$, $MC$ curve will be downward sloping; and with rising output, the $MC$ curve is increasing too.

At any level of output, the average cost is equal to the slope of a ray from the origin to a particular point on total cost curve. The higher is the slope of the ray, the higher average cost it represents. From Figure 2.7 we see that for $FC$ curve, by drawing rays at greater and greater level of output, slope of rays is decreasing. Therefore, the whole $AFC$ curve is downward sloping. For $TC$ and $VC$ curve, rays 0N and 0M represent rays with the lowest slope; $ATC$ and $AVC$ curves have their minimum at output $q^N$ and $q^M$. Notice that at point N, the slope of a ray drawn to that point is equal to the slope of $TC$ curve; and accordingly, at point M, the slope of a ray drawn to that point is equal to the slope of $VC$ curve. Thus, $MC$ curve intersects $ATC$ curve and $AVC$ curve at their minimum point.

In the long-run, all firm's costs are variable, and therefore, the total cost is defined as:

$$c(q) = TC(q) = VC(q) \tag{2.14}$$

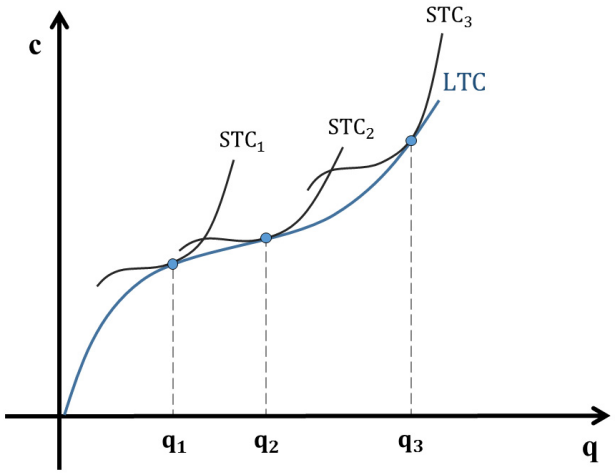



**Figure 2.8** Long-run total cost curve as the envelope of short-run total cost curves

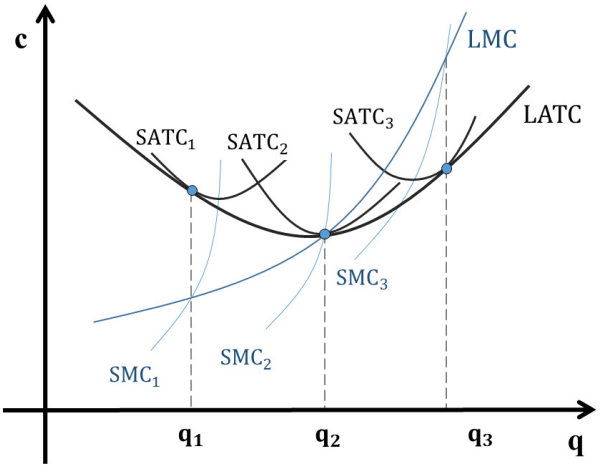



**Figure 2.9** Long-run average and marginal cost curve

In Figure 2.8, we can see the relationship between the short-run total cost of a firm, $STC$, and the long-run total cost, $LTC$. Lon-run total cost is the lower envelope of the short-run total cost curves. The reason is that long-run cost is always lower than short-run costs of the firm Unlike in short-run, in long-run, the firm can freely choose the amount of all inputs optimally. In short-run the amounts of some inputs are fixed and not subject to the choice of the firm.

The envelope relationship applies not only for total cost curves, but also for average total cost as it is depicted in Figure 2.9. The marginal cost curve intersects the long-run average total cost curve at its minimum. For average total cost in the long-run applies that:

$$ATC(q) = \frac{VC(q)}{q} = AVC(q) \tag{2.15}$$

## 2.3 Profit maximisation

The difference between *total revenue*, $R(q)$, and total cost, $c(q)$, of production is the *profit*, $\pi(q)$:

$$\pi(q) = R(q) - c(q) \tag{2.16}$$

Total revenue is the product of output price multiplied by quantity of output, $R(q) = p.q$. Profit can be therefore expressed as $\pi(q) = p.q - \boldsymbol{w}.\boldsymbol{z}$.

When the objective of a firm is to maximise profits, the firm will choose the level of output and inputs at which applies:

$$\max\ p.q - c(q) \tag{2.17}$$

The first-order condition for maximum is that the first derivative of $\pi$ with respect to $q$ is zero,

$$\frac{d\pi}{dq} = \frac{d(p.q)}{dq} - \frac{dc(q)}{dq} = 0, \tag{2.18}$$

which solves for

$$\frac{d(p.q)}{dq} = \frac{dc(q)}{dq}. \tag{2.19}$$

Equation (2.19) can also be written as

$$MR = MC. \tag{2.19.1}$$

It means that a firm can maximise profits if it produces at the level of output where *marginal revenue* ($MR$), which is the rate at which the total revenue changes with respect to a change in firm's output, equals *marginal cost* ($MC$).

The second-order condition for profit maximisation requires the second derivative of $\pi$ with respect to $q$ to be negative:

$$\frac{d^2\pi}{dq^2} = \frac{d^2(p.q)}{dq^2} - \frac{d^2c(q)}{dq^2} < 0 \tag{2.20}$$

and from that,

$$\frac{d^2(p.q)}{dq^2} < \frac{d^2c(q)}{dq^2}. \tag{2.20.1}$$

According equation (2.20.1), the algebraic value of slope of the marginal cost must be greater than the algebraic value of the marginal revenue's slope.

# Chapter 3 MARKET AND MARKET STRUCTURES

## 3.1 Market demand

A *market* is a place where sellers (producers) sell or rent out products, commodities, services or anything else what is tradeable to buyers (consumers). Some markets are well organised and interaction between buyers and sellers takes place in a specific time and place like for example auctions of paintings or stock exchanges, while other markets can be dispersed over large territories or extended over long times like cereals markets or eBay market place.

*Market demand* is the relationship between prices and quantities demanded by all consumers at the market. Graphically, market demand is represented by the *market demand curve*. The market demand curve is a horizontal summation of all individual demand curves. For illustration, a two-consumer market is depicted in Figure 3.1. There are two consumers who have different individual demand curves resulting from their different preferences and incomes.

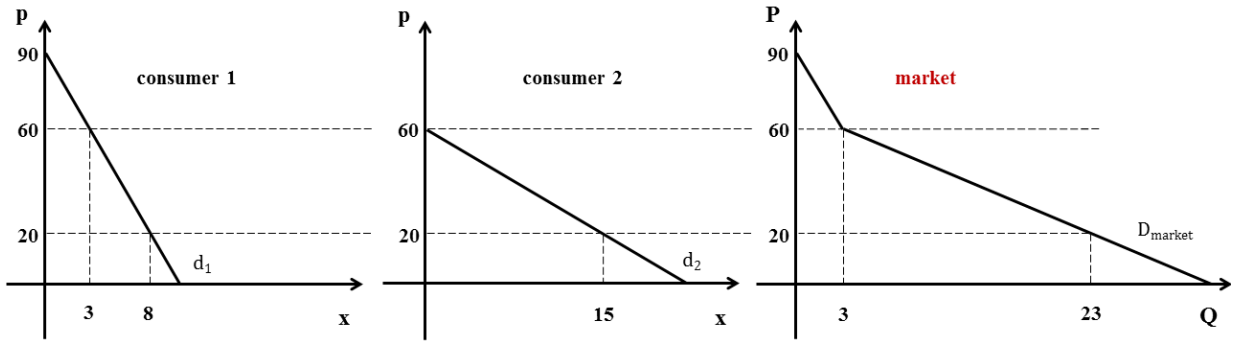



**Figure 3.1** Derivation of market demand curve

To derive the market demand curve $(D)$, we add the quantities of the good each consumer purchases at each price. This is a horizontal summation. For example, at the price of 20 EUR/unit, consumer 1 demands 8 units and consumer 2 demands 15 units. The market demand amounts to 23 units at price 20 EUR/unit. Note that when the market price is between 90 EUR/unit and 60 EUR/unit, the market demand consists of only consumer 1. When price falls below 60 EUR/unit, the market demand is a summation of individual demands of both consumers.

The *law of demand* says, that other things being equal, when the price of a good rises, the quantity demanded falls and vice versa. Economists use a demand function defined as $Q(P)$, which means that quantity demanded of a good $(Q)$ is a function of price $(P)$.

### 3.1.1 Determinants of changes in demand

Demand relationships do not remain stable over time. Change of the own price of the good affects quantity demanded, while change of other determinants of demand (preferences, incomes, prices of other goods …) could shift the demand curve or change its slope.

There is a difference between the change in quantity demanded and the change in demand. Graphically, change in quantity demanded is a result of own price change and it is represented by a movement along the demand curve, Figure 3.2. For example, if the market price falls from $P_1$ to $P_2$ quantity demanded increases from $Q_1$ to $Q_2$.

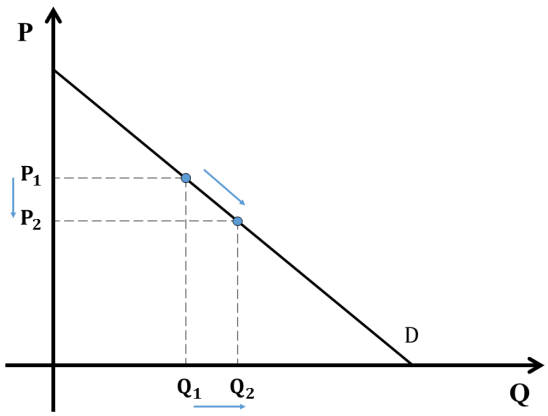



**Figure 3.2** Change in quantity demanded

The change in other determinants of demand (not own price) shifts the demand curve to the right (i.e. demand increases, Figure 3.3a) or to the left (i.e. demand decreases, Figure 3.3b) or impacts the slope of the demand curve. The most important determinants of demand are number of buyers, age and geographic distribution of buyers, tastes and preferences, expectations, prices of complements and substitutes, consumers' income and its distribution.

**Number of buyers:** The rise of number of buyers (population growth or immigration) shifts the demand curve to the right. Outmigration or reduction of population growth shifts demand curve to the left. Change of the distribution of buyers by age or education or income shifts the demand curve too.

**Preferences:** Preferences of buyers need not stay fixed. They can be affected by marketing, new scientific evidence, changes in lifestyles or other factors. Change of preferences of consumers' leads to the shift of the demand curve to the right or to the left.

**Expectations:** Buyers form expectations about future, which affects current decisions. If buyers expect that the price will decrease in the future, they are less willing to buy the good at the current price. They will postpone purchase decision and current demand curve shifts to the left.

**Income:** The rise of income shifts demand curve to the right for normal goods, while it shifts demand curve to the left for inferior goods. The change of income distribution also affects the demand.

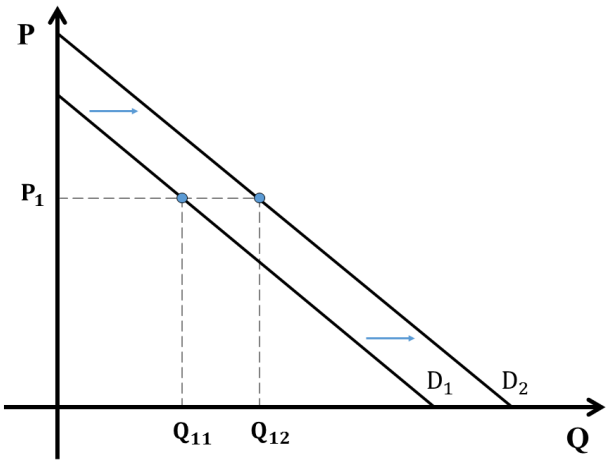



**Figure 3.3a** Increasing demand

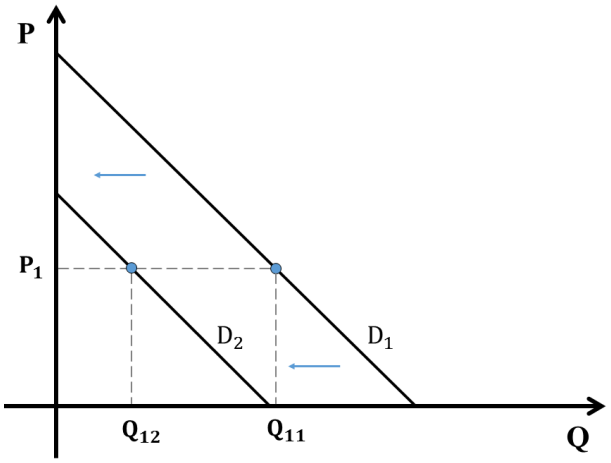



**Figure 3.3b** Decreasing demand

### 3.1.2 Demand elasticity

Consumers react to change of own price, income, and prices of other goods by change in quantity demanded. The intensity of the consumer response to changes in prices and income can be measured by elasticities. The most commonly used elasticities are own-price, cross-price and income elasticities. Elasticities are unit-free numbers and therefore are not dependent on the units of measurement. On the other hand, slopes of the demand curve depend on the measurement units, which means that changing units of measuring weight from kilograms to pounds affects the slope but has no impact on the elasticity.

**Own-price elasticity (price elasticity)**

Own-price elasticity of demand ($E_{pd}$) measures percentage change in quantity demanded for 1 percent change in own price:

$$E_{pd} = \frac{\%\Delta Q}{\%\Delta P} = \frac{\frac{\partial Q}{Q}}{\frac{\partial P}{P}} = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q} \tag{3.1}$$

$P$ and $Q$ represent the co-ordinates of the point on the demand curve at which the elasticity is measured. Different points on the demand curve therefore can have different elasticity. The $\partial Q/\partial P$ is the partial derivative of demand function with respect to the price. The ratio represents the slope of demand curve.

Since the slope of demand function is negative, the price elasticity coefficient has a negative sign, $E_{pd} \in \langle 0, -\infty)$. If the absolute value of the coefficient of price elasticity is greater than 1, demand is *elastic*. It means that a good's quantity demanded is responsive to price change, i.e. a small change of price leads to large change in quantity demanded. If the coefficient is less than 1, demand is *inelastic*, and quantity demanded is relatively unresponsive to price change. Large change of price leads to a small change of quantity demanded. The limiting cases are the *perfectly elastic* and *perfectly inelastic* demand curves. In the former case, the price elasticity is infinity and demand curve is horizontal, while in the latter case the price elasticity is 0 and the demand curve is vertical.

Since the elasticity varies along the demand curve, demand can be elastic within some range of prices while inelastic within some other range of prices. For some demand functions, however, the price elasticity is constant along the whole curve. For example,

$$Q = k.P^{(-\eta)}, \tag{3.2}$$

where $k$ and $\eta$ are positive numbers, and price elasticity equals to

$$E_{pd} = -\eta. \tag{3.3}$$

Price elasticity is closely related to revenues. Revenue is defined as the product of price and quantity sold,

$$R = P.Q. \tag{3.4}$$

Due to the fact that price and quantity are inversely related, it is not immediately clear how the price would affect revenue. If demand for a good is own price elastic, the percentage change in quantity is greater than the percentage change in price. This means that quantity change has a bigger impact on revenue than the change of price. For example, let us assume that price of a good rises; then, quantity of good purchased falls. If demand for this good is elastic, the revenue decreases too. Thus, in case of elastic demand, price and revenue are negatively related. Price and revenue are positively associated in case of inelastic demand.

**BOX**

**Demand elasticities of food in Slovakia**

Many studies deal with the estimation of food demand elasticities. For example, authors Benda-Prokeinová and Hanová estimated food demand elasticities in Slovakia using the household budget survey data over the period of 1999-2014. They found out that demand for beef, pork, poultry, potatoes and milk is own-price elastic (see the Table 3.1), and demand for fish, rice, flour, bread and fruit is own-price inelastic.

The results also show that the own price changes affect the quantity demanded of bread and fruit only slightly. On the other hand, the reaction of pork's and milk's quantity demanded to own price changes is relatively strong.

**Table 3.1**
Own-price elasticity of food demand in Slovakia

| Type of food | Own-price elasticity |
|---|---|
| Beef meat | -2.22 |
| Pork meat | -3.16 |
| Poultry | -1.02 |
| Fishes | -0.68 |
| Potatoes | -1.24 |
| Fruits | -0.13 |
| Rice | -0.20 |
| Flavour | -0.33 |
| Bread | -0.08 |
| Milk | -3.23 |

Source: Benda-Prokeinová and Hanová, 2016[7]

### Income elasticity

Income elasticity ($E_Y$) of demand measures a percentage change of the quantity demanded for 1 percent change in income:

$$E_y = \frac{\%\Delta Q}{\%\Delta Y} = \frac{\frac{\partial Q}{Q}}{\frac{\partial Y}{Y}} = \frac{\partial Q}{\partial Y} \cdot \frac{Y}{Q} \tag{3.5}$$

For most goods, $E_y$ is positive. An increase in consumer income leads to an increase in quantity demanded. Goods that have positive income elasticity are called superior goods. On the other hand, for inferior goods income elasticity is negative. Superior goods (also called normal goods) are further divided into necessities and luxuries (Table 3.2).

**Table 3.2** Income elasticity and resulting categories of goods

| Value of income elasticity | Characteristic of goods or services |
|---|---|
| $E_y > 0$ | **superior good** |
| $E_y \in (0,1)$ | necessities |
| $E_y > 1$ | luxuries |
| $E_y = 0$ | **sticky good** (a change of income has no impact on quantity bought) |
| $E_y < 0$ | **inferior good** |

Most of agricultural goods are superior goods. A fragment of superior goods are goods consumer cannot live without, known as *necessity goods*. Demand for such goods is not very responsive to income changes. The examples of necessity goods are drinking water, salt, bread, basic clothing, some medications

[7] Source: Benda-Prokeinová, R. – Hanová, M. 2016. Consumer's behavior of the foodstuff consumption in Slovakia. In Procedia - Social and Behavioral Sciences, vol. 220, pp. 21 – 29. ISSN 1877-0428. Retrieved from <https://ac.els-cdn.com/S1877042816305663/1-s2.0-S1877042816305663-main.pdf?_tid=7dda9c36-cecc-11e7-931a-00000aacb35d&acdnat=1511276514_86b294fdc47a556dc00a4bf6e275d973>

or petrol. What should be also noted is that high-income households have in general smaller income elasticity for food than low-income households.

In empirical studies, income elasticity is sometimes computed from expenditure data (from household surveys) and not from data on quantities and income. Important is the relation between expenditures on an individual good and consumers' or households' total expenditures. Such elasticity can be interpreted as percentage change (or respond) of expenditures on a commodity to 1-percent change of total expenditures.

### Cross-price elasticity

Cross-price elasticity ($E_{ij}$) measures a percentage change in quantity demanded for good $i$ for 1 percent change in price of good $j$:

$$E_{ij} = \frac{\%\Delta Q_i}{\%\Delta P_j} = \frac{\frac{\partial Q_i}{Q_i}}{\frac{\partial P_j}{P_j}} = \frac{\partial Q_i}{\partial P_j} \cdot \frac{P_j}{Q_i} \tag{3.6}$$

Based on the value of cross-price elasticity, goods are classified into substitutes, complements, and independents (Table 3.3).

**Table 3.3** Cross-price elasticity and resulting relations of goods

| Value of cross-price elasticity * | Relationship between good $i$ and $j$ |
|---|---|
| $E_{ij} > 0$ | $i$ and $j$ are substitutes |
| $E_{ij} = 0$ | $i$ and $j$ are independent |
| $E_{ij} < 0$ | $i$ and $j$ are complements |

Note: *This cross-price elasticity values are relevant only for goods for which $SE > IE$ (it will not hold for Giffen goods or goods with large share of expenditures on total consumer expenditures).

*Example*

How would a price change in good $j$ ($P_j$) affect the demand for good $i$? At first, rise of $P_j$ would result in a fall of good's own quantity demanded ($Q_j$).

In case $i$ and $j$ are substitutes, consumers will substitute relatively cheaper good $i$ for the now relatively more expensive good $j$. Consequently, quantity demanded of good $i$ ($Q_i$) increases, and quantity demanded of good $j$ decreases. We see that $P_j$ and $Q_i$ are positive correlated, therefore $E_{ij} > 0$. Do not forget that we would get the same result also by analysing the case for a fall of price $P_j$.

In case $i$ and $j$ are complements, there is a negative relationship between $P_j$ and $Q_i$. An increase in price $P_j$ would cause a decrease in $Q_j$, and quantity of the complementary good $i$ would decline too. If $i$ and $j$ are independent on each other, change in $Q_j$ in consequence of $P_j$ change will have no effect on quantity of good $i$.

Important is also to know that cross-price elasticity $E_{ij}$ and the reversed elasticity $E_{ij}$ do not necessarily have to be equal. Here is an example of this fact.

*Example*

Let good $i$ be tee and good $j$ honey. Than cross-price elasticity of tee with respect to honey may be different from cross-price elasticity of honey with respect to tee. It is possible that the reaction of quantity demanded of tee on a change in price of honey could be stronger than the reaction of honey's quantity demanded on change in tee price.

### 3.1.3 Some properties of agricultural demand

There are some specific properties of demand for agrarian commodities and food resulting from special characteristics of these commodities.

**Speculative demand**

The typical characteristic of food or agriculture commodities is that they are produced seasonally but consumed during the whole year. Therefore, price of the commodities is increasing from harvest during the year. The total demand function includes demand for current and for the future (speculative or expected) use of goods as well. Agriculture harvest is influenced by weather or consumption trends but also by transportation conditions, which in consequence of crises, strikes or wars could be endangered. So, if a crisis or poor harvest is expected, speculative demand can rise and influence the total demand for goods. Moreover, the current prices can be affected by expected future market situations.

**Derived demand**

Demand for production inputs is derived from consumers demand for the final product. In case of derived demand, economist have to consider not only the traditional demand determinants (consumer income, population, the own price of a good, etc.); also important are the conditions on markets with the primary (processed) goods.

Note that most of agricultural products serve as inputs to produce final goods. For example, demand for flour is derived from demand for bread. If demand for bread increases, demand for flour increases too. Also, demand for certain food ingredients are affected by demand for final meals made from these ingredients. Another example is that the demand for labour, capital, and land is affected by demand for products produced by this production factors.

## 3.2 Market supply

*Market supply* is the relationship between prices and quantities supplied by all producers at the market. Graphically, market supply is represented by the *market supply curve*. The market supply curve is a horizontal summation of individual supply curves of all producers in the market in a particular time period.

Let us assume, there are only two firms in the market (Figure 3.4). To derive the market supply curve, we sum up the quantity of goods each producer supplies at each price. At price of 35 €/unit, for example, the seller 1 supplies 5.5 units while the seller 2 supplies 2.5 units. Market supply is therefore 8 units at that price. At price of 8 €/unit, only seller 1 is willing to supply the market, therefore, market supply consist of only seller's 1 supply. When we follow this logic at all prices, we get the good's market supply.

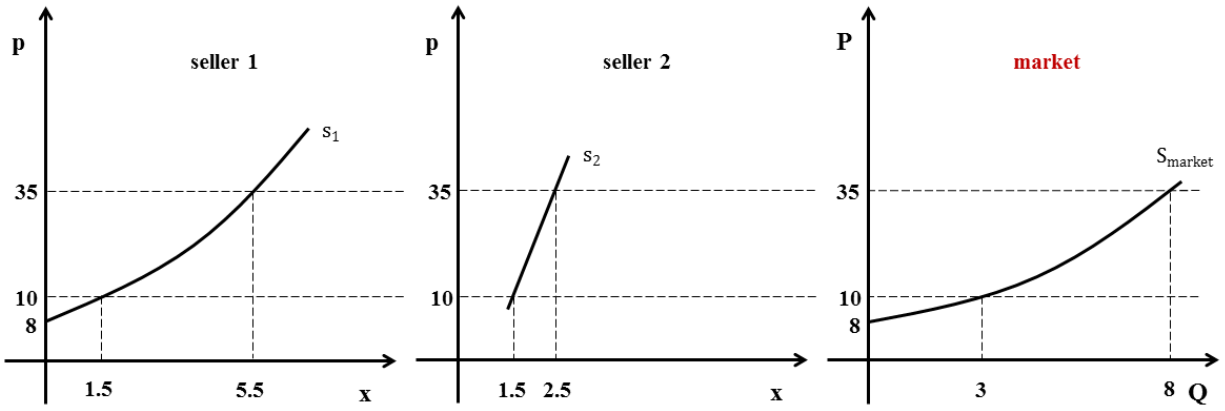



**Figure 3.4** Derivation of market supply curve

### Determinants of changes in supply

When the price of a good rises, sellers are more motivated to supply goods, and the quantity supplied rises and vice versa. This relationship between price and quantity supplied is illustrated in Figure 3.5 and is known as the *law of supply*. Change of other determinants of supply cause the supply curve to shift, Figure 3.6. The most important determinants of supply are input price, technology, prices of other goods, expectations and number of producers.

**Input price:** If the price of one or more inputs rises, the production costs increase and at given price firms produce less. Some firms leave the market as they are not competitive at higher input costs. For example, the rise of rental price of land causes the decline of agricultural production.

**Technology** affects production function. Better technology means that more output (or better) is produced from the same amount of inputs. Unit costs therefore decline, and supply curve shifts to the right. At given price firms produce more.

**Prices of other goods:** Usually, producers produce more than just one output. Vegetable growers produce for example carrots, tomatoes, potatoes, cabbage, etc. If market price of carrots increases, producers devote more land to production of carrots and less land is available for other commodities, which means that supply curve for other goods shifts to the left.

**Expectation** of future affect current decisions. If producers expect that price will increase in the future, they will increase production immediately and store products for future sale at higher price. Current supply curve will shift to the right.

**Number of sellers** is closely related to market supply. If number of vendors of hot-dogs increases, supply of hot-dogs in the city goes up too. In the end, supply curve for hot-dogs shifts to the right.

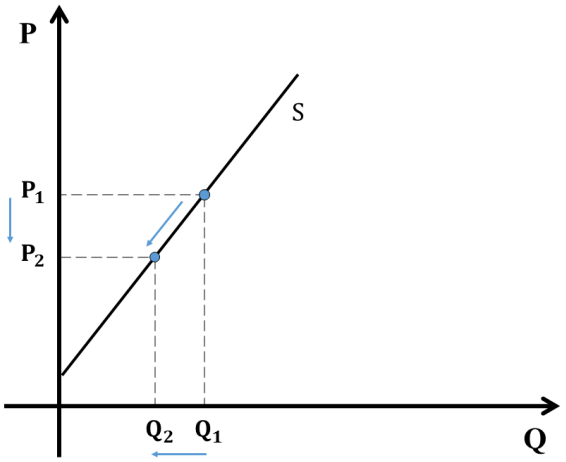



**Figure 3.5** Change in quantity of good supplied

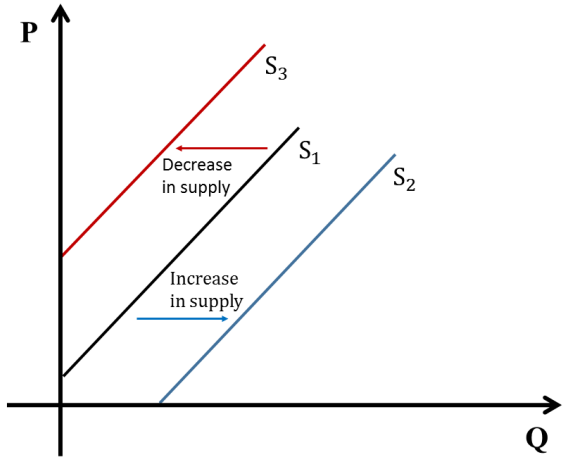



**Figure 3.6** Increase and decrease in supply

### Own-price elasticity (price elasticity)

Producers react to change of own price, costs of production, technology by change in quantity supplied. Own-price elasticity of supply ($E_{ps}$) measures percentage change in quantity supplied for 1 percent change in own price:

$$E_{ps} = \frac{\%\Delta Q}{\%\Delta P} = \frac{\frac{\partial Q}{Q}}{\frac{\partial P}{P}} = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q} \tag{3.8}$$

When the absolute value of the coefficient of price elasticity is greater than 1, supply is *elastic*. It means that quantity supplied is responsive to price change. When the coefficient is less than 1, supply is *inelastic*, and quantity supplied is relatively unresponsive to a price change. The price elasticity depends on how flexible are the producers to change the amount of good produced when its price changes. Supply is quite inelastic in short-run and more elastic in the long-run. In a very short time, we can observe a *perfectly inelastic* supply curve, where $E_{ps} = 0$ and the supply curve is vertical. In case of perfectly inelastic supply curve, the quantity supplied does not react to a price change.

In the short-run, the supply elasticity is positive because the supply curve is upward-sloping. According the law of diminishing marginal returns, the productivity of the variable input decreases when more of that input (other inputs holding constant) is used. Marginal cost therefore increases too, and higher market price is needed to break even. In other words, in the short-run, the firm will supply more only at higher market price. In the long-run supply curve can be upward sloping but also horizontal or downward sloping.[8] Long-run own price elasticity of supply can be positive, infinite (*perfectly elastic* supply curve) or negative.

[8] More information on downward-sloped supply curves you can find here: <http://www.economicsdiscussion.net/articles/short-run-and-long-run-supply-curves-explained-with-diagram/1677>

## Exercise

1. Illustrate the impact of following events on the demand for beefsteaks:
   a) There is a significant increase in the price of beefsteaks.
   b) Health journal announces that "reducing red meat intake will likely decrease the incidence of CHD (Congenital Heart Defect), diabetes, colon cancer, and possibly premenopausal breast cancer"[9].
   c) There is an increase in the cost of producing beefsteaks.
   d) There is an increase in the price of white meat, which is generally considered to be red meat's substitute.
   e) There is a decrease in the income of consumers of red meat; the beefsteak is considered to be a superior good.
2. Suppose demand for beef has the following form: $Q = 125P^{-3}$. *Determine the value of demand's price elasticity. How would an increase in beef meat market price (ceteris paribus) affect producers' revenue in the market?* The original price of beef was 5 €/kg, now consumers can buy beef for 6 €/kg, and the quantity of beef purchased is given in tonnes.
3. Scientists estimated demand function for cars: $Q_c = 5{,}000.6 - 1P_c - 4{P_f}^2 + 0.1Y$, where $Q_c$ is the quantity of cars purchased, $P_c$ is average price of cars, $P_f$ represents the average price of fuel and $Y$ the average income of a household.
   a) Calculate income elasticity of demand for cars, when the average household income in the monitored period of time was 18,000 € per year and household, and average annual number of cars purchased was 1,000.
   b) Calculate cross-price elasticity between cars and fuels, when the average annual fuel price was at level of 1.20 €/litre.

*Solution*

1. Commonly, the meat of four-legged land animals (beef, pork and lamb) is known as red meat.
   a) An increase in beefsteaks price causes a change in quantity of beefsteaks demanded. As the commodity is more expensive, its quantity demanded will fall. This situation is depicted below in Figure 3.7a.
   b) The negative journal article will cause demand for red meat to fall as some consumers will likely stop or limit their beef meat consumption in the future, Figure 3.7b.
   c) Increase in production costs does not affect the demand for beefsteaks; the production costs affect changes in good's supply.
   d) A price of a substitute for beefsteaks, price of white meat, increased. As a result, some consumers will substitute the relative more expensive good, white meat, with relative cheaper good; the demand for beefsteak will increase as it is shown in Figure 3.7c.
   e) Lower consumer income causes demand for superior goods to fall. Demand for beefsteak is negatively affected by consumers' decrease in purchasing power, Figure 3.7b.

[9] This example is based on Willett, W.C. – Stampfer, M.J. 2013. Current evidence on healthy eating. In Annual review of public health, vol. 34, pp. 77-95. Retrieved from <http://www.annualreviews.org/doi/10.1146/annurev-publhealth-031811-124646>

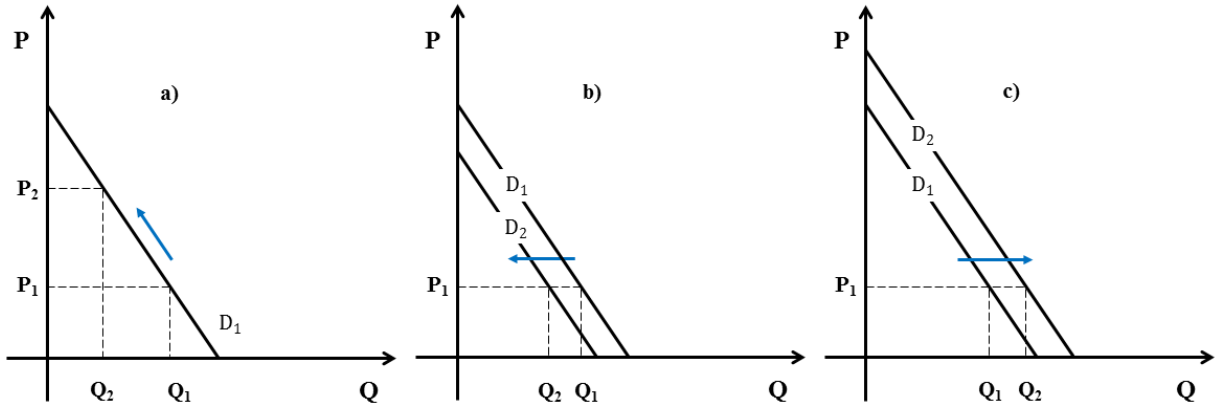



**Figure 3.7a-c** Changes in demand for beefsteaks

2. We use equation (3.2) to calculate the value of price elasticity of demand. At first, we determine the derivative of $Q$ with respect to $P$, and then we substitute the demand equation into the ratio $P/Q$:

$$E_{pd} = \frac{\partial Q}{\partial P} \cdot \frac{P}{Q} = \frac{\partial(125P^{-3})}{\partial P} \cdot \frac{P}{125P^{-3}} = -375P^{-4} \cdot \frac{1}{125} P^4 = -3 \ .$$

The demand price elasticity is $-3$, demand is elastic along the entire curve. With these results, we verified the validity of equation (3.3).

If the price of beef rises from 5 €/kg to 6 €/kg, what amount of beef will consumers purchase? Substituting the price development into the demand function we get $Q_{P=5} = 125 \cdot 5^{-3} = \frac{125}{5^3} = 1$ tonne and $Q_{P=6} = 0.58$ tonne.

According to theory, if demand is elastic, quantity change has a bigger impact on revenue as the price change. Let us verify this information. At first, producers' revenue was $R = PQ = 5 \cdot 1 = 5$ thousand euro. The new revenue of producers at the higher market price is $R = 3.47$ thousand euro. The result is that the decrease of quantity of beef purchased has a bigger impact on revenue that the increase in beef price. Therefore, the revenue decreased too.

3.

a) To calculate the income elasticity of demand for cars, at first, we determine the partial derivative of demand function with respect to the household income. Secondly, we multiply the result by the ratio of means of income and quantity purchased:

$$E_y = \frac{\partial Q_c}{\partial Y} \cdot \frac{Y}{Q_c} = 0.1 \cdot \frac{18{,}000}{1{,}000} = 1.8$$

The value of income elasticity tells us that consumers consider cars to be superior and luxury goods.

b) Analogous to problem a) we determine the demand cross elasticity:

$$E_{CF} = \frac{\partial Q_c}{\partial P_f} \cdot \frac{P_f}{Q_c} = -8 \cdot \frac{1.20}{1{,}000} = -0.0096$$

The cross-price elasticity value is negative, which is a sign of complementary relation between cars and fuels used for the cars.

## 3.3 Market equilibrium

The intersection of the demand and supply curves is called a *market equilibrium* (point E), Figure 3.8. Equilibrium price, $P^*$, is the price at which quantity supplied equals quantity demanded. At this price, there is neither surplus nor shortage at the market. At prices above equilibrium price, quantity supplied is bigger than quantity demanded and there is a surplus of goods on the market, while at prices below equilibrium price, quantity demanded is higher than quantity supplied resulting in shortage of goods at the market.

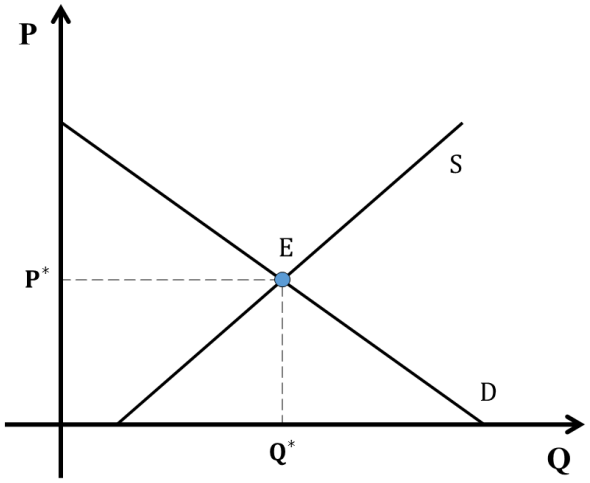



**Figure 3.8** Market equilibrium

Figure 3.9a denotes the situation when price is above the equilibrium price. At price $P_1$, quantity supplied is $Q_s$ and quantity demanded is $Q_d$. The difference $Q_s - Q_d$ represents market shortage. This situation is not stable, and a pressure is created for the price to decline. Figure 3.9b, on the other hand, denotes the situation when price is below the equilibrium price. At price $P_2$ quantity supplied is $Q_s$ and quantity demanded is $Q_d$. The difference $Q_d - Q_s$ is market surplus. At this price, there is a pressure for the price to go up.

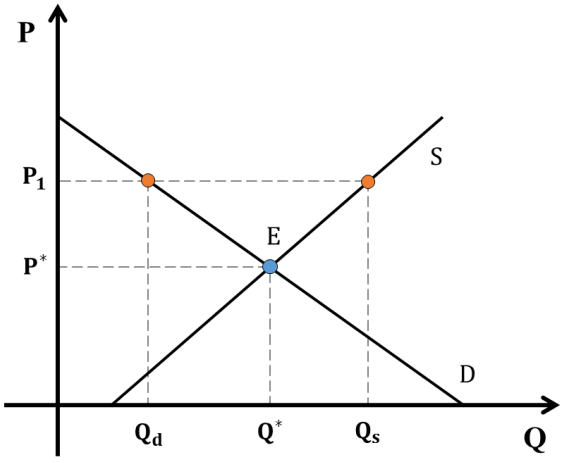



**Figure 3.9a** Excess supply

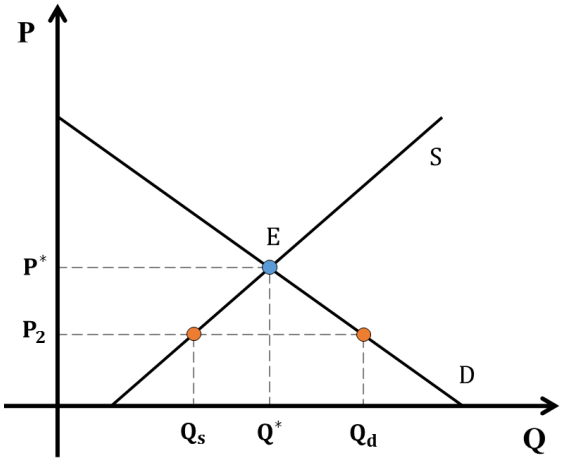



**Figure 3.9b** Excess demand

### 3.3.1 Consumer and producer surplus

Let us consider a market demand for office water delivery of a company as it is depicted in Figure 3.10a. Amount of water supplied monthly for one person is usually around 10 litres. This amount of water will represent one unit of water demanded. According the figure, the maximum price the company is willing to pay for one unit of water is €3.6; buying 20 litres of water, company is willing to pay 3.3 €/unit; for 30 litres of water, it is willing to pay 3 €/unit, and so on. Now, suppose the market price of office water supply is 2.1 euro per unit of water, which is lower than company's willingness to pay. From that we can clearly see that the company is better off when purchasing the good at the market given price. This benefit is called the *consumers surplus* ($CS$), and it is the difference between the price consumers are willing to pay and the price they are actually paying to purchase the good in the marketplace. In our example, consumer surplus of the company is €4.5 (€1.5 when buying 1 unit of water + €1.2 when buying the second unit + €0.9 for the third + €0.6 for fourth + €0.3 for fifth unit). Graphically, consumer surplus is represented by the shaded area in Figure 3.10a; it is the area below the demand curve and above the market price consumers pay for the good. This also applies for a smooth or continuous demand curve as it is depicted in Figure 3.10b.

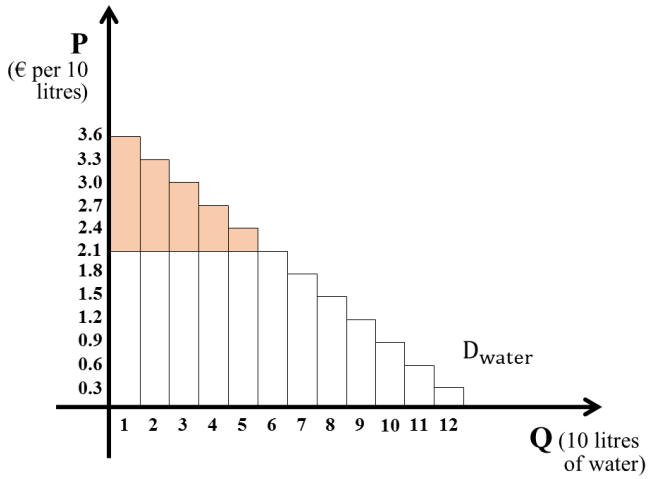



**Figure 3.10a** Consumer surplus, discrete demand

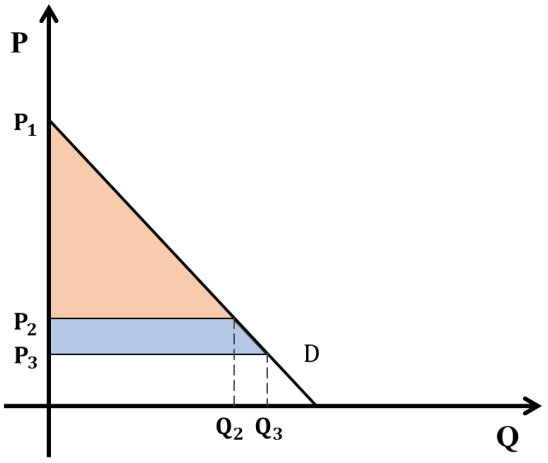



**Figure 3.10b** Consumer surplus, continuous demand

In the figure, $P_1$ is the maximum price consumers are willing to pay for a unit of a good and $P_2$ is the actual market price at which consumer must buy the good; then, consumer surplus is represented by the orange shaded area of the graph. As the area has the form of a triangle, we can formally define consumer surplus as $(P_1 - P_2)Q_2/2$. If the market price of the good falls, for instance to $P_3$, consumer surplus rises by the blue shaded area, and the new consumer surplus is in amount of $(P_1 - P_3)Q_3/2$.

The concept of a surplus can be extended also for the other market subject, the firms or sellers. Sellers can benefit from engaging in market transactions if the market price at which they sell their good is higher as the price at which they are willing to supply the good in the marketplace. In other words, to supply the good, their producing costs have to be lower than the market price; thus, a *producer surplus* ($PS$) is generated. As we will see in the following chapters, not every firm is a price-taking firm. Some firms in the market are considered to be price-makers. A price-making firm has the power to influence the market price of its product, and for such case, the concept of producer surplus would not fully apply.

Now, let us go further and analyse the benefit of the market equilibrium for sellers and buyers. Figure 3.11a illustrates the consumer and producer surplus when the market is in its equilibrium.

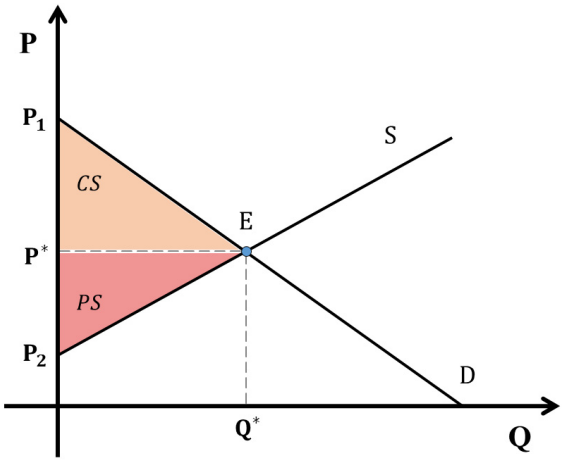



**Figure 3.11a** Total surplus in market equilibrium

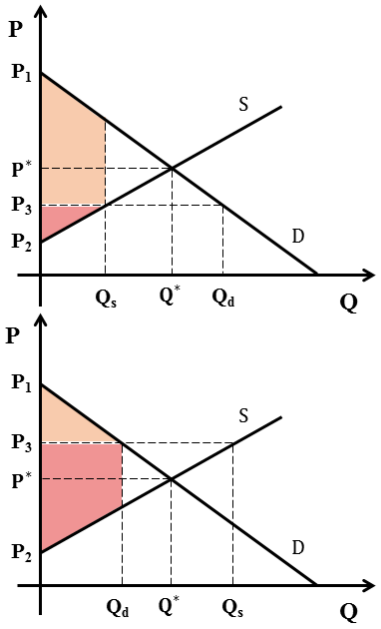



**Figure 3.11b** Total surplus in non-equilibrium market

Under the condition of equilibrium applies that all buyers whose willingness to pay is greater than the market price in equilibrium ($P^*$) buy the good; their consumer surplus is given by the area of $(P_1 - P^*)Q^*/2$. Buyers whose willingness to pay is lesser than $P^*$ do not buy the good and have no consumer surplus. Accordingly, sellers whose costs are lower than $P^*$ supply the good and benefit in a market equilibrium by having a producer surplus of $(P^* - P_2)Q^*/2$. Those sellers whose costs are greater than $P^*$ do not supply any amount of the good.

Let us now consider a non-equilibrium situation in the market. As example, we take the excess demand and excess supply (Figure 3.11b) introduced above in this chapter. The situation of excess demand is shown in the upper figure. As the market price, $P_3$, is lower than the equilibrium price, consumers are motivated to demand more quantity of good, $Q_d$. For some firms, however, the price is too low and does not cover their costs; that causes the amount of supplied good in the market to fall to the level of $Q_s$. Producer surplus is then given by the pink area. As only $Q_s$ amount of good is available for sale, consumers have no other option as to buy $Q_s$ level of good. Thus, consumer surplus is restricted by the amount of good bought as it is depicted in the figure. A similar situation we can observe in case of the excess supply. As the market price, $P_3$, is higher than the equilibrium price, consumers demand less of the good. Even if the sellers supply $Q_s$ level of good, they can sell only $Q_d$ amount; their producer surplus is limited by the amount of good they can sell.

We can conclude that at any quantity of good below equilibrium quantity, the *total surplus* in the market (which is a sum of $CS$ and $PS$) would be less than it is at equilibrium quantity of good. This tells us that in equilibrium, the total market surplus is as large as it can be, and resources are efficiently allocated. Note that at quantities above $Q^*$, the price had to be either too high for consumers or too low for firms, and in the end, that would limit the total surplus in the market.

## Exercise

1. The market demand and supply functions for tuna fish are $P_D = 5 - 2Q$ and $P_S = 2 + 4Q$, where $P$ represents the price in euro per kilogram of the fish and $Q$ is the quantity of tuna fish in tonnes. Calculate the equilibrium price and quantity in the tuna market, and draw a graph of the situation.
2. Let us consider the tuna market from exercise 1. Graphically show the effect of the following determinants at the current state of market equilibrium:
   a) Some fish products contain different amounts of heavy metals. Studies show that concentration of mercury in bodies of tuna fishes are extremely high this year.
   b) Consumers' income increased, and consumers consider tuna to be a superior good.
   c) Consumer price of tuna fish increased from its equilibrium level to 4.5 €/kg.
   d) In three months, the tuna fish processors expecting a decrease in tuna price.
   e) Fishermen have problems with their old fish nets, they tend to tear.

*Solution*

1. To determine the market equilibrium algebraically, we use the information that equilibrium occurs at the point, where demand and supply intersect. At this point, price of good for all consumers and sellers is equal and so are the quantity demanded and supplied. Since in equilibrium applies

$$\text{E: } P_D = P_S, \tag{E.3.1}$$

then,

$$5 - 2Q = 2 + 4Q.$$

We solve the equation for $Q$, which gives the equilibrium quantity of tuna, $Q^* = \frac{1}{2}$ tonne. Substituting $Q^* = \frac{1}{2}$ back into either the supply or demand equation gives the equilibrium price, $P^* = 4$ €/kg.

2.

a) High concentration of mercury in tuna meat can cause serious health issues. Consumers react on such information with decrease of their demand. As it is depicted in Figure 3.12a, decrease in demand is followed by an increase in quantity of good sold (from $Q_1^*$ to $Q_2^*$) and decrease in price level at which is the good sold in the market.

b) Increased income allows consumers to purchase goods that are considered to be of greater quality or are more expensive (superior goods). The tuna meat is considered to be a superior good, which means that the income rise causes an increase in demand for tuna. In new equilibrium, the equilibrium price is higher and the quantity of good sold grows to $Q_2^*$ level.

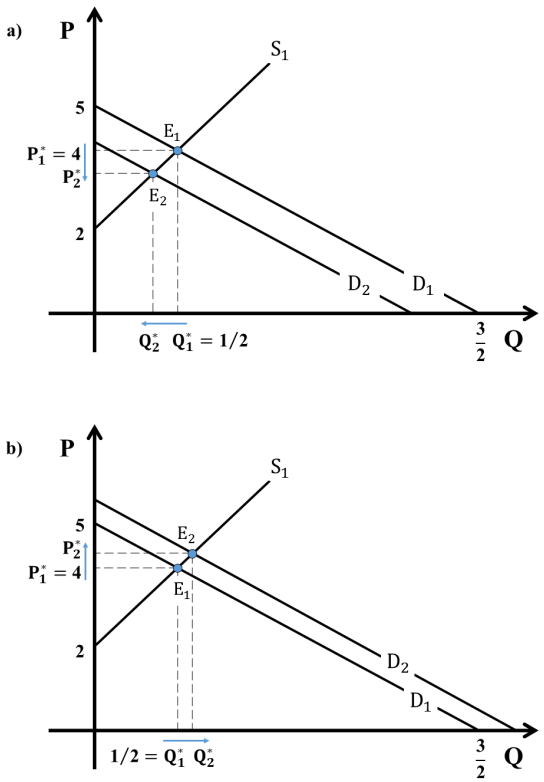



**Figure 3.12a-b** Equilibrium changes in the tuna meat market

c) Consumer price of tuna increased from its equilibrium level to 4.5 €/kg. This situation is followed by the reaction of quantity demanded. The quantity demanded falls. It new level can be calculated by substituting the new price level into the demand equation: $4.5 = 5 - 2Q$ and then $Q_d = 0.25 = \frac{1}{4}$. Here, no change in equilibrium occurs.

d) The processors expect in the future lower profits caused by lower tuna price, and therefore they try to sell their product now, what shifts the tuna supply curve to the right; supply increases. Increase in supply cases the equilibrium price to fall and quantity sold to rise.

e) Technology the fishermen use has a low quality. It has to be repaired, which increases the fishing costs. It can also happen that while repairing, they will have to use leased nets, and again, costs will be even higher. Higher fishing costs shift the supply curve to the left, the tuna supply falls. Decrease in supply causes an increase in equilibrium price and a decrease in quantity sold.

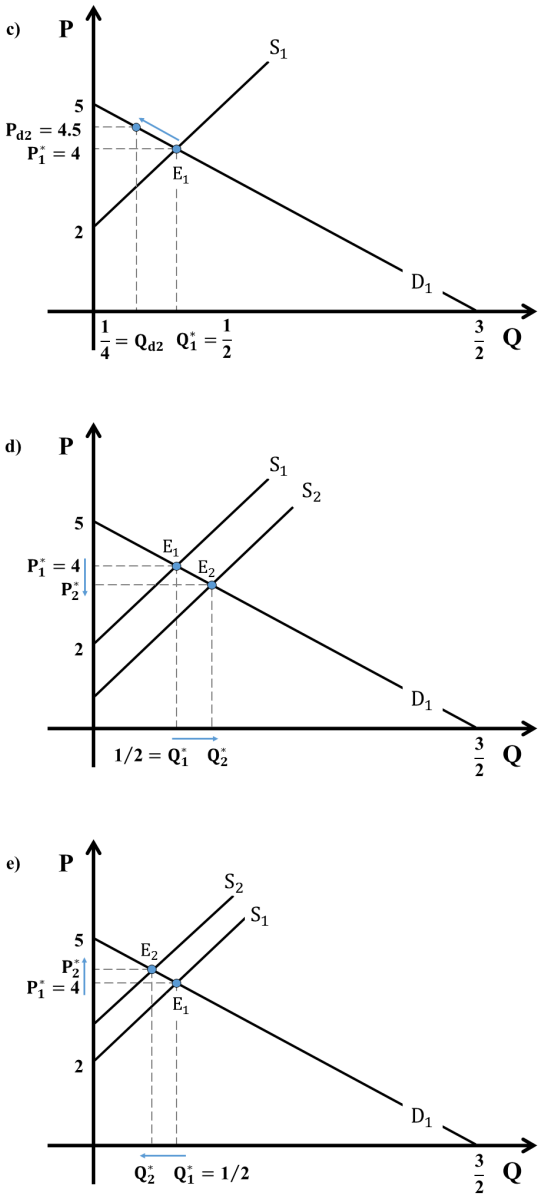



**Figure 3.12c-e** Equilibrium changes in the tuna meat market

## Problems and questions

For better understanding of theory, solve following problems and questions:

1. Consider the markets for heating oil, heating gas, and gas boiler. For each pair of goods, identify whether they are complements, substitutes or neutral goods:
   a) heating oil and heating gas
   b) heating gas and gas boiler
   c) gas boiler and heating oil
2. The leading food industry in grain processing in Europe is the flour milling industry[10]. Wheat and rye flour are the main products of this industry. Identify the impact of following events on wheat flour market supply in Europe:
   a) The market price of rye flour significantly decreased.
   b) The market price of wheat flour significantly increased.
   c) Economists expect a significant decline of wheat flour price next year.
   d) A drought destroyed 30 percent of wheat crops in Europe.
   e) The average price of agricultural land in Europe increased by 15 percent year-on-year.
3. Market demand and supply of pepperoni pizza in USA are $P_D = 22 - 0.5Q$ and $P_S = 5 - 0.5Q$, where $P$[$/pizza]; $Q$[number of pizzas].
   a) Graph a figure displaying the pepperoni pizza market in USA.
   b) Calculate the equilibrium price and quantity.
   c) Calculate the total market surplus in its equilibrium.
   d) If the market price would fall to 9 dollars per pizza, what would be the new total market surplus?
   e) Do consumers and sellers benefit from the fall of the market price?

[10] This example is based on information from European flour millers retrieved from <http://www.flourmillers.eu/page/facts-figures-flour-milling-industry/>

## 3.4 Market structures

The market structure refers to characteristics of the market such as organisation, competition, number of buyers, number of sellers, type of product exchanged, cost of entering or exiting the market, degree of knowledge the participants have about market prices and conditions, etc. There are four main different types of market structure: *perfect competition, monopolistic competition, oligopoly and monopoly*. Let us shortly define the essential features of introduced market structure types:

**Perfect competition** is a market organisation with many buyers and sellers of a product whose *market power* (capability to affect the price of product by their actions) is very small or none. The good traded is homogeneous. In perfect competition, there are no barriers of entering and exiting the market, and economic agents (producers, sellers, buyers) have perfect knowledge of market conditions.

A market structure close to perfect competition is the **monopolistic competition**. In monopolistic competition, there are many sellers supplying a differentiated good. Consequently, entering or exiting the market is rather easy and the goods are substitutes to each other. The market power of sellers is greater than in case of perfect competition.

**Oligopoly** is a market structure with few sellers of a homogeneous or differentiated product. Entry into the market is rather difficult but possible. The smaller the number of sellers forming the oligopoly, the greater is their market power.

In **monopoly**, only a single firm is selling a good for which there are no close substitutes. For other firms, to entry the market is at least difficult, if not impossible.

Perfect competition and monopoly are, in a way, extreme forms of market organisation. Most of the industries are monopolistic competitions or oligopolies. Thence, we will first examine the former market structures and then proceed with the latter ones. The purpose of next chapters is to analyse how price and output are determined under specific conditions of different market structures.

### 3.4.1 Perfect competition

Under perfect competition, there is a large number of buyers and sellers of a product, who have no market power. This means that if a single firm changes its output, it will not perceivable affect the market price of the product; also, a buyer of the product is not able to change the market price (e.g. to gain quantity discounts from the seller). The market price and quantity of a product are determined by the forces of market demand and market supply. At this market price, firms sell and consumers buy any quantity of the product; thus, each firm and buyer acts as a *price-taker*.

The product of each firm is *homogeneous*. Because of the homogeneous character of products, consumers consider the goods to be identical (in quality and size) regardless their producer; consumers are indifferent from which firm they will purchase the good. Agriculture products (e.g. corn), metal or energy commodities can be considered as examples of homogeneous products.

Another characteristic of the perfect competition is the perfect mobility of resources. All production inputs can be reallocated geographically without any difficulties, and no input is monopolised. Moreover, firms can enter or leave the industry freely. When it is profitable for firms to enter the industry, they will do so; on the other hand, when losses occur in the industry, some firms will be motivated to leave. The established firms do not have any cost advantages over new entered firms.

Economic agents in the market have perfect knowledge about prices, costs, and market conditions (demand and supply). Consumers are provided with information, which allows them not to pay a higher price than necessary, and leads producers to produce only the necessary amount of the good. Perfect knowledge makes the market effective.

Note, the perfect competition is only a theoretical concept; it does not exist in reality. According some economists, the stock market is the closest to a perfectly competitive market. Moreover, some assumptions of the perfect competition are fulfilled by the market for some agricultural commodities as wheat or corn.

### Determination of market price in perfectly competitive market

The market price of a product under perfect competition is determined at the intersection of the market demand curve ($D$) and the market supply curve ($S$) as it is displayed in Figure 3.13. The equilibrium price is denoted by $P^*$ and the equilibrium quantity by $Q^*$. A firm in perfect competition can sell all its production at price $P^*$, while it would sell nothing if charging higher price than $P^*$. Setting price below $P^*$ makes no sense for the firm as it could also sell all its production at $P^*$. A perfectly competitive firm faces a horizontal (i.e. perfectly elastic) demand curve $d$ as it is shown in Figure 3.13.

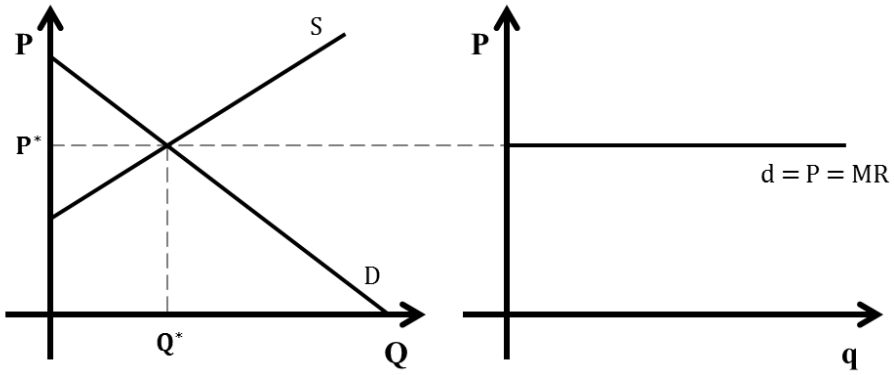



**Figure 3.13** The market equilibrium price of the product and demand of a perfectly competitive firm

Marginal revenue for a perfectly competitive firm is equal to equilibrium price, because change of firm's production has no impact on the market price as the firm is price-taker.

$$MR = \frac{dR}{dq} = \frac{d(P.q)}{dq} = \frac{P(dq)}{dq} = P \tag{3.9}$$

### Perfect competition in the short-run

A perfectly competitive firm has to decide on the amount of production. The objective of the firm is to maximise profit so profit maximising quantity is attained when $MR$ equals $MC$:

$$P = MR = MC \tag{3.10}$$

This fact can be explained also graphically. As it is illustrated in Figure 3.14, when producing the amount of good at which $MC$ exceeds $MR$ (e.g. $q_1$), it is better for the firm to reduce the output; this way, the firm will add more to its total revenue than to total cost and firm's total profit will increase. On the contrary, when producing at level at which $MR$ exceeds $MC$ (e.g. $q_2$), it pays for the firm to expand the production even more. The growth of production will cause firm's revenue to increase more than its total cost; so, the total profit will rise. This implies that the best level of output is the total profit maximising output ($q_b$) at which $MR = MC = P$.

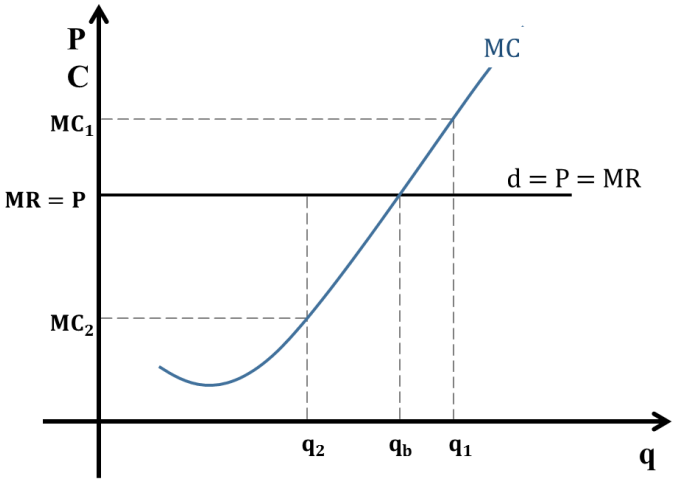



**Figure 3.14** Best level of output of a perfectly competitive firm in the short-run

However, a perfectly competitive firm is not assured profit. If the firm incurs loss, the best level of output would be the output at which the firm minimises its loss. At such output, the difference between firm's cost and revenue is minimal. For the loss minimisation applies:

$$\min\ p.q - c(q) \qquad (3.11)$$
$$\text{s.t. } q(\boldsymbol{z})$$

The first-order condition for finding an extreme of a function is to put the first derivative of $\pi$ with respect to $q$ equal zero

$$\frac{d\pi}{dq} = \frac{d(p.q)}{dq} - \frac{dc(q)}{dq} = 0, \qquad (3.12)$$

which solves for

$$\frac{d(p.q)}{dq} = \frac{dc(q)}{dq}. \qquad (3.13)$$

Equation (3.13) can also be written as

$$MR = MC. \qquad (3.13.1)$$

Again, the best level of output of a loss minimising firm is the amount of product at which $MR = MC$; or, under perfect competition, $P = MR = MC$. The second-order condition for loss minimisation requires the second derivative of $\pi$ with respect to $q$ to be positive:

$$\frac{d^2\pi}{dq^2} = \frac{d^2(p.q)}{dq^2} - \frac{d^2c(q)}{dq^2} < 0 \qquad (3.14)$$

From that,

$$\frac{d^2(p.q)}{dq^2} > \frac{d^2c(q)}{dq^2}, \qquad (3.14.1)$$

which means that the slope of the marginal cost must be lesser than the slope of marginal revenue.

In the short-run, if the firm does not produce, it has no revenues, but it still has to pay the fixed costs. That is, the firm incurs losses in amount of $FC$. For the firm, fixed costs are *sunk costs*, i.e. the firm cannot avoid it. Therefore, in general, if the firm does produce any quantity of good, the total profit earned for selling the good has to cover at least firm's variable cost, $\pi(q) > VC(q)$ or $P > AVC$.

In Figure 3.15a we see a situation where at the profit-maximising output, $q_b$, firm's total cost ($ATC \cdot q_b$) is lower than its total revenue ($P \cdot q_b$). Then, the blue area represents firm's earned profit.

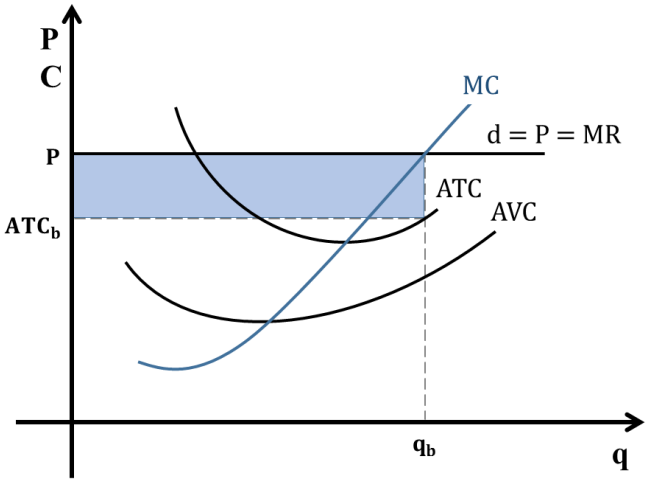



**Figure 3.15a** Output of a perfectly competitive firm in the short-run

When firm makes loss ($ATC$ is higher than $P$), it can still be optimal for the firm to continue production in the short-run. The reason is that shutting down the firm would lead to higher loss in the short run because fixed costs would need to be incurred anyway. However, to continue production in the short-run the price has to cover at least average variable cost. In Figure 3.15b optimal level of output, $q_b$, minimises loss, rather than maximises profit.

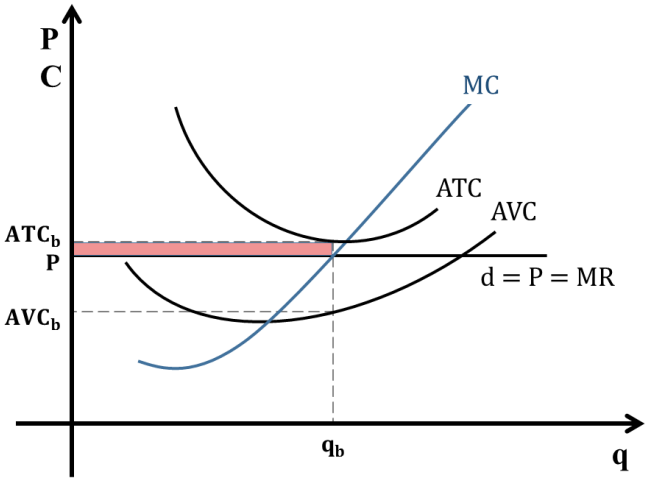



**Figure 3.15b** Output of a perfectly competitive firm in the short-run

However, if the market price is lower than the $AVC$ (see Figure 3.15c), the firm cannot even cover its variable costs, and it has to go out of business. Then, the point at which the marginal cost curve crosses the average variable cost curve is the so-called *shut-down point* of a firm.

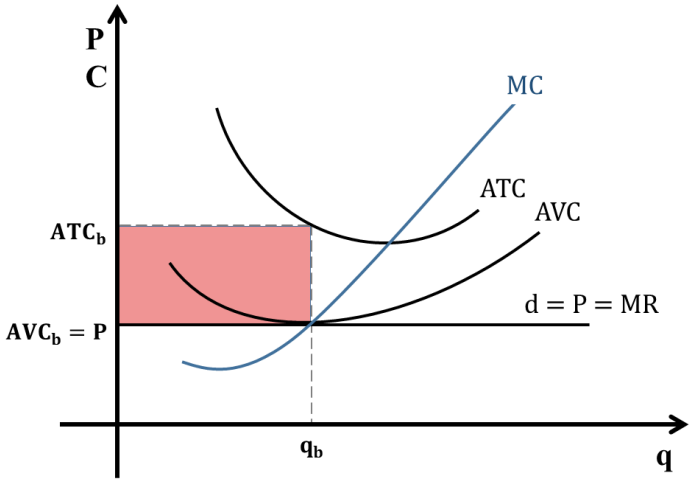



**Figure 3.15c** Output of a perfectly competitive firm in the short-run

### Short-run supply curve of the competitive firm

We summarise that a firm can stay in business when the price of the product is higher than its average variable cost. Therefore, the part of firm's $MC$ curve, which lies above the lowest point of $AVC$ curve, represents the short-run supply of a perfectly competitive firm (see Figure 3.16). Thus, the firm reacts to the change of price by moving along the $MC$ curve as profit-maximising quantity is given by the interaction of the $MC$ and $P$. The perfectly competitive market supply curve is then derived by the horizontal summation of firms' individual supply curves.

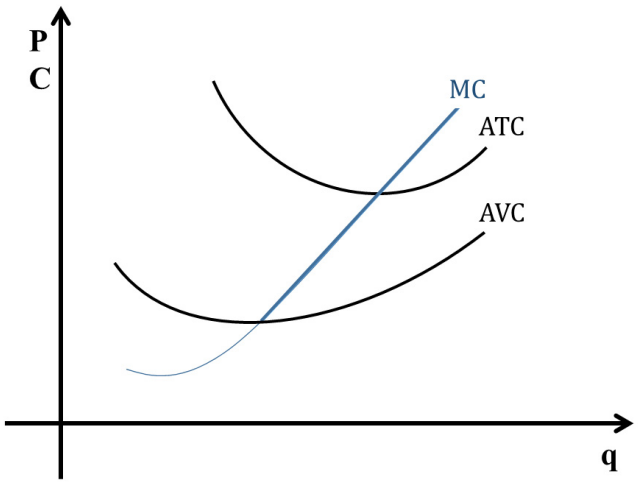
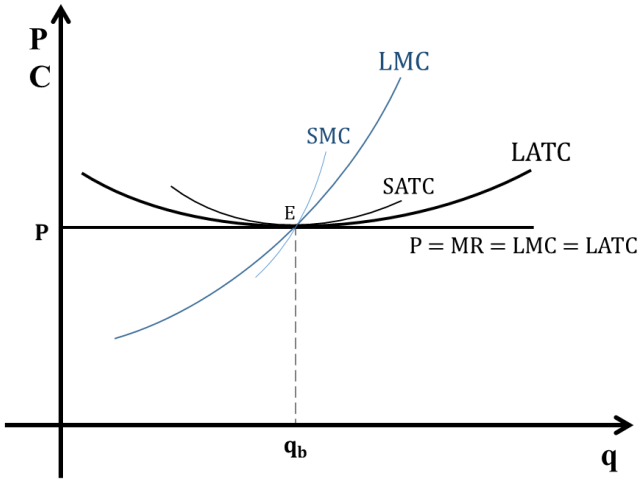



**Figure 3.16** Short-run supply curve of the competitive firm and market

### Perfect competition in the long-run

The main characteristics of the long-run period is that all production inputs and costs are variable. Thus, it applies that long-run total cost is equal to long-run variable cost, $LTC = LVC$, and from that $LATC = LAVC$. The best level of output is the output at which price equals firm's long-run marginal cost ($LMC$), Figure 3.17. As we can see in the figure, the best level of output of the perfectly competitive firm in the long-run is $q_b$ at price $P_b$. At $q_b$, the price covers the long-run average total cost ($LATC$) of a firm, $P = LATC$.




Note: $LATC, LMC, LMR$ represent the long-run average total cost, marginal cost and marginal revenue and $SATC, SMC$ represent short-run average total cost and marginal cost

**Figure 3.17** Long-run equilibrium of the perfectly competitive firm and industry

If firms in the industry earn profits, it attracts other firms to enter the industry in the long-run. Consequently, the market supply of the product increases and the product price falls. As a result, the profits in the industry get lower. On the contrary, if firms in the industry incur losses, some of them will leave. That will be happening until the remaining firms break even; thus, firms will produce at the lowest point on their $LATC$. In Figure 3.17, point E represents the long-run equilibrium of the competitive market at which firms' total revenues just cover the total costs (zero profits are earned).

### 3.4.2 Monopoly

*Monopoly* is a market organisation where there is only one seller. The monopolist faces a downward sloping demand curve, which at the same time represents the market demand curve. There are no close substitutes for the product sold by the monopolist and entry of other firms into the industry is costly. There are either high fixed costs in the industry or entry into the industry is protected by government regulation.

How can a monopoly arise? There are several determinants giving rise to monopoly:

- single firm controls crucial input into the production process (e.g. De Beers – rough cut of diamonds in 20th century[11]),
- single firm owns a patent or copyright for producing a product (e.g. Microsoft Windows),
- production process is characterised by significant economy of scale, and such monopolies are referred to as *natural monopolies* (e.g. aeroplane producer[12]),
- the government establishes the monopoly (e.g. energy monopolies).

#### Short-run analysis

Unlike the perfectly competitive firm, monopolist faces a downward sloping market demand curve of the product. This means that for selling more units of the product, the monopolist has to lower its price. Another characteristic of a monopoly firm is that its marginal revenue curve is below the demand curve it faces,

[11] This information is based on Biesheuvel, T. 2016. It's a great time to buy a diamond, but fewer people want one. Retrieved from <https://www.bloomberg.com/news/articles/2016-04-07/jewel-heist-geriatrics-crave-diamonds-spurned-by-ipad-generation>

[12] For more information on natural monopolies see Natural monopolies. In Economics online. Retrieved from <http://www.economicsonline.co.uk/Business_economics/Natural_monopolies.html>

Figure 3.18. In the figure, $D$ represents the market demand curve faced by the monopolist and $MR$ represents the marginal revenue curve.

What is the reason that $MR$ curve is below $D$ curve? Let us suppose, the demand function of the monopolist is given by equation, where $a$ is the price intercept of the demand curve with the vertical axis and $-b$ is the slope of the demand curve:

$$P = a - b.Q \tag{3.15}$$

Then, the total revenue is

$$R = P.Q = (a - b.Q)Q = a.Q - b.Q^2, \tag{3.16}$$

and the marginal revenue can be defined as follows:

$$MR = \frac{\Delta R}{\Delta Q} = \frac{\Delta(a.Q - b.Q^2)}{\Delta Q} = a - 2bQ \tag{3.17}$$

Both $D$ and $MR$ curve have the same price intercept, $a$, but the slope of the $MR$ curve, $-2b$, is twice the slope of the $D$ curve, $-b$. That is way the $MR$ curve lies under the $D$ curve.

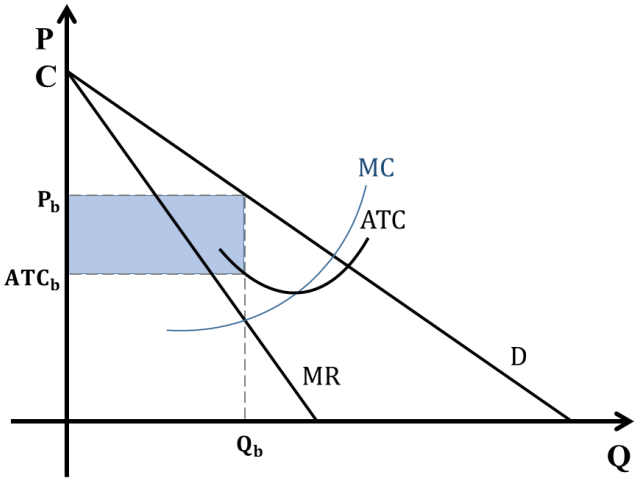



**Figure 3.18** Price and output determination of the monopolist in the short-run

In the short-run, the best level of output ($Q_b$) is given by the intersection of $MC$ and $MR$ curves. If the monopolist produces at the level of output where $MR > MC$, by expanding the output, the firm can increase its total profits. Accordingly, at the level of output where $MR < MC$, the total profits of the monopolist can be increased by reducing the output. At output at which $MR = MC$, monopoly maximises its total profits. The price at which the monopolist sells its best level of output can be derived from the $D$ curve; it is the price $P_b$. As we see in Figure 3.18, at any level of output, the price of the product is higher than the marginal revenues; thus, for a monopolist applies that:

$$P > MR = MC \tag{3.18}$$

The largest profit that the monopolist can earn in the short-run represents the area of rectangle $Q_b(P_b - ATC_b)$. But, as well as a monopolist can earn profits in the short-run, it could also break even or incur losses. It depends on the level of the $ATC$ compared to the price of the product at the best level of its output. As it is in perfect competition, if $ATC = P$ at $Q_b$, the monopolist breaks even; if $ATC < P$, it earns profits. If $ATC > P$ at $Q_b$, the monopolist incurs a loss. The monopolist would stay in business in the short-run even incurring losses, but only as long as $P > AVC$.

Note that under monopoly, there is no particular relationship between $P$ and $Q$. Monopolist decides at which price to sell the product; it acts as a price-maker. The monopolist could also supply a particular quantity of product at different prices. Therefore, we cannot derive a supply curve of the monopolist the way we did in case of perfectly competitive firm. A supply function can be identified only when the firm has no control over the price of the product.

### Long-run analysis

In the long-run, the best level of output of the monopolist (as depicted in Figure 3.19) is given at the point at which applies:

$$MR = LMC \tag{3.19}$$

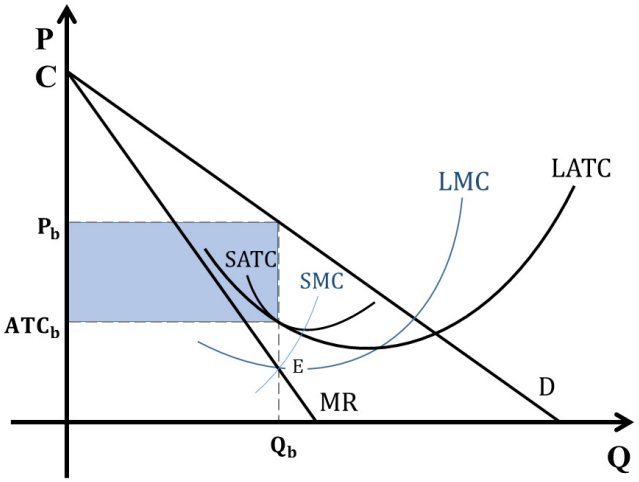



**Figure 3.19** Price and output determination by a monopolist in long-run

This point is called the long-run equilibrium (point E) of the monopolist. At the best level of output, the monopolist is earning a profit of $Q_b(P_b - ATC_b)$. Since entry into the industry is very difficult, the monopolist does not produce at the lowest point on its $LATC$ curve as does a perfectly competitive firm forced by its competition.

## BOX
## Monopolies of today

In the 21st century, monopolies have a different form than their predecessors. Today's monopolies do not own the whole supply chains, which means that they cannot keep out other competitors from the industry, they are defined as platform businesses[13]. Activity of such firms is based on managing of vast networks of users. The more users they have, the more stable is their position in the industry. For instance, Facebook, Google, Alibaba or Uber are examples of the platform businesses. The fact that these monopolies do not have the power keep out the competition is good news for users, because competition makes the firms consider consumer's interests.

Source: Moazed, 2016[14]

[13] For more information on platform businesses see Thornhill, J.2016. Platform businesses may wipe out classic 20th century companies. Retrieved from <https://www.ft.com/content/67705108-580c-11e6-8d05-4eaa66292c32>

[14] Moazed, A. 2016. Why Modern Monopolies Are Good. Retrieved from <https://www.inc.com/alex-moazed/why-modern-monopolies-are-good.html>

## Exercise

The demand function and total cost function of the firm constructing highway roads are $P = 24 - 4Q$ and $TC = Q^3 - Q^2 + 1$. The price of one kilometre of the highway is measured in millions of euro and the quantity in kilometres of roads constructed:

P[mil. €/km]; Q[100 km]

a) Algebraically determine the best level of output of the firm.
b) Producing the best level of output, is the firm earning profits, breaking even or incurring losses?
c) Algebraically determine the level of output at which the firm would minimise its $ATC$.
d) Decide, if this firm is a price-taker.
e) Is the firm producing in the short-run or in the long-run? Explain your answer.

*Solution*

1. The demand is given by the equation $P = 24 - 4Q$ and $TC = Q^3 - Q^2 + 1$.
   a) We can calculate the best level of output by using equation (3.13.1). First, it is necessary to determine the marginal revenue and marginal cost of the firm. The total revenue of a firm is calculated as product's price multiplied by its quantity sold, and how the price changes in regard to the level of product's quantity is reflected by the demand function. Thus, the firm's total revenue is $R = PQ = (24 - 4Q)Q = 24Q - 4Q^2$. From that we can derive equation for marginal revenue, $MR = \frac{dR}{dQ} = 24 - 8Q$.

   As we know the total cost function, it is easy to derive the function of marginal cost of the firm: $MC = \frac{dTC}{dQ} = 3Q^2 - 2Q$.

   At best level of output applies that $MR = MC$, and thus, $24 - 8Q = 3Q^2 - 2Q$. We solve the equation for quantity: $Q = 2$. The best level of output is the construction of 200 kilometres of highway.
   b) For finding the answer to problem b), we have to determine the relation of firm's $ATC$ and $P$. The average total cost is defined as the total cost divided with the level of product produced: $ATC = \frac{TC}{Q} = Q^2 - Q + \frac{1}{Q}$. Producing 200 km of highway (2 units), $ATC = 2^2 - 2 + \frac{1}{2} =$ €2.5 mil., and the price at which the firm is selling its product is $P = 24 - 4 \cdot 2 = 16$ mil. €/km. As $P > ATC$, the firm earns profit.
   c) In chapter 2.2.1, we found out that the $ATC$ curve is crossed by the $MC$ curve of a firm in $ATC$'s minimum. Thus, we can find the minimum of $ATC$ by determining the level of output at which $MC = ATC$. We solve the equation $3Q^2 - 2Q = Q^2 - Q + \frac{1}{Q}$ for $Q$. At first, we rearrange the equation and get that $0 = 2Q^2 - Q - \frac{1}{Q}$., which is equivalent to $0 = 2Q^3 - Q^2 - 1$ and then to $0 = (Q - 1)(2Q^2 + Q + 1)$. The solution is $Q = 1$, i.e. the average total cost is minimal at production of 1 unit (100 km) of highways.
   d) As the demand for highways is downward sloping and the slope of marginal revenue curve is twice the slope of demand, the firm is not a price-taker.
   e) Firms total cost is $TC = Q^3 - Q^2 + 1$. The firm is producing in short-run because it has fixed cost in amount of 1 unit.

### 3.4.3 Monopolistic competition

In reality, more common as perfect competition or monopoly are market structures known as *monopolistic competition* and *oligopoly*. We will introduce information on the former market structure first.

In monopolistic competition, there are many sellers supplying a differentiated good. Produced goods are substitutes to each other. It is rather easy to enter or exit the industry in the long-run because there is no problem for the firms to acquire production inputs. When there is possibility to make profits, new firms will enter, and on the contrary, in case of incurring loss they will leave the industry. The market power of sellers is greater than under perfect competition, but the firms are not price makers as in monopoly.

Characteristics mentioned above are common features in retail or service sectors. Examples of differentiated products are branded products as food products (e.g. fast-food companies producing burgers), beauty and health aids (e.g. toothpastes or face creams of different brands) or clothing (e.g. shirts of different brands). Sellers try to win over the buyers by differentiating their product by price, quality, packaging or using advertisement techniques.

#### Short-run analysis

Monopolistically competitive firm produces a differentiated product for which there is lots of substitutes. Because of that demand curve the firm is facing ($d$) is highly elastic and has a negative slope as it is depicted in Figure 3.20.

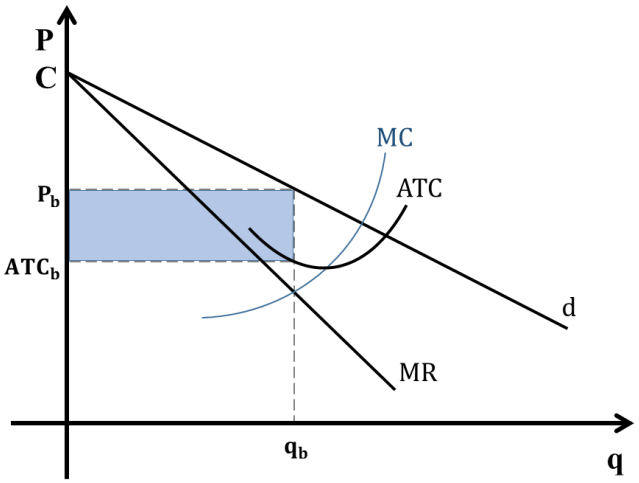



**Figure 3.20** Short-run price and output determination of monopolistic competitive firm

The slope of marginal revenue curve is negative too and graphically it lies below $d$ curve. Both curves have a common intercept and the slope of $MR$ curve is twice the $d$ curve slope. Similarly as in case of other market structures, the best level of output of a monopolistically competitive firm in the short-run is given by the interception of marginal revenue curve and marginal cost curve. At the best level of output, the firm can earn profits ($P > ATC$), break even ($P = ATC$), or incur losses ($P < ATC$), and it minimises losses by continuing to produce as long as $P > AVC$. Since the demand curve is downward-sloped, at the best level of output always applies that $MR = MC < P$. Firm under monopolistic competition is a price-maker, and it can set the price where it gets maximum profits. Thus, the firm does not decide about the quantity produced only based on the price, which means that there is no specific relation between the price and quantity of product produced. It is consequently not possible to derive a short-run market supply curve from the rising part of the $MC$ curve above the $AVC$ curve as in perfect competition.

**Long-run analysis**

If in the short-run firms earn profits, new firms will enter the monopolistic competitive market in the long-run. Increasing number of entrants increases on one hand the range of products; demand becomes consequently more price elastic in the long-run, and the slope of $d$ curve gets lower. On the other hand, the market share of each firm is decreasing, which causes the demand curves of monopolistically competitive firms shift to the left. As long there is a possibility to earn profits in the industry and new firms will come, demand curve will continue to move leftward until each firm's $D$ curve tangents its $LATC$ curve, as it is depicted in Figure 3.21. $d$ curve tangents $LATC$ curve at point E, which represents the long-run equilibrium of a firm under monopolistic competition. At the long-run equilibrium, the monopolistically competitive firm produces its best level of output, $q_b$ at which $MR = LMC$.

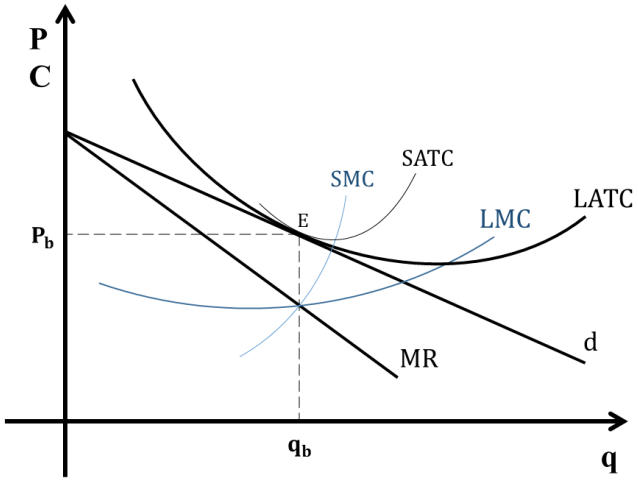



**Figure 3.21** Long-run price and output determination under monopolistic competition

We can summarise that monopolistically competitive firms in the long-run produce on the downward-sloped part of the $LATC$ curve. And by getting to the long-run equilibrium, they break even.

### 3.4.4 Oligopoly and its models

Oligopoly is a market structure with few sellers producing homogeneous or differentiated products. Determinants allowing existence of an oligopoly are similar as for a monopoly; they represent entry barriers for other firms. Entry into an oligopolistic market is rather difficult but possible. The less firms there is in an oligopoly industry, and the larger is their market share, the greater is firms' effect on production prices in the market. In addition, another barrier of entry could result from the so-called *limit pricing* at which existing firms in the market charge such a low price that it makes unprofitable for other firms to enter the industry in the long-run. This way, oligopolistic firms give up their short-run profits in order to maximise long-run profits.

Oligopoly is most common in the manufacturing sector, but it exists also in food sector[15]. If there are only 2 sellers, the industry is known as *duopoly* (i.e. Microsoft Windows and Apple production of PCs[16]). *Pure oligopoly* is a type of oligopoly producing homogeneous products (e.g. coffee beans[17],

[15] For further information on oligopoly in food sector see Severová, L. – Kopecká, L. – Svoboda, R. – Brčák, J. 2011. Oligopoly competition in the market with food products. In Agricultural economics-Czech, 57(12), pp. 580-588. Retrieved from <http://www.agriculturejournals.cz/publicFiles/53983.pdf>

[16] This example is based on Dvorak, J.C. 2013. Understanding the duopoly phenomenon. Retrieved from <https://www.pcmag.com/article2/0,2817,2421060,00.asp>

[17] This example is based on Mitsuru, I. 2012. Oligopoly in international commodity markets: the Case of coffee beans. Retrieved from <https://economics.yale.edu/sites/default/files/igami-120926.pdf>

aluminium). If firms produce differentiated products (e.g. meat products[18], automobiles), which are close substitutes to each other, we call the oligopoly a *differentiated oligopoly*. Firms under oligopoly compete mostly by product differentiation or advertising, which is a form of *non-price competition*.

As there is only a small number of firms in an oligopolistic industry, decisions of each firm affect the other firms. Therefore, if an oligopolists sets price of its product or decides about the form of advertisement, it has to consider the possible reaction of other firms.

### 3.4.4.1 Classic models of duopoly

Let us assume that there are only two firms in the market, then, the market represents a *duopoly*. The duopolists can compete with each other through the choice of quantity or price of the product.

There are different approaches to decision-makings under oligopoly. The approach of French mathematician and economist Antoine Augustin Cournot (1838) describes decision of one duopolist about the level of its output produced, and the impact of that choice on the output decision of a second duopolist. Firms in this model act simultaneously, and consider the output of the other firm to be fixed. Another approach was created in 1883 by French mathematician Joseph Louis François Bertrand. In this model, each duopolist sets the product's price dependent on the price charged by the other duopolist. Again, firms act simultaneously. German economist Heinrich Freiherr von Stackelberg developed in the 20th century a further duopoly model in which one of the duopolists acts as a leader and one as a follower. The follower takes the other firm's output as given, and decides which level of output to produce depending on its information. The other duopolist acts as a leader, and it expects that the other firm will behave as a follower, and chooses its own output depending on that information. While choosing the level of production, duopolists maximise the profit according the following condition:

$$MR(q) = MC(q). \tag{3.20}$$

The profit maximising equation for firms setting the price charged is

$$MR(p) = MC(q(p)). \tag{3.21}$$

It has to be noted that the above-mentioned models of duopoly have many restrictions, and some of their features are unrealistic. For instance, firms in Cournot's models assume that quantity of each rival produced is fixed, or in Bertrand's model it is assumed that price of each rival charged is fixed (in other words that duopolists do not learn from previous experiences). Another restriction is that these models omit the possibility of new firm's entry or possibility to use advertising or other selling techniques.[19]

#### Bertrand's model of duopoly

Bertrand's model was created as a reaction on Cournot's quantity-taking behaviour. As firms are rather behaving by setting the price of a product than by choosing the output level, Bertrand's model seems to have a better applicability to real industry conditions.

Firms produce homogeneous product, and their total cost curves are the same. Once the duopolists choose their prices, they will decide about the level of production following the demand curve they face in order to satisfy the consumer's demand. The firm, which would set the lower price, would occupy the whole market, and the second firm would sell no product. This situation would cause the second firm to lower its price too to get its advantage in the market, and again, the first firm would react to this situation by lower price. Firms would reach an equilibrium only if they lower the price at the level of marginal cost. As they

[18] This example is based on Anand, A. 2015. Oligopolies in the pork industry. Retrieved from <https://themarketmogul.com/oligopolies-in-the-pork-industry/>

[19] For more information on duopoly behaviour see Serrano, R. – Feldman, M. A. 2011. Duopoly. Retrieved from <http://www.econ.brown.edu/Faculty/serrano/textbook/Lesson13PlusGraphs.pdf>

have the same total costs, the marginal cost is also equal, and firms would have to set the same price of the product.

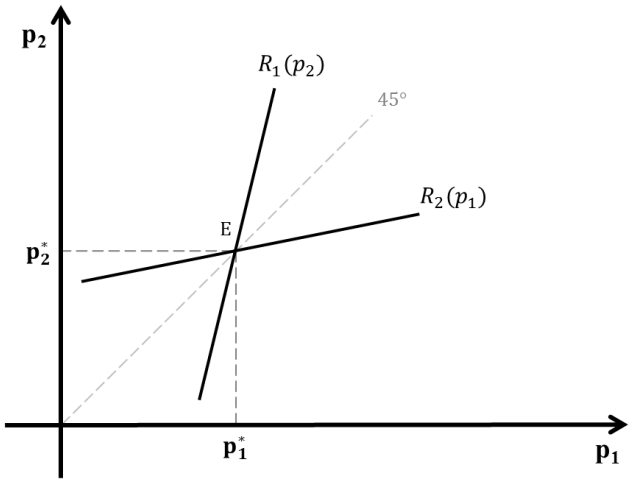



**Figure 3.22** Bertrand equilibrium

In the Figure 3.22, we can see the possible reactions of each firms in the market represented by the reaction curves; $R_1(p_2)$ represents the price reaction of the first firm at the price of the second firm, and accordingly, $R_2(p_1)$ represents the price reaction of the second firm at the price of the first firm. The optimal level of price in Bertrand's model can be found at the intersection of both reaction curves, E.

### 3.4.4.2 Non-collusive models

Non-collusive or competitive firms under oligopoly tend to experience rigid (or sticky) prices. It means that once the optimal price is set or determined by the oligopolists, there is no or very little incentive to change it. In this case, the firms competing using non-price possibilities. An example of non-collusive model is the *kinked demand curve model* or *non-price competition*.

**Model of the kinked demand curve**

This model was created by the economist P. M. Sweezy (1939). Firms in this oligopoly market produce a differentiated product as for example butter or beef steaks, and the model presumes that prices of the product can remain rigid. The logic behind this is that an oligopolist would not raise the price of the product, because other firms in the industry would not follow this price change, and it would lose a part of the market share; and in the contrary, the rival firms would react if an oligopolist decreases the price also by lowering their prices, and hence, the initiator of price change would not gain customers by the price decrease.

In the Figure 3.23a and 3.23b, we introduce the kinked demand curve model more closely. Oligopolists face the demand curve, $D$, which has a kink at point K. Now, there are two scenarios which could happen if a oligopolist changes the price of the product. Firstly, if the rivals do not follow the price change, and they keep their prices constant, market demand for the product becomes relatively elastic (i.e. the demand curve becomes flatter, e.g. $D_1$). It is due to the fact that only one firm changed the price (the good became relatively cheaper in comparison to other firms' product), but it gained lots of customers wanting to buy the product cheaper. Secondly, if the rival firms do change their price too, the change in price is relatively smaller than in the former case, and market demand becomes less elastic (i.e. demand curve becomes steeper, e.g. $D_2$).

Let us suppose that the initial market price is $P_K$, and the quantity of product demanded is $Q_K$. If one oligopolist raises its price above the $P_K$ level, and other firms would hold the prices fixed, quantity of

product demanded would decrease along the $D_1$ curve. On the other hand, if one oligopolist lowers the price from $P_K$, and the other competitors follow, quantity demanded of the product would increase along the $D_2$ curve. From that, the market demand in this oligopoly industry is represented by $D$ curve, Figure 3.23b.

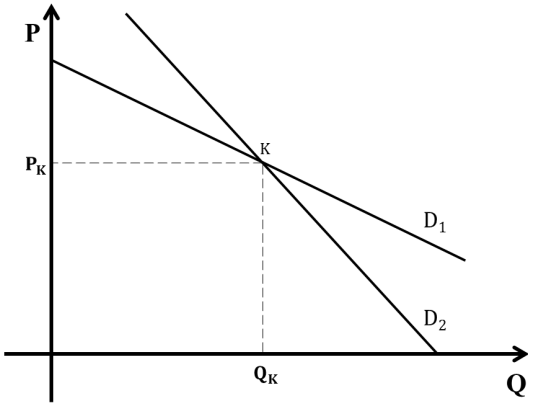



**Figure 3.23a** Determining the kink in the market demand

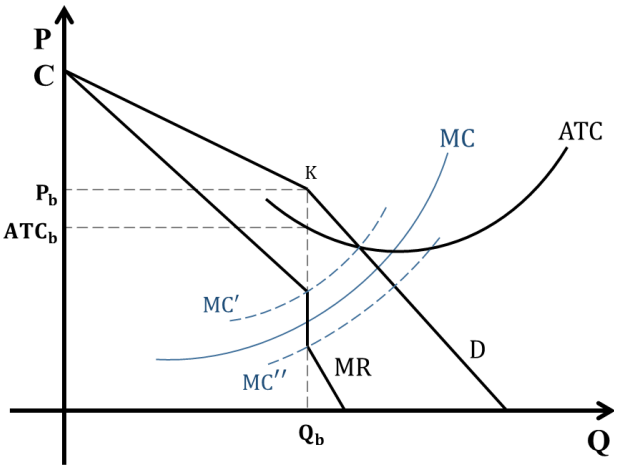



**Figure 3.23b** The kinked demand curve model
Source: Salvatore, 1996

In the figure, $MR$ is the marginal revenue curve. Note, that kink in demand curve causes a discontinuity in the $MR$ curve. The upper segment of $MR$ curve is associated with the demand curve above the kink; the lower segment of $MR$ curve is associated with the demand curve below the kink. The best level of output is given by point at which the $MC$ curve intersects the vertical portion of the $MR$ curve. For this amount of product, the oligopolist will charge the price $P_b$. As under monopoly, monopolistic competition and perfect competition, the oligopolist can earn profits, break even, or incur losses, and the firm minimises losses by producing the level of output at which $P > AVC$.

The $MC$ curve of the oligopolist can shift within the discontinuous portion of the $MR$ curve. Let us now assume, the marginal cost rises to the $MC'$ level. As long as $P > AVC$, higher cost would not lead to a change in quantity produced or price charged. The introduced information displays the rigidness of prices in oligopoly. Only a further rise of the $MC$ curve above the $MC'$ would force the oligopolist to increase its price and reduce quantity. Accordingly, only a fall of the $MC$ curve under $MC''$ would lead the oligopolist to lower the price and increase quantity.

### Non-price competition and the sales maximisation model

Often, firms in the oligopoly try to avoid engaging into the so-called *price wars*. The constant lowering of price leads to the loss of possible profits. When firms do not compete with price, the market is characterised by the product differentiation. *Non-price competition* can be realised on the basis of quality, advertising, sales promotion, product's and customer service, etc. The goal is to create a brand loyalty by the buyers and increase sales. Non-competing actions can be analysed by the game theory or sales maximisation models.

We have assumed in previous chapters that firm seeks to maximise profits. But firms can follow other goals as for example maximising market-share or maximising sales (i.e. total revenue). The most known sales maximisation model was developed by American economist William Baumol.

We introduce the sales maximisation in Figure 3.24. $TC$ represents the total cost curve, $R$ is the total revenue curve of an oligopolistic firm, and $\pi$ represents its profit earned. Firm aiming to maximise profits would produce the level of output $q_\pi$ at which the difference between total revenue and total cost is the greatest, as it is shown in the figure. But the sales maximising firm produces the $q_R$ level of output, which

is greater than the profit maximising output, $q_\pi$. Note, that at $q_R$ level of output the slope of the $R$ curve is zero. A further conclusion of the model is that product's price under sales maximisation is lower than under profit maximisation. Baumol states that "if at the point of maximum profit the firm earns more profit than the required minimum, it will pay the sales maximiser to lower his price and increase his physical output[20]".

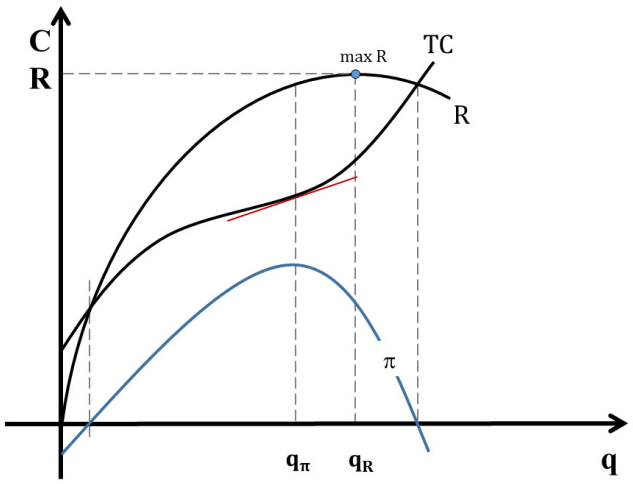



**Figure 3.24** The sales maximisation model

Baumol pointed out that as an increase of price definitely causes the sales to fall, the effect of price decrease is uncertain. Thus, to have a positive change on sales, advertising is more suitable for how to achieve it.

### 3.4.4.3 Collusive models

The kinked demand model or non-price competition models mentioned before do not exhibit collusion. *Collusion* represents an activity of firms, which leads to restriction of competition in order to increase their profits. The stronger is the collusion among firms, the greater is the market power in the industry. Collusion can be overt or explicit as in case of cartels, and tacit or implicit as in price leadership models. At first, we will examine the condition of a price leadership model.

#### Price leadership model

Let us assume a market where a firm is considered a *price leader*. Often, the price leading company is a firm with the largest market share in the industry (low cost price leadership), but also it could be a firm which is considered to have more complex information about the market than other firms (barometric price leadership), or a form of tacit agreements between firms can exist in the market (collusive price leadership). The role of the price leader can shift from one firm to another over time.

When such firm initiates a change of price, other firms in the market follow (or copy) its price decisions. Sometimes, however, the follower firms may lower their prices compared to the dominant firm in order to "steal" a bit of the market. The price leading firm produces the profit-maximising quantity and sets a price at which it sells the products. The followers act as price-takers in the market and sell the product at price set by the dominant firm. The product sold is homogeneous.

[20] Baumol. W. J. 1959. Business behavior, value and growth. New York : Macmillan. 164 p.

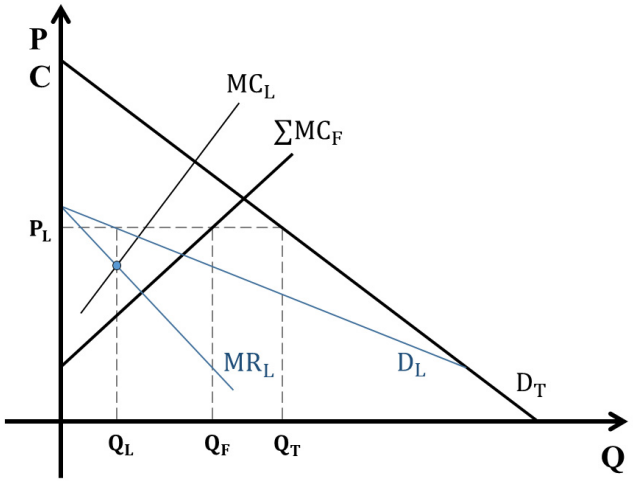



**Figure 3.25** Price leadership of dominant firm
Source: Salvatore, 1996[21]

In the Figure 3.25, $D_L$ represents the demand curve and $MR_L$ the marginal revenue curve of the leading firm. $MC_F$ is the marginal cost curve of all follower firms in the market constructed by horizontal summation of their individual marginal cost curves. Price leader produces the level of output at which it maximises the profit, i.e. at which it applies that $MC_L = MR_L$, and sells this level of output at the price $P_L$. Since the follower firms act as price-takers (i.e. perfect competitors), they sell the product at $P_L$, and produce the level of output at which $P_L = MC_F$. To summarise, the price leading firm in the market supplies the $Q_L$ units and the followers $Q_F$ units of the product. Then, $Q_T$ is the total amount of product supplied in the market: $Q_L + Q_F = Q_T$, and $D_T$ curve represents the total market demand of the product sold.

## Cartels

There can be distinguished two types of cartels: the market-sharing cartel and centralised cartel. Members of the *market-sharing cartel* spilt the market according a mutual agreement, in which they agree that each member operates in a particular region and does not interfere with actions of others. Firms engage into the market-sharing cartel, so they get profits from sales. Product sold in the industry is homogeneous.

Let us suppose a cartel consisting of two firms, which agreed share the market equally. The production costs of both firms are identical. Figure 3.26 shows an example of a market-sharing cartel. In the figure, $D$ is the market demand the oligopolists face, $\Sigma MC$ is the sum of individual marginal costs curves of both firms, and as both firms have the same production costs, $MC$ represents their marginal cost curve. The blue $MR$ curve is the marginal revenue firm of whole cartel, and its slope is twice the slope of the market demand. As the firms agreed to share the market equally, the demand each firm faces ($d$) is to times smaller the market demand and therefore it is equal to the marginal revenue curve of the whole cartel. The black $MR$ curve is the marginal revenue curve of each cartel member.

The cartel produces the $Q$ level of output at which the cartel's marginal cost curve crosses its marginal revenue curve: $\Sigma MC = MR$. The price at which the cartel sells the product can be derived from the demand of the whole cartel; it is the price $P$. At this price, the members produce their profit-maximising quantity of product, $q$, and for the cartel production applies: $Q = 2q$.

[21] Salvatore, D. 1996. Managerial Economics in a Global Economy. New York : McGraw-Hill College. 723 p. ISBN 978-0070571150.

The market-sharing cartel depicted in the Figure 3.26 represents a *perfect collusion* of firms, where the joint profit maximisation is aimed, and all firms are under cartel agreement. There are also cartels showing signs of imperfect collusion: not every firm in the industry is party to the agreement, or the agreement terms are ambiguously understood by some firms. Under unperfect collusion, the firms will act individualistically in some decisions; mainly, they would aim to maximise their individual profits, and together produce a larger output than the joint profit maximising output[22].

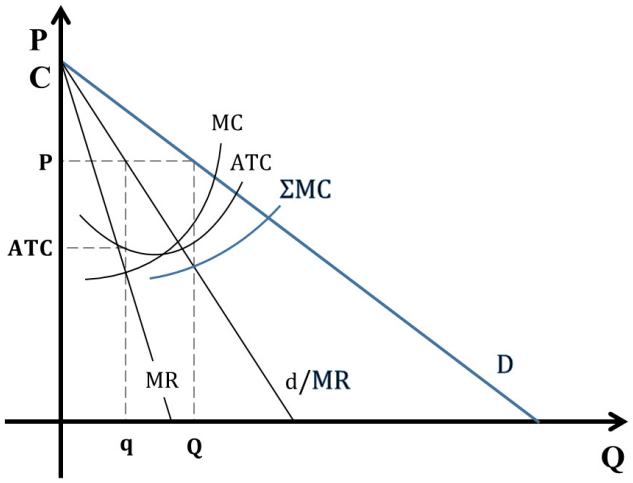



**Figure 3.26** The market-sharing cartel

*Centralised cartel* is another type of an agreement among oligopolistic firms. In this type of cartel, the centralised body decides on the pricing of the product produced in the industry, which is homogeneous, and allocate the quantity produced among cartel members. The goal the cartel agreement is to maximise joint profits.

Let us assume that two oligopolistic firms producing a homogeneous product formed a centralised cartel. In Figure 3.27, $D$ is the total market demand curve, $MR$ is the marginal revenue curve of the market, and $MC$ is the marginal cost curve of the market. The market's $MC$ curve is obtained by the horizontal summation of individual marginal cost curves of the firms. As it is depicted in the figure, the firms have different costs of production of the product.

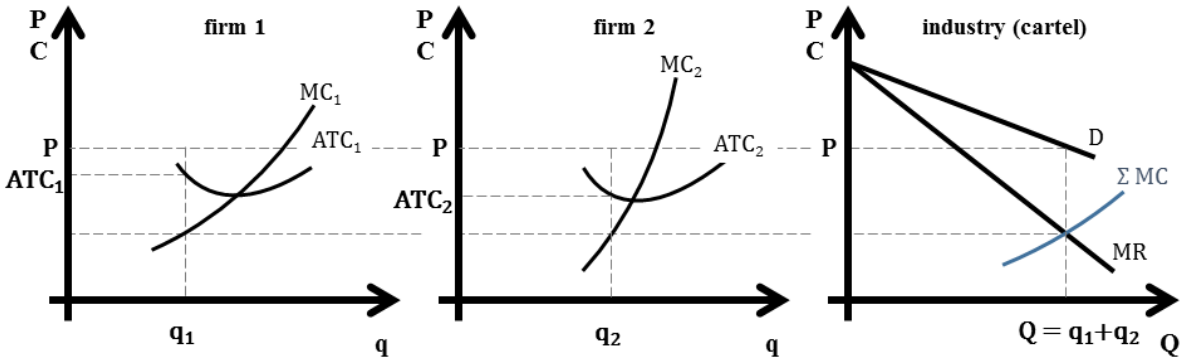



**Figure 3.27** The centralised cartel

[22] Lofaro, A. 1999. When imperfect collusion is profitable. In Journal of economics, 70(3), pp. 235-259. ISSN 1617-7134. Retrieved from < https://link.springer.com/article/10.1007/BF01224738>

The best level of output of the cartel is given at the point where the $MR$ curve and $MC$ curve cross. The price at which the cartel sells its best level of output, $P$, can be derived from the $D$ curve. In order to minimise the production costs, the centralised body will allocate $q_1$ units of output to firm 1 and $q_2$ units of output to firm 2. The $q_1$ and $q_2$ are the best levels of output of each cartel member derived at point where marginal cost of each firm equals marginal revenue of the cartel, $MC_1 = MR$ and $MC_2 = MR$. Thus, when the cartel's goal is to maximise the joint profit, it will produce level of outputs at which it applies,

$$MC = MR = MC_1 = MC_2. \tag{3.22}$$

The profit of each firm in cartel is determined by bargaining.

The volume of restrictions of centralised form of cartel exercised upon the members, e.g. the mutual pricing, allocated level of production and profits, make a market-sharing cartel more likely to occur. On the other side, members of a market-sharing cartel tend to break the cartel agreement by producing more than its quota or try to get higher market shares by threatening to leave the cartel. In this case, the existence of such cartel is also threatened.

## Problems and questions

For better understanding of theory, solve following problems and questions:

1. We have a knowledge of the marginal revenue function and average total cost function of a farm producing crops: $MR = 114$, $ATC = Q - 6 + \frac{100}{Q}$.
   a) Algebraically determine the best level of farm's output.
   b) What is the level of farm's total revenues at the best level of output?
   c) Is the farm earning profits, breaking even, or incurring losses?
   d) Is the farm a price-taker or price-maker? Explain your answer.
   e) Is the farm producing in the short-run or in the long-run? Explain your answer.
2. [23]Two firms producing crude form a cartel. Demand the cartel is facing is given by the equation $Q = 200 - 0.5P$. The average total cost function of the first firm is $ATC_1 = 5 + 3Q_1$ and average total cost function of the second firm is $ATC_2 = 3 + 3Q_2$.
   a) Determine algebraically the marginal cost function of each firm, and graph $MC$ of both firms and of the whole market.
   b) Graph the best level of output and price of crude the cartel charges, the output of each firm, which minimises the total cost of production for the cartel.
3. An oligopolist faces following demand function, $P = 24 - 0.1Q$.
   a) Determine algebraically the total revenue function of the oligopolist and draw the total revenue curve.
   b) Graph the total cost function. The cost schedule of the firm is the one shown below:

| Q | 40 | 50 | 60 | 80 |
|---|---|---|---|---|
| ATC | 13 | 12.3 | 12 | 13 |

   c) Show graphically the level of output at which the firm maximises the total profits.
   d) Show graphically the level of output at which the firm maximises the total revenue.
4. The demand function faced by an oligopolist is $Q = 100 - 10P$ or $P = 10 - 0.1Q$. The total cost function of the firm is given by $TC = 70 + 2Q$. Determine algebraically the level of output at which the firm maximises its
   a) total revenue and calculate the price, total revenue and profits at this level of output.
   b) total profits and calculate the price, total revenue and profits at this level of output.

[23] This example is based on Salvatore, D. 1993. Managerial economics in a global economy. USA : McGraw-Hill, Inc. 722 p. ISBN 0-07-054599-5.

# Part II
# International trade and welfare analysis

International trade is the exchange of goods and services (and capital) between countries. It represents a significant share of the gross domestic product in many countries. In the World Trade Statistical Review 2017[24], the World Trade Organisation (WTO) notes that world exports of manufactured goods increased from $8 trillion[25] to $11 trillion and world exports of commercial services from $2.9 trillion to $4.8 trillion over the past ten years (2006-2016).

Countries engage in international trade because they differ in technology and in abilities to produce goods and services or in resource endowments (e.g. labour, capital, natural resources). Other reasons include different preferences and demand for goods and services, the existence of economies of scale and increasing returns to scale in production, and government policies. Countries can benefit from their differences in international trade.

Trade can be considered as an indirect method of production, and its main advantages are larger quantity, broader range of goods, cheaper goods and services for consumers and higher earnings for producers.

Trade patterns show which products are sold or bought and to which (or from which) partner countries.

This chapter presents theories of international trade, policies affecting international trade, role of the WTO and EU in international trade, special features of agricultural trade and the link between trade and development.

# Chapter 4 RICARDIAN THEORY OF INTERNATIONAL TRADE AND COMPARATIVE ADVANTAGE

David Ricardo published the theory of comparative advantage in his book The Principles of Political Economy and Taxation in 1817. The main idea of his model is that countries trade with each other because of different technologies reflected in different productivity of labour. Ricardo provided a compact explanation of international trade and impacts of international trade.

**Model assumptions[26]:**

The Ricardian model assumes:

- two countries: Home and Foreign,
- two production industries and production of two goods: good 1 and good 2,
- one factor of production is used: labour,
- labour productivity in each industry in each country is constant, but different across countries (because of different technology),

[24] Retrieved from <https://www.wto.org/english/res_e/statis_e/wts2017_e/wts17_toc_e.htm>

[25] Billion means one thousand million, and trillion means one million million.

[26] Sections Model assumptions, Trade patterns and Gains from trade are based on Krugman, P. – Obstfeld, M. – Melitz, M. 2014. International Economics. Theory and Policy. Pearson, 10. ed., 792 p. ISBN 978-0133423648. Suranovic, S. 2010. International Economics: Theory and Policy. FlatWord, 1. ed., 614 p. eISBN 978-1-4533-2722-7. Feenstra, R.C. – Taylor, A.M. 2014. International Economics. Worth Publishers, 3 ed., 464 p. ISBN 978-1429278423.

- labour supply in each country is constant and labour is fully employed: labour is mobile across industries in a country but is immobile across countries,
- perfect competition in all markets (goods and labour): price of labour (wage) is given by the value of production (price of goods) and wages are equal in both production industries within a country.

We denote labour supply in the Home country by $L$ and labour supply in the Foreign country by $L^*$. Labour productivity varies across countries because of different technology and depends on unit labour requirement, i.e. the amount of labour (number of hours) required to produce one unit of output. For the first industry, unit labour requirement is denoted by $a_{L1}$ in Home and by $a_{L1}^*$ in Foreign. For industry 2, unit labour requirement is denoted by $a_{L2}$ in Home and by $a_{L2}^*$ in Foreign. Higher values of unit labour requirement mean lower productivity of labour. The amount of output produced in the industry 1 and in the industry 2 is $Q_1$ and $Q_2$, respectively, without an asterisk for Home ($Q_1$, $Q_2$) and with an asterisk for Foreign ($Q_1^*$, $Q_2^*$).

Initially, let us suppose a situation without any trade (closed, self-sufficient countries, i.e. autarkies). Both countries, Home and Foreign, have to produce all goods for their consumers of their own resources. Home has to produce good 1 and good 2 for domestic citizens. Therefore, it has to allocate its labour to both production industries, where $L_1$ represents labour in industry 1 and $L_2$ is labour in industry 2.

How much labour is needed in industry 1? The economy needs labour to produce one unit of output given by unit labour requirement, $a_{L1}$, times the quantity of production, $Q_1$. Analogically, in industry 2 labour to produce one unit of output, $a_{L2}$, times production, $Q_2$, is needed. However, the sum of labour employed in industry 1 and in industry 2 must be equal to total amount of labour in the country, $L = L_1 + L_2$; full employment of labour is assumed.

The higher is the production of good 1, the more labour is needed in industry 1. Due to limited resources (fixed labour supply), if more labour is employed in one industry, less labour is available for production in the second industry. Thus, to increase production of one good, production of the other good must be reduced. This concept is called *opportunity costs*. Opportunity cost of producing one unit of good 1 is the amount of good 2 not produced. Vice versa, opportunity cost of producing one unit of good 2 is given by the amount of good 1 which could not be produced.

Many combinations of good 1 and good 2 could be produced as Home can redistribute its labour in a variety of ways between the industries. Combinations of both goods that can be produced are called *production possibilities*. Given our resources and technology, we can construct an equation to find production possibilities of the Home economy.

The basic condition for Home is:

$$L = L_1 + L_2 \tag{4.1}$$

As $L_1 = a_{L1}Q_1$ and $L_2 = a_{L2}Q_2$,

$$L = a_{L1}Q_1 + a_{L2}Q_2. \tag{4.2}$$

By solving the equation for $Q_2$ we get:

$$Q_2 = \frac{L}{a_{L2}} - \frac{a_{L1}}{a_{L2}}Q_1 \tag{4.2.1}$$

Possible combinations of good 1 and good 2 that the Home economy could produce can be plotted graphically, Figure 4.1. A line running through all points representing production possibilities is called the *production possibility frontier*. The production possibility frontier is a curve which shows the maximum quantity of output of two goods that can be produced in an economy with given technology and resources.

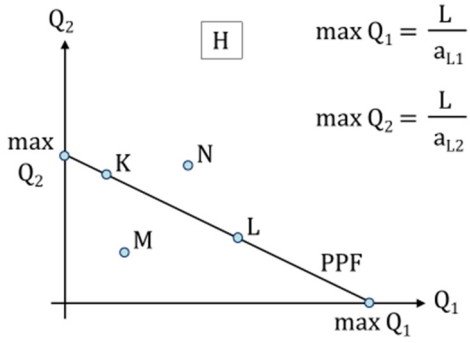



**Figure 4.1** Production possibility frontier (PPF), Home economy (H)

$Q$ – amount of output ($Q_1$ - quantity of good 1 and $Q_2$ – quantity of good 2)
K, L, M, N – points represent possible production combinations. Combinations of goods given by points K and L can be produced from our resources. Combination M could be produced but resources would not be fully used (we will not consider these combinations). Combination N cannot be produced from given resources.

$maxQ_1$ – maximum production of good 1 (if good 2 is not produced and all labour is allocated to industry 1, $maxQ_1 = L/a_{L1}$).
$maxQ_2$ – maximum production of good 2 (if good 1 is not produced and all labour is allocated to industry 2, $maxQ_2 = L/a_{L2}$).

Slope of the production possibility frontier is $\frac{\Delta Q_2}{\Delta Q_1} = -\frac{a_{L1}}{a_{L2}}$, and it says how many units of good 2 cannot be produced in order to produce one more unit of good 1. The slope (its absolute value) represents the opportunity cost of producing one unit of good 1, $\frac{a_{L1}}{a_{L2}}$. Accordingly, opportunity cost of producing one unit of good 2 is $\frac{a_{L2}}{a_{L1}}$. Opportunity costs are constant because the unit labour requirements are constant.

Home could produce any combination of goods from the production possibility frontier. The point which the country decides for depends on preferences and utility of domestic consumers. On one hand, domestic citizens are workers and produce goods in the economy, on the other hand, they are also consumers of produced goods. Consumers' preferences are represented by indifference curves. Home's autarky production and consumption point is determined where the economy maximises utility subject to production possibilities, i.e. where the highest indifference curve is tangent to the production possibility frontier (see Figure 4.2).

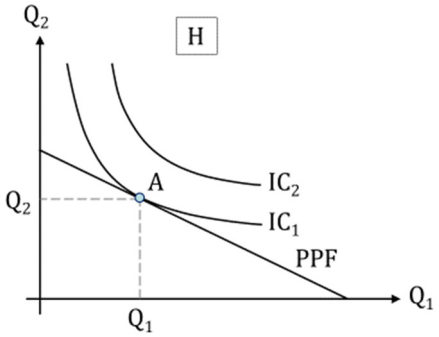



**Figure 4.2** Production possibility frontier (PPF) and indifference curves (IC), Home economy (H)

$Q$ – quantity of good ($Q_1$ - quantity of good 1 and $Q_2$ – quantity of good 2)
A – point representing production and consumption combination of good 1 and good 2 in a closed Home economy

If Home is not involved in trade, produced combination of goods equals consumed combination. Home's production possibility frontier is also its consumption possibility frontier. To produce both goods, Home has to allocate its labour to both industries. However, workers prefer to work in the industry that pays a

higher wage. So, to ensure production of good 1 and good 2, wages in both industries have to be equal. The wage (hourly) in production of good 1 ($w_1$) depends on the value of good 1 produced in one hour. The value of good 1 produced in an hour is given by its price ($P_1$) divided by the number of hours used to produce one unit of the good, $w_1 = P_1/a_{L1}$. Hourly wage in production of good 2 ($w_2$) is $w_2 = P_2/a_{L2}$, where $P_2$ is price of good 2 and $a_{L2}$ is the number of hours required to produce one unit of good 2 (unit labour requirement in industry 2). To summarise,

$$w_1 = w_2 \qquad \frac{P_1}{a_{L1}} = \frac{P_2}{a_{L2}} \tag{4.3}$$

and from that:

$$\frac{P_1}{P_2} = \frac{a_{L1}}{a_{L2}} \tag{4.4}$$

In other words, in a closed economy prices of goods must adjust so that wages are equal in both industries. As is clear from equation (4.4), this is possible only if the relative price of good 1 equals the opportunity cost of producing good 1; relative price of good 1 is the price of good 1 relative to price of good 2.

If the relative price of good 1 exceeds the opportunity cost of producing good 1, then the wage in industry 1 is higher than the wage in industry 2, formally written, if $\frac{P_1}{P_2} > \frac{a_{L1}}{a_{L2}}$ then $\frac{P_1}{a_{L1}} > \frac{P_2}{a_{L2}}$ and $w_1 > w_2$. Hence, workers move to industry 1 and produce only good 1.

If the relative price of good 1 is less than the opportunity cost of producing good 1, then the wage in industry 1 is lower than the wage in industry 2: if $\frac{P_1}{P_2} < \frac{a_{L1}}{a_{L2}}$ then $\frac{P_1}{a_{L1}} < \frac{P_2}{a_{L2}}$ and $w_1 < w_2$. Hence, workers move to industry 2 and produce only good 2.

If the relative price of good 1 equals the opportunity cost of producing good 1, then the wage in industry 1 equals the wage in industry 2 and workers are-- willing to work in both industries and to produce both goods (good 1 and good 2), if $\frac{P_1}{P_2} = \frac{a_{L1}}{a_{L2}}$ then $\frac{P_1}{a_{L1}} = \frac{P_2}{a_{L2}}$ and $w_1 = w_2$. In this case, the relative price of good 2 also equals the opportunity cost of producing good 2, $\frac{P_2}{P_1} = \frac{a_{L2}}{a_{L1}}$.

To sum up, in a country that is not participating in international trade, production of both goods is possible if the relative price of a good is equal to the opportunity cost of producing that good. Then also consumption of both goods can occur.

In the absence of international trade, Foreign follows the same principles as Home. Production possibility frontier of the Foreign economy is $Q_2^* = \frac{L^*}{a_{L2}^*} - \frac{a_{L1}^*}{a_{L2}^*} Q_1^*$. For the Foreign country, opportunity cost of producing one unit of good 1 is $\frac{a_{L1}^*}{a_{L2}^*}$ and opportunity cost of producing one unit of good 2 is $\frac{a_{L2}^*}{a_{L1}^*}$. Foreign relative prices are $\frac{P_1^*}{P_2^*} = \frac{a_{L1}^*}{a_{L2}^*}$ and $\frac{P_2^*}{P_1^*} = \frac{a_{L2}^*}{a_{L1}^*}$. The production and consumption point of the country is where the indifference curve tangents its production possibility frontier (Figure 4.3).

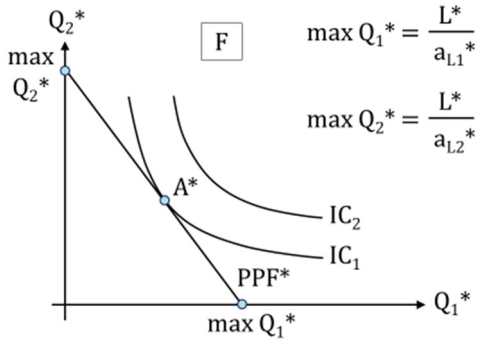



**Figure 4.3** Production possibility frontier (PPF) and indifference curves (IC), Foreign economy (F)

$Q^*$ – quantity of good ($Q_1^*$ - quantity of good 1 and $Q_2^*$ - quantity of good 2)

$maxQ_1^*$ – maximum production of good 1 (if good 2 is not produced and all labour is allocated to industry 1, $maxQ_1^* = L^*/a_{L1}^*$:).
$maxQ_2^*$ – maximum production of good 2 (if good 1 is not produced and all labour is allocated to industry 2, $maxQ_2^* = L^*/a_{L2}^*$).

A* – point representing production and consumption combination of good 1 and good 2 in a closed Foreign economy

## Trade patterns

Now suppose, Home and Foreign start free trade with each other. Which country will export which product to its partner?

The Ricardian model uses the concept of comparative advantages. A country has a *comparative advantage* in producing a good if its opportunity cost in producing the good is lower than in other countries. Countries should specialise in production of goods in which they have a comparative advantage and trade them for other goods from other countries.

To produce one unit of good 1, Home needs labour in the amount of $a_{L1}$ working hours, and Foreign needs $a_{L1}^*$ working hours. If unit labour requirement for good 1 is lower in Home than in Foreign, Home is more efficient in production of good 1 and has an *absolute advantage*. Similarly, the country that needs less labour to produce one unit of good 2 has an absolute advantage in good 2. Further, it applies that if:

| | |
|---|---|
| $a_{L1} < a_{L1}^*$ | Home has an absolute advantage in good 1, i.e. Home can produce one unit of good 1 with less labour than Foreign. |
| $a_{L1} > a_{L1}^*$ | Foreign has an absolute advantage in good 1. |
| $a_{L2} < a_{L2}^*$ | Home has an absolute advantage in good 2. |
| $a_{L2} > a_{L2}^*$ | Foreign has an absolute advantage in good 2. |

It is important to know that countries participate in international trade even when one country is the most efficient producer and has absolute advantage in all goods.

The Ricardian model states that both countries can benefit from trade if trade is based on comparative advantages, not absolute advantages. A country can have absolute advantage in both goods, but it can have comparative advantage in one good only. Trade based on comparative advantage can make both trading countries better off.

To produce one unit of good 1, Home has to give up production of good 2; its opportunity cost is $\frac{a_{L1}}{a_{L2}}$. Opportunity cost of producing good 1 in Foreign is $\frac{a_{L1}^*}{a_{L2}^*}$. If the opportunity cost of producing good 1 is lower in Home than in Foreign, Home has a comparative advantage in good 1. In order to produce one unit of good 1, Home has to give up production of less units of good 2 than the Foreign country. Similarly, the country that has lower opportunity cost of producing good 2 has a comparative advantage in good 2. It applies that if:

$\frac{a_{L1}}{a_{L2}} < \frac{a_{L1}^*}{a_{L2}^*}$ Home has a comparative advantage in good 1 since Home has lower opportunity cost of producing good 1, i.e. if Home increases production of good 1, it reduces production of good 2 less than the Foreign country does.

$\frac{a_{L1}}{a_{L2}} > \frac{a_{L1}^*}{a_{L2}^*}$ Foreign has a comparative advantage in good 1.

$\frac{a_{L2}}{a_{L1}} < \frac{a_{L2}^*}{a_{L1}^*}$ Home has a comparative advantage in good 2.

$\frac{a_{L2}}{a_{L1}} > \frac{a_{L2}^*}{a_{L1}^*}$ Foreign has a comparative advantage in good 2.

Assume, that Home has a comparative advantage in production of good 1 and Foreign in good 2, $\frac{a_{L1}}{a_{L2}} < \frac{a_{L1}^*}{a_{L2}^*}$ and $\frac{a_{L2}}{a_{L1}} > \frac{a_{L2}^*}{a_{L1}^*}$. Home should specialise in production of good 1, Foreign should specialise in production of good 2. In international trade, Home is exporter of good 1 and importer of good 2, Foreign trades good 2 for good 1.

### Gains from trade

Gains from trade can arise if countries specialise in goods in which they have comparative advantage and then trade together. To see if it is advantageous for such countries to trade among each other we need to determine relative prices when trade occurs.

Before trade, the relative price of good 1 reflects the opportunity cost of good 1; in Home $\frac{P_1}{P_2} = \frac{a_{L1}}{a_{L2}}$ and in Foreign $\frac{P_1^*}{P_2^*} = \frac{a_{L1}^*}{a_{L2}^*}$. We assume that the Home country has a comparative advantage in production of good 1 and the Foreign country in good 2. It means that Home has lower opportunity cost of producing good 1 than Foreign, which implies that the good 1's relative price is lower in Home and higher in Foreign, $\frac{P_1}{P_2} = \frac{a_{L1}}{a_{L2}} < \frac{a_{L1}^*}{a_{L2}^*} = \frac{P_1^*}{P_2^*}$ and from that $\frac{P_1}{P_2} < \frac{P_1^*}{P_2^*}$. Higher relative price of good 1 in Foreign motivates domestic workers to produce and export this good. Their production of good 1 can be better exchanged for good 2 in Foreign than in Home, i.e. they can get more of good 2.

Some domestic workers start to sell their production in the Foreign market. As Home's production of good 1 enters the Foreign market, supply of the good increases. The increased supply slowly causes the relative price of good 1 in the Foreign market to decrease. On the other side, export of good 1 causes an increase in the relative price of good 1 in Home. This will continue as long as the relative prices of good 1 differ between the two markets. Once the relative prices are equal in Home and Foreign, a unit of good 1 will be traded for the same quantity of good 2 in both markets. The opposite process occurs with good 2 and its relative price.

World relative price of a good is the price settled in the international market based on world relative supply and relative demand for the good; accordingly, world relative price of good 1 is determined by relative supply and relative demand for good 1 in the international market. Let us know explain the concepts of relative supply and relative demand. *Relative supply* ($RS$) of good 1 represents the quantity of good 1 supplied by both countries relative to the quantity of good 2 supplied by both countries:

$$RS = \frac{Q_1 + Q_1^*}{Q_2 + Q_2^*} \tag{4.5}$$

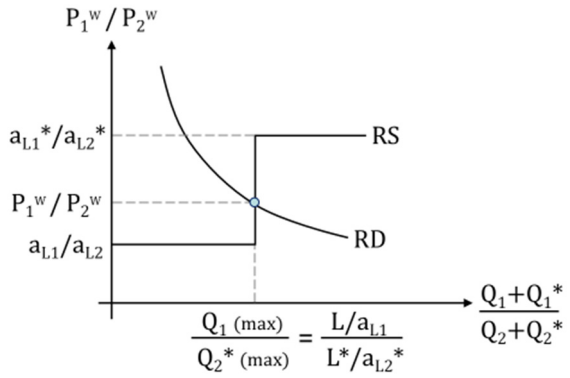
If the world relative price of good 1 is the same as the relative price in Home before trade and equals the opportunity cost of producing good 1 in Home, $\frac{P_1^W}{P_2^W} = \frac{a_{L1}}{a_{L2}} < \frac{a_{L1}^*}{a_{L2}^*}$, workers in the Home country produce both goods, good 1 and good 2 (wages in both industries are the same), but Foreign workers produce only good 2 (foreign wage in industry 2 is higher).

If the world relative price of good 1 is the same as the relative price in Foreign before trade and equals the opportunity cost of producing good 1 in Foreign, $\frac{a_{L1}}{a_{L2}} < \frac{a_{L1}^*}{a_{L2}^*} = \frac{P_1^W}{P_2^W}$, workers in Foreign are indifferent about producing good 1 or good 2 (wages in both industries are the same), but domestic workers produce only good 1 (Home's wage in industry 1 is higher).

If the relative price of good 1 settles in between the relative prices of good 1 in Home and Foreign (and in between the opportunity costs of producing good 1 in Home and Foreign), $\frac{a_{L1}}{a_{L2}} < \frac{P_1^W}{P_2^W} < \frac{a_{L1}^*}{a_{L2}^*}$, workers in the Home country produce only good 1 (due higher wages in industry 1) and Foreign workers produce only good 2 (due higher wages in industry 2). Home specialises in production of good 1 and Foreign specialises in good 2. In the world market, good 1 is supplied by the Home country, and good 2 is supplied by the Foreign country. The world relative supply of good 1 equals maximum production of good 1 in Home divided by maximum production of good 2 in Foreign, $RS = \frac{Q_1+Q_1^*}{Q_2+Q_2^*} = \frac{Q_1(max)}{Q_2^*(max)} = \frac{L/a_{L1}}{L^*/a_{L2}^*}$.

World relative supply is a step function. First step occurs at relative price of good 1 equal to Home's opportunity cost $\frac{a_{L1}}{a_{L2}}$, and second step occurs at relative price of good 1 equal to Foreign opportunity cost $\frac{a_{L1}^*}{a_{L2}^*}$. The jump between these two steps represents world relative price of good 1 between Home's and Foreign opportunity costs; here the relative quantity supplied of good 1 equals Home's maximum production of good 1 divided by Foreign maximum production of good 2.

*Relative demand* ($RD$) of good 1 is created by consumers, and it is the quantity of good 1 relative to the quantity of good 2 demanded in all countries. For consumers, if the relative price of good 1 rises, relative quantity demanded of good 1 falls. With higher relative price of good 1 consumers prefer to purchase less of good 1 (because it is relatively expensive) and more of good 2 (because it is relatively cheaper).




$Q$ – quantity of a good
$P$ – price of a good

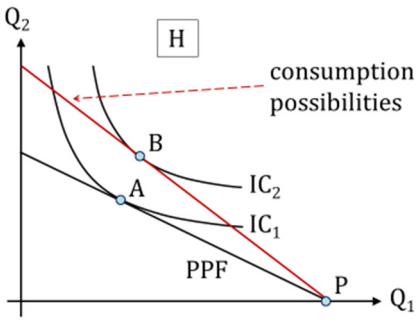
$P_1^W / P_2^W$ – world relative price of good 1

**Figure 4.4** Relative supply (RS) and relative demand (RD) for good 1, World market

World relative price of good 1 is represented by the intersection of relative supply and relative demand curves. With world relative price of good 1 in between original relative prices in both countries, it is possible to specialise in production (according to the comparative advantage) and to trade.

Trade allows the exchange of produced goods for other goods the country wants to consume. With specialisation, world production is expanded, and so, the amount of goods available for each country's consumers increases. At world relative price of good 1 in between the original autarkies' relative prices, Home can get a larger amount of good 2 from Foreign than the amount it has given up producing. Analogically, Foreign can get a larger amount of good 1 (for its production of good 2) from the Home country than the amount of good 1 it has given up producing. Trade expands consumption possibilities in both countries and their consumption possibility frontiers are outside the production possibility frontiers.

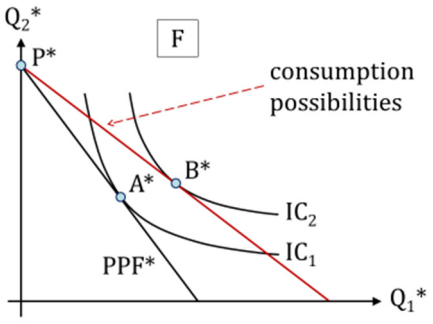
If trade exists, Home's and Foreign production and consumption point is no more the same (Figures 4.5 and 4.6). Countries specialise in producing goods in which they have comparative advantage; Home economy produces at point P (max. production of good 1, no production of good 2) and the Foreign economy at point P* (no production of good 1, max. production of good 2). But consumption possibilities are given by mutual trade, and both countries can consume outside their production possibility frontiers. The consumption point is where utility of consumers is maximised subject to consumption possibilities after trade, i.e. where the consumption possibility frontier is tangent to the highest indifference curve. Both goods can be consumed in both countries; Home consumes at point B and Foreign at point B*.




$Q$ – quantity of a good

P – production point with trade
B – consumption point with trade

**Figure 4.5** Consumption possibilities with trade, Home economy (H)




$Q^*$ – quantity of a good

P* – production point with trade
B* – consumption point with trade

Note that since the slope of the PPF indicates the opportunity cost of good 1, Home's PPF is flatter than Foreign's, because Home has lower opportunity cost of good 1 and comparative advantage in good 1.

**Figure 4.6** Consumption possibilities with trade, Foreign economy (F)

The free trade relative price differs from relative prices in both countries before trade. It supports specialisation, extends consumption possibilities and determines wages of workers. In our case Home has a comparative advantage and specialises in production of good 1, and Foreign has comparative advantage and specialises in production of good 2. When trade occurs, new relative prices of goods influence wages

of workers in both countries. For the Home country, relative price of good 1 increases with trade, $\frac{P_1}{P_2} < \frac{P_1^W}{P_2^W}$, and Home produces good 1, so domestic workers in industry 1 can be paid a higher wage ($w_1 = P_1^W / a_{L1}$). From Foreign country perspective, relative price of good 1 decreases with trade, $\frac{P_1^W}{P_2^W} < \frac{P_1^*}{P_2^*}$, so relative price of good 2 increases with trade. Foreign specialises in production of good 2, so Foreign workers in industry 2 can earn a higher wage ($w_2^* = P_2^W / a_{L2}^*$).

The Ricardian model of international trade is based on comparative advantage and predicts complete specialisation in the type of production with comparative advantage. All other goods and services that countries desire are bought in the international market. Trade leads to expanded consumption possibilities and to higher wages for workers in the particular industry.

In many cases, full specialisation of countries is prevented because some goods or services cannot be traded (for example fresh bread, shoe repair, hair cut), because of more factors of production (i.e. labour is not the only input), because of transportation or other cost connected to trade and because of protectionism, economic policies and trade barriers.

## Exercise

Two different countries, Home and Foreign, would like to trade with each other. They both produce strawberries and potatoes. Home has 5000 hours of labour available, Foreign has 2400 hours of labour. Domestic workers can pick one kilogram of strawberries in 5 hours, but they can gather one kilogram of potatoes in 2 hours. Foreign workers can pick one kilogram of strawberries in 3 hours and can gather one kilogram of potatoes in 0.6 hour.

a) Graph the production possibility frontiers of both countries, and construct their equations.
b) In the absence of trade, what can be the maximum consumption of potatoes in Home if domestic citizens wish to consume 500 kg of strawberries? Suppose that Foreign is currently producing 2000 kg of potatoes. How many kilograms of strawberries can be produced in Foreign?
c) What is the opportunity cost of strawberries in terms of potatoes in Home? And in Foreign?
d) Which country has the absolute advantage in strawberries? And which country in potatoes?
e) Which country has the comparative advantage in strawberries? And which country in potatoes?
f) If no trade occurs, calculate the relative price of strawberries in each country.
g) Home and Foreign decide to open their markets and start free trade. They specialise in production of their comparative advantage good. Is world production of strawberries and potatoes expanded with specialisation?
h) With trade, the relative price of strawberries is 4. How consumption possibilities of domestic consumers can be expanded (if they still wish to consume 500 kg of strawberries)?
i) Calculate wages of domestic workers before and after trade, and wages of Foreign workers before and after trade (pre-trade prices of strawberries are 12.5 €/kg in Home and 18 €/kg in Foreign; pre-trade prices of potatoes are 5 €/kg in Home and 3.6 €/kg in Foreign; with trade, the world market price of strawberries is 16 €/kg and world market price of potatoes is 4 €/kg).

*Solution*

| | **Home** | **Foreign** |
|---|---|---|
| strawberries (good 1) | $a_{L1} = 5$ | $a_{L1}^* = 3$ |
| potatoes (good 2) | $a_{L2} = 2$ | $a_{L2}^* = 0.6$ |
| labour supply | $L = 5000$ | $L^* = 2400$ |

a) The production possibility frontier shows all the possible combinations of goods that can be produced from given resources in an economy.

Home's PPF:

$$Q_2 = \frac{L}{a_{L2}} - \frac{a_{L1}}{a_{L2}} Q_1$$

$$Q_2 = \frac{5000}{2} - \frac{5}{2} Q_1$$

$$Q_2 = 2500 - 2.5Q_1$$

Foreign's PPF:

$$Q_2^* = \frac{L^*}{a_{L2}^*} - \frac{a_{L1}^*}{a_{L2}^*} Q_1^*$$

$$Q_2^* = \frac{2400}{0.6} - \frac{3}{0.6} Q_1^*$$

$$Q_2^* = 4000 - 5Q_1^*$$

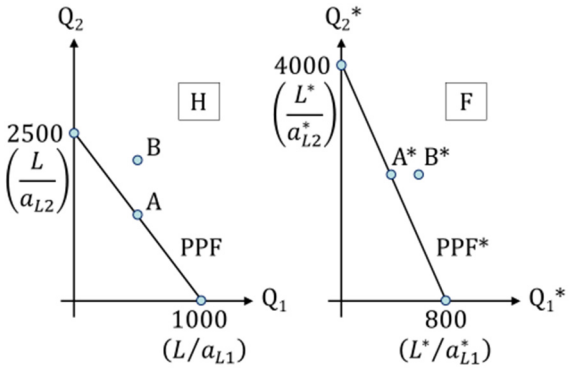



**Figure 4.7** Example - production possibilities of countries producing strawberries and potatoes

b) If countries are closed to trade, domestic consumers can consume the quantity of goods as it has been produced. If they wish to consume 500 kg of strawberries, 500 kg have to be produced. The respective output in the potato industry can be calculated using Home's PPF equation.

If $Q_1 = 500$, then $Q_2 = 2500 - 2.5 \cdot 500$

$Q_2 = 1250.$

In the absence of trade, the Home's economy is producing and consuming a combination of goods consisting of 500 kg of strawberries and 1250 kg of potatoes (point A).

Foreign is producing 2000 kg of potatoes and its production of strawberries can be calculated using its PPF equation.

If $Q_2^* = 2000$, then $2000 = 4000 - 5Q_1^*$

$Q_1^* = 400.$

Foreign economy is producing 400 kg of strawberries and 2000 kg of potatoes (point A*).

c) Opportunity cost measures the quantity of one good, we have to give up in order to produce another good.

Home's opportunity cost of producing 1 kg of strawberries is $\frac{a_{L1}}{a_{L2}} = \frac{5}{2} = 2.5$. To produce 1 kg of strawberries, Home has to give up production of 2.5 kg of potatoes. (Producing an additional kg of strawberries requires 5 hours of labour. Each hour devoted to strawberry production could have been used instead to produce potatoes. In the potato industry, we need 2 hours of labour per 1 kg of output. In 5 hours, 2.5 kg of potatoes could not have been produced.)

Foreign's opportunity cost of producing 1 kg of strawberries is $\frac{a_{L1}^*}{a_{L2}^*} = \frac{3}{0.6} = 5$ (5 kg of potatoes).

d) Absolute advantage in producing a good means the ability to produce one unit of the good with lower costs, i.e. with less labour than other countries. To determine the absolute advantage in strawberry production, we have to compare unit labour requirements to produce 1 kg of strawberries in Home and in Foreign.

Absolute advantage in strawberries:

$a_{L1} > a_{L1}^*$

$5 > 3$ Foreign has absolute advantage in producing strawberries.

Absolute advantage in potatoes (similar principle):

$a_{L2} > a_{L2}^*$

$2 > 0.6$ Foreign has absolute advantage in producing potatoes.

e) A country that can produce a good at lower opportunity cost than any other country has comparative advantage in producing the good. To determine the comparative advantage in strawberry production, we have to compare opportunity costs of both countries in producing strawberries.

Comparative advantage in strawberries:

$\frac{a_{L1}}{a_{L2}} < \frac{a_{L1}^*}{a_{L2}^*}$

$2.5 < 5$ Home has comparative advantage in producing strawberries.

Comparative advantage in potatoes (find a country with lower opportunity cost of producing potatoes):

$\frac{a_{L2}}{a_{L1}} > \frac{a_{L2}^*}{a_{L1}^*}$

$0.4 > 0.2$ Foreign has comparative advantage in producing potatoes.

f) In a closed economy, relative price of a good equals its opportunity cost.

Relative price of strawberries in Home is $\frac{P_1}{P_2} = \frac{a_{L1}}{a_{L2}} = 2.5$.

Relative price of strawberries in Foreign is $\frac{P_1^*}{P_2^*} = \frac{a_{L1}^*}{a_{L2}^*} = 5$.

g) Before trade, total world production of strawberries is 900 kg (500 kg Home + 400 kg Foreign). Total production of potatoes in both countries is 3250 kg (1250 kg Home + 2000 kg Foreign).
If we allow the countries to specialise and to trade, world production of strawberries is 1000 kg (produced in Home), and total world production of potatoes is 4000 kg (produced in Foreign). More of both goods can be produced in the global economy.

h) With trade, countries can consume outside their PPF. Home produces 1000 kg of strawberries (because Home has comparative advantage in strawberry production and specialises in this industry). Domestic consumers wish to consume 500 kg, so, the remaining amount, $1000 - 500 = 500$ kg, can be exchanged in the international market for potatoes. World relative price of strawberries is $\frac{P_1^W}{P_2^W} = 4$. How many potatoes can Home get for its strawberries in the international market? For 500 kg of strawberries, Home can get 2000 kg of potatoes (500 kg of strawberries is exchanged at the relative price of strawberries 4). Home's consumption point is now given by B in the figure above.
Consumption possibilities of the Foreign economy are expanded too. Foreign produces 4000 kg of potatoes; it consumes 2000 kg, and 2000 kg can be exchanged for strawberries. World relative price

of potatoes is $\frac{P_2^W}{P_1^W} = \frac{1}{4} = 0.25$. Foreign can trade its non-consumed 2000 kg of potatoes for 500 kg of strawberries ($2000 \cdot 0.25 = 500$). Foreign consumes at point B*.

i) Prices of goods before trade and world prices in the international market are summarised below.

| | Home | Foreign | World |
|---|---|---|---|
| price of strawberries (good 1) | $P_1 = 12.5$ | $P_1^* = 18$ | $P_1^W = 16$ |
| price of potatoes (good 2) | $P_2 = 5$ | $P_2^* = 3.6$ | $P_2^W = 4$ |

In a closed economy that produces two goods, wages in both industries have to be equal. Wages depend on prices of goods and the amount of labour used in production. The relative price of a good equals the opportunity cost of producing the good. Then, wages can be calculated in the following way:

Home's wage in strawberry production: $w_1 = \frac{P_1}{a_{L1}} = \frac{12.5}{5} = 2.5$

Home's wage in potato production: $w_2 = \frac{P_2}{a_{L2}} = \frac{5}{2} = 2.5$

Pre-trade wage is 2.5 €/h in both industries in Home (wages are equal across industries, thus, Home can produce both goods).

Foreign wage in strawberry production is $w_1^* = \frac{P_1^*}{a_{L1}^*} = \frac{18}{3} = 6$.

Foreign wage in potato production is $w_2^* = \frac{P_2^*}{a_{L2}^*} = \frac{3.6}{0.6} = 6$.

Pre-trade wage is 6 €/h in both industries in Foreign (wages are equal across industries and Foreign can produce both goods).

With trade, Home specialises in strawberry production. All workers get their income from this industry and they are paid a wage depending on the new world price of strawberries, $w_1 = \frac{P_1^W}{a_{L1}} = \frac{16}{5} = 3.2$.

Foreign specialises in potato production and the wage of its workers depends on the world price of potatoes, $w_2^* = \frac{P_2^W}{a_{L2}^*} = \frac{4}{0.6} = 6.7$.

Trade benefits all countries. World relative price of a good is in between pre-trade relative prices in individual countries. The relative price of the exported good is higher than it was in the producer's country before trade, i.e. imported goods are relatively less expensive. Wages of workers, who produce exported goods, are higher with trade than without trade.

# Chapter 5 HECKSCHER-OHLIN THEORY OF INTERNATIONAL TRADE AND FACTOR ENDOWMENT

In the Ricardian model, the main reason for international trade is the existence of differences in technology and productivity of labour across countries. Another source of differences, and therefore another reason for trade, is the existence of differences in countries' resource endowments.

The Heckscher-Ohlin theory, developed by Eli Heckscher (1919) and Bertin Ohlin (1933), argues that the main reason for international trade is differences in labour, labour skills, physical capital or other production factors across countries. It is based on the assumption that countries use identical technologies, but production of different goods uses factors of production with different relative intensity (i.e. the proportion of one factor to another used in the production process is different in each industry) and that countries have different relative abundance of inputs (i.e. different ratio of available amount of one factor to another in each country).

**Model assumptions[27]:**
The Heckscher-Ohlin model (H-O model) assumes:

- two countries: Home and Foreign,
- production of two goods: good 1 and good 2,
- two factors of production are used: labour and capital (H-O model introduces capital as a second factor of production; capital refers to physical capital as machines, equipment, buildings, etc. and to land as a specific kind of physical capital),
- both factors are used to produce any of the goods: a mix of labour and capital is used to produce good 1, and another mix of factors is used to produce good 2,
- labour supply in each country is constant, and capital supply in each country is constant too: labour and capital are mobile across industries in a country but are immobile across countries; labour and capital are fully employed,
- perfect competition in all markets (goods and factors): all buyers and sellers are price takers. Prices of production factors are tied to prices of goods.

To understand why factor endowments are important in international trade, we analyse the situation without trade, and next, we extend our analysis for trade between Home and Foreign.

For further reference, let us define the main variables. Unit labour requirement, i.e. the amount of labour (number of hours) required to produce one unit of output, is $a_{L1}$ for industry 1 and $a_{L2}$ for industry 2. Unit capital requirement, i.e. the amount of capital required to produce one unit of output, is $a_{K1}$ for industry 1 and $a_{K2}$ for industry 2. For the Home economy, we denote labour supply by $L$ ($L_1$ is labour employed in industry 1, and $L_2$ is labour employed in industry 2), capital supply by $K$ ($K_1$ is capital employed in industry 1, and $K_2$ is capital employed in industry 2). The amount of output produced in industry 1 and in industry 2 is $Q_1$ and $Q_2$, respectively. Price of good 1 is denoted by $P_1$ and price of good 2 by $P_2$. Wage rate paid for one hour of labour is $w$, and rent that must be paid for one unit of capital is $r$. Starred variables will be used for the Foreign country.

[27] Sections Model assumptions, Trade patterns and Gains from trade are based on Krugman, P. – Obstfeld, M. – Melitz, M. 2014. International Economics. Theory and Policy. Pearson, 10. ed., 792 p. ISBN 978-0133423648. Suranovic, S. 2010. International Economics: Theory and Policy. FlatWord, 1. ed., 614 p. eISBN 978-1-4533-2722-7. Feenstra, R.C. – Taylor, A.M. 2014. International Economics. Worth Publishers, 3 ed., 464 p. ISBN 978-1429278423.

Production technology in Home and Foreign is the same; production of both goods requires two inputs, labour and capital, but in different proportions. Suppose a fixed mix of labour and capital has to be used to produce one unit of output in each sector (certain number of working hours and certain amount of capital is required, i.e. we cannot use more of one factor and less of another). Labour intensive industry requires a higher ratio of labour to capital than the other industry. Capital intensity is determined as proportion of capital to labour used in production of good 1 and good 2.

If $\frac{a_{L1}}{a_{K1}} > \frac{a_{L2}}{a_{K2}}$ Production in industry 1 is relatively labour intensive.

$\frac{a_{L1}}{a_{K1}} < \frac{a_{L2}}{a_{K2}}$ Production in industry 2 is relatively labour intensive.

$\frac{a_{K1}}{a_{L1}} > \frac{a_{K2}}{a_{L2}}$ Production in industry 1 is relatively capital intensive.

$\frac{a_{K1}}{a_{L1}} < \frac{a_{K2}}{a_{L2}}$ Production in industry 2 is relatively capital intensive.

Assume that the production process of good 1 is relatively labour intensive and production of good 2 is relatively capital intensive, $\frac{a_{L1}}{a_{K1}} > \frac{a_{L2}}{a_{K2}}$ (or $\frac{L_1}{K_1} > \frac{L_2}{K_2}$) and $\frac{a_{K1}}{a_{L1}} < \frac{a_{K2}}{a_{L2}}$.

Production possibilities of the Home economy are determined by both production factors, labour and capital. Possible combinations of two goods that can be produced with Home's given labour supply are:

$$L = L_1 + L_2 \tag{5.1}$$

$$L = a_{L1}Q_1 + a_{L2}Q_2 \tag{5.2}$$

And from that:

$$Q_2 = \frac{L}{a_{L2}} - \frac{a_{L1}}{a_{L2}}Q_1 \tag{5.2.1}$$

Possible combinations of two goods that can be produced in Home with given capital supply are:

$$K = K_1 + K_2 \tag{5.3}$$

$$K = a_{K1}Q_1 + a_{K2}Q_2 \tag{5.4}$$

$$Q_2 = \frac{K}{a_{K2}} - \frac{a_{K1}}{a_{K2}}Q_1 \tag{5.4.1}$$

The production possibility frontier, i.e. combinations of goods that it is possible to produce in the Home economy, depends on the quantity of both resources the country has. We can draw a labour constraint that shows all the possible combinations of goods that are possible to produce given Home's labour supply and its technology. We also can draw a capital constraint that shows all combinations of goods that are possible to produce given Home's capital supply and its technology. But to produce goods, Home needs both factors of production; labour and capital are needed in the production process at the same time. Thus, the economy must produce subject to both constrains. The production possibility frontier of the Home country will be given by the interior section of its labour and capital constraint.

Good 1 is more labour intensive than good 2, $\frac{a_{L1}}{a_{K1}} > \frac{a_{L2}}{a_{K2}}$, and graphically the labour constraint is steeper than the capital constraint. After rearranging the equation, we get that $\frac{a_{L1}}{a_{L2}} > \frac{a_{K1}}{a_{K2}}$, i.e. the value of slope in labour constraint is higher than in capital constraint. Home's production possibility frontier is the internal area of both constraints. Therefore, the PPF is kinked. The production possibility frontier represents all combinations of the two goods that can be produced with full employment of at least one factor of production. If we require full employment of both factors, the production possibility frontier reduces to one point; the point where labour and capital constrain intersect, point D, as it is depicted in Figure 5.1.

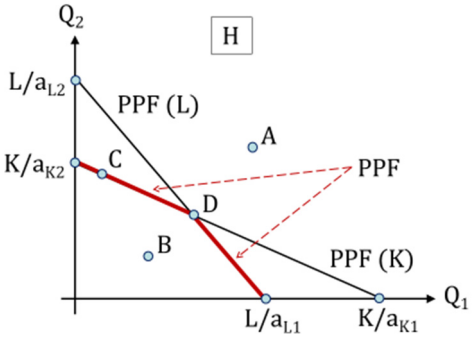



**Figure 5.1** Production possibility frontier without input substitution (PPF), Home economy (H)

$Q$ – amount of output ($Q_1$ - quantity of good 1 and $Q_2$ - quantity of good 2)

PPF (L) – labour constraint
PPF (K) – capital constraint
A, B, C, D – points representing different production possibilities. Combination A cannot be produced from given resources. C and D represent combinations that are possible for the country to produce because it has enough labour and capital for their production. Production point C fully uses capital, with excess labour. In D both factors, labour and capital, are fully employed. Combination of goods given by point B could be produced from our resources, but no production factor is fully used (we will not consider these combinations).

The slope of the production possibility frontier is no longer constant, because with more factors of production the production possibility frontier is no longer a straight line. The slope reminds us of opportunity cost of producing one good in terms of the other – how many units of good 2 Home has to give up, if it wants to produce one more unit of good 1. The value of slope of the first segment of the production possibility frontier (that segment including point C) is smaller, and the slope of the second segment is higher. The opportunity cost of producing one more unit of good 1 is lower when Home produces a low amount of good 1; for quantities of good 1 smaller than in point D, the opportunity cost of good 1 is $a_{K1}/a_{K2}$. The opportunity cost of producing one more unit of good 1 is higher when Home produces a high amount of good 1; for amounts of good 1 higher than in point D, the opportunity cost of good 1 is $a_{L1}/a_{L2}$.

With a technology requiring a fixed mix of labour and capital in production of each good (i.e. fixed coefficients), the economy fully uses both factors of production if a combination of good 1 and good 2 represented by point D on the production possibility frontier is produced.

The price of each good has to cover total production costs of the good. The cost of producing one unit of output is the sum of labour cost and capital cost, which can be calculated as the amount of factor used times price for the factor. In this model, production of both goods is assumed, i.e. there is no specialisation in one commodity. Factor prices in both production industries must be equal, otherwise labour and capital would tend to move to the industry that pays a higher wage/rental. The following two equations must hold:

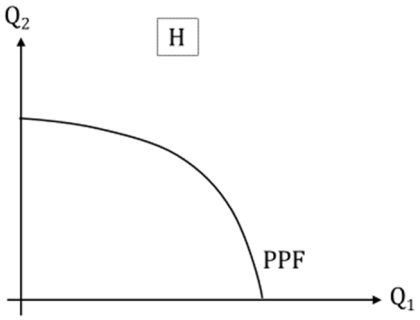
$$P_1 = a_{L1}.w + a_{K1}.r \quad (5.5)$$

$$P_2 = a_{L2}.w + a_{K2}.r \quad (5.6)$$

The above production possibility frontier does not allow substitution of inputs in the production process of goods, i.e. fixed mix of labour and capital has to be used in each industry. More realistic assumption is, that it is possible to substitute labour for capital and capital for labour (variable proportions of labour and capital can be used in production; the ratio of labour to capital used in production can vary). If substitution of one input for another is possible, then, the production possibility frontier is curved, i.e. it is a concave decreasing curve. In case of a curved production possibility frontier, the opportunity cost of producing a good continually increases as production of the good increases.

With substitution of inputs in the production process, Home's production possibility frontier becomes a smooth curve (Figure 5.2) and all combinations of goods at the frontier can be produced given Home's resources and technology. When the economy produces a low quantity of good 1, the opportunity

cost of producing that good is low. When Home produces a high quantity of good 1, its opportunity cost is high. Accordingly, the same is true for good 2.




$Q$ – amount of output ($Q_1$ - quantity of good 1 and $Q_2$ - quantity of good 2)

**Figure 5.2** Production possibility frontier with input substitution (PPF), Home economy (H)

All points on the production possibility frontier are potential combinations of good 1 and good 2 that can be produces in the Home economy given its labour and capital endowment and its technology. Which point will the country choose? Rational choice is to produce at the point that represents the maximum value of production. Value of production, $V$, can be calculated as follows:

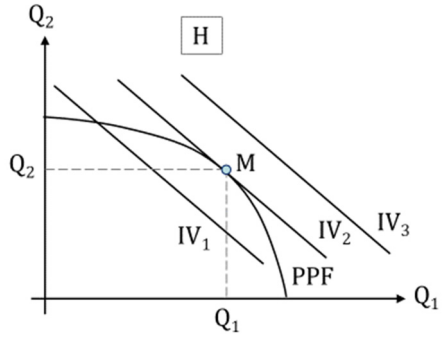
$$V = P_1Q_1 + P_2Q_2 \tag{5.7}$$

By rearranging the equation (5.7) we get:

$$Q_2 = \frac{V}{P_2} - \frac{P_1}{P_2}Q_1 \tag{5.7.1}$$

The locus traced out by various combinations of quantities of two goods that have the same value of production at given prices is known as the *isovalue line*. Parallel isovalue lines represent different total value of production. Slope of the isovalue lines is $-\frac{P_1}{P_2}$.

The Home economy produces at the point that maximises the value of production. At that point the highest possible isovalue line is tangent to the production possibility frontier, as it is shown in Figure 5.3.




$Q$ – amount of output ($Q_1$ - quantity of good 1, and $Q_2$ - quantity of good 2)

M – point representing production combination of good 1 and good 2 with the highest value of production

**Figure 5.3** Production possibility frontier (PPF) and isovalue lines (IV), Home economy (H)

At point M in the figure, the slope of the production possibility frontier equals the slope of the isovalue line. The value of the slope of the production possibility frontier represents opportunity cost of producing good 1, and therefore, opportunity cost of producing good 1 is equal to the relative price of good 1, $P_1/P_2$.

When an economy produces a combination of goods with the highest value, the opportunity cost of producing a good equals the relative price of that good.

Let us come back to the substitution of inputs in the production process. If each good is produced with labour and capital, and substitution of labour for capital and capital for labour is possible, producers may choose different combinations of production factors that produce the same amount of output. All input combinations that yield the same amount of output are represented by an isoquant.

The amount of labour and capital the producers use depends on the price of labour (i.e. wage) and on the price of capital (i.e. rental rate). All combinations of labour and capital that cost the producers the same amount of money at given factor prices are shown by an isocost line. The aim of producers is to produce any given output level of a good at smallest possible costs.

In Figure 5.4, a unit isoquant for good 1 is illustrated. It represents combinations of labour and capital that produce one unit of good 1. Each isocost line depicts combinations of labour and capital that have the same total cost of producing good 1, formally:

$$TC = w.a_{L1} + r.a_{K1} \tag{5.8}$$

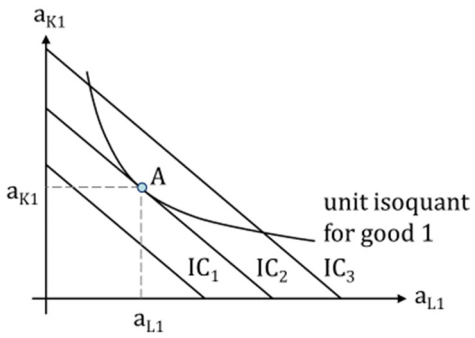
or

$$a_{K1} = \frac{TC_1}{r} - \frac{w}{r}a_{L1} \tag{5.8.1}$$

Different isocost lines represent different levels of total costs.

The cost minimising input bundle that can produce the given amount of output (here one unit of good 1) is at the point where the isoquant tangents the lowest isocost curve. This combination of labour and capital produces one unit of good 1 with the lowest costs.

Under perfect competition, the price of a good is equal to the cost of producing one unit of the good. Hence, for one unit of production it applies, $TC = P_1$ and $P_1 = w.a_{L1} + r.a_{K1}$. Similar principles are valid for producers in industry 2.




$a_{L1}$ – unit labour requirement
$a_{K1}$ – unit capital requirement
unit isoquant – isoquant with combinations of inputs that produce one unit of good 1 (for this isoquant $Q_1 = 1$)
$IC$ – isocost lines
A – a point representing combination of inputs that can produce one unit of good 1 with the lowest costs

**Figure 5.4** Optimal combination of inputs (cost minimising combination), industry 1

The amount of labour and capital used in production can vary, thus, the ratio of labour and capital used to produce a good is not constant. The optimal combination of inputs is where the isoquant touches the lowest isocost. At the point of tangency, the slope of the isoquant equals the slope of the isocost, and its value is set by $w/r$. A change in inputs prices causes the optimal combination of inputs change too due the change

of the slope of isocost lines. If the relative wage increases (wage relative to capital rental rate), producers will tend to use less labour and more capital in the production of their good.

The amount of inputs used in production depends on the relative price of inputs. It is no more so simple to determine which good is labour intensive and which good is capital intensive. Therefore, we always have to compare factor intensities when the two industries face the same factor prices.

If production of good 1 is labour intensive, it means that at any given factor prices, production of good 1 uses more labour relative to capital than production of good 2, $\frac{a_{L1}}{a_{K1}} > \frac{a_{L2}}{a_{K2}}$. Then, production of good 2 is relatively capital intensive.

What happens in the Home economy, if relative prices of goods change? Combination of inputs and production costs depend on factor prices. On the other hand, production costs should be covered by sales revenues that depend on prices of goods. Change in input prices will affect the production process. Change in good prices will affect the production process too.

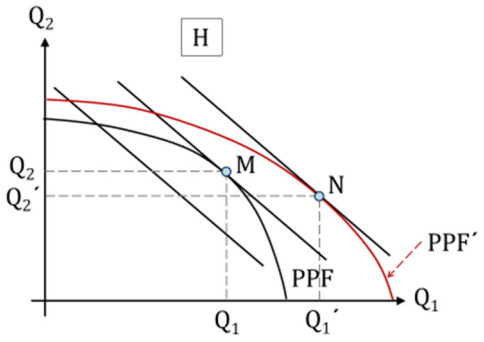
If the relative wage increases, it should affect the price of good 1 more than the price of good 2 since industry 1 is labour intensive. Vice versa, if the relative price of good 1 increases (rise of $P_1/P_2$), then the wage increases relative to the rental of capital because labour is used intensively in the production of good 1.

This logic is formulated by the *Stolper-Samuelson theorem*: If the relative price of a good increases, then the return of the factor used more intensively in production of that good increases, while the return of the other factor decreases.

Any change in relative prices of goods affects income of workers and capital owners. An increase in the relative price of good 1 leads to higher wages for workers relative to rental paid to capital owners. An increase of relative wages leads to lower ratio of labour to capital used in both industries.

What happens in the Home economy, if the country's endowments change? A change in labour or capital supply would affect production possibilities and the combination of goods produced.

Suppose, there is an increase in the labour supply. Production possibility frontier will expand but more in the direction of good 1 (labour intensive industry) than in the direction of good 2 (capital intensive industry). The new production possibility frontier is shifted outwards and biased toward labour intensive good 1, because supply of labour increased, Figure 5.5.




$Q$ – amount of output ($Q_1$ - quantity of good 1 and $Q_2$ - quantity of good 2)

N – point representing production combination of good 1 and good 2 after increase in labour supply

**Figure 5.5** Increase of resources and change in production of goods, Home economy (H)

If prices of goods remain unchanged, the ratio of labour to capital used in production of both goods remains constant, but the production of the labour intensive good (good 1) increases and production of the capital intensive good (good 2) decreases. The more labour the country has relative to capital, the higher is the production of good 1 to good 2. New output combination is represented by a point where the new

production possibility frontier and the highest isovalue line are tangent (point N; slope of isovalue lines is unchanged, $P_1/P_2$).

The effect of changes in factor endowments on production of an economy is stated by the *Rybczynski theorem*: At constant prices of goods, an increase of a country's amount of a production factor will cause an increase in production of the good that uses this factor intensively and a decrease in the output of the other good.

Although our explanation so far referred to the Home country, Foreign follows similar principles if no trade is possible. In the next section, we show how the countries are affected by international trade.

## Trade patterns

In the H-O model trade is based on differences in factor endowments between countries. According the *Heckscher-Ohlin theorem*, a country that is relatively abundant in a factor exports goods whose production is relatively intensive in that factor.

Suppose that Home is relatively abundant in labour and Foreign in capital, $\frac{L}{K} > \frac{L^*}{K^*}$.

If: $\frac{L}{K} > \frac{L^*}{K^*}$ Home is relatively abundant in labour.

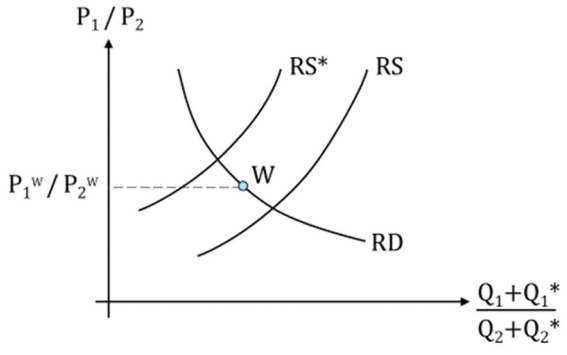
$\frac{L}{K} < \frac{L^*}{K^*}$ Foreign is relatively abundant in labour.

$\frac{K}{L} > \frac{K^*}{L^*}$ Home is relatively abundant in capital.

$\frac{K}{L} < \frac{K^*}{L^*}$ Foreign is relatively abundant in capital.

Some countries are relatively well endowed with labour; in our case it is Home because it has a higher ratio of labour to capital than Foreign. With the same technologies, Home produces higher amount of good 1 relative to good 2 because good 1 is relatively labour intensive (at each relative price of good 1 to good 2). Foreign produces higher relative amount of good 2 because good 2 is relatively capital intensive and the country is relatively abundant in capital. At each relative price of good 1, relative quantity of good 1 supplied is higher in Home than in Foreign (see relative supply curves in the Figure 5.6).

On the demand side, relative quantity demanded of good 1 increases when the relative price of good 1 decreases. Consumers in both countries are assumed to have the same tastes, so the relative demand curve ($RD$) will be the same for both countries.




$Q$ – quantity of a good
$P$ – price of a good
$RS$ – relative supply in Home
$RS^*$ - relative supply in Foreign
$RD$ – relative demand

$P_1^W/P_2^W$ – world relative price of good 1

**Figure 5.6** Relative supply (RS) and relative demand (RD) for good 1 in each country and world relative price of good 1

In the absence of trade, the relative price of good 1 is lower in Home than in Foreign. Pre-trade prices can be found at the point where relative supply and relative demand curves intersect. International trade leads to convergence of relative prices of goods. Under free trade, the world relative price of goods will be settled in between the original relative prices in individual countries before trade. In the figure above, world relative price of good 1 can be given by point W.

International trade results in convergence of relative prices. The relative price of good 1 rises in Home and decrease in Foreign. Good 1 is relatively labour intensive and Home is well endowed with labour, thus, higher relative price of good 1 leads to higher relative supply. On the other hand, increased relative price of good 1 leads to a decline in relative consumption of good 1. Home becomes and exporter of good 1.

But in Foreign, the relative price of good 1 decreases after trade, and Foreign becomes an importer of good 1. The opposite happens with the relative price of good 2; relative price of good 2 decreases in Home and increases in Foreign. Consequently, Home becomes an importer of good 2 and Foreign an exporter.

Exports of a labour-abundant country come from labour intensive industries, and its imports consist of capital intensive goods as the country is relatively scare in capital.

### Gains from trade

International trade changes relative prices of goods. In perfectly competitive markets, the prices of goods influence sales revenues, which are in turn used to pay production factors. Any change in output prices affects the earnings of inputs.

Free trade equalises relative prices of goods. As factor prices are tied to output prices, factor prices are also equalised. This theorem is called the *factor price equalization theorem*: when the prices of goods are equalised between countries, the prices of production factor will be also equalised. Thus, wage for labour is the same in both industries and in both countries, and rental rate for capital is the same in both industries in both countries.

A movement to free trade caused an increase in the relative price of good 1 in Home. The real return of labour rises, while the real return of capital decreases. Domestic workers will experience an increase in the purchasing power of their wages, i.e. they will gain. Capital owners in the Home country will experience a fall in the purchasing power of their rental income, i.e. they will lose. In Foreign, the relative price of good 1 declined, so the relative price of good 2 increased with trade. Foreign is a capital abundant country, and production of good 2 is capital intensive. With higher relative price of good 2, production of good 2 is relatively increased and capital owners are paid better, while wage for workers decreased.

In the H-O model, international trade affects income distribution in a way that owners of a country's abundant factors gain, but owners of a country's scare factors lose from trade. Scare factors lose because they are intensively employed in the import-competing industry; as the return of these factors is the same in both industries, they lose regardless of the industry in which they are used. But countries as a whole benefit from trade.

In reality, good prices and factor prices are not completely equalised among countries. The H-O model assumes that technologies of trading partners are the same and since wages and rental rates should be equalised after trade, countries should use the same ratio of labour and capital in production. They should differ only in labour and capital supply and therefore in the quantities of goods produced. The assumption of equal technologies is considered unrealistic. Further assumption of the model is often violated too, and equalization of output and input prices is prevented. The reasons are for example differences in demand, imperfect competition in markets, transportation cost, government policies and other trade barriers.

## Exercise

Two countries, Home and Foreign, produce tomatoes and wheat. In the production process, they use the same technology, which requires two factors of production: labour and capital. To produce one kilogram of tomatoes, 3 units of labour and 3 units of capital are needed. In the production process of wheat, 2 units of labour and 4 units of capital are required to produce one kilogram of grain.

a) Which good is relatively labour intensive? Which product is relatively capital intensive?
b) Home's labour supply is 3000 units, and its capital supply is 4560 units. Graph the labour and capital constraint of the Home's economy. Calculate the amount of tomatoes and wheat, which can be produced if both inputs are fully employed in production.
c) What happens to the economy if Home's labour supply increases to 3360 units?
d) Foreign has 4200 units of labour and 6900 units of capital available for production of tomatoes and wheat. Graph the labour and capital constraint of the Foreign economy. Calculate the quantity of each good produced at full employment of resources.
e) Which country is relatively abundant in labour (Home is characterised as in exercise b)? Which good should Home export if mutual trade is possible?
f) In the absence of trade, Home's price of tomatoes was 18 and the price of wheat was 18 monetary units per kg. Foreign price of tomatoes was 24 and Foreign price of wheat 20 monetary units per kg. Trade leads to convergence of relative prices, more specifically, the world price of tomatoes is 21 and world price of wheat is 19 monetary units per kg. What is the impact of free trade on factor prices such as wage and interest rates?
g) If the countries adopt a production technology that enables substitution between labour and capital, how the production possibility frontier would be affected?

*Solution*

| | | **Home** | **Foreign** |
|---|---|---|---|
| tomatoes (good 1) | $a_{L1} = 3, a_{K1} = 3$ | $L = 3000$ | $L^* = 4200$ |
| wheat (good 2) | $a_{L2} = 2, a_{K2} = 4$ | $K = 4560$ | $K^* = 6900$ |

a) Labour intensive industry requires a higher ratio of labour to capital to produce one unit of a good than another industry. Capital intensive industry requires a higher ratio of capital to labour than another industry.

Labour intensive good:

$$\frac{a_{L1}}{a_{K1}} > \frac{a_{L2}}{a_{K2}}$$

$1 > 0.5$ Production of tomatoes is relatively labour intensive.

Capital intensive good:

$$\frac{a_{K1}}{a_{L1}} < \frac{a_{K2}}{a_{L2}}$$

$1 < 2$ Production of wheat is relatively capital intensive.

b) The labour constraint shows all the possible combinations of goods that can be produced from given labour supply in an economy. The capital constraint shows all the possible combinations of goods that can be produced from given capital supply.

Home's labour constraint PPF(L):

$$Q_2 = \frac{L}{a_{L2}} - \frac{a_{L1}}{a_{L2}} Q_1$$
$$Q_2 = \frac{3000}{2} - \frac{3}{2} Q_1$$
$$Q_2 = 1500 - 1.5Q_1$$

Home's capital constraint PPF(K):

$$Q_2 = \frac{K}{a_{K2}} - \frac{a_{K1}}{a_{K2}} Q_1$$
$$Q_2 = \frac{4560}{4} - \frac{3}{4} Q_1$$
$$Q_2 = 1140 - 0.75Q_1$$

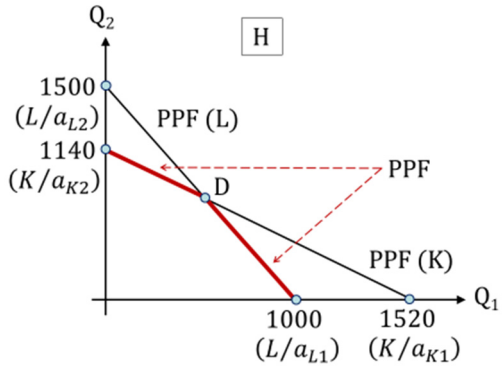



**Figure 5.7** Example – labour and capital constraint of a country producing tomatoes and wheat (Home)

The economy needs both production factors to produce tomatoes and wheat. Labour and capital are fully employed if Home produces in point D. Labour and capital constraints intersect in this point. By solving both constraints equations for $Q_1$ and $Q_2$, we get the quantity of tomatoes and wheat produced in Home.

$$\left.\begin{aligned} Q_2 &= 1500 - 1.5Q_1 \\ Q_2 &= 1140 - 0.75Q_1 \end{aligned}\right\} \qquad \begin{aligned} Q_1 &= 480 \\ Q_2 &= 780 \end{aligned}$$

If both resources are fully employed, Home produces 480 kg of tomatoes and 780 kg of wheat.

c) Labour supply in Home increases, now, Home has $L' = 3360$ units of labour, which can be used in production. Labour constraint will change, capital constraint remains the same.

Home's new labour constraint PPF(L'):

$$Q_2 = \frac{L'}{a_{L2}} - \frac{a_{L1}}{a_{L2}} Q_1$$
$$Q_2 = \frac{3360}{2} - \frac{3}{2} Q_1$$
$$Q_2 = 1680 - 1.5Q_1$$

Home's capital constraint is the same, PPF(K):

$$Q_2 = \frac{K}{a_{K2}} - \frac{a_{K1}}{a_{K2}} Q_1$$
$$Q_2 = 1140 - 0.75Q_1$$

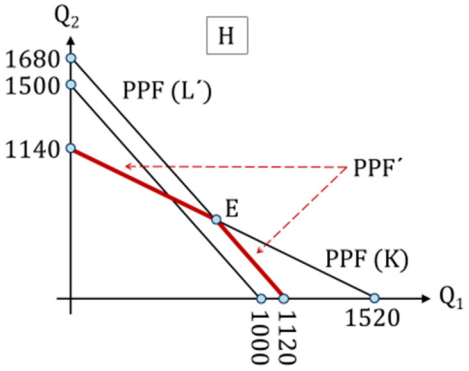



**Figure 5.8** Example – increase in labour supply: new labour and capital constraint of a country producing tomatoes and wheat

If both resources are fully employed, Home produces 720 kg of tomatoes and 600 kg of wheat (point E). The country expanded production of tomatoes and contracted production of wheat. As the labour supply increased, production possibilities are expanded and biased toward tomatoes because tomatoes are the relatively labour intensive good.

$$\left.\begin{aligned} Q_2 &= 1680 - 1.5Q_1 \\ Q_2 &= 1140 - 0.75Q_1 \end{aligned}\right\} \qquad \begin{aligned} Q_1 &= 720 \\ Q_2 &= 600 \end{aligned}$$

d) Foreign economy is constrained by its labour and capital supply.

Foreign labour constraint PPF*(L):

$$Q_2^* = \frac{L^*}{a_{L2}} - \frac{a_{L1}}{a_{L2}} Q_1^*$$

$$Q_2^* = \frac{4200}{2} - \frac{3}{2} Q_1^*$$

$$Q_2^* = 2100 - 1.5 Q_1^*$$

Foreign capital constraint PPF*(K):

$$Q_2^* = \frac{K^*}{a_{K2}} - \frac{a_{K1}}{a_{K2}} Q_1^*$$

$$Q_2^* = \frac{6900}{4} - \frac{3}{4} Q_1^*$$

$$Q_2^* = 1725 - 0.75 Q_1^*$$

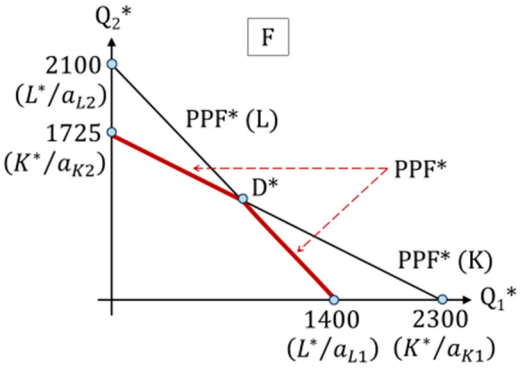



**Figure 5.9** Example – labour and capital constraint of a country producing tomatoes and wheat (Foreign)

If both resources are fully employed, Foreign produces in point D*; 500 kg of tomatoes and 1350 kg of wheat:

$$\left.\begin{aligned} Q_2^* &= 2100 - 1.5 Q_1^* \\ Q_2^* &= 1725 - 0.75 Q_1^* \end{aligned}\right\} \qquad \begin{aligned} Q_1 &= 500 \\ Q_2 &= 1350 \end{aligned}$$

e) A country relatively abundant in labour has a higher ratio of labour to capital than another country.

Labour abundant country:

$$\frac{L}{K} > \frac{L^*}{K^*}$$

$0.66 > 0.61$ Home is relatively abundant in labour.

Capital abundant country:

$$\frac{K}{L} < \frac{K^*}{L^*}$$

$1.52 < 1.64$ Foreign is relatively abundant in capital.

Each country should export goods that use its abundant factors intensively. Home is relatively abundant in labour, and therefore, Home will export tomatoes (labour intensive good). Foreign is relatively abundant in capital, and therefore, Foreign will export wheat (capital intensive good).

f) Prices of goods before trade and world prices in the international market are summarised below.

| | **Home** | **Foreign** | **World** |
|---|---|---|---|
| price of tomatoes (good 1) | $P_1 = 18$ | $P_1^* = 24$ | $P_1^W = 21$ |
| price of wheat (good 2) | $P_2 = 18$ | $P_2^* = 20$ | $P_2^W = 19$ |

In an autarky, factor prices depend on regional market conditions. Hence, factor prices differ between countries. With trade, prices of good will be equalised, and factor prices will be equalised too.

In perfectly competitive markets, price of a good should cover production costs, i.e. labour and capital costs of producing one unit of output. We can calculate pre-trade wage and rental rate in Home and Foreign; within a country wages and rental rates are equal in both industries, otherwise it would not be possible to produce both goods. If trade occurs and world prices of goods are known, we can also find the wage and rental rate in both countries; according to the H-O theory, trade equalises factor prices and there will be no differences in wages and rental rates across countries.

Home's pre-trade wage and rental rate is defined as follows:

$P_1 = a_{L1}w + a_{K1}r$

$P_2 = a_{L2}w + a_{K2}r$

then:

$18 = 3w + 3r$

$18 = 2w + 4r$

$w = 3$

$r = 3$

Foreign's pre-trade wage and rental rate:

$P_1^* = a_{L1}w^* + a_{K1}r^*$

$P_2^* = a_{L2}w^* + a_{K2}r^*$

then:

$24 = 3w^* + 3r^*$

$20 = 2w^* + 4r^*$

$w^* = 6$

$r^* = 2$

With trade, wage and rental rate paid for factors of production are determined by world prices. In Home and Foreign, factor prices are equalised, $w = w^*$ and $r = r^*$, so we will denote wage by $w$ and rental rate by $r$:

$P_1^W = a_{L1}w + a_{K1}r$

$P_2^W = a_{L2}w + a_{K2}r$

then:

$21 = 3w^* + 3r^*$

$19 = 2w^* + 4r^*$

$w = 4.5$

$r = 2.5$

Home is relatively abundant in labour, and it exports labour intensive good (tomatoes). Wage for domestic workers increases with trade. But Home's scare factors loose, the rental rate is lower than it was before trade. Foreign is relatively abundant in capital, and it exports capital intensive good (wheat). Foreign capital owners are better off with trade, but Foreign workers are worse off.

g) A production technology that allows substitution of one input for another in the production process leads to a curved production possibility frontier (see Figure 5.10).

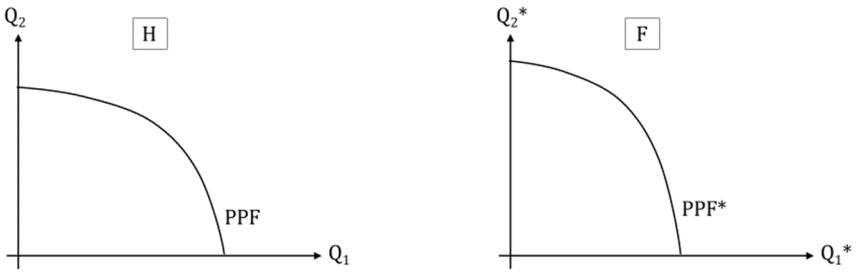



**Figure 5.10** Example – Home's and Foreign's production possibility frontier with input substitution

# Chapter 6 ECONOMIES OF SCALE AND INTERNATIONAL TRADE

Countries trade with each other because of their differences – the Ricardian theory and Heckscher-Ohlin theory of international trade consider differences in technology and differences in resource endowments, respectively, to be the main reason of international trade. Among other reasons, economies of scale (or increasing returns to scale in production) attract attention of trade economists. Models that explain the role of economies of scale in international trade are known as the *new trade theory* (NTT). If economies of scale in production exist, trade can be beneficial even for countries with identical technology and factor endowments.

Returns to scale refer to the relationship between inputs and output of a firm or industry in the long run. They represent changes in output as all inputs change by the same proportion (in the long run, all inputs are variable). As we now from Chapter 2.1, there are three types of returns to scale: decreasing, constant and increasing returns to scale. Up to now, we assumed constant returns to scale, i.e. that an increase in all factors of production leads to a proportionate increase in output (e.g. if all inputs double, production doubles too). Increasing returns to scale exist if a proportional change in all inputs leads to a proportional greater change in production (e.g. if all inputs double, output triples). Increasing returns to scale result in economies of scale, i.e. unit costs of production fall as output rises.

The existence of economies of scale, or increasing returns to scale, can be an incentive for international trade between similar countries. If two countries produce a good and economies of scale is present in the industry, it should be more efficient to concentrate production of the good in one of the countries rather than to produce a portion of the good in both countries. With economies of scale, average costs of production decrease as the quantity produced increases. World production can be increased with the same total amount of resources used. The country that will produce the good has to employ more factors of production in the particular industry, which leaves less inputs available for other industries. Production of other goods will be contracted, and these goods will be imported to keep or expand consumption possibilities for consumers.

Economies of scale are achieved if average cost (and marginal cost) of producing a good get lower as the volume of production increases. Economies of scale can be classified into two types: external and internal economies. *External economies of scale* refer to average cost reduction arising from increasing size of the particular industry. *Internal economies of scale* refer to average cost reduction arising from increasing size of a firm.

## External economies of scale[28]

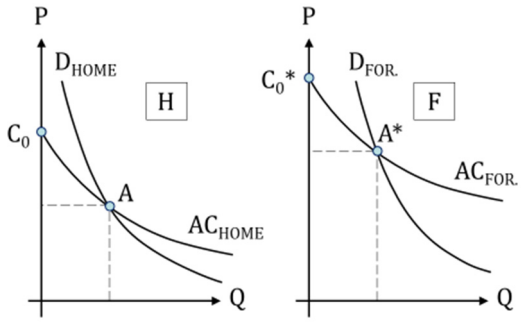
If the size of an industry influences average cost of production in the industry, external economies of scale may occur. The whole industry usually consists of many small firms concentrated in a country or in a region. Examples of industries that benefit from external economies of scale include textile industry concentrated in China or banking institutions concentrated in Benelux countries. With increasing size of the industry, firms can gain cost advantage because of (i) specialised suppliers of inputs: costs connected to special equipment or services used in the industry can be lower if the industry is large enough, specialised

[28] Sections External economies of scale and Internal economies of scale are based on Krugman, P. – Obstfeld, M. – Melitz, M. 2014. International Economics. Theory and Policy. Pearson, 10. ed., 792 p. ISBN 978-0133423648. Suranovic, S. 2010. International Economics: Theory and Policy. FlatWord, 1. ed., 614 p. eISBN 978-1-4533-2722-7. Feenstra, R.C. – Taylor, A.M. 2014. International Economics. Worth Publishers, 3 ed., 464 p. ISBN 978-1429278423.

inputs can be supplied faster, at lower prices (e.g. discounts), more specific services would be available, etc.; (ii) labour pooling: large industries may attract workers, accessibility of labour force and sharing a territorially limited labour market may reduce search and hiring costs; (iii) knowledge spillovers: firms and workers can easily get new knowledge and skills, share experience and new ideas, introduce new technologies and produce more efficiently.

In an industry with external economies of scale, production cost per unit of output decreases when the industry increases in size. More firms established in the industry generate a larger industry output, and consequently, a larger industry leads to lower average costs for all producers. Decreasing costs mean that firms are willing to sell their product at a lower price. Thus, as the output in the industry increases, its price decreases. This negative relationship implies a downward sloping supply curve.

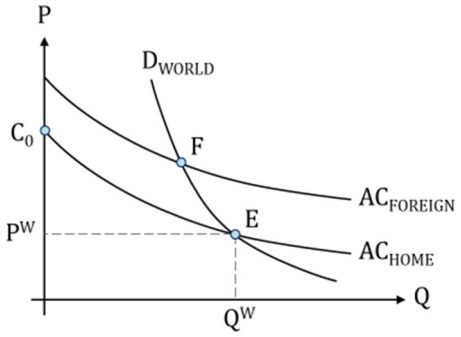
Assume two countries, Home and Foreign, producing a good within an industry with external economies of scale. Prior to trade, each country's industry consists of many firms, and perfect competition pushes the price of the good down to its average cost. The equilibrium level of output and the price of the good is given by the intersection of the supply curve (i.e. average cost curve) and the demand curve in each country's national market.




$Q$ – quantity of a good
$P$ – price of a good
AC – average cost
D – demand

**Figure 6.1** Home's (H) and Foreign (F) market equilibrium in an industry with external economies of scale before trade

With international trade, the whole industry will be concentrated in one country and that country will supply the whole international market. Usually the country with lower average cost curve will use its advantage to produce any output level at lower average cost; it specialises in production of the particular good and supplies the international market. Assume that Home can produce the good with lower cost (i.e. Home's average cost curve is below Foreign's), so Home increases production. In addition, external economies of scale enable to set lower price of the good. World equilibrium point is where world demand curve intersects Home's supply curve (point E in Figure 6.2). On the other hand, Foreign's industry goes down, costs are rising, so Foreign will stop producing the good.




$Q$ – quantity of a good
$P$ – price of a good
AC – average cost
D – demand

**Figure 6.2** World market equilibrium in an industry with external economies of scale

To sum up, international trade based on external economies of scale leads to specialisation and to lower prices of goods in all countries (not to equalisation of prices).

In some cases, one country establishes the industry first. Suppose that due to historical reasons, Foreign was first in the international market. Foreign would supply both countries, and world equilibrium would be in point F. Any domestic firm considering production of the good has to face initial average cost $C_0$, which is above the price in the international market. Thus, no domestic firm would start production. Historically established countries may remain large producers despite of the potential of other countries to produce the good cheaper.

External economies of scale can be applied to trade within a country – interregional trade. Some industries may be located and concentrated in specific regions within a country. But non-tradeable locally demanded goods and services has to be spread throughout the country.

### Internal economies of scale

Internal economies of scale depend on the size of a firm. The more output a firm produces, the lower its average cost of production. Thus, large firms have lower average cost than small firms. Therefore, small firms are not competitive, and as a result, they have to leave the market. Internal economies of scale tend to break down perfect competition. In imperfect competitive markets, firms can influence good prices, and they can sell more by cutting their price. In many industries, goods produced by individual firms are differentiated from each other. Examples of imperfect competitive markets with only a few producers in the industry whose products are differentiated from each other include GPS map providers, hotels or car producers. As mentioned in Chapter 3.4, there are three basic forms of imperfect competition: monopoly, oligopoly, monopolistic competition. As pure monopoly is rare, the most industries are imperfectly competitive.

In the national market, the quantity produced by a firm is where marginal cost of the firm equals marginal revenue. The price at which this output is demanded can be found using the demand curve. If the country decides to engage in free trade, the size of the market increases. National firms can operate in a bigger world market where more firms meet together, and a greater variety of products is produced and offered to consumers. Under new market conditions, some of the worse performing firms may exit, and better performing firms will expand. Any of the better performing firms may increase production in order to meet the larger demand. With internal economies of scale, the firm is able to offer its products at a lower price. But to use internal economies of scale, the firm must allocate the whole production of a good in one country although it is selling the good to consumers in both trading partners (Home and Foreign). There is

no clear rule in which of the countries the firm should concentrate its production. Some firms may localise their production in Home, some in Foreign. Yet the firms belong to the same industry, no specialisation will occur. As the products of individual firms are differentiated, consumers will demand goods from their, as well as from other countries. An international exchange of differentiated goods from the same industry is called *intra-industry trade*. Trade in goods from different industries is called *inter-industry trade*.

Firms in imperfect competitive markets can influence their prices. Sometimes they use a pricing strategy based on charging different consumers different prices. Price discrimination is possible if markets are segmented and consumers from one country cannot easily buy goods from the other country's market. If a firm charges lower price for exported goods than it charges for these goods in the domestic market, this form of price discrimination is called dumping in international trade.

An overwhelming majority of economists agree that free trade maximises welfare of domestic citizens as well as global welfare. Previous parts of this textbook led us also to this conclusion. However, we observe in reality that governments often get involved in international trade and impose barriers to trade, like tariffs or import quotas that reduce the extent of international trade. As a consequence, those governmental actions reduce welfare, as we will see in this chapter.

If economists who are interested in maximising social welfare were in government, no protectionist policies would be imposed. This implies that real politicians are either ignorant of international economics or they do not maximise social welfare. Ignorance on the part of politicians is not a tenable proposition because politicians have easy access to the advice of economists. So, the most likely reason for imposing tariffs, quotas and other trade reducing instruments is the fact that maximisation of welfare is not the main objective of politicians.

Politicians often follow other goals rather than welfare maximisation in their conduct of trade policy. Modern political economy literature agrees basically that politicians maximise their chance of reflection. They try to stay in government because a government position brings income, reputation, power, and other benefits that are valuable. The chances of being reflected increase with the redistribution of incomes through trade policy. So, the main motivation for trade policy lies in political markets rather than in economics.

There is basically only one purely economic reason for trade policy. That is the case of a large country that can improve the welfare of its citizens by imposing import tariffs. A large country is a monopsonist and the reduction of imports caused by tariffs reduces the world price, which benefits domestic citizens overall. The increase of domestic welfare is at expense of trading partners, however, and the global welfare decreases as a consequence.

Another often cited reason for trade policy is the protection of infant industries, i.e. those new, promising industries that may have comparative advantages in the long-run but must be assisted in the early years and helped along to maturity. Most other reasons for trade policy either directly or indirectly are based in a redistribution of income – that is, the protection of some politically influential industries. Industries that often receive protection in developed countries are mostly labour intensive (textile, clothing) and land intensive (agriculture). Those industries do not possess comparative advantages. Tariffs and quotas have been historically the most extensively used instruments of trade policy. In current years, they are giving way to non-tariff trade barriers like licenses and phytosanitary/sanitary measures.

# Chapter 7 TARIFFS

A *tariff* is a tax on imports. Tariffs are not applicable to domestic production but only to imported goods. There are basically two types of tariffs: specific and *ad valorem*. Specific tariffs are levied per unit of imported product – per automobile or per tonne of wheat. On the other hand, ad valorem tariffs are paid according to the value of imports, as for example, ten percent of the value of imported sugar. There are also various combinations of specific and ad valorem tariffs – for example ten euros per one tonne of wheat and twenty percent of the value of imported wheat.

When a tariff is levied by a small country like Slovakia (before its accession into the European Union) the world markets are not affected. Slovakia is a small country in the global context, which means that changes in imports by Slovakia do not affect world prices. On the other hand, when a tariff is levied by the European Union (EU), there will be repercussions felt on the world markets. The European Union is a large country and its import/export decisions affect world prices. When tariffs are analysed we have,

therefore, to distinguish two cases: the large country case and the small country case. The results for both cases differ slightly.

### The impact of a tariff – the small country case

Figure 7.1 illustrates the impact of a small country imposing a tariff. The figure is divided into two panels. The left-hand panel illustrates the situation at the domestic market, i.e. in Slovakia before its accession to the EU, while the right-hand panel illustrates the situation in the international market. In isolation, the domestic price in Slovakia would be $P_A$, which is the intersection of the domestic supply ($S$) and demand ($D$) curves. $P_A$ is sometimes referred to as an autarky price where *autarky* means a no-trade situation (often referred to as "isolation").

When Slovakia is allowed to trade with the world, the Slovak domestic price will become the same as the world price ($P_W$). The reason is simple. Higher Slovak prices would invite traders to buy on the world markets and sell in Slovakia, thereby bringing Slovak prices down. On the other hand, if Slovak prices are lower than world prices, traders are motivated to buy goods in Slovakia and export them abroad, which would increase Slovak prices. Traders conduct arbitrage, i.e. buying at cheap places and selling at expensive places, and in so doing they equalise the prices at different places. Obviously in reality some differences in prices of tradeable commodities could persist due to transportation costs or different tax treatment or other transaction costs. However, larger differences in international price exist for non-tradable goods, like land or haircuts. For the sake of simplicity, we assume that transportation costs and other transaction costs are negligible.

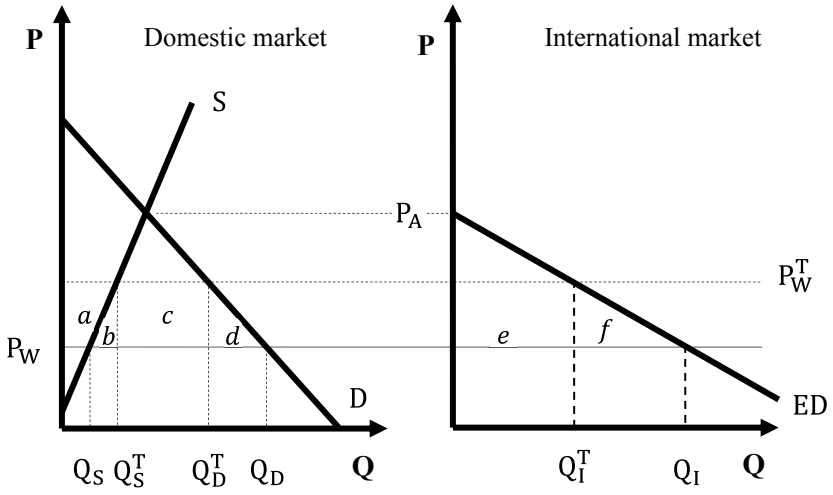



**Figure 7.1** Specific tariff – small country case

Where:

$P_A$ – autarky price
$P_W$ – the world price
$P_W^T$ – price in the domestic market after the imposition of a tariff ($P_W$ plus the specific tariff)
$Q_S$ and $Q_D$ – domestic supply and domestic demand at the world price $P_W$
$Q_S^T$ and $Q_D^T$ – domestic supply and domestic demand at the tariff price $P_W^T$
$Q_I, Q_I^T$ – imported quantities
$ED$ – import demand curve (excess demand)

Now the Slovak government imposes a tariff, $t = P_W^T - P_W$, in order to protect domestic producers from foreign competition. What happens to trade and domestic production, and consumption? Now traders can still buy at

world markets at price $P_W$ and transport goods to Slovakia, but at the border they must pay tariff $t$ to the state treasury. To remain profitable, traders have to charge higher prices to Slovak consumers. Domestic price will therefore increase to the level $P_W^T$, i.e. the domestic price will increase by the full amount of the tariff. The higher domestic price then motivates domestic producers to increase production from $Q_S$ to $Q_S^T$ while domestic consumption decreases, from $Q_D$ to $Q_D^T$. Increased production and lower consumption lead to the decrease in imports, from $Q_I$ to $Q_I^T$.

Producers are helped by the tariff; their selling price is higher and their domestic production expands. On the other hand, Slovak consumers are worse off. They are purchasing smaller quantities and their purchasing price is higher than before. There is also a third group of people that is affected by the tariff – taxpayers. Slovak taxpayers are better off because the state treasury obtains additional funds in the form of tariff revenue. The amount of additional tax revenues can be computed as the quantity imported multiplied by the tariff $(Q_I^T = (P_W^T - P_W))$. The government can then reduce domestic taxes or distribute to taxpayers better services like highways and schools. Due to the imposition of the tariff, there is more money in the state budget.

When we evaluate the impact of the tariff on the entire Slovak society we must take into consideration all the above groups: producers, consumers and taxpayers. We know that consumers are worse off while producers and taxpayers are better off. Can gains of by producers and taxpayers outweigh the loss to consumers? The general answer is NO. From previous chapters of this book we know that the welfare of producers is best measured by producer surplus ($PS$). Graphically producer surplus is the area below the market price and above the supply curve. The higher the producer surplus, the bigger is the welfare of producers. The welfare of consumers, by analogy, is measured by consumer surplus ($CS$), which is graphically the area below the demand curve and above the consumer price. It is the difference between consumers' willingness to pay and their actual payment at the market price. The welfare of taxpayers is measured by the amount of *tax revenues* ($G$) from the trade policy or tax outlays due to the policy. Some policies bring revenues to the state budget, while other policies require government expenditures. Taxpayers' welfare therefore changes by the amount of budget revenues or expenditures due to the government intervention.

If we treat each group equally, then we can add the welfares of three groups together to obtain the welfare of the whole society. That is, *societal welfare* ($W$) is the summation of producer surplus, consumer surplus and budget revenue (or expenditure). Mathematically,

$$W = PS + CS + G\ , \tag{7.1}$$

where

$W$ = societal welfare,
$PS$ = producer surplus,
$CS$ = consumer surplus,
$G$ = government budget expenditures or revenues.

Going back to Figure 7.1, the imposition of a tariff in a small country leads to the following changes in welfare:

| | | |
|---|---|---|
| Change in consumer surplus ($\Delta CS$): | $-(a+b+c+d)$ | (7.2) |
| Change in producer surplus ($\Delta PS$): | $+a$ | |
| Change in taxpayers' welfare ($\Delta G$): | $+c$ | |
| Change in societal welfare ($\Delta W$): | $-(b+d)$ | |

The "delta" symbol (Δ) denotes "the change in"; a negative sign indicates a reduction in welfare, while a positive sign means that welfare increases.

From Figure 7.1 we can see that the negative impacts of a tariff are felt by consumers who finance the imposition of a tariff by paying a higher price. The first part of the additional costs to consumers (area

$a$) becomes the gain for producers. A tariff therefore causes a transfer of income from consumers to producers. This income transfer occurs through the price change. The higher price results in higher incomes for producers and lower real incomes for consumers. The second part of the costs to consumers brought about by a tariff (area $c$) becomes tariff revenue for the state budget. Here consumers transfer some of their income to taxpayers. That is, consumers themselves finance additional government expenditures or a reduction in taxes that result from higher budget revenues.

Thus far the tariff cannot be viewed very negatively, because it simply causes transfers of income from consumers to producers and taxpayers. However, this is not the end of the tariff story. A tariff unfortunately makes some income disappear. These are areas $b$ and $d$ in Figure 7.1. Areas $b$ and $d$ are losses of consumer surplus that do not appear as gains anywhere. Those losses caused by government policies are referred to as *deadweight losses* (also known as or deadweight costs, welfare losses, and efficiency losses). Geometrically, areas $b$ and $d$ together are the same area as the triangle $e$, because the $ED$ curve is simply the horizontal difference between the demand curve ($D$) and the supply curve ($S$).

Area $d$ is the consumption part of the deadweight loss. Due to the tariff that causes higher domestic prices, consumers cannot make their best possible choice. Higher product prices resulting from the government-imposed tariff forces consumers to reduce their purchases of this particular product and buy other similar products. These similar products are called *substitutes* in economics. For example, if the EU imposes a tariff on Japanese cars, then some Slovak consumers who would like to buy a Toyota Auris might consider switching to a VW Golf because of the higher price of Auris resulting from the tariff. Consumers' decisions are not as efficient as before, so the area $d$ is a consumer-based efficiency loss.

Area $b$ is the production part of the deadweight loss. The deadweight loss in production is due to an inefficient allocation of resources. Higher prices for the product on which the tariff is imposed motivates domestic producers to increase their production of this product. More resources are put into the production of the product; those resources are necessarily extracted from the production of other products where they were used more efficiently (perhaps even optimally) without government intervention. For example, if the EU imposes higher tariffs on imports of cereals, then agricultural producers would transfer some of their land from production of oilseeds to the production of cereals. That transferred land (and labour and capital) was better utilised for production of oilseeds, but due to government policy the land is used for production of a less suitable commodity. A tariff is an artificial price change that does not reflect underlying changes in demand or supply conditions. This tariff affects producers who react to it by producing a greater quantity of the tariff-protected product, a non-optimal outcome from a societal point of view.

In summary, a tariff policy in a small country causes a redistribution of income within society and reduces overall economic welfare. In the long-run, it leads to a misallocation of resources and reduces the efficiency of domestic producers. Domestic producers are thus sheltered from tough world competition, which makes them less competitive in the long-run.

### The impact of a tariff – the large country case

If a tariff is imposed by a large country, there is a decline in the world price. The reason is simple. A large country has a large share of world trade. If such a large country reduces its imports, there will be a significantly higher quantity of the good left on world markets. The higher quantity of surplus goods makes that product less valuable and creates pressure for the world price to decline. By analogy, a small country does not have such an influence on world markets.

Figure 7.2 denotes the situation where a large country imposes a specific tariff equal to $P_D^T - P_W^T$. A large country imposing a tariff creates a "wedge" between the excess supply and excess demand functions in the right-hand panel. The original world price, $P_W$, is reduced to $P_W^T$ (where the tariff wedge strikes the international excess supply function), whereas the domestic price increases to $P_D^T$ (where the tariff wedge strikes the domestic excess demand function). Domestic production increases from $Q_S$ to $Q_S^T$ while domestic

consumption decreases, from $Q_D$ to $Q_D^T$. Increased production and lower consumption lead to the decrease in imports, from $Q_I$ to $Q_I^T$.

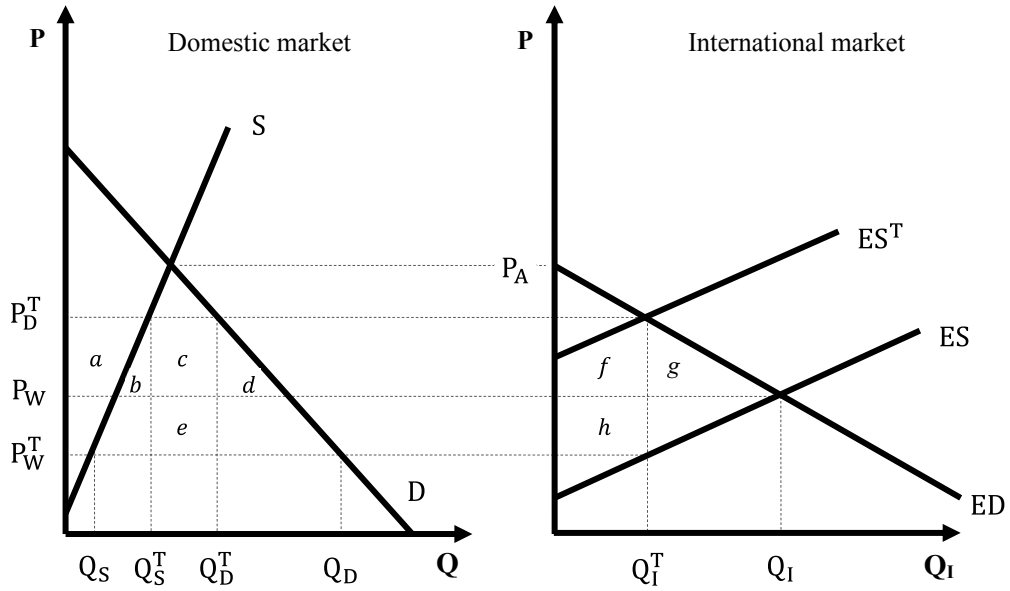



**Figure 7.2** Specific tariff – the large country case

The welfare impacts of the tariff are similar to the small country case, but there are a few exceptions. The imposition of a tariff in a large country leads to the following welfare changes in the domestic country:

| | | |
|---|---|---|
| Producer surplus change | $+a$ | (7.3) |
| Consumer surplus change: | $-(a+b+c+d)$ | |
| Budget (taxpayers) change: | $+c+e$ | |
| Total welfare change: | $+e-(b+d)$ | |

The biggest difference between the large country case and the small country case is that when a large country reduces the world price through imposition of a tariff, then part of the tariff revenue is financed by foreigners. It means that some cost of tariff protection by a large country are borne by foreign producers. Graphically it is the area $h$ in the right-hand panel or $e$ in the left-hand panel of Figure 7.2.

Domestic welfare in large country increases if the tariff cost borne by foreign producers outweighs the domestic deadweight loss, i.e. if $e > b + d$ or $h > g$ (because geometrically $g = b + d$). Otherwise domestic welfare declines. In both cases the world welfare unequivocally declines.

By imposing a tariff, a large country improves its terms of trade. By reducing imports, it reduces the price at which it buys the goods on world markets. This could in some cases lead to an increase in welfare in the large country. Obviously, the welfare gain is at the expense of trading partners. This outcome is often referred to as a "*beggar thy neighbour*" policy. Such a policy is strongly opposed by trading partners. Domestic protection has a negative impact on trading partners. A tariff makes exporting their goods more difficult, which negatively affects production and welfare of the trading partners. Their natural political reaction is to impose retaliatory tariffs on our products.

## 7.1 The optimal tariff

The previous section suggests that a large country can improve its welfare by imposing a tariff. By importing a smaller amount, a large country reduces the world price and therefore is able to import goods at lower costs. That is, a large country in international trade behaves like a monopsonist – a single buyer, in contrast to a monopolist, a single seller. The important question, then, is what is the optimal tariff for a large importing country? Is the optimal tariff near zero or is it a prohibitive tariff, a tariff so large than no imports occur? The answer to this question depends on the interaction between the terms of trade effect and the deadweight cost. As noted above, the change in welfare due to the imposition of tariff in a large country is $e - (b + d)$, where $e$ represents increase in welfare due to a positive terms of trade effect while $b$ and $d$ together stand for the deadweight cost caused by tariff. A very small tariff causes small deadweight costs but also does not help to significantly improve the terms of trade for the importing country. On the other hand, a large tariff improves the terms of trade but also leads to large deadweight costs as imports are severely reduced. Therefore, the optimal tariff will be somewhere in between, higher than zero but lower than the prohibitive tariff.

A graphical depiction of the optimal tariff is shown in Figure 7.3, which mostly replicates Figure 7.2. The optimal tariff is that one tariff level that creates the largest difference between $h$ and $g$. This occurs at the import quantity where the *marginal outlay curve* ($MO$) intersects the excess demand curve. The $MO$ curve measures the marginal change in expenditure for imported good when one additional unit is imported. Basically, $MO$ in the monopsonist case is comparable to the marginal revenue curve for a monopolist. The large country imposes a tariff equal to $P_1 - P_2$, the "wedge" between the excess demand function and the excess supply function at that intersection. The optimal domestic price of the imported good increases to $P_1$ while the world price drops to $P_2$.

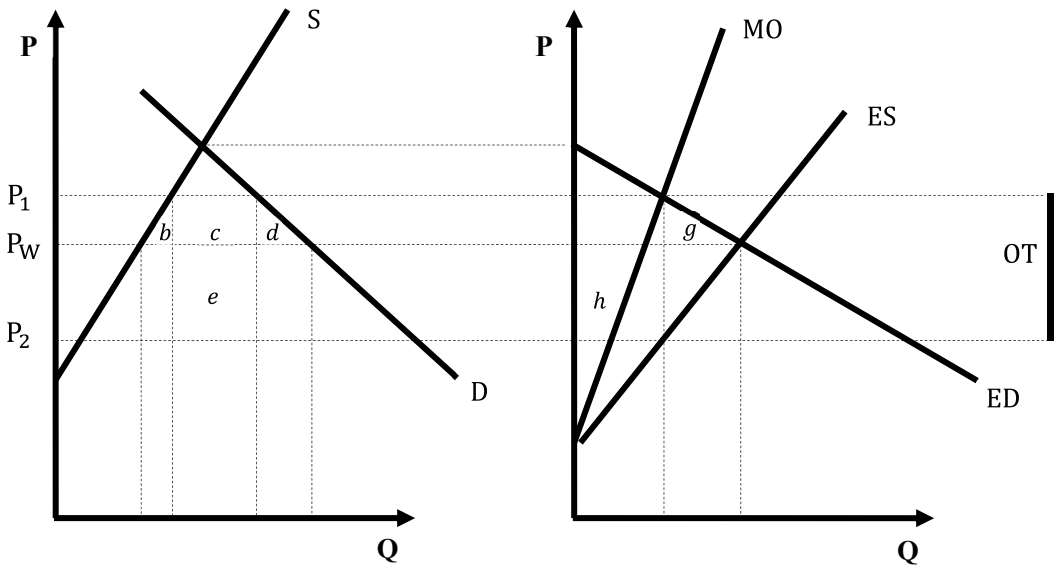



**Figure 7.3** Optimal import tariff – the large country case

By imposing the optimal tariff, a large importing country maximises its welfare. If all countries were to independently maximise their welfare, they all would impose optimal tariffs. As a consequence, global trade and global welfare would decline, which means that welfare in each single country would have to decline as well. A good policy for one country only, therefore, is not a good policy for all countries taken together. That is why some sort of international cooperation within the World Trade Organization (WTO) or through various regional trade agreements is needed, to avoid falling into the trap of each country

maximising its own welfare heedless of international consequences that in the end may make everyone worse of.

### Effective rates of protection

A tariff imposed on final goods protects domestic producers of final goods. A tariff imposed on inputs into production, however, can make the domestic cost of production higher, thereby hurting domestic producers of final goods. Each country has a tariff structure, the set of tariffs affecting the entire country, which shows how tariffs affect final goods and inputs as well. It is important to know the effect of the whole tariff structure, not just the impact of the tariff imposed on the final good. For this reason, the effective rate of protection was created.

The *effective rate of protection* compares value added of the industry before and after the application of the tariff structure on the whole industry. It is defined as the percentage by which the industry value added is increased with the application of the whole tariff structure in the country. Mathematically,

$$ERP = (VAT - VA)/VA, \tag{7.4}$$

where $ERP$ is the effective rate of protection, $VAT$ is the value added per unit of production with the application of the whole tariff structure, and $VA$ is the value added per unit of production without the application of tariffs.

There are some interesting results that occur when we look at effective rates of protection. We assume, for simplicity, only one final good and one imported input in the production of that final good, with import tariffs on both the final product and the imported input. If the tariff on the import is equal to the tariff on the final product, the effective rate of protection is equal to the nominal rate of protection. However, when the tariff on the imported input is less than the tariff on the final product, the effective rate of protection is actually greater than the nominal rate of protection. That is, with low tariffs on imported inputs, domestic producers actually receive greater protection than the posted tariff on the final product.

The unusual case occurs when the tariff on the imported input is greater than the tariff on the final product. In this case the effective rate of production is less than the nominal rate of protection. That is, a high tariff on imported inputs can hurt domestic producers. It can even be the case that the effective rate of protection can be negative, especially if the imported input constitutes a large percentage of the total value of inputs in the production process. Effectively, this last combination results in a production tax instead of tariff protection.

### Protection of infant industries

We often hear that the use of tariff is reasonable for protection of an industry that is threatened by tough foreign competition, but could be a very promising, competitive industry in the future. In economic jargon those people support protection of the infant industry. Infant industry protection is effective if the tariff helps the industry to increase its current production, lowering its per-unit costs and increasing the quality of its products in the future. In such a case, a tariff enables the industry to learn and grow up by isolating it for a time from international competition.

The infant industry argument implicitly assumes that the protected industry must achieve a profit in each stage of its development in order to survive. In other words, the industry is not able to borrow money from banks, financing that will help it to produce for a time with negative profit and then repay later when profits are achieved. Basically, it is assumed that the capital markets are not working properly, which could be the case in many developing and transition countries. The difficult question, however, is to choose the industry that currently is not producing and that with some government assistance will be profitable in the future. The government is expected to make better choice than the financial markets, despite the fact that governments are also not functioning well, especially in developing and transition countries. The additional tough question to be decided is for how long the tariff should be used to provide assistance to the infant

industry. Is it five or twenty years? Deciding on the front end is difficult enough. Moreover, when a protective tariff has been imposed to protect an infant industry, the industry enjoying that protection is not easily willing to give up that protection for many years down the road.

**BOX**

The EU's Council Regulation (EEC) No. 2658/87 of July 23, 1987 establishes the *Combined Nomenclature* (CN) as the EU's common customs tariff for imports and exports, and for statistical purposes. It is updated yearly and provides the tariff nomenclature, description and the rates of duty applied by the customs union to external trade. The latest version of the nomenclature, applicable as from January 1, 2017, has been published October 6, 2016.

HS is a *multipurpose international product nomenclature* developed by the World Customs Organization (WCO). It comprises about 5,000 commodity groups; each identified by a six-digit code, arranged in a legal and logical structure and is supported by well-defined rules to achieve uniform classification. The system is used by more than 200 countries and economies as a basis for their Customs tariffs and for the collection of international trade statistics. Over 98 % of the merchandise in international trade is classified in terms of the HS. The HS contributes to the harmonization of Customs and trade procedures, and the non-documentary trade data interchange in connection with such procedures, thus reducing the costs related to international trade. It is also extensively used by governments, international organisations and the private sector for many other purposes such as internal taxes, trade policies, monitoring of controlled goods, rules of origin, freight tariffs, transport statistics, price monitoring, quota controls, compilation of national accounts, and economic research and analysis. The HS is thus a universal economic language and code for goods, and an indispensable tool for international trade. The Harmonised System is governed by "The International Convention on the Harmonised Commodity Description and Coding System".

Since the completion of the internal market, goods can circulate freely between Member States. The common customs tariff (CCT) therefore applies to the import of goods across the external borders of the EU. The tariff is common to all EU members, but the rates of duty differ from one kind of import to another depending on what they are and where they come from. The rates depend on the economic sensitivity of products. The tariff is therefore the name given to the combination of the nomenclature (or classification of goods) and the duty rates which apply to each class of goods. In addition the tariff contains all other Community legislation that has an effect on the level of customs duty payable on a particular import, for example country of origin. The tariff is a concept, a collection of laws as opposed to a single codified law in itself. There is however a kind of working tariff, called TARIC, which is not actually a piece of legislation. the tariff, the Community applies the principle that domestic producers should be able to compete fairly and equally on the internal market with manufacturers exporting from other countries.

CN is used to classify most goods when they are declared to customs in the EU. The CN subheading stated in declarations for imported and exported goods determines:

- which rate of customs duty applies
- how the goods are treated for statistical purposes or for other European Union policies

The CN includes:

- preliminary provisions
- descriptions of the goods
- additional section/chapter notes and footnotes relating to CN subdivision
- conventional duty rates
- supplementary units
- annexes.

Each subdivision of the nomenclature is known as a ‘CN code’. It has an 8-digit code number followed by a description and a duty rate, and as the case may be, a supplementary unit.

| ***1. ad valorem tariffs*** – e.g. | | |
|---|---|---|
| CN code | Description | Conventional rate of duty |
| 0304 75 00 | Frozen fillets of Alaska pollack | 13.70 % |
| 0601 10 30 | Tulips bulbs | 5.10 % |
| 0707 00 90 | Gherkins, fresh or chilled | 12.80 % |
| 0807 11 00 | Watermelons | 8.80 % |
| 2103 20 00 | Tomato ketchup | 10.20 % |
| 2202 10 00 | Waters, including mineral waters and aerated waters | 9.60 % |
| ***2. specific tariffs*** – e.g. | | |
| CN code | Description | Conventional rate of duty |
| 0203 21 10 | Carcases and half-carcases of domestic swine, frozen | 53.6 €/100 kg net |
| 0403 90 23 | Edam | 151 €/100 kg net |
| 1001 19 00 | Durum wheat | 148 €/t |
| 1002 90 00 | Rye | 93 €/t |
| 1008 60 00 | Triticale | 93 €/t |
| 1101 00 11 | Wheat flour of durum wheat | 172 €/t |
| 3. ***combined tariffs*** – e.g. | | |
| CN code | Description | Conventional rate of duty |
| 0202 10 00 | Carcases and half-carcases of bovine animals, frozen | 12.8 %+176.8 €/100 kg net |
| 1905 10 00 | Crispbread | 5.8 %+13 €/100 kg net |
| 1905 90 10 | Matzos | 3.8 %+15.9 €/100 kg net |
| 2005 80 00 | Prepared sweetcorn | 5.1 %+9.4 €/100 kg net |
| 2009 11 11 | Frozen orange juice | 33.6 %+20.6 €/100 kg net |
| 2102 10 31 | Dried bakers' yeast | 12 %+49.2 €/100 kg net |

Within Uruguay Round of WTO negotiations, tariffication was part of the reduction of tariffs. First specific and combined tariffs (combination of ad valorem and specific tariffs) were converted to ad valorem equivalents and later reduced as agreed. Slovak Republic used only ad valorem tariffs. However European Union used specific, ad valorem, and combined tariffs. Within WTO there was agreed the following formula for converting of specific tariffs to ad valorem tariffs.):

$$AVE = (SP * 100)/(UV * XR)$$

where:
$AVE$ – Ad valorem equivalent (in %)
$SP$ – monetary value of import tariff per unit of measurement
$UV$ – unit value of imports:

$$UV = V/(Q * C_Q)$$

where:
$V$ – value of import
$Q$ – quantity of import (mainly in kilograms)
$C_Q$ – conversion coefficient for units of volume when necessary
$XR$ – exchange rate when necessary.

| CN code | Description | Conventional rate of duty (%) | Supplementary unit |
|---|---|---|---|
| 1 | 2 | 3 | 4 |
| | – – Other: | | |
| 0206 10 95 | – – – Thick skirt and thin skirt | 12,8 + 303,4 €/ 100 kg/net (1) | — |
| 0206 10 98 | – – – Other | Free | — |
| | **– Of bovine animals, frozen:** | | |
| 0206 21 00 | **– – Tongues** | Free | — |
| 0206 22 00 | **– – Livers** | Free | — |
| 0206 29 | **– – Other:** | | |
| 0206 29 10 | – – – For the manufacture of pharmaceutical products (2) | Free | — |
| | – – – Other: | | |
| 0206 29 91 | – – – – Thick skirt and thin skirt | 12,8 + 304,1 €/ 100 kg/net (1) | — |
| 0206 29 99 | – – – – Other | Free | — |
| 0206 30 00 | **– Of swine, fresh or chilled** | Free | — |
| | **– Of swine, frozen:** | | |
| 0206 41 00 | **– – Livers** | Free | — |
| 0206 49 00 | **– – Other** | Free | — |
| 0206 80 | **– Other, fresh or chilled:** | | |
| 0206 80 10 | – – For the manufacture of pharmaceutical products (2) | Free | — |
| | – – Other: | | |
| 0206 80 91 | – – – Of horses, asses, mules and hinnies | 6,4 | — |
| 0206 80 99 | – – – Of sheep and goats | Free | — |
| 0206 90 | **– Other, frozen:** | | |
| 0206 90 10 | – – For the manufacture of pharmaceutical products (2) | Free | — |
| | – – Other: | | |
| 0206 90 91 | – – – Of horses, asses, mules and hinnies | 6,4 | — |
| 0206 90 99 | – – – Of sheep and goats | Free | — |
| 0207 | **Meat and edible offal, of the poultry of heading 0105, fresh, chilled or frozen:** | | |
| | **– Of fowls of the species *Gallus domesticus*:** | | |
| 0207 11 | **– – Not cut in pieces, fresh or chilled:** | | |
| 0207 11 10 | – – – Plucked and gutted, with heads and feet, known as '83 % chickens' | 26,2 €/100 kg/ net (1) | — |
| 0207 11 30 | – – – Plucked and drawn, without heads and feet but with necks, hearts, livers and gizzards, known as '70 % chickens' | 29,9 €/100 kg/ net (1) | — |
| 0207 11 90 | – – – Plucked and drawn, without heads and feet and without necks, hearts, livers and gizzards, known as '65 % chickens', or otherwise presented | 32,5 €/100 kg/ net (1) | — |

(1) WTO tariff quota.
(2) Entry under this subheading is subject to the conditions laid down in the relevant provisions of the European Union (see Articles 291 to 300 of Commission Regulation (EEC) No 2454/93 (OJ L 253, 11.10.1993, p. 1)).

## 7.2 Non-tariff barriers

The classification of *non-tariff barriers* (NTB) includes all barriers to trade that are not tariffs. There is a plethora of non-tariff barriers. The most relevant NTB are quantitative restrictions, non-tariff charges, government policies affecting trade (like subsidies), customs procedures, and government standards[29]. The importance of NTB is growing because tariff rates are being reduced as a result of multilateral trade negotiations within the WTO or due to the formation of regional trade agreements.

Non-tariff barriers are less transparent and more difficult to notice and quantify than tariffs. That is why they are more resistant to efforts to reduce them. Furthermore, some non-tariff barriers (government standards like technical barriers to trade or sanitary and phytosanitary measures) are used to remedy market failures, which means that the application of such measures might increase economic welfare and even enhance trade.

### Import quotas

An *import quota* is a quantitative restriction on imports. Prior to entering the EU, for example, Slovakia limited its imports of Czech beer to 500 thousand hectolitres per year. With such a policy, less beer will be imported to Slovakia from the Czech Republic than under the free market, and Slovak breweries are better off. Not surprisingly, the imposition of the quota was largely the result of the political influence of the Slovak beer and malt producers. An import quota reduces the competition from cheaper or better beer from abroad. If the Slovak beer were better or cheaper, there would be no need to impose the quota. However, beer consumers are worse off. The quota will cause the price of beer to rise or the average quality of beer consumed in Slovakia will decrease. The impact of the quota on Slovak taxpayers (the Treasury) is uncertain, being largely dependent on the allocation of quota rights (import licenses). If licenses are sold the Slovak Treasury will gain resources. In this case the quota is similar to a tariff, in that there is a logical relationship between the quantity and price on the market. A lower quantity of the product on the market leads to higher prices. Therefore, increasing the domestic price with a tariff leads to lower imports, and reducing the imports by means of an import quota leads to higher domestic prices. These actions are equivalent. There is an equivalent tariff for each import quota and an equivalent quota for each import tariff. Figure 7.4 shows this graphically.

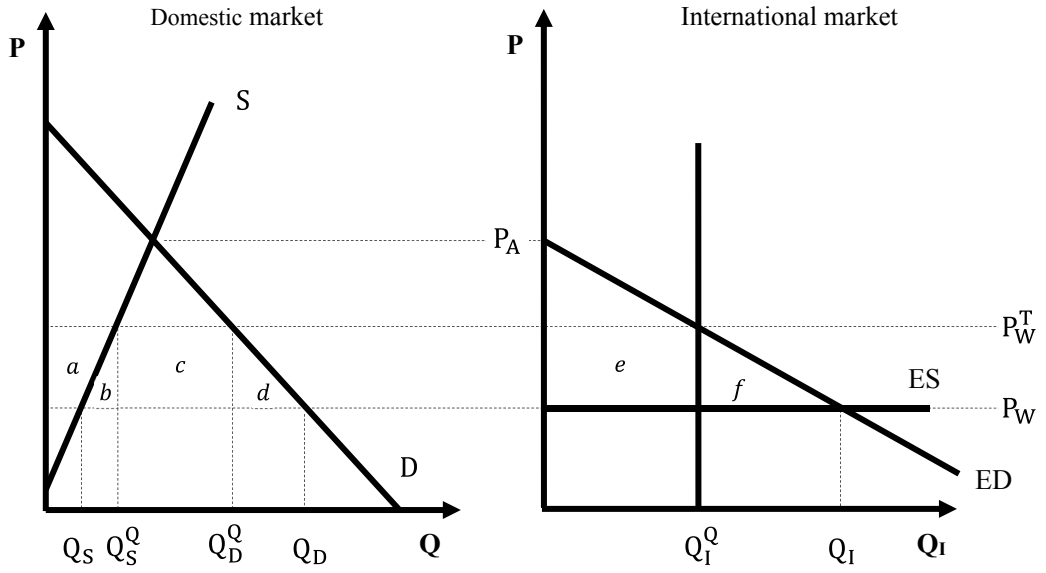



**Figure 7.4** Import quota

[29] This classification is based on Deardorff, A.V. – Stern, R.M. 1985. Methods of measurement of non-tariff barriers. Geneva : UNCTAD. Can be retrieved from <https://digitallibrary.un.org/record/80394>

An import quota of $Q_I^Q$ has the same impact on the domestic market as a specific tariff $t = P_W^T - P_W$. Both instruments of trade policy will lead to an increase in the domestic price to $P_W^T$, which as a consequence will increase domestic production from $Q_S$ to $Q_S^Q$ and reduce domestic consumption from $Q_D$ to $Q_D^Q$. Imports are reduced from $Q_I$ to $Q_I^Q$, the amount of the actual import quota. The welfare effects of an import quota are similar to those of a tariff. Consumer surplus is reduced by the area $a + b + c + d$ while producer surplus increases by area $a$. Welfare of taxpayers depends on the allocation of quota rights (import licenses). If quota rights are sold at a competitive auction, the impact on the state budget is exactly the same as in the case of a tariff. Importers will be willing to pay the area $c$ in order to obtain the quota rights. In other words, for the right to import one unit the importer is willing to pay $P_W^T - P_W$, because it buys each unit at the world market price, $P_W$, and sells each unit at the domestic price, $P_W^T$.

There are, however, ways other than transparent auctions to allocate quota rights. Governments often distribute quota rights to firms on the basis of their import shares prior to the introduction of an import quota. Quota rights for the import of Czech beer into Slovakia were allocated in this way. Czech breweries received the share of the quota right equivalent to their share of imports before the introduction of the quota. If for example Pilsner Urquel imported 40 percent of the Czech beer into Slovakia before the introduction of the quota, it received 40 percent of the quota rights. A quota right (an import license) is an asset that has an economic value, in that it brings an economic rent to its holder. For the Czech breweries who became holders of the quota rights, the Slovak government enables to increase prices without fear from the competition. They have their share on the Slovak market guaranteed. Furthermore, new Czech breweries cannot export to the Slovak market because they do not own any quota rights.

Non-price competition tends to be a very inefficient way for distributing quota rights to firms. For example, the allocation of quota rights based on production capacity leads to overproduction and inefficient allocation of resources. Companies that want to have access to imported products, which are often inputs for their production processes, expand production capacities because the higher the production capacity, the higher quota share and quota rent they receive. If all companies expand production capacity, however, then the industry will produce more than the profit maximising optimal level and will attract resources away from other industries where they could have been used more efficiently. There are still other cases where quota rights are not distributed in a transparent auction, but instead government bureaucracies decide who obtains the quota rights. Non-transparent auctions invite corruption and lead to wasteful competition among potential quota rights holders who spend money, time and effort to curry favour with the government in order to obtain economic rent.

The WTO in its Uruguay Round negotiations banned the use of quotas in agricultural trade and ordered their replacement with equivalent tariffs. Quotas in industrial products trade were illegal long before that. There are several reasons why quotas are viewed as a more damaging instrument of international trade than equivalent tariffs.

First, quotas are less transparent and visible than tariffs and are therefore more difficult to liberalise than tariffs. Tariffication of quotas is therefore the first step towards liberalization.

Second, a quota is a more protectionist instrument than a tariff because it better isolates domestic markets if foreign producers become more competitive over time. If domestic market is protected by a tariff, imports will grow if foreign firms become more competitive. On the other hand, protection by a quota does not allow foreign companies to export more to the domestic market, even if their competitiveness vis-à-vis domestic producers increases because the maximum amount of imports is determined in advance.

Furthermore, the equivalence of quotas and tariffs breaks down when there is imperfect competition in the domestic market as, for example, if there is a domestic monopoly. Figure 7.5 provides a comparison between monopoly and perfect competition in the absence of trade and with free international trade. In autarky, the domestic price is $P_C$ under perfect competition and $P_M$ in the case of a domestic monopoly.

The monopoly price is significantly higher than the competitive price which creates large inefficiencies in the economy.

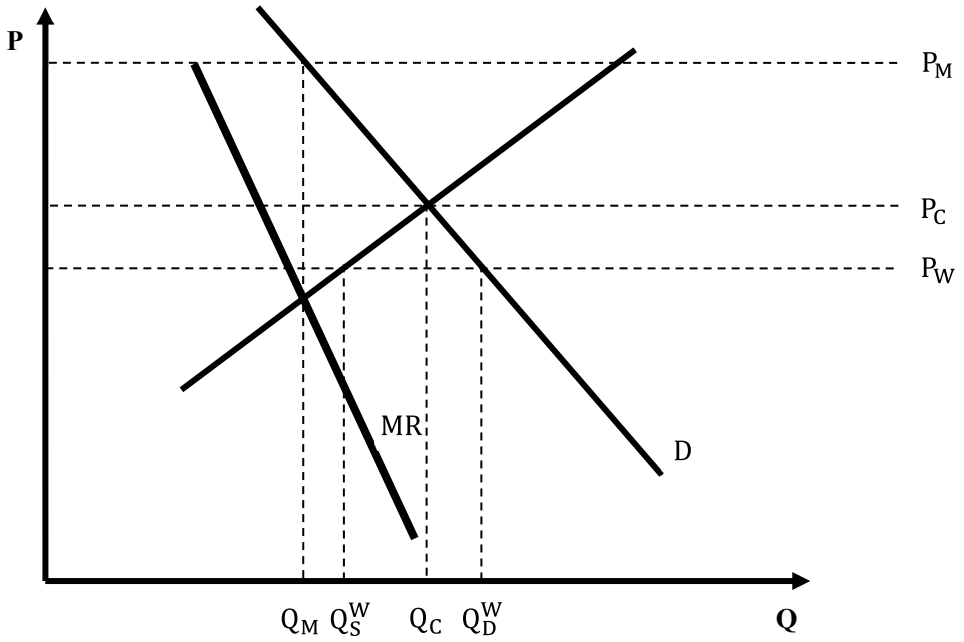



**Figure 7.5** Domestic monopoly and trade

When a country opens itself to imports at the world price, $P_W$, which is (in our case) even lower than the competitive price in autarky, domestic production is $Q_S^W$ and domestic consumption is $Q_D^W$, with imports equal to $Q_D^W - Q_S^W$. When the country freely trades with the world, there is no difference whether there is a monopoly or perfect competition at home. A domestic monopoly cannot increase its price to $P_M$ by cutting on production because any reduction in domestic production is immediately replaced by imports at $P_W$. This fact is especially important for countries with small domestic markets that cannot sustain many producers and are therefore susceptible to the formation of monopolies or oligopolies. If such a country engages in free trade the power of monopolies is eliminated.

When the domestic country introduced a tariff $t$ in Figure 7.1 the domestic price increased to $P_W + t$, domestic production expanded from $Q_S^W$ to $Q_S^T$, domestic consumption declined from $Q_D^W$ to $Q_D^T$, and imports decreased to $Q_D^T - Q_S^T$. Figure 7.6 compares an import quota and a tariff when there is a domestic monopoly, beginning from this post-tariff outcome from Figure 7.1, with imports equal to $Q_D^T - Q_S^T$ when a tariff is imposed. Now, when the domestic country introduces an equivalent import quota, equal to $Q_D^T - Q_S^T$, then the demand curve faced by the domestic monopolist becomes $D - (Q_D^T - Q_S^T)$, since $Q_D^T - Q_S^T$ is the amount imported within the quota from abroad.

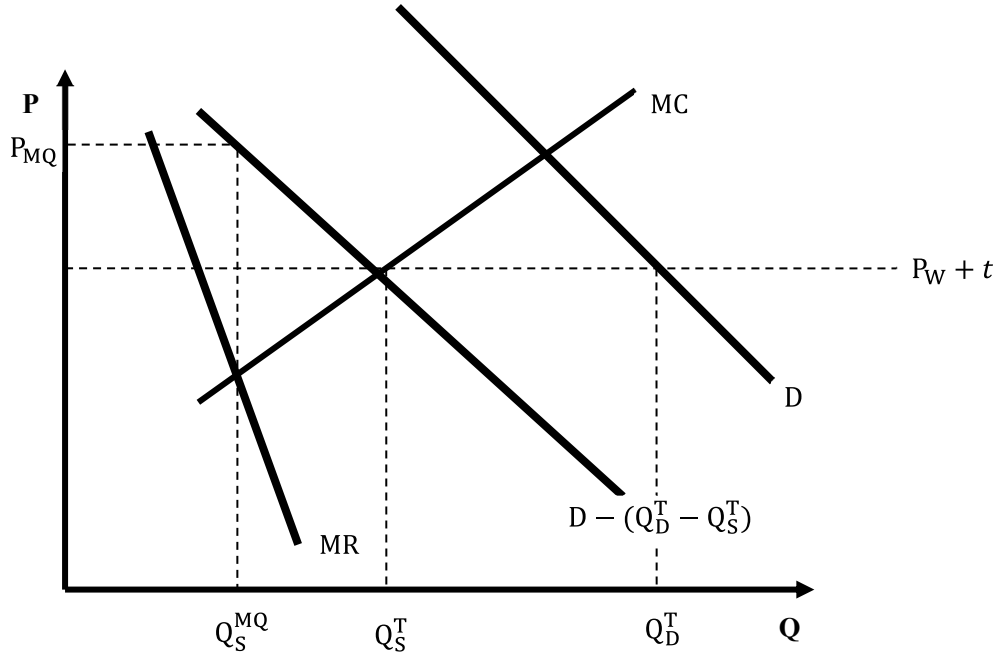



**Figure 7.6**. Non-equivalence of tariff and quota with imperfect competition

The domestic monopolist faces this "residual demand" in maximising profit, setting the price at the level when marginal revenue $(MR)$ is equal to marginal cost $(MC)$. The intersection of $MC$ and $MR$ determines the optimal level of production for the domestic monopolist, $Q_S^{MQ}$ in Figure 7.6. The profit maximising price then is $P_{MQ}$. It always holds that $P_{MQ}$ is higher than $P_W + t$, which means that the import quota leads to higher domestic prices than an equivalent tariff if there is imperfect competition in the domestic market. A quota thus involves a higher cost to society.

### Variable levies

Variable levies have been an integral part of the Common Agricultural Policy of the European Union (CAP). However, the Uruguay Round of the General Agreement on Trade and Tariffs (GATT) forced the EU to replace variable levies with ordinary tariffs. Variable levies are used to isolate domestic prices from the fluctuation of world prices. The domestic price is fixed at a *target price* level $P_T$ (Figure 7.7). If the world price is lower than the target price, a levy is imposed to bring the price of imports to the target level. The size of the levy changes if the world price increases or decreases. For example, if the domestic target price is 100 €/unit and the world price is 80 €/unit then a levy of 20 is imposed on each unit imported in order to have domestic price of imports equal to the target price. However, if the world price declines to 70 €/unit then the variable levy increases to 30 €/unit.

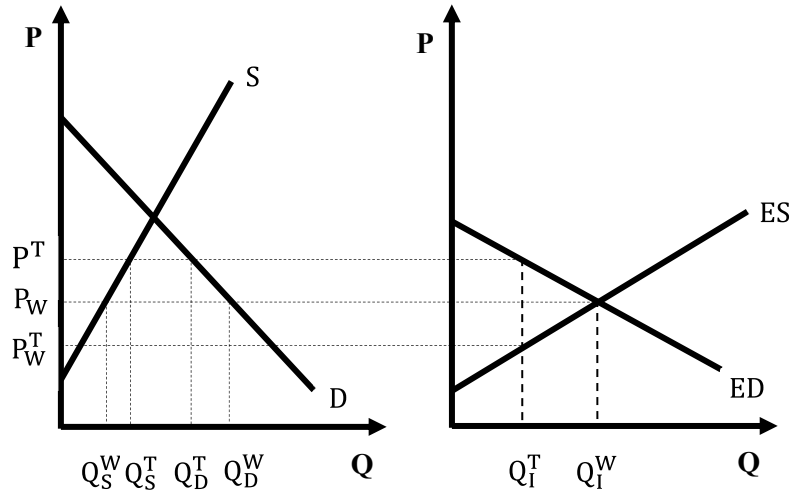



**Figure 7.7** Variable levy

To have domestic price equal to $P^T$, the imports must be $Q_I^T$. Higher imports than $Q_I^T$ would lower domestic price below the $P^T$ level. By the same token, lower imports than $Q_I^T$ would result in higher domestic price than $P^T$. To have domestic price equal to $P^T$ either a levy in the amount of $P^T - P_W^N$ must be applied or an import quota of $Q_I^T$ must be imposed. In the static situation, there is obviously no difference between a variable levy and an ordinary tariff. In addition, the equivalence between a tariff and a quota holds. A major difference between a quota and a variable levy is observed in a dynamic situation when either supply or demand changes with time.

If for example excess demand moves to the right in Figure 7.7, then under a quota the domestic price will rise and the quantity imported will remain the same. The application of a fixed tariff $P^T - P_W^N$ would also result in a higher domestic price and higher imports. However, the variable levy would keep the domestic price fixed and would allow imports to increase. When the excess demand curve moves to the left the levy increases to keep the domestic price at the level of $P^T$. The levy is variable – it changes when market situation changes.

The welfare consequences of a variable levy are exactly the same as in the case of a tariff. Producer surplus increases, consumer surplus decreases, and the government of the importing country earns tariff revenue from the levy. In reality, the tariff revenue collected from the variable levy is lower than the tariff revenue from the ordinary tariff. The reason is simple; the importer knows that the levy changes to allow the domestic price to achieve the target price. The importer is therefore indifferent what import price is declared in customs procedures. The exporter takes advantage of the importer's indifference and declares a higher price than $P_W^N$ which lowers tariff revenue for the government.

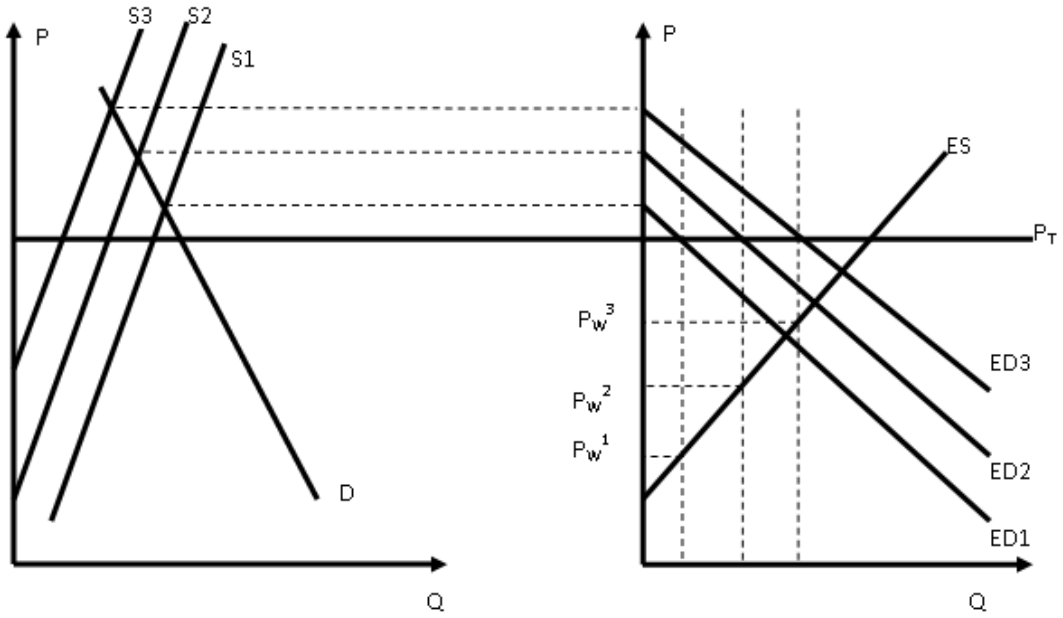



**Figure 7.8** Variable levy and the fluctuation of world prices

A variable levy imposed by a large country makes world prices more volatile than an ordinary levy. In fact, domestic price stability is achieved at the expense of higher world price fluctuations. This negative impact of a variable levy was the primary reason behind the GATT/WTO changing all such levies into ordinary tariffs. Figure 7.8 above illustrates this point. When domestic supply of (for example) wheat in a large country is $S1$ domestic demand for imports is $ED1$. To achieve the target price, the importing large country imposes a levy equal to $P^T - {P_w}^1$. When the domestic supply of wheat is reduced, for example, by bad weather to $S2$, the domestic excess demand curve becomes $ED2$. In order to achieve the target price $P^T$ the large importing country imposes a smaller levy, $P^T - {P_w}^2$. A further decrease in supply to $S3$ results in an even smaller levy, $P^T - {P_w}^3$, to keep the price at $P^T$. Domestic fluctuations of supply (or demand) are then transferred into huge fluctuations in world prices (from ${P_w}^1$ to ${P_w}^2$ and ${P_w}^3$). The fluctuation of world prices would be lower with ordinary tariffs or under free trade.

## Public regulations and standards

Trade policy is often used to redistribute income within a society. For example, as we learned above, an import tariff redistributes income from consumers to producers and taxpayers. There are, however, some public policies affecting international trade that enhance the efficiency of the economy by eliminating or reducing market failures. Government standards imposed on products and methods of production belong to that category. On the one hand, these standards provide useful services to the public, like providing information on product characteristics or making sure that the product fulfils certain safety or quality criteria. On the other hand, as a by-product, they also affect international trade.

Standards and regulations are mandatory requirements imposed by public authorities. There are also private standards, like those imposed by the International Organization for Standardization within the ISO series. Private standards are voluntary, which means that firms do not have to comply with them. They are imposed by firms in order to maximise profit or to increase their market share by distinguishing their product from products of other firms. On the other hand, the objective of public standards should be to maximise social welfare.

*Public standards and regulations* are often classified as product standards, production process or methods standards, and labelling requirements. Product standards are requirements that products must fulfil. They include, for example, requirements on maximum allowable amounts of residues, contaminants

or additives, minimum nutritional values, requirements on fat or protein content, and so on. Product standards also refer to the requirements on product performance or its interoperability with other products in the system. Grading of the products (meat classes, for example) and requirements on packaging of the product (material or size of the packaging) also belong to the rubric of product standards and regulations. Production process or methods standards provide requirements on conditions under which products are made. They refer, for example, to hygiene and sanitary or handling requirements.

# Chapter 8 ECONOMIC RATIONALE FOR PUBLIC STANDARDS

As mentioned above public standards are imposed to maximise social welfare. Free markets are a prerequisite for maximising social welfare. This is the famous invisible hand theorem of Adam Smith. A modern version of the theorem is known as the *first fundamental welfare theorem*. Simply put it states that competitive markets lead to the efficient use of resources and maximisation of social welfare. However, for markets to maximise welfare certain preconditions need to be met, including no market power, non-existence of public goods and externalities, perfect information, complete markets, and so on. If the precondition is not met the competitive system does not work properly and market failures occur. Public standards deal with market failures stemming from the existence of public goods and from incomplete information. As such, public standards enhance the efficiency of the markets.

### Incomplete information

When making a purchase, consumers are often ignorant as to many characteristics of the product. Consumers in a supermarket, for example, do not know (from inspection) the content of certain residuals in apples lying on the shelf. There is a problem of *incomplete information*. Characteristics of goods that are revealed after the purchase (post-consumption) are called *experience characteristics*. For example, one can verify the shelf life of apples only by purchasing them. Furthermore, some characteristics of goods cannot be verified even after the purchase or after the consumption. It is hard to figure out the number of additives in yoghurt by consuming the yoghurt. These characteristics of products are called *credence characteristics*. In food products, there are a number of credence characteristics, such as the quality, health, or methods of production that are difficult to ascertain by consumers even if repeated purchases are made.

Governments help consumers make better choices by providing minimum information about the quality of the product. Compulsory labelling is used to provide consumers with basic knowledge about the quality of the product, such as ingredients, nutritional value, and best consumption date. Compulsory labels also provide information about the country of origin of the product and production methods. Labelling and third-party verification reduce search costs for consumers and increase the efficiency of the market system. Standards therefore improve the flow of information between suppliers and consumers.

### Public goods

Standards are also used to achieve provision of certain public goods. A *public good is* a good that possesses two characteristics: non-exclusion and non-rivalry. Non-exclusion means that it is difficult or very costly to exclude someone from the consumption of the good. Non-rivalry means that the consumption of the good by one person does not reduce the consumption of the good by other persons. Basic research is an example of a public good. It is difficult to exclude someone from the use of Pythagorean Theorem and if one person uses the theorem other people can use it too at the same time. National defence, statues in the city square, and paved roads are all public goods.

Standards are used as a means for the achievement of public goods. Emission standards contribute to cleaner air; health standards or hygiene requirements improve the public health; and environmental standards help to preserve the environment. Clean air, public health and a preserved environment are all public goods.

### Standards and trade

Standards are very useful because they help to improve the functioning of the market. They serve to achieve the provision of certain public goods, like public health or high environmental quality. Well devised and properly applied standards enhance international trade also. To producers they signal which product characteristics are important for consumers, especially those located overseas, and help them to reduce

search costs while providing consumers with higher levels of confidence in their consumption of imported products.

However, standards also impose real costs on producers. Producers must invest in resources to comply with the standards. They have to invest into new technology, enhanced labelling, or stricter monitoring of production process. In particular, small firms and producers in developing countries might have problems in complying with the strict standards imposed by developed countries.

Furthermore, what is also important here is that standards can be devised to discriminate against foreign competition. There can be direct discrimination against foreign firms if foreign firms must meet stricter requirements than domestic firms. Even if the standards are the same for both domestic and foreign producers, foreign producers might have higher compliance costs because they use different production processes and inputs or have to change their labelling or packaging. Very often discrimination occurs when a firm does not recognise foreign tests of product quality, with additional tests required, thus increasing the costs to producers.

Public standards and regulations are subject to the rules of the World Trade Organization within Sanitary and Phytosanitary (SPS) and Technical Barriers to Trade (TBT) agreements. The WTO urges countries to use internationally agreed-upon regulations. Stricter regulations can be used if they are non-arbitrary, non-discriminatory, and minimally trade restricting.

Typically, the application of welfare-enhancing standards shifts demand curves to the right, both at home and in foreign countries. Consumers have higher confidence in the product and increase their purchases accordingly. On the other hand, the compliance with standards involves additional costs, which shifts supply curves to the left. The impact of standards is therefore theoretically ambiguous and has to be determined empirically, case by case. In our example, the shift of the supply curve to the left was bigger than the shift of the demand curve to the right, such that standards had a stronger negative influence on producers than a positive influence on consumers. In such a case, the world price increases and international trade decreases. However, it can happen that in reality the imposition of a standard can have more pronounced impacts on consumers than on producers, such that the world price would decrease and trade would increase.

# Chapter 9 POLICIES AFFECTING EXPORTERS

Government involvement with trade is omnipresent and the sphere of exports of goods and services is not an exception. On the contrary, as a rule many countries strongly support their export sectors. In Slovakia, there is, for example, EXIMBANKA SR, which supports Slovak exporters, firms that under contractual conditions produce and/or export products and services of predominately Slovak origin. The European Union uses export subsidies for agricultural commodities. Japan is notoriously known for its industrial policy that supposedly significantly contributed to its export boom and the United States relies on antidumping policies aimed at fighting "subsidised" imports.

This chapter will try to shed some light on the most often used export policies, dumping and export subsidies. Decisions on "dumping" are typically firm level issues. In most cases dumping is a normal marketing strategy, from an economic perspective. From a legal perspective, however, it is not a straight marketing activity but rather an illegal action damaging the domestic market. Domestic firms threatened by tough competition from abroad often abuse the legal definition of dumping in order to lobby for protectionist barriers against imports. Often, the legal and economic aspects of dumping can be in conflict.

Export subsidies are government policies. Export subsidies increase exports beyond the economically optimal level. An industry that receives an export subsidy can increase its exports and its production, attracting resources away from other industries. These resources could have been used more efficiently in other industries, causing export subsidies to waste society's precious resources. Export subsidies also distort markets and relative prices and create deadweight losses, not only in production but also in consumption.

## 9.1 Dumping

*Dumping* is an example of price discrimination – selling the same product at different prices to different groups of consumers. Price discrimination is a widespread phenomenon in any market economy. Movie theatres, for example, charge lower prices to children or to students than to adults. Airplane tickets cost less when ordered far in advance compared to being booked only a week before departure. In the case of dumping, price discrimination occurs between different countries. The same product is sold in one country at a different price than in another country. According to the World Trade Organization, dumping occurs if the company sells its products to foreign consumers at lower prices than to domestic consumers. Selling at prices below costs of production is a second, more rigorous definition of dumping.

The economic basis for dumping arises with differences in price elasticity of demand. For example, the textbook *Economics* by Samuelson and Nordhaus is sold at higher prices in the United States than in other countries. The reason is simple that U.S. students (or their parents) are richer than their counterparts abroad and therefore can afford to pay a higher price for the textbook. The demand for the textbook in the United States is therefore more price inelastic than the demand for the textbook in Mexico (for example). The more inelastic is the demand for a good, the higher will be the profit maximising price. Price discrimination can work only if the two groups if consumers can be separated from each other. If it were cheap and quick to travel from the United States to Mexico many American students would rather buy the textbook in Mexico than to pay the more expensive price in the United States. However, in reality it is not economically feasible to make a trip to Mexico because of a small difference in the price of the good.

The other prerequisite for the price discrimination is market power. The company that wants to price discriminate must be able to set its prices. It cannot be in the position of being a price-taker, like firms in perfect competition. Figure 9.1 describes graphically the economic rationale for dumping. The firm in the diagram faces an inelastic demand in the domestic market, possibly due to a lack of competition from firms producing substitutes or because the domestic market is small or protected from foreign firms. At world

markets, however, the firm faces tougher competition, leading to an elastic demand curve. To maximise profit, the firm sets its production quantity at the level where its marginal cost equals its marginal revenue. The price in different markets is therefore dependent on the demand. The optimal price in the domestic market is $P_H$, while in international markets it is optimal to charge a lower price, $P_I$.

### Anti-dumping duties

Article VI of the GATT/WTO enables WTO member states to protect their industries from damage caused by dumping. The importing country must establish a clear causal relationship between dumped products and injury to a domestic industry. There are clear procedures and methodologies for how to initiate anti-dumping cases and how to conduct investigations. All relevant players (exporters, importers, governments…) are allowed an opportunity to present evidence in favour of or against the alleged dumping. If dumping is confirmed in the investigation, the importing party can apply provisional anti-dumping measures for a set time period. After that time period, anti-dumping measures must be terminated unless it is determined that dumping and injury will reoccur. The importer must immediately terminate anti-dumping duties if it is determined by the authorities that the damage is minimal or that the imports are negligible.

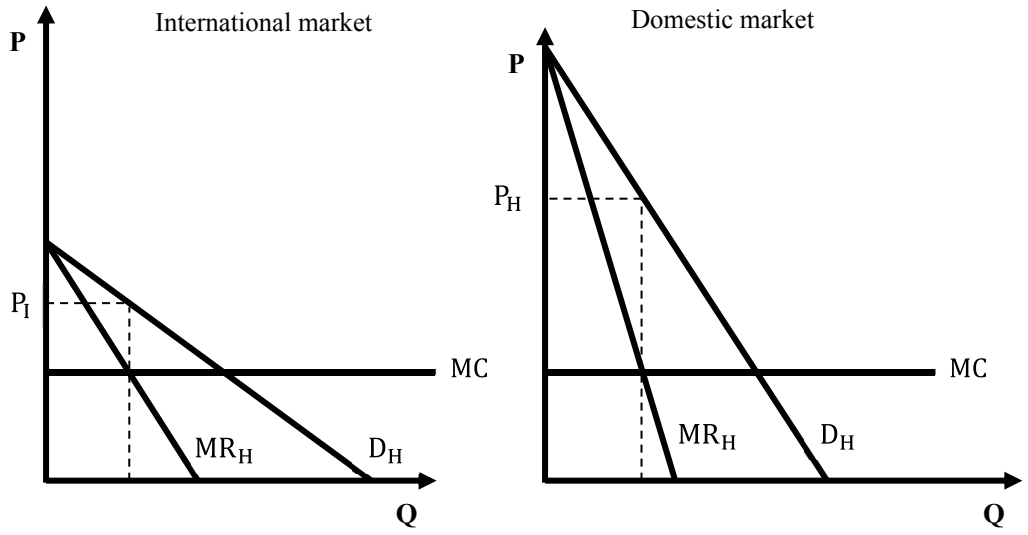



**Figure 9.1** Dumping

Countervailing duties, on the other hand, can be applied by the government of importing country to offset export subsidies provided by the government in exporting countries if those export subsidies and the subsequent surge of exports causes damage to industries in the importing country. The difference between anti-dumping duties and countervailing duties is that the former eliminates the effects of price discrimination that is being conducted by a firm, while the latter one offsets a government supported export subsidy.

Both countervailing and anti-dumping investigations can be initiated by firms affected by foreign competition who are looking for relief. Such an investigation harms exporting firms which must increase their prices or reduce their exports during the time of the investigation. Such investigations have also chilling effects on international trade, because the threat of anti-dumping investigations that can result in huge damages to exporting firms may curb their initiative to engage in fierce competition. Anti-dumping investigations can be used by firms or governments as a strategy to reduce or eliminate foreign competition.

## 9.2 Export subsidies

An *export subsidy* is a payment to a firm or an individual for exporting products abroad. An export subsidy can be either specific or *ad valorem*. In the former case, the government pays a certain amount of euros for each exported unit, while in the latter case the government pays a certain percentage of the value of exports. Figure 9.2 shows graphically the impact of a small country instituting an export subsidy, with the existence of perfect competition assumed. The international demand for imports from that small country is a horizontal line at $P_W$, which means that the world buys all the exports it wants from the small (domestic) country at the existing world price. The export supply curve from the domestic country is denoted by $ES$. The intersection of the $ES$ curve and $P_W$ determines the export quantity, $Q_E^W \equiv Q_S^W - Q_D^W$. The export subsidy $s = P_W^S - P_W$ shifts the export supply curve to the right, from $ES^W$ to $ES^S$. Producers who export their products obtain the price $P_W + s$. This means that they will also require at least the same price at domestic market. The export subsidy thus creates a wedge between the domestic price and the world price. The domestic price will rise from $P_W$ to $P_W^S$, which is equal to $P_W + s$ while the world price remains lower at $P_W$. The wedge between world and domestic price amounts to the size of the export subsidy $s$.

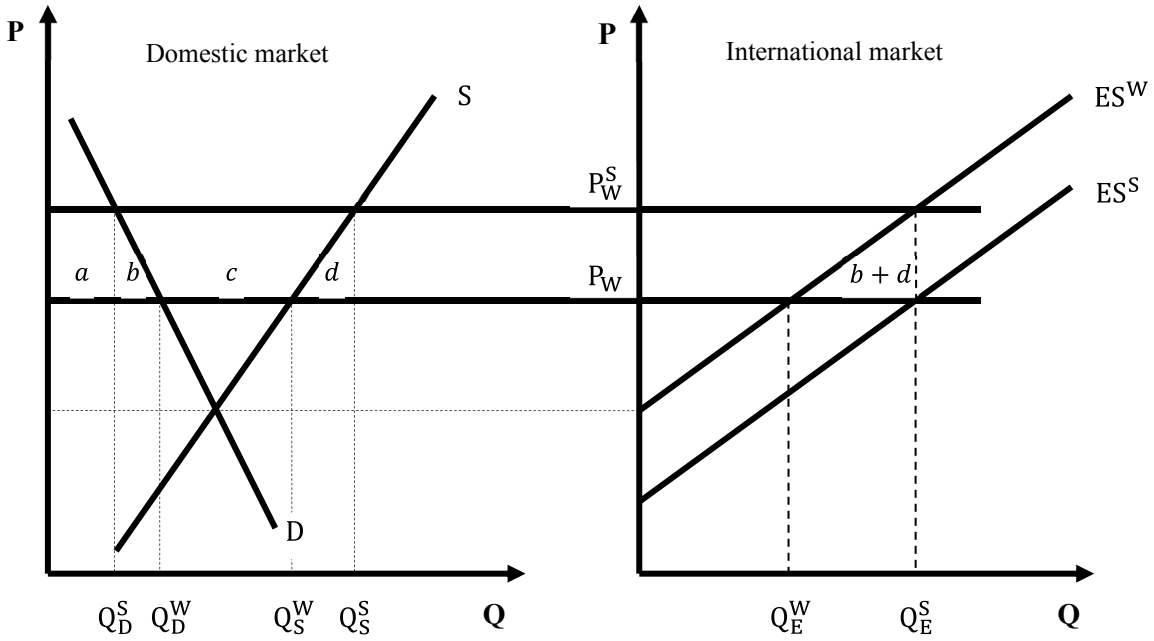



**Figure 9.2** Export subsidy by a small country

The export subsidy obviously leads to higher exports $Q_E^S \equiv Q_S^S - Q_D^S$. More of the product is exported and therefore less remains in the domestic market, which creates pressure for a price increase at home. The higher price causes domestic production to increase from $Q_S$ to $Q_S^S$, but domestic consumption declines from $Q_D$ to $Q_D^S$. The rise of the domestic price is beneficial for domestic producers but harms domestic consumers. Domestic taxpayers are also worse off because they finance the additional exports with their taxes. Producer surplus increases by area $a + b + c$ while consumer surplus declines by area $a + b$. Government expenditures increase by area $b + c + d$. Thus, the overall impact of the export subsidy is negative. The export subsidy creates a deadweight cost equal to $b + d$.

The deadweight cost represented by area $b$ is due to the distortion of the domestic consumption pattern. The higher price that is due not to market forces but to a government policy of subsidising production in the domestic market provides consumers an incentive to reduce consumption of the good and replace it with a substitute. The deadweight cost represented by area $d$ represents the distortion in

production. Because of the higher price of the subsidised product, producers move part of their capacity from production of other products to production of the subsidised product. The rise of the price of the subsidised product is, again, due to the government intervention only and does not represent the genuine societal demand. Society's resources could have been used more efficiently elsewhere rather than in the production of the subsidised product.

Figure 9.3 depicts the impacts of an export subsidy in a large country. A large country faces a declining demand curve for its exports, $ED^W$. The world price, $P_W$ is at the intersection of the $ES^W$ and $ED^W$ curves. By introducing an export subsidy, the large country decreases the world price to $P_W^S$ and raises its domestic price to $P_W^D$. The difference between the domestic price and the world price is equal to export subsidy $s$. It follows from Figure 9.3 that domestic production increases from $Q_S^W$ to $Q_S^S$ as domestic producers respond to higher prices, domestic consumption decreases from $Q_D^W$ to $Q_D^S$ because domestic consumers reduce their consumption due to higher prices, and exports increase from $Q_E^W$ to $Q_E^S$.

The following welfare changes are expected to occur. Producer surplus increases by the area $a + b + c$, consumer surplus declines by the area $a + b$, and the cost of export subsidy for the state budget amounts to $b + c + d + e$, where $e$ is an area bounded only by dashed lines. Thus, the export subsidy results in an overall welfare decline of $b + d + e$. Of this, the consumption and production deadweight costs are represented by areas $b$ and $d$, while area $e$ is the loss that occurs due to a worsening in the terms of trade. A large domestic country subsidising exports leads to a decline in the world price. This is the opposite of the effects of a tariff, where a tariff imposed by a large country reduces the world price and improves the large country's terms of trade. Therefore, there exists an optimal tariff. On the other hand, an export subsidy applied by a large country reduces the world price and worsens the country's terms of trade. Therefore, there is no optimal export subsidy.

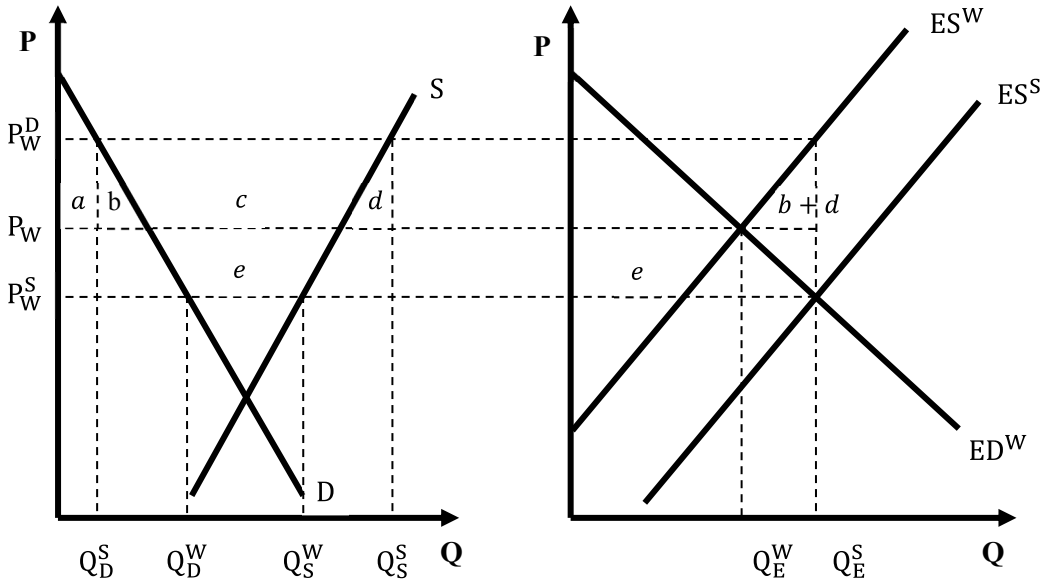



**Figure 9.3** Export subsidy in a large country

## 9.3 Optimal export tax

An export tax is a tax placed on exports of a country's goods and services. In contrast to the situation with an export subsidy where there is no optimal export subsidy, in a large country case, there is optimal export tax. The analogy is with a monopoly. To maximise its profit a monopoly reduces its production in order to increase its price. The optimal level of production is where its marginal cost equals its marginal revenue. If large country in international trade affects the world price, then we can consider it as a monopoly. Figure 9.4 denotes this situation graphically. Large domestic exporting country with export supply curve $ES$ faces the international excess demand curve $ED$. The large country's marginal revenue curve is denoted by $MR$ (recall that marginal revenue for a monopolist is always at all points below the demand curve). The intersection of $MR$ and $ES$ is the optimal level of exports, $Q_E^{TX}$, which maximises welfare in the large exporting country. The large country can charge price $P_W^F$ to foreign importers – because a smaller amount is exported, there is less of the exported product on the world markets and its price therefore increases. The domestic price, however, declines to $P_W^D$ – more of the product remains at home and its price therefore goes down.

The export tax, $P_W^F - P_W^D$, will therefore reduce exports to $Q_E^{TX}$, which maximises social welfare in the large exporting country. Consumer surplus increases by area $a$, producer surplus declines by area $a + b + c + d$, and government revenue increases by area $c + e$. The overall impact is the area $e$ minus the sum of the areas $b$ plus $d$. The *optimal export tax* maximises the difference between the improvement in the terms of trade, represented by area $e$, and the domestic deadweight losses, equal to areas $b + d$. Global welfare, however, declines when an export tax is applied. The export tax increases prices in importing countries, which makes them unequivocally worse off. So, if we add the changes in welfare in exporting country and in importing countries the overall outcome is negative. When food prices increased in 2007-2009 many exporters of agricultural goods banned exports or reduced them significantly in order to avoid food price increases in their domestic countries. These policies exacerbated the food situation in the world by reinforcing the trend of increasing of prices.

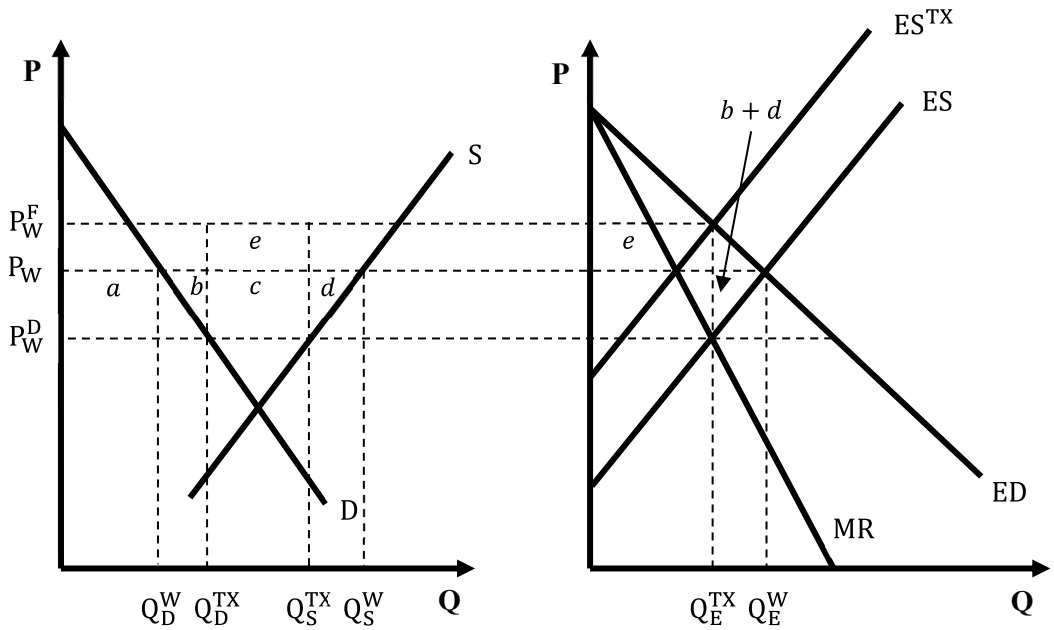



**Figure 9.4** Optimal export tax

There are advantages for exporting countries to act as a monopoly because it maximises their welfare. Oil exporting countries, for example, have agreed to form a monopoly, known as a *cartel* that attempts to

control the output of oil on world markets. A cartel is created when several producers behave together as a monopoly because they can agree together on producing the monopoly output. Formation of such a cartel by agreement would be illegal in the European Union or the United States. Countries try to protect their citizens from practices of monopolies and anti-trust legislation prevents firms from colluding to create a cartel. In the international arena, however, the formation of a cartel is perfectly legal, because there is no international organisation that would prevent countries from forming an export cartel. That is why oil exporting countries can form OPEC (the Organization of Petroleum Exporting Countries), which is an export cartel that together reduces the supply of oil in order to achieve a higher world price. The supply of oil is reduced not by application of an export tax, but by agreement of the countries on the division of market shares of oil production. The agreements on market shares, however, are the Achilles' heel of their endeavours to form an export cartel. When prices of oil are high then each country in the cartel agreement has a strong motivation to cheat and to export more than the agreed allocation. If all parties increase production, then prices return to their normal, or even lower levels.

## 9.4 Export quotas and voluntary export restraints

Some countries use export quotas to reduce their own exports. Exports quotas are unusual as most countries prefer to promote exports rather than inhibit them. However, if the goal of the domestic government is, for example, to keep domestic prices of food low to make food more affordable to poor people, then an export quota can help to achieve this goal. Many developing countries reacted to the rise of world agricultural prices in 2007-2009 by limiting exports so as to keep food at affordable prices for poor people. *Export quotas* are quantitative restraints on exports, which means that their application either reduces exports or leaves exports unaffected (as in the case of an ineffectively large export quota). Under an export quota on food, a higher proportion of food production remains at home, thus reducing domestic prices and making food cheaper for the public.

Figure 9.5 can be used to show the effects of an export quota on the domestic market. Under free trade the world market price, $P_W$ would prevail in the domestic market. Domestic production would amount to $Q_S^W$, with domestic consumption at $Q_D^W$. The difference between $Q_S^W$ and $Q_D^W$ is exported. An export quota would constrain exports to quantity $Q_E$. More of the product would be forced to stay at home thus reducing the domestic price to $P_Q$. Domestic production would decline to $Q_S^Q$ while domestic consumption increases to $Q_D^Q$. The difference between $Q_S^Q$ and $Q_D^Q$ is exactly equal to the export quota $Q_E$.

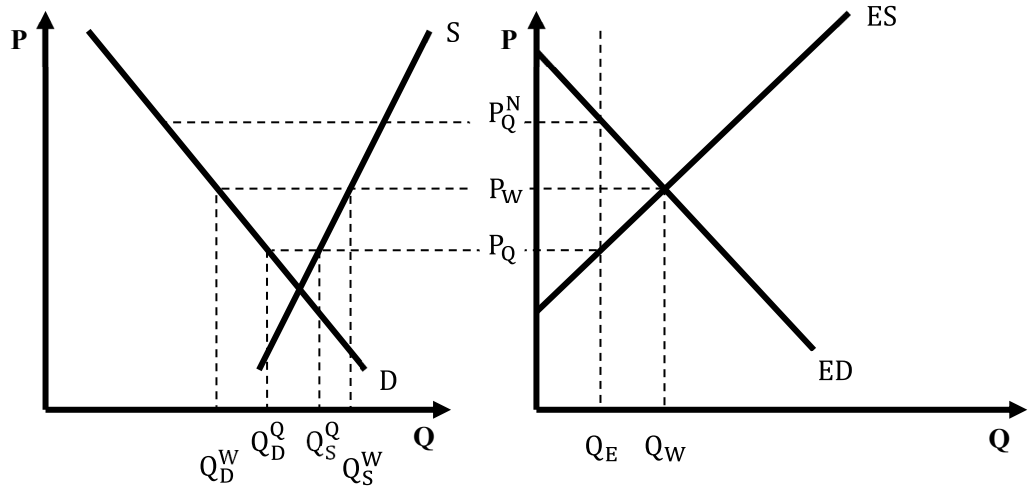



**Figure 9.5** Export quota and voluntary export restraints

Export licenses are often used to limit exports to $Q_E$. The holder of the export license earns economic rent because there is a wedge between the domestic price, $P_Q$ and the world price, $P_W^N$. Sometimes export restraints are imposed not to achieve a domestic policy of low prices for costumers, but because importing countries threaten to impose a tariff or an import quota on the domestic country's exports. Because of international economic and political pressure domestic governments often give in and impose a *voluntary export restraint* (VER). The effects of VERs are similar to those of export quotas (or an equivalent import quota or import tariff), but the motivation is different. The exporting country is better off with a VER than with an importing country imposing an import quota or an import tariff because the rent under a VER remains with domestic producers rather than accruing to foreign state budget as tariff revenue or quota license sales.

# Chapter 10 REGIONAL TRADE AGREEMENTS

Policy-makers have a wide range of possibilities for instruments of trade policy, like import tariffs, export subsidies, and non-tariff barriers. The formation of *regional trade agreements* (RTA) is an additional instrument that policy-makers can use to regulate international trade. There is a spectrum of RTAs, ranging from measures that are less interventionist, such as a *free trade area* (FTA), to measures that affect the entire economy, such as an economic union. In a free trade area member states eliminate tariffs and other trade barriers among themselves, but keep separate tariffs with other countries. A *customs union* (CU) is like a free trade area, except that members of the CU also agree to have a common external tariff. A common market allows for the free movement of the factors of production, in addition to the free movement of goods within a customs union. Finally, in an economic union, in addition to forming a common market, member states also unify many of their national activities, like their monetary and fiscal policies or their social and or legal structures.

Figure 10.1 depicts graphically the hierarchical structure of regional trade agreements, from the lowest level of integration, a free trade area (for example, the Central European Free Trade Agreement (CEFTA) or the North American Free Trade Agreement (NAFTA)) through customs union (the customs union between the Czech and Slovak Republics) and common market (the European Union) to economic union (the Eurozone of the European Union).

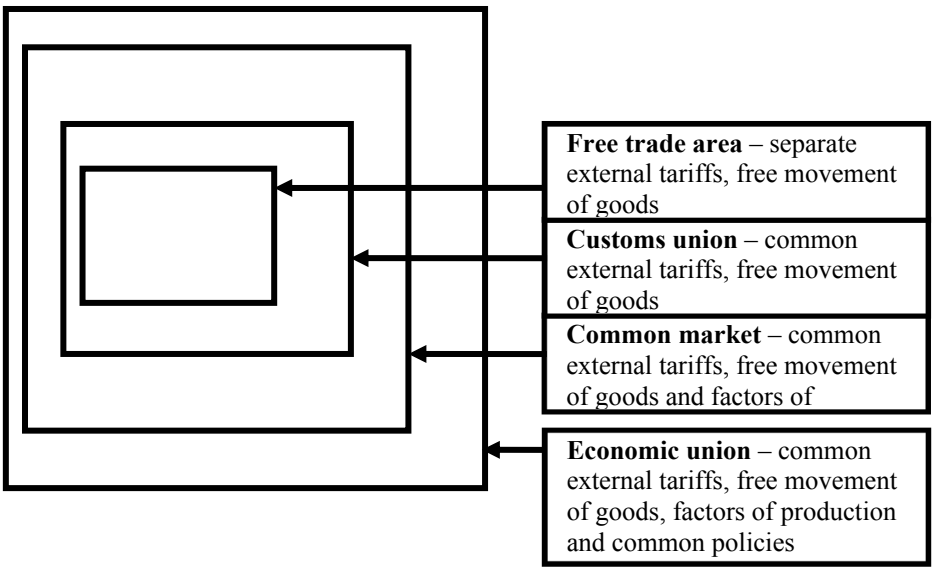



**Figure 10.1** Hierarchical structure of integration agreements

RTAs are exceptions to the World Trade Organization's (WTO) ruling principle of non-discrimination. WTO is based on the Most Favored Nation (MFN) Principle, which states that all trade preferences granted to one member state must also be extended to all other member states (Article I of WTO). The WTO recognises three exceptions to the MFN principle: (1) Developed countries can give non-reciprocal trade preferences to developing countries within the Generalised System of Preferences (GSP); (2) Developing countries can grant partial trade preferences to each other within the so called Enabling Clause, and (3) Countries can, according to Article XXIV, form customs unions or free trade areas if they cover substantially all trade between the countries.

Almost all countries of the world are members to some RTA, as shown (to some degree) in Tables 10.1 and 10.2 below (WTO). By July 2005, only one WTO member, Mongolia, was not party to a regional

trade agreement. By July 2005, a total of 330 regional trade agreements had been reported to the WTO. RTAs are observed on all continents (except Antarctica). In Europe, regional trade is dominated by the common market of the European Union. The United States used to rely on the multilateral trading system characterised by the MFN principle. Recently, however, the United States became strongly involved in regional trade within the North American Free Trade Agreement (NAFTA) and in negotiation to establish free trade for the Americas. Similar developments are taking place in Asia and other continents. According to the WTO, estimates of preferential world trade shares within RTAs reached 51.2 percent of all world trade in 2005. This share constitutes 67.0 percent for Western Europe.

Historically[30], there were two waves of RTA creation. The first took place in the 1960s and 1970s, but did not spread beyond Western Europe. The second wave of RTA creation started in the 1980s when the United States switched its trade policy from multilateral approach to trade liberalization to a regional liberalization of trade within RTAs.

[30] Bhagwati, J. 1993. Regionalism and multilateralism: An overview. In De Melo, J, – Panagariya, A (eds). New dimensions in regional integration. Cambridge : Cambridge University Press, pp. 22–51. ISBN 0-521-44431-4

## 10.1 Trade creation and trade diversion

On the one hand, the formation of an RTA can be viewed as a move towards free trade, because some trade barriers are eliminated. However, an RTA liberalises trade among a subset of countries only, not globally like multilateral trade liberalization within the WTO. From a welfare perspective, RTAs are therefore a second-best concept, not a first-best outcome. The British economist Jacob Viner was the first one to notice that an RTA can either increase the overall welfare or reduce it. As Viner concluded, an RTA does not automatically increase welfare.

**Table 10.1** Selected regional trade agreements in the world

| RTA Name | Coverage | Type |
|---|---|---|
| Andean Community (CAN) | Goods | CU |
| ASEAN Free Trade Area (AFTA) | Goods | FTA |
| Asia Pacific Trade Agreement (APTA) | Goods | PTA |
| Australia - New Zealand (ANZCERTA) (G) | Goods | FTA |
| Australia - New Zealand (ANZCERTA) (S) | Services | EIA |
| CARICOM (G) | Goods | CU |
| CARICOM (S) | Services | EIA |
| Central American Common Market (CACM) | Goods | CU |
| Central European Free Trade Agreement (CEFTA) 2006 | Goods | FTA |
| Common Economic Zone | Goods | FTA |
| Common Market for Eastern and Southern Africa (COMESA) | Goods | FTA |
| Commonwealth of Independent States (CIS) | Goods | FTA |
| East African Community (EAC) | Goods | CU |
| EC Treaty | Goods & Services | CU & EIA |
| Economic and Monetary Community of Central Africa (CEMAC) | Goods | CU |
| Economic Community of West African States (ECOWAS) | Goods | CU |
| Economic Cooperation Organization (ECO) | Goods | PTA |
| EFTA (S) | Services | EIA |
| EFTA (Stockholm Convention) (G) | Goods | FTA |
| Eurasian Economic Community (EAEC) | Goods | CU |
| European Economic Area (EEA) | Services | EIA |
| Global System of Trade Preferences among Developing Countries (GSTP) | Goods | PTA |
| MERCOSUR (G) | Goods | CU |
| MERCOSUR (S) | Services | EIA |
| North American Free Trade Agreement (NAFTA) | Goods & Services | FTA & EIA |
| Pacific Island Countries Trade Agreement (PICTA) | Goods | FTA |
| Pan-Arab Free Trade Area (PAFTA) | Goods | FTA |
| South Asian Free Trade Agreement (SAFTA) | Goods | FTA |
| South Asian Preferential Trade Arrangement (SAPTA) | Goods | PTA |
| South Pacific Regional Trade and Economic Cooperation Agreement (SPARTECA) | Goods | PTA |
| Southern African Customs Union (SACU) | Goods | CU |
| Southern African Development Community (SADC) | Goods | FTA |
| Trans-Pacific Strategic Economic Partnership | Goods & Services | FTA & EIA |
| Turkey – Albania | Goods | FTA |

Source: WTO

Whether an RTA has overall positive or negative effects depends on the extent of trade creation and trade diversion. Trade creation occurs when one of the members of the RTA import goods and services from the other member which it formerly did not import. Trade creation therefore occurs when production in a member country is replaced by imports from a more efficient producer in member state of the RTA. However, when one of the members starts to import from the other members at the expense of imports from the rest of the world, then trade diversion occurs as a result of this discriminatory tariff reduction. Trade diversion thus occurs when imports from a more efficient producer from outside the RTA are replaced by imports from a less efficient RTA member.

For instructional purposes, we introduce the concepts of trade creation and trade diversion within a model with infinite supply elasticities and zero demand elasticities[31]. In Figure 10.2 three countries are considered, A, B, and C. Each country supplies a product at constant prices $P_A$, $P_B$, and $P_C$, respectively. We assume that A is the least efficient supplier and C the most efficient supplier. Demand in country A is denoted by $D_A$ in Figure 10.2. Initially country A imposes a non-discriminatory tariff $t$ on imports from all countries. Country A imports the entire quantity demanded from C because C is a more efficient producer than B. The consumer price in country A then is $P_C + t$ and $e + f$ is the tariff revenue.

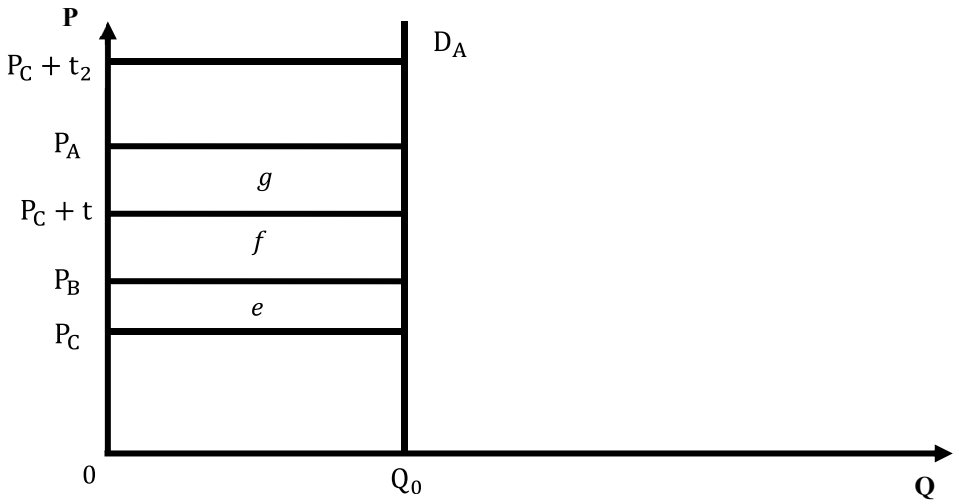



**Figure 10.2** Trade diversion and trade creation with zero demand elasticity and infinite supply elasticities.

If country A imposes a tariff on a discriminatory basis only on imports from country C, A will import all quantity demanded from country B. The more efficient supplier, country C is replaced by the less efficient supplier, country B. That is, all trade was diverted, and no trade was created. In country A tariff revenue $e + f$ is eliminated; $f$ is redistributed to consumers and $e$ is used to pay for higher prices of import. The overall effect in country A and the world is negative, $-e$.

To show the trade creation and trade diversion effects of the customs union or free trade area we can also consider a more realistic downward sloping demand curve[32]. In Figure 10.3, when there is a non-discriminatory tariff $t$, the domestic price in country A is $P_C + t$ and the amount $Q_N$ is imported. When the tariff on B only is removed the price declines to $P_B$. The quantity $Q_F$ is now imported; the distance $Q_N Q_F$

[31] Meade, J.E. 1955. The theory of customs unions. Amsterdam : North-Holland publishing company. 121 p.
[32] Lipsey, R.G. 1957. The theory of customs unions: Trade diversion and welfare. In Economica, 24(93), pp. 40-46. Can be retrieved from <http://www.development.wne.uw.edu.pl/uploads/Courses/lipsey_CU_1957.pdf> and Gehrels, F. 1956 – 57, Customs union from a single-country viewpoint. In The review of economic studies, 24(1), pp. 61-64.

is trade creation while $Q_N$ is trade diversion. The net welfare effect is $h - e$; there is therefore a possibility of welfare improving trade diversion as well.

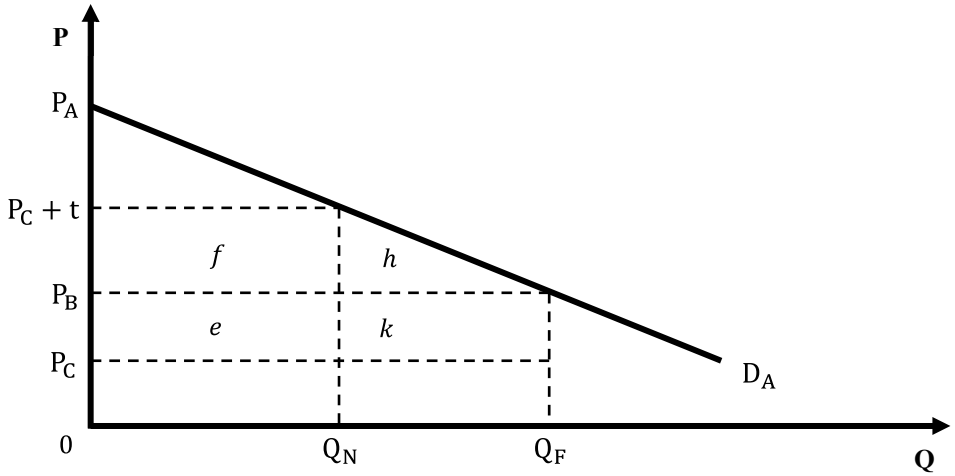



**Figure 10.3** Trade creation/trade diversion: downward sloping demand curve.

Figures 10.4 and 10.5 present the standard treatment of trade creation and trade diversion caused by RTAs. The situation depicted in Figure 10.4 is that of a customs union formed with a partner who has more efficient producers than those in the outside world. Before the formation of the customs union the domestic price was $P_B + t$, the price in the partner country plus the tariff, $t$. After the formation of the customs union, the price decreases to $P_B$. Imports increase from a more efficient producer from within the customs union at the expense of domestic production, while domestic consumption increases. Trade creation is measured by $S_1S_2$ plus $D_1D_2$. The customs union implies the following changes in welfare. The welfare of consumers increases by $a + b + c + d$, the welfare of domestic producers declines by $a$, and tariff revenue declines by $c$. Hence the net effect is positive, $b + d$. Because the partner country (B) was the sole supplier to country A from the beginning, there was no trade distortion when the RTA was formed and there was an unambiguous gain from forming the RTA. This is equivalent to a unilateral trade liberalization.

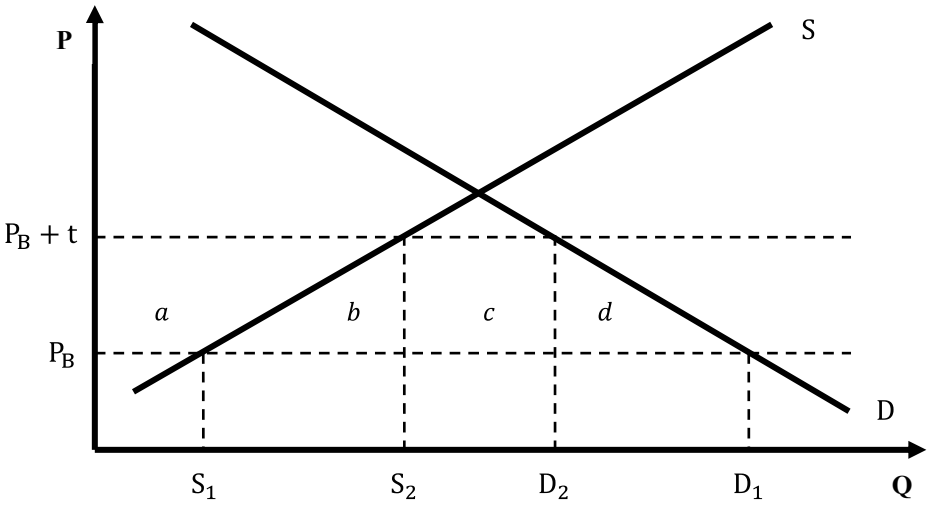



**Figure 10.4** Formation of a customs union with the most efficient producers

In Figure 10.5, $P_B$ represents the supply curve from a preferred partner with whom a customs union is formed, while $P_C$ represents the world price. When the customs union is formed with the preferred partner, imports previously supplied by more efficient producers from outside the customs union at price

$P_C + t$ are replaced by imports from the partner country within the customs union at price $P_B$. Because of the formation of the customs union the domestic price declines from $P_C + t$ to $P_B$ and some trade is created, namely $S_1S_2$ and $D_2D_1$, which is the difference between $D_1S_1$ and $D_2S_2$. $D_2S_2$ therefore represents the trade diversion effect of the customs union.

The welfare implications are the following: Consumers gain area $a + b + c + d$; producers lose area a; and tax revenues decline by $-(c + g)$. Hence the net welfare outcome is $d + b - g$. A net welfare loss occurs when the sum of areas $b$ and $d$ is smaller than area $g$, and a net welfare gain occurs the larger are areas $b$ and $d$. Thus, the welfare impact of a customs union increases when the demand and supply curves are more elastic, when the efficiency difference between producers in the partner country and producers in the rest of the world is lower, and when the pre-union tariff is higher, leading to lower imports relative to domestic consumption and production before the formation of customs union.

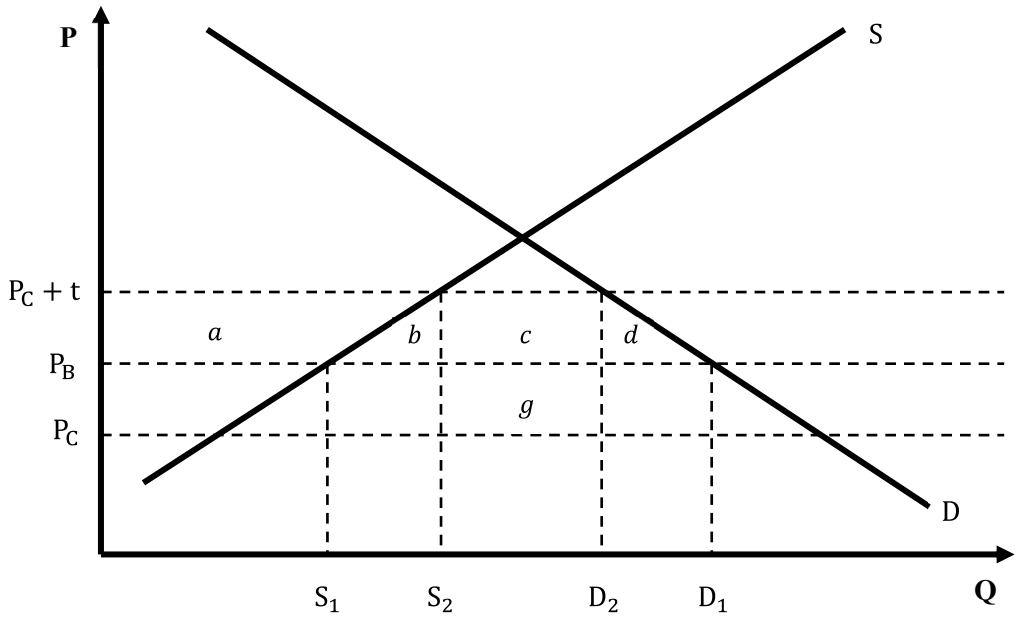



**Figure 10.5** Formation of a customs union with less efficient producers

### Customs union vs. free trade area

There is an important difference between a customs union and a free trade area. Members of an FTA can impose their own tariffs on imports from third countries while members of customs union must agree on common external tariffs. When tariffs differ in a FTA, then imports to the FTA will be directed through the low tariff country. That is, trade deflection will occur. Governments try to avoid trade deflection by imposing rules of origin. Tariff-free imports within FTA take place only if the imported goods contain significant amounts of value-added from a member state within the FTA. Thus, if country A has a lower tariff than country B and they form an FTA, then imports into the FTA will be channelled through country A. Rules of origin make sure that country B imports free of tariffs from country A only those goods produced in country A, not those goods transhipped from third countries. However, when country A's production is higher than country B's imports, country A will export its own goods free of tariffs to country B, with domestic consumption in country A satisfied by domestic production and imports from third countries. In such a case prices in both A and B will be equal to the price in country B, which is the world price plus the tariff (assuming both countries are net importers). Initially the high tariff country will be better off when reducing its tariff below the tariff rate of the low tariff country in order to increase its tariff

revenue. A race to lower tariffs because of competition for tariff revenue between members of an FTA will lead to the total elimination of tariffs – therefore FTAs are inherently unstable[33].

### Trade creation and diversion: additional considerations

In addition to the primary reactions of production and consumption to changes in tariffs, there are also secondary repercussions. Suppose we assume three countries, country A exporting good 1 to B and C, while country B exports good 2 to countries A and C, and large-country C producing all three goods. Initially country A imposes tariffs on good 1 ($t_1$) and on good 2 ($t_2$). The effect of a reduction of $t_2$ leads to trade creation and its subsequent welfare gain. However, a discriminatory tariff reduction $t_2$ affects also the demands for goods 1 and 3 too. If the goods are substitutes, then imports of good 3 decrease (trade diversion) and exports of good 1 increase (trade creation). For a small change in $t_2$ trade creation dominates, leading to a welfare gain. However, if $t_2$ approaches zero, then trade diversion might be bigger than trade creation leading to a welfare loss. Economic theory therefore does not provide a clear-cut decision whether an RTA is welfare improving or not. Rather the welfare consequence of an RTA is an empirical question; that is, it depends on the underlying parameters of the economy (especially supply and demand elasticities and elasticities of substitution).

An alternative approach to trade creation and diversion within RTAs is provided by Krugman[34] and Summers[35]. Instead of looking at underlying parameters of the economy, they consider the initial volume of trade or the distance between trading countries. Krugman states that if the distance between trading countries is low, then the formation of an RTA between them will most likely lead to trade creation rather than trade diversion. By the same token, Summers exerts that if the initial volume of trade prior to the formation of RTA is large, then forming an RTA will have positive impacts on the welfare in both countries, as trade creation will dominate trade diversion.

---

[33] For details, see Shibata, H. 1967. The theory of economic unions: A comparative analysis of customs unions, free trade areas and tax unions. In Shoup, C.S. (ed.). 1967. Fiscal harmonization in common markets, Vol. 1, Theory. New York : Columbia university press, pp. 145-264. and
Richardson, M. 1994. Why a free trade area? The tariff also rises. In Economics and politics, 6(1), pp. 79-96.

[34] Krugman, P. 1991. The move toward free trade zones. In: Policy implications of trade and currency zones, proceedings of a Federal reserve bank of Kansas City symposium, pp. 7-58. Retrieved from <https://www.kansascityfed.org/publicat/sympos/1991/S91krugm.pdf>

[35] Summers, L. 1991. Regionalism and the world trading system. In: Policy implications of trade and currency zones, proceedings of a Federal reserve bank of Kansas City symposium, pp. 295-301. Retrieved from <https://www.kansascityfed.org/publicat/sympos/1991/S91summe.pdf>

## 10.2 Non-reciprocal preferences

In addition to *reciprocal regional trade agreements* characterised by the mutual reduction or elimination of trade barriers by trading partners there are also non-reciprocal preferential arrangements. *A non-reciprocal preferential arrangement* exists when one country (a donor) provides other countries (beneficiaries) with better than most favourite nation (MFN) access to its market without requesting reciprocal market access to their markets. Non-reciprocal trading arrangements are best known for the General System of Preferences (GSP). The GSP is a system under which developed countries grant preferential tariff treatment to imports of certain products from certain developing countries. The granted preferences are almost unilateral, i.e. the policy does not require the developing countries to grant similar access to their markets.

GSP arrangements were introduced between 1971 and 1976 as a result of two United Nations Conference on Trade and Development (UNCTAD) conferences that took place in 1964 and 1968. At its inception GSP was opposed by protectionist forces in the donor countries and by supporters of the MFN principle, as well as by proponents of our multilateral trading system. However, GSP as promoted by UNCTAD and also by the World Bank is non-discriminatory for countries at the same level of development. That is, it does not recommend discrimination between developing countries. In practice developed countries adopt non-reciprocal trade arrangements on a selective basis, favouring mostly their colonies or some specific regions where they have particular interests.

The purpose of non-reciprocal preferences is to assist developing countries, with the assistance to be provided through trade in selected products. In donor countries producers are worse off with increased imports and tariff revenues decline, but consumers are better off because the increase in imports results in a decline in domestic prices. The overall effect is ambiguous and depends on the levels of trade creation and trade diversion. The net impact of non-reciprocal preferences on beneficiary countries is positive. The higher the preference margins (the difference between the MFN tariff and the GSP tariff), the higher will be the exports from those lesser developed countries to developed countries leading to higher economic growth and welfare. On the other hand, because preferential access is only given for a subset of products selected by donor countries and not to all products, the pattern of exports from developing countries is strongly influenced by the political economy of preferential treatment in donor countries instead of the relative comparative advantages in beneficiary countries.

Through GSP developed countries grant tariff concessions to developing countries which is in conflict with the MFN principle of the General Agreement on Tariff and Trade. The MFN principle requires a country to extend a tariff reduction granted to one contracting party to all contracting parties. To reconcile GSP with GATT principles, in 1971 GATT member states allowed a 10-year MFN waiver for the GSP. This was later extended indefinitely by the Enabling Clause adopted in Tokyo Round of GATT negotiations.

## 10.3 Trade and integration policies of the European Union

The European Union has been a WTO member since January 1995. All EU member states are also WTO members. The European Commission (EC) represents the EU member states in WTO meetings. With respect to trade the European Union is a customs union with a single trade policy and a common external tariff. This means that there are no tariffs or other trade barriers on trade within the EU, and all member countries have the same external tariffs on trade with third countries. The same tariff is paid for imported good irrespective of the entry point into the EU and after the completion of customs procedures goods can be moved within the EU without paying additional duties on the internal borders. Exports from members of the World Trade Organization to the EU face Most Favored Nation tariffs. Many countries, however, have signed trade agreements with the EU and face preferential tariffs that are lower than MFN tariffs (Table 10.2). The formation and participation in *preferential trade agreements* (PTAs) is a widely used instrument of EU's trade policy. EU's PTAs are especially effective in reducing tariffs and other trade barriers in non-agricultural products, while there was only limited liberalization of agricultural trade through PTAs.

The European Union uses the Combined Nomenclature (CN) system to code and classify products for customs and statistical purposes. CN is basically a coding system and it is based on the international Harmonised Commodity Description and Coding System, or simply, the Harmonised System (HS**)** of names and codes for classifying traded products. HS was developed, and it is maintained by the World Customs Organization, an intergovernmental organisation based in Brussels. HS divides all traded goods into 21 sections, 97 chapters and 5,000 commodity classes. Goods in the sections belong to the same sector of the economy. Section 1 for example contains live animals and animal products while section 2 contains vegetable products. The first two digits denote the chapter. Code 01 (chapter 01) stands for live animals, while code 02 (chapter 02) is meat and edible meat offals. Agricultural, food and fishery products are listed under chapters 1 through 24. The first four digits of the HS code denote the HS heading. For example, code 0101 stands for live horses, asses, mules, and hinnies, while code 0102 represents live bovine animals. Six digits of the HS code divide traded goods further into smaller categories. Code 010110 contains pure-bred breeding animals of live horses, asses, mule and hinnies. The CN code adds two additional digits on top of the HS code to make classifications finer.

In addition to the CN code, the EU also uses the TARIC (Tarif Intégré Communautaire) code. The TARIC codes break the CN codes down further to the 10-digit level. The TARIC contains information on tariff quotas, preferential quotas, tariff suspensions, and other trade measures.

**Table 10.2** Regional trade agreements in Europe

| RTA Name | Coverage | Type |
|---|---|---|
| EC – Albania | Goods & Services | FTA |
| EC – Algeria | Goods | FTA |
| EC – Andorra | Goods | CU |
| EC – Bosnia and Herzegovina | Goods | FTA |
| EC – Cameroon | Goods | FTA |
| EC - CARIFORUM States EPA | Goods & Services | FTA & EIA |
| EC – Chile | Goods & Services | FTA |
| EC – Côte d'Ivoire | Goods | FTA |
| EC – Croatia | Goods & Services | FTA & EIA |
| EC – Egypt | Goods | FTA |
| EC – Faroe Islands | Goods | FTA |
| EC – Former Yugoslav Republic of Macedonia | Goods | FTA |
| EC – Iceland | Goods | FTA |
| EC – Israel | Goods | FTA |
| EC – Jordan | Goods | FTA |
| EC – Lebanon | Goods | FTA |
| EC – Mexico | Goods & Services | FTA & EIA |
| EC – Montenegro | Goods | FTA |
| EC – Morocco | Goods | FTA |
| EC – Norway | Goods | FTA |
| EC – Overseas Countries and Territories (OCT) | Goods | FTA |
| EC - Palestinian Authority | Goods | FTA |
| EC – South Africa | Goods | FTA |
| EC – Switzerland – Liechtenstein | Goods | FTA |
| EC – Syria | Goods | FTA |
| EC – Tunisia | Goods | FTA |
| EC – Turkey | Goods | CU |
| EC (27) Enlargement | Goods & Services | CU & EIA |
| EC Treaty | Goods & Services | CU & EIA |
| EFTA – Chile | Goods & Services | FTA & EIA |
| EFTA – Croatia | Goods | FTA |
| EFTA – Egypt | Goods | FTA |
| EFTA - Former Yugoslav Republic of Macedonia | Goods | FTA |
| EFTA – Israel | Goods | FTA |
| EFTA – Jordan | Goods | FTA |
| EFTA - Korea, Republic of | Goods & Services | FTA & EIA |
| EFTA – Lebanon | Goods | FTA |
| EFTA – Mexico | Goods & Services | FTA & EIA |
| EFTA – Morocco | Goods | FTA |
| EFTA - Palestinian Authority | Goods | FTA |
| EFTA – SACU | Goods | FTA |
| EFTA – Singapore | Goods & Services | FTA & EIA |
| EFTA – Tunisia | Goods | FTA |
| EFTA – Turkey | Goods | FTA |
| EFTA (S) | Goods & Services | FTA & EIA |
| EFTA accession of Iceland | Goods | FTA |
| Eurasian Economic Community (EAEC) | Goods | CU |
| European Economic Area (EEA) | Services | EIA |

Source: WTO

### Generalised System of Preferences

The EU's Generalised System of Preferences is a non-reciprocal trade arrangement through which the EU provides preferential access of imports into the EU market from developing countries. The primary objective of the EU's GSP is to contribute to the reduction of poverty and to the promotion of sustainable development and good governance. The first GSP arrangement was adopted by the EU in 1971 for the period of 10 years. The arrangement has been renewed periodically. Within that GSP the EU has allowed developing countries to export to the EU at zero or reduced tariffs. Stronger tariff concessions were granted for non-sensitive products than for sensitive products, which often included agricultural products. Lower tariffs were frequently combined with import quotas and import ceilings by product or by country.

The current GSP system of the EU contains three arrangements: The General arrangement (General GSP), the Special incentive arrangement for sustainable development and good governance (GSP+), and the Special arrangement for the least developed countries (EBA). The General GSP arrangement provides preferential treatment to 176 developing countries and territories. It covers 6244 products that are divided into non-sensitive and sensitive products. About half of 6244 products are non-sensitive. These products can be imported into the EU duty-free. For sensitive products duties are reduced relative to MFN duties by 20 or 30 percent. The GSP+ scheme provides additional preferences for vulnerable countries (small size, landlocked, isolated island or small diversification in exports) which adhere to international standards for human rights, sustainable development (and environment), and good governance. GSP+ scheme applies to Armenia, Azerbaijan, Bolivia, Colombia, Costa Rica, Ecuador, El Salvador, Georgia, Guatemala, Honduras, Mongolia, Nicaragua, Paraguay, Peru, Sri Lanka and Venezuela. It covers 6336 products and allows them to be imported into the EU duty free. EBA (Everything But Arms) is applicable to 49 least developed countries as recognised by the United Nations. These countries can export 7140 products to the EU duty free and quota free. The exception is Chapter 93 of the Harmonised System, which contains arms and armaments. In addition, there are special regimes for 3 sensitive products (rice, bananas and sugar).

### Africa Caribbean and Pacific (ACP)

Historically EU countries had colonies with which they traded duty free in Africa, the Caribbean and the Pacific. When the EU was formed an exception was made that free trade with these third countries would continue in the future, in that imposing higher MFN tariffs would harm former colonies. Formally EU established unilateral preferential trade agreements with former colonies under the auspices of the Yaoundé Convention and the Arusha Agreement. The number of former colonies grew substantially when the United Kingdom joined the EU in 1974. The new agreement with former colonies from Africa, Caribbean and Pacific was signed in Lomé granting them unilaterally free access to EU markets, subject to quotas for sensitive products. The Lomé agreements are renewed periodically.

The Lomé agreements, however, discriminated against some developing countries, in that former colonies received better treatment than other similar developing countries. The Lomé agreements therefore violated the WTO principle of non-discrimination. The new agreement between the EU and ACP countries, signed in year 2000 and known as the Cotonou Agreement, paved the way for a trading system that is WTO compatible. The objective of the Cotonou Agreement is to change unilateral preferences to reciprocal preferences, that is, to form free trade agreements between the EU and groupings of ACP countries. These free trade agreements are known as Economic Partnership Agreements (EPAs) and are based on Article XXIV of the WTO.

## 10.4 Accession of Slovakia into the EU and agricultural trade creation and diversion[36]

Since the collapse of communism, the European Union has strongly determined the trade patterns and policies of Central and East European countries (CEECs). Mutual trade between the EU and the CEECs, including Slovakia, has been increasing since the beginning of the 1990s. Part of this increase has been also due to liberalization of trade between the EU15 (EU when it had 15 member states) and the CEECs through a series of tariff reductions. Agricultural trade between the CEECs and the EU15 was gradually liberalised also, although liberalization in agricultural trade lagged behind that in industry. Both in the EU15 and the CEECs, agriculture was and still is heavily subsidised. The bulk of these subsidies is provided in the form of price supports, i.e. increasing the domestic price above the world price by setting a price floor. To sustain a high domestic price, governments implement border protection in the form of import tariffs and quotas, or export subsidies in the case of net exporters.

Non-tariff barriers, like sanitary and phytosanitary standards, quality standards, and import licensing, as well as differing regulatory policies also inhibited trade between the CEECs and the EU15. Initially many food processors in the CEECs did not meet the high product standards imposed by the EU's common market and were forced to sell in domestic markets. The previously available Soviet Union market was effectively closed. Producers in the CEECs had to invest significantly in order to comply with sanitary, phytosanitary, and quality standards. Import licensing inhibited mutual agricultural trade until the day of accession.

In May 2004, eight of the CEECs (Bulgaria, the Czech Republic, Estonia, Hungary, Latvia, Lithuania, Poland, Romania, Slovakia and Slovenia). together with Malta and Cyprus joined the EU's common market, followed by Bulgaria and Romania in January 2007. For Slovakia, EU accession in most cases increased tariffs with the rest of the world (Figure 10.6). On average, Slovak tariffs for third countries increased by 8.6 percentage points (ppt) after EU accession.[37]

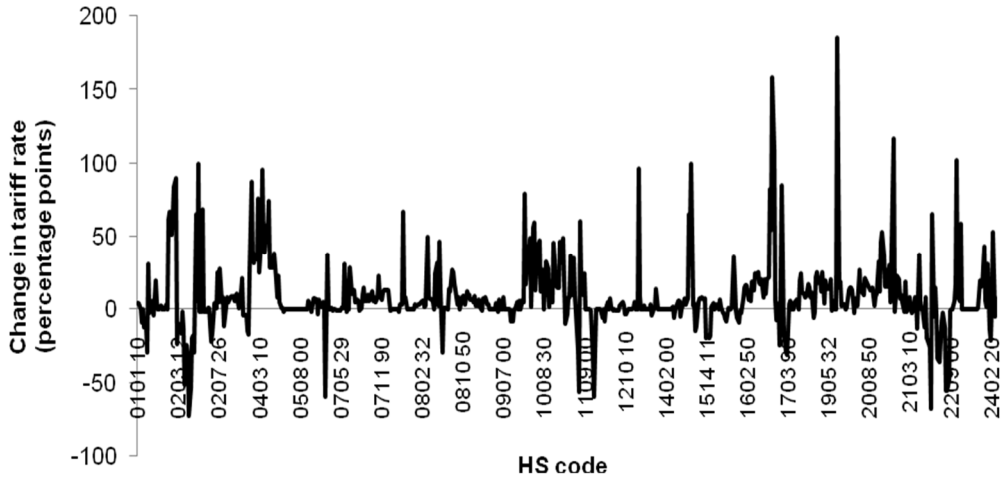



**Figure 10.6** Change in tariff rates applied by Slovakia for third countries after the EU accession (tariff rates in 2005 minus tariff rates in 2002)
Source: own calculations

[36] This part is based on Ciaian, P. – Pokrivčák, J. – Drabik, D. 2008. Prečo sú niektoré sektAory v tranzitívnych ekonomikách menej reformované ako ostatné? Prípad výskumu a vzdelávania v oblasti ekonómie. In Politická ekonomie, vol. 6., pp. 819-836.

[37] In fact, out of 635 tariff lines considered, there was an increase in tariff rates in 387 cases (average increase of 18.6 percentage points), a decrease in 134 cases (average decrease of 13.2 percentage points), and tariff rates did not change in 114 cases.

The EU enlargement of 2004 also fully liberalised mutual agricultural trade between the EU15 and the new CEE member states and harmonised national legislations. Agricultural trade between the enlarged EU and the rest of the world (ROW), however, remained significantly hindered by trade barriers. Upon their accession to the EU, new CEE member states adopted the common external tariffs of the European Union.

On the one hand, there are positive effects as new members replace expensive domestic production with cheaper imports from other EU member states because of trade barriers for intra-EU trade being eliminated. Trade creation is taking place, which improves the allocation of resources in the economy. On the other hand, there is a negative effect as new member states start to import from other member states at the expense of cheaper imports from the rest of the world because tariffs on goods from the rest of the world have not been eliminated. This is a situation of trade diversion, which worsens the allocation of resources in the economy. The probability that trade diversion takes place is higher in agriculture than in industry because agricultural tariffs are significantly higher than industrial tariffs in the EU. The EU average level of customs duty protection amounts to around 4 % on industrial goods while the average agricultural customs duty actually paid by exporters entering the EU market is 20 % in most cases, but only 10.5 % when EU preferences granted to developing countries are taken into consideration.

Whether trade creation or trade diversion prevails is a complex question. Concurrent with gradual trade liberalization between the EU15 and CEECs, a number of other important things have happened. These include the collapse of the Council of Mutual Economic Assistance system, the transformation of the agricultural policies of the CEECs, the reforms of the EU Common Agricultural Policy (CAP), and the completion of the GATT/WTO Uruguay Round.

### Agricultural tariffs and non-tariff measures in Slovakia before EU accession

After the breakup of Czechoslovakia in 1993, the Czech Republic and Slovakia formed a customs union. There were no barriers to agricultural trade between the two countries. Slovakia and the Czech Republic used different tariffs for agricultural imports from WTO members (MFN tariffs) and for imports from non-members. Tariffs applied to imports from the WTO members were the same or lower than tariffs for imports from non-members. In the European Union accession process, Slovakia and other acceding states provided preferential access to their domestic markets for the EU15 and other CEECs. Lower tariff rates (preferential tariff rates) were applied for imports from the EU15 and other CEECs than for imports from the rest of the world. Preferential tariffs differed among the CEECs according to the country of origin. That is, the preferential tariff for Slovak importation of maize, for example, from Poland differed from the preferential tariff for importation of wheat from Hungary. The number of preferential tariffs applied to the EU15 and CEECs increased during 2000-2004. However, the number of items not covered by the preferential treatment was still significant. Slovakia had preferential tariffs also with other countries, in addition to the EU15 and CEECs including, for example, Croatia, Israel and Turkey.

Preferential tariffs in some cases were combined with import quotas within a so-called tariff rate quota. There was a preferential tariff rate for imports within the import quota (for example, the first 205,000 kg of butter at a 15 % tariff rate) and higher tariff rates for imports outside of the quota (for example, 25 % for volumes exceeding 205,000 kg). When a quota was fully used, the quantity outside of the quota was levied using either an applied MFN tariff or a tariff applied to non-WTO members. In general, tariff rate quotas for the EU15 and CEECs were less restrictive than those for the rest of the world.

Despite the customs union between the Czech Republic and Slovakia, the countries did not apply identical MFN tariffs. There were small differences in several commodities. The differences (in commodity coverage, tariff rate and/or quota quantity) were greater for preferential tariffs and quotas than for MFN tariffs. This suggests that some arbitrage in agricultural trade could be present. However, there are no reliable data on this.

### The chronology of EU enlargement

After the collapse of communism, the EU granted trade concessions to the CEECs. These concessions involved the removal of import quotas and the extension of the Generalised System of Preferences (GSP). Trade and Cooperation Agreements between the EU15 and CEECs were signed. Europe Agreements (Association Agreements) were signed between the EU15 and CEECs in the early 1990s. The trade provisions of the Europe (Association) Agreements created a free trade area including the EU and CEECs from January 1, 2001. The Association Agreements also liberalised movement of capital, services and workers Europe Agreements allowed for the gradual creation of a free trade area between CEECs and the EU. In agriculture, Europe Agreements reduced duties and provided preferential access to each other's markets. Mutual concessions were asymmetric; the EU provided to the CEECs bigger reductions in tariffs, higher quotas and lower in-quota duties than those offered by the CEECs to the EU. However, the CEECs did not fully utilise lower in-quota tariff rates and other preferential concessions.

Agricultural trade was further liberalised in 2000 when bilateral agreements between the EU and all eight CEE candidate countries were concluded. The agreements liberalised a wide range of agricultural products, either fully or with the use of tariff rate quotas. A further round of negotiations launched in December 2001 resulted in the expansion of sub-sectors of agriculture that were liberalised. The Central European Free Trade Agreement (CEFTA) liberalised agricultural trade only marginally. There were many exceptions to free trade among CEFTA countries in agriculture. Agricultural products were considered sensitive for liberalization. In spite of this, agricultural trade among CEFTA countries was more liberal than trade between CEFTA countries and the EU. CEFTA had almost the same agricultural trade tariffs with the Baltic States as with the EU.

### EU accession of Slovakia and Trade creation and trade diversion

Total agricultural trade between the CEECs and the EU15 has been growing since the 1990s. Figure 10.7 describes the development of Slovak agricultural trade with the EU15+CEECs and the ROW in the period 1996-2005. Slovak agricultural trade with the EU15+CEECs grew faster than trade with the ROW. Particularly fast rates of Slovak trade growth with the EU15+CEECs are observed after the year 2003. Several factors could have contributed to the expansion of agricultural trade between Slovakia and the EU15+CEEC. Probably the most important were: (1) the liberalization of global agricultural trade due to the GATT/WTO, especially the Uruguay Round; (2) the liberalization of the CEEC economies; (3) reforms of the EU's CAP; (4) the gradual formation of a free trade area and subsequently a customs union and common market between the CEECs and the EU15; and (5) the collapse of the Council of Mutual Economic Assistance. It is therefore not clear whether the expansion of trade was due to the gradual integration of the Slovak economy into the EU or due to other reasons.

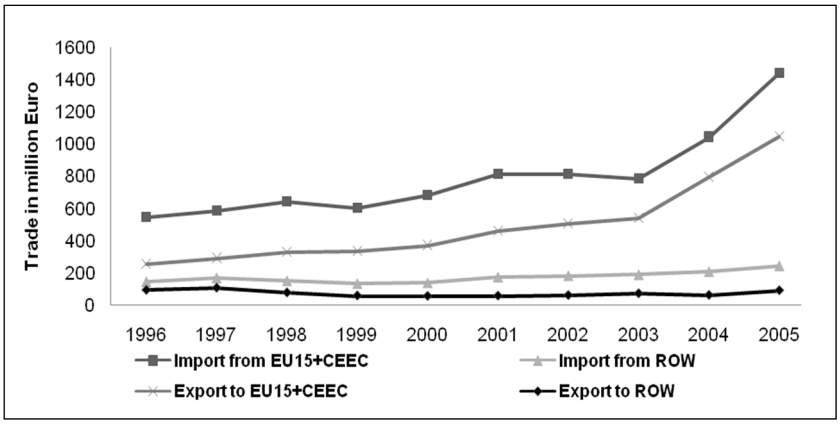



**Figure 10.7** Slovak agri-food trade with EU15+CEEC and ROW (mil. €)
Source: own calculations

Furthermore, it is not clear whether the expansion of Slovak agricultural trade with the EU15+CEECs represents a trade creation or trade diversion effect. In general, the share of Slovak agricultural exports to and imports from the EU15+ CEECs has been increasing at the expense of exports to and imports from the rest of the world (Figures 10.8 and 10.9). This could indicate that some of the Slovak agricultural trade with the ROW was replaced by trade with the EU15 and CEECs. More precisely, trade with the EU15+CEECs is growing faster than trade with the ROW, which implies the existence of the trade diversion effect of agricultural trade liberalization between Slovakia and the EU.

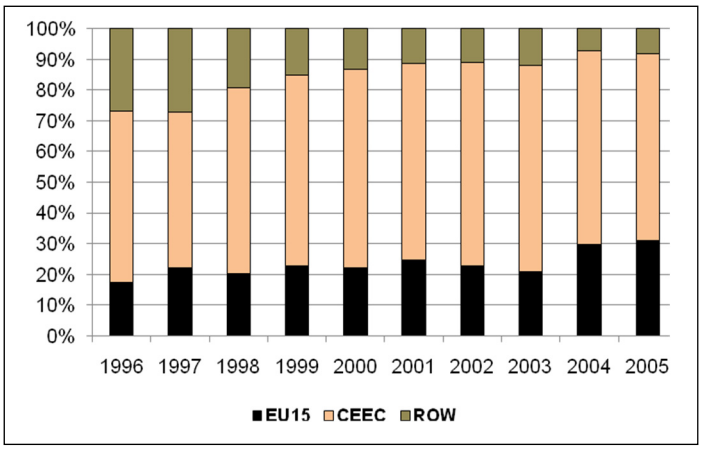



**Figure 10.8** Structure of Slovak agri-food exports by regions
Source: own calculations

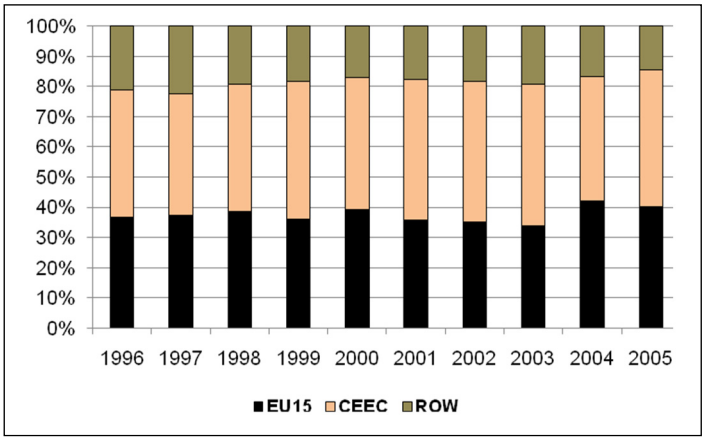



**Figure 10.9** Structure of Slovak agri-food imports by regions
Source: own calculations

A review of the detailed data shows that there are many cases when gradual liberalization increased Slovakia's agricultural imports from the EU15+CEECs, while at the same time Slovak agricultural imports from the ROW decreased. Out of 193 agricultural commodities classified by the four-digit HS code, in 42 cases agricultural imports from the EU15+CEECs increased between 2000-2001 (2004-2005)[38], while imports from the ROW declined. This is an indication that imports from the EU15+CEECs, which receive more favourable treatment, replaced imports from the ROW, an indication of trade diversion. It is worth mentioning that out of 42 commodities where a pure trade diversion effect was seen, 39 are considered

[38] 2000-2001 (2004-2005) means the average value of trade flows of respective commodities in 2000 and 2001 (2004 and 2005). We averaged the values of agricultural imports in the respective years to get more robust results because weather could have led to fluctuations in imports.

high-value commodities according to the USDA trade classification (classification conducted by the United States Department of Agriculture). At the level of individual commodities international trade is crucially dependent on agricultural support policies such as price supports and accompanying border measures.

The growth of Slovak agro-food imports from the EU15+CEECs and the ROW is related to the extent of the reduction of Slovak tariffs for the EU15+CEECs that occurred between 2000 and 2002 (Figure 10.10) and between 2002 and 2005 (Figure 10.11). In the period 2000-2002 tariff reductions on Slovak agricultural imports from the EU15 and CEECs did not lead to a high increase in those imports. Moreover, imports from the ROW grew faster (Figure 10.10). During the second wave of agricultural trade liberalization, from 2002 to 2005, Slovak agricultural imports from the EU15+CEECs were positively related to the extent of tariff cuts. The largest increase of imports from the EU15+CEECs occurred for commodities for which tariffs were reduced by between 25 and 50 percentage points.

Statistical regression results indicate that 31.4 % of the increase in agricultural imports from the EU15+CEECs between 2000 and 2005 was due to the discriminatory trade liberalization between Slovakia and the EU15+CEECs, that is, due to the formation of a customs union. The rest of the increase in respective agricultural imports was due to other reasons such as globalization, transformation of the economy, harmonization of regulatory policies, elimination of non-tariff barriers and others. Furthermore, we found that for Slovakia the second wave of agricultural trade liberalization (from 2002 onward) brought about greater effects in terms of the increase in agricultural imports from the EU15 and CEECs than was the case with the first wave.

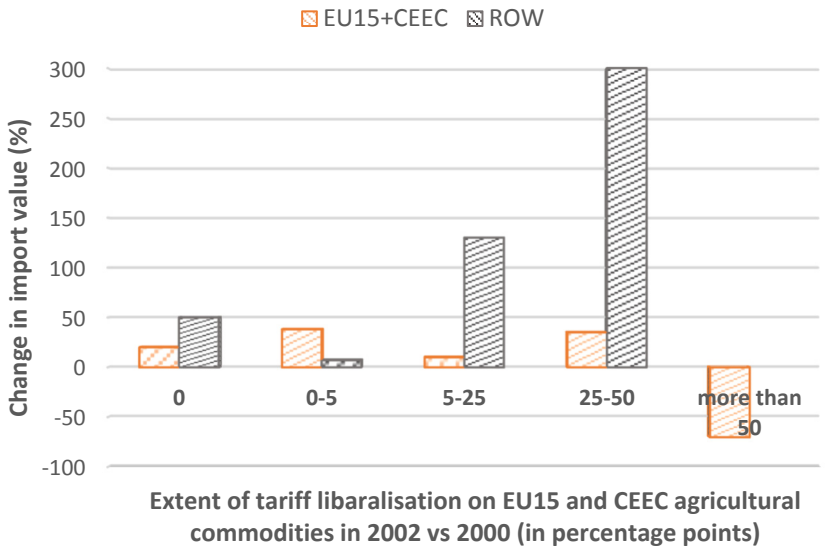



**Figure 10.10** Change of Slovak agricultural imports from EU15 + CEECs and ROW for different levels of tariff liberalisation (2002 vs. 2000)
Source: own calculations

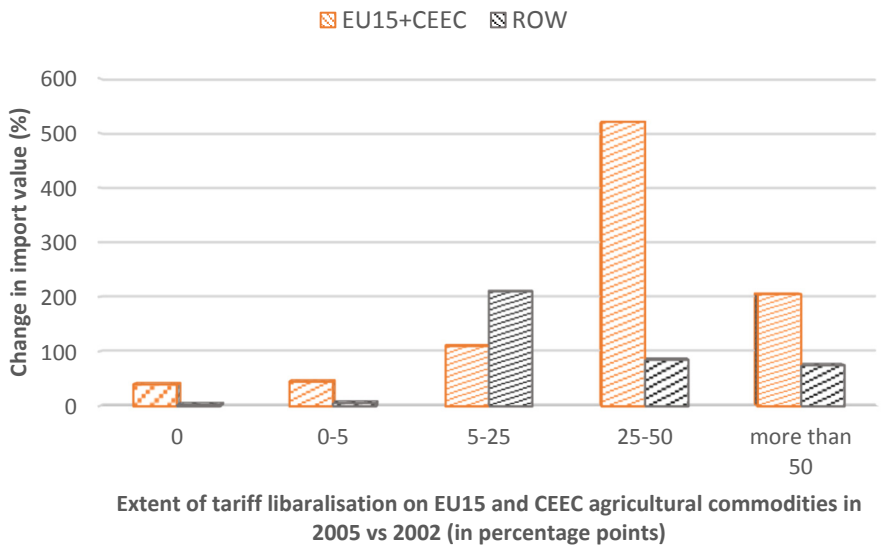



**Figure 10.11** Change of Slovak agricultural imports from EU15 + CEECs and ROW for different levels of tariff liberalisation (2005 vs. 2002)
Source: own calculations

Part of the increase in agricultural trade with the EU15+CEECs was at the expense of trade with more efficient producers from the rest of the world, i.e. there is an indication that some trade diversion could have occurred. The possibility of the occurrence of trade diversion leads to the conclusion that the overall global trade liberalization is better from the welfare perspective than "fortress Europe", which eliminates trade barriers only within Europe and retains significant protection rates against imports from outside Europe. However, to reach our conclusions we did not consider some trade barriers that affect international agricultural trade. In particular, there are no data on fill rates of the quotas and it is not possible to unequivocally attribute the quota share to a commodity specified by an eight-digit code.

# Chapter 11 THE WORLD TRADE ORGANIZATION

In previous chapters we learned that international trade is beneficial for all nations. Trade barriers like tariffs distort markets and reduce efficiency, which is reflected in a decrease in domestic welfare by the amount of the deadweight losses. Unilateral liberalization of trade would therefore increase domestic welfare. Historically this was the case for England, which pursued free trade policies regardless of trade barriers imposed by its trading partners.

Politically, however, it is easier to liberalise trade through multilateral negotiation. That is why the World Trade Organization is needed. There are several reasons why international multilateral negotiation leads to better results than a unilateral or bilateral approach. First, for large countries (including customs unions) there is an optimal tariff, a tariff that maximises domestic welfare. Recall that tariff causes deadweight losses to the domestic economy, but also improves the terms of trade for a large country, which imposes a cost to foreigners. Hence a large country causes some damage to its trading partners. Policy making by individual countries acting independently will lead to the imposition of tariffs in that each country would like to maximise its own welfare. If each country uses optimal tariffs, then gains from trade are not realised.

In other words, irrespective of what other countries do, a domestic large country prefers some protection of its domestic market. But when all countries pursue protectionist policies the outcome is worse than if all countries follow free trade. This situation is illustrated in Table 11.1. For the sake of simplicity, we consider only two countries that are named the USA and the EU. The top number in each cell is the EU payoff (gain); the bottom number is the USA payoff.

**Table 11.1** Trade war and advantages of international negotiation.

| | **Free trade EU** | **Protectionism EU** |
|---|---|---|
| Free trade USA | 100<br>100 (1) | 200<br>-100 (2) |
| Protectionism USA | -100<br>200 (3) | -50<br>-50 (4) |

If the USA chooses a protectionist policy by implementing optimal tariffs and the EU follows free trade policy, the USA gains €200 billion due to the improved terms of trade and the EU loses €100 billion (the outcome is depicted in cell 3 of the matrix in Table 11.1. By analogy, if the EU conducts protectionist policy while the USA has a free trade policy the EU gains €200 billion while the USA loses €100 billion (cell 2). If both countries choose protectionist policies each country loses €50 billion (cell 4). The USA improves its own terms of trade with respect to the EU and the EU likewise improves its own terms of trade vis-à-vis the USA. The outcome is a disaster because the USA and the EU trade policies mutually eliminate their gains from the use of optimal tariff and the subsequent reduction of trade has a negative impact on welfare in both countries. Globally the best outcome is achieved when both countries follow free trade policies, whereby both gain €100 billion (cell 1). Notice, however that the global free trade is politically not easily sustainable because each country would prefer unilaterally to change to protectionism. If the USA moves unilaterally to protectionism while the EU remains dedicated to free trade, the USA gain increases from €100 to €200 billion. The same outcome occurs for the EU if it moves unilaterally to protectionism.

What will be the outcome of such an economic game? That is, what does economics predict will happen in reality? The prediction must be reasonable, meaning that economics should give strategies to both players that both will follow, a strategy that maximises their payoff and is the best reaction to what the other player does. Simply put, we look for a strategy that is optimal for player 1 (the USA) when player

2 (the EU) plays its optimal strategy and vice versa. The outcome predicted by the theory must be stable, which means that no one will want to change his/her strategy unilaterally. Such analyses as described above are studied within a context known as "Game Theory", a rapidly developing branch of economics.

To solve the above optimal tariff game, we first assume that the EU pursues free trade policies and ask what would be the best response by the USA. Given free trade policies of the EU, the best response for the USA is to choose protectionist policies. The reason is simple, if given free trade policies by the EU, the USA can choose between a payoff of €100 or €200 billion. Obviously €200 billion is better, and since it is associated with a USA protectionist reaction to the free market policies of the EU, cell (3) will be chosen. By the same token, if EU chooses protectionist policies the best reaction of the US is to choose protectionist policies also (cell 4). The USA decision involves the selection between a payoff of -€100 and -€50 billion and obviously -€50 is better for the USA. It means that the USA is better off with protectionist policies irrespective of what EU does. In the jargon of game theory protectionist policies for the USA are dominant.

Similarly, we come to conclusion that protectionist policies for the EU are the best reaction to any policies the USA chooses. EU is better off choosing protectionist policies irrespective of what US chooses. The equilibrium outcome of the above game is that both the USA and the EU choose protectionist policies if they make decisions individually by taking into consideration only their own welfare. This outcome is known as a *Nash equilibrium* in the literature, in deference to economist and mathematician John Nash, who first proposed such an outcome in 1954. Notice, however, that both countries would be better off if they were able to negotiate and make credible commitments that they each follow free trade agreements. Comparing €100 billion from mutual free trade policies with -€50 billion stemming from individually rational protectionist policies, clearly cell (1) would be chosen over cell (4). The role of the WTO, therefore, is to provide a forum for such negotiation and an institutional setting for making credible commitments for following free trade policies. Such a commitment signed by all countries will prevent them from unilaterally deviating from free trade and receiving short-run windfall gains from protectionist policies when all other countries are pursuing free trade.

The second reason for the use of multilateral negotiation is that it enables domestic exporters to participate more effectively in the process. When the EU negotiates with the US within the WTO, then the EU lowers trade barriers for US exports to the EU, which helps US exporters. At the same time the US lowers trade barriers for EU exports to the US, which helps EU exporters. Unilateral reduction of trade barriers by the EU would threaten domestic producers; potential EU exporters would not support such a policy. Multilateral negotiations, however, bring exporters on board.

Multilateral negotiations also help governments to gain credibility vis-à-vis the private sector. If there is a commitment not to support a sector with tariffs or export subsidies, then the domestic government can sustain domestic political pressure from firms in the sector by referring to international commitments that are difficult to revoke. The sector cannot rely on a political solution to its problems but rather it must look for help in international markets.

## 11.1 A brief description of GATT/WTO

The World Trade Organization (WTO) deals with the rules of international trade between nations at a global level. It is a forum where national governments meet to negotiate trade agreements, create global trade rules, and solve trade disputes. The WTO is based on agreements signed by a large majority of nations. From a legal perspective, nations sign binding contracts to keep trade policies within certain limits. The WTO‘s objective is to create transparent rules that promote free trade without barriers. Trade disputes are solved according to legal rules. All agreements signed within the WTO are based on the following principles:

**1. Trade without discrimination**. Trade policies of WTO contracting parties should not discriminate some member states vis-à-vis other member states. This is the Most Favored Nation principle, which means that if a WTO member state provides a concession to another WTO member state, it must extend that concession to all other nations that are members of the WTO. This principle protects especially small countries from large countries that arbitrarily use trade policies to achieve political goals. There are, however, exceptions to this principle. WTO members can sign customs union or free trade agreements that discriminate against WTO members that are not party to a customs union or a free trade agreement. Furthermore, developed countries can provide unilateral trade concessions to developing countries. The WTO also endeavours to establish policies that do not discriminate against foreign goods, services or trademarks. Once goods, services and trademarks enter the territory of a country, they should be treated as domestic goods, services or trademarks.
**2. Freer trade**. WTO agreements aim to reduce trade barriers (tariffs, quantitative limits, administrative obstacles). The reduction of trade barriers takes place slowly, enabling countries to adjust their economies and to avoid painful restructuring.
**3. Predictability and transparency**. The WTO supports stable and transparent rules. Binding limits on trade policies are set within negotiations that countries have to comply with. Frequent or *ad hoc* changes of tariff rates would lead to a risky economic environment and could cause damage to trading partners. Transparency was strengthened, for example, by switching from quotas to tariffs.
**4. Fair trade**. Fair trade can be achieved by non-discrimination, but also by limits on dumping or export subsidies.
**5. Encouraging development and economic reform**. The WTO system and its principles are conducive to economic development and growth. Moreover, special treatment is applied to developing countries. The WTO provides developing countries with additional flexibility and a certain level of positive discrimination.

The WTO as an international organisation was created on January 1, 1995. The General Agreement on Tariffs and Trade (GATT) was the predecessor to the WTO. The original GATT accord was signed in 1947 in Geneva. The GATT at that time was not a full blown international organisation, like the International Monetary Fund or the World Bank. Rather, it was an unofficial international organisation overseeing international trade within negotiation rounds. The first GATT negotiation round began in Geneva in 1947; the last negotiation round was the Uruguay Round that lasted from 1986 until 1994. While the GATT focused on trade in physical goods, the WTO includes also trade in services and trade-related intellectual property rights.

The original plan after world war II was to create an organisation under the auspices of the United Nations that would oversee international trade relations. Its name was the International Trade Organization (ITO) and it would complement the World Bank and the International Monetary Fund. The charter of the ITO was not ratified in national parliaments, however. Only a less ambitious plan was achieved; only 23 contracting parties signed agreements that provided rules governing international trade and reducing trade

barriers. These agreements were named the GATT. Until 1995 the GATT provided the only forum for trade negotiations. From 1948 until 1995 there were 8 negotiating rounds of the GATT (Table 11.2). The biggest progress in development of trade rules and in the liberalization of trade has been achieved within these rounds.

**Table 11.2** GATT negotiating rounds

| Year | Place/Name | Topic of negotiations | Number of participating nations |
|---|---|---|---|
| 1947 | Geneva | Tariffs | 23 |
| 1949 | Annecy | Tariffs | 13 |
| 1951 | Torquay | Tariffs | 38 |
| 1956 | Geneva | Tariffs | 26 |
| 1960/61 | Geneva (Dillon round) | Tariffs | 26 |
| 1964/67 | Geneva (Kennedy round) | Tariffs, anti-dumping measures | 62 |
| 1973/79 | Geneva (Tokyo round) | Tariffs, non-tariff measures, framework agreements | 102 |
| 1986/94 | Geneva (Uruguay round) | Tariffs, non-tariff measures, rules, services, intellectual property, dispute settlements, textile, agriculture, creation of WTO | 123 |

Source: WTO

The scope of negotiation has been widening in GATT/WTO. The first negotiating rounds of the GATT dealt with tariff reductions. Only in the Kennedy round were anti-dumping measures added to the agenda. The Tokyo round achieved significant reductions in tariffs but also opened the door for reductions of non-tariff measures that had started to replace reduced tariffs as a means of protection of domestic producers. However, the Tokyo round did not succeed in getting agriculture on board for liberalization. The Uruguay Round imposed rules on agricultural domestic policies, export subsidies and the protection of domestic agricultural markets from foreign competition. This was another success for international cooperation in trade policies, but only small progress was made in the liberalization of international agricultural trade. The current Doha Development Round of the WTO is expected to bring liberalization in agriculture to the same levels as happened to industry in the early rounds of the GATT.

The outcome of the Uruguay Round is a document entitled "The Results of the Uruguay Round of Multilateral Trade Negotiations: The Legal Texts", which consists of about 60 agreements summarising 8 years of negotiations. The results can be divided into six distinct parts. The first part is the agreement creating the WTO, which is followed by three agreements on trade in goods, services and trade-related intellectual property rights, respectively. The fifth part is the agreement on dispute settlement, while the last part contains reviews of governments' trade policies (Table 11.3). The three agreements on trade in goods (General Agreement on Tariffs and Trade – GATT), services (General Agreement on Trade in Services – GATS) and intellectual property rights (Trade Related Aspects of Intellectual Property Rights – TRIPS) have a common structure. After general principles are outlined in the beginning, the second part consists of additional agreements and appendixes devoted to special requirements of some sectors. The third part is the schedule (list) of commitments by countries.

**Table 11.3** Uruguay round GATT agreements

| (1) Agreement on creation of the WTO | | |
|---|---|---|
| (2) GATT<br>General Principles<br>Agreements<br>Commitments | (3) GATS<br>General Principles<br>Agreements<br>Commitments | (4) TRIPS<br>General Principles<br>Agreements<br>Commitments |
| (5) Dispute Settlement | | |
| (6) Review of Trade Policies | | |

Source: WTO

Commitments on tariff bindings agreed upon in the Uruguay Round significantly increased transparency in international trade relations, because they limited governments' freedom to increase tariffs in an *ad hoc* fashion. Furthermore, the Uruguay Round reduced industrial tariffs by 40 percent in industrial countries, while the relative number of commodities with bound tariffs increased from 78 to 99 percent.

## 11.2 GATT/WTO and agriculture

The original GATT agreements of 1947 applied equally to industry and agriculture. There were, however, two exceptions. In agriculture, quantitative restrictions and export subsidies were allowed if they were needed to support domestic market organisation – provided they were not used to gain more than an equitable share in world trade.

The first four rounds of the GATT focused mostly on industrial tariffs and non-tariff measures and were not very relevant for agriculture. There was no political will to restrict domestic agricultural policies (like price supports and deficiency payments) or agricultural border policies (like import quotas and export subsidies). The Uruguay Round of the GATT included agriculture into the negotiation for the first time in history. A document entitled the Uruguay Round Agreement on Agriculture (URAA) was the outcome of the agricultural GATT negotiation. The agreement came into effect in 1995 and was fully implemented within a period of six years (ten years in the case of developing countries). The URAA has three integral parts: market access, domestic support, and export support.

### Market access

In the market access area, tariffication (the replacement of non-tariff measures like quotas with equivalent tariffs) was introduced. The "price-gap" method was used for converting non-tariff measures into tariffs. The price-gap method compares domestic prices with international prices, with the difference between the prices assigned to the application of non-tariff measures. For example, if the domestic price is 120 euro per unit and the international price is 100 euro per unit, then the difference of 20 euro per unit is due to the existence of non-tariff measures. Thus, the equivalent tariff that the country can use instead of non-tariff measures is exactly 20 euro per unit. Tariffication made protection of domestic markets more transparent because it is easier to compare tariffs than, for example, quotas in different countries. Tariffication was not compulsory for developing countries.

In the second stage (after tariffication) agricultural tariffs were reduced by 36 percent on average, with a minimum reduction of 15 percent. For developing countries, the average reduction was 25 percent and the minimum reduction was at least 10 percent. Many countries worked around this obligation by reducing already low tariffs while altering high tariffs for sensitive products only slightly. For example, reducing tariff from 4 percent to 2 percent is a 50 percent reduction of tariffs, but has only a very small impact on the domestic market.

Each country has a schedule of commitments for agricultural products that reports the maximum tariff for each product. This maximum tariff is called the *bound tariff*. Countries cannot increase tariffs above bound tariffs, but can apply lower tariffs; these are called applied tariffs. Bound tariffs became the main instrument of border protection after the Uruguay Round. As always there are several exceptions to the rule. Countries can restrict imports with tariffs higher than bound:

- to protect human, animal or plant life or health,
- to protect public morals and national treasures,
- for national security reasons,
- for balance of payments reasons,
- to undertake anti-dumping or countervailing action, and
- to apply Special Agricultural Safeguard provisions (SSG). The URAA enables countries that are concerned with falling prices or rising imports to use minimum imports rather than bound tariffs. The countries and products for which SSG is applied are listed in the URAA

Before the Uruguay Round agricultural tariffs were very high and substantially limited imports. Some countries, however, provided limited access to their markets by applying low tariffs for a limited amount of imports. After the URAA agricultural tariffs still remained very high. In the year 2000 the

average world bound tariff was 62 percent, with averages of 25 percent in North America, 30 percent in the European Union, 49 percent in Eastern Europe, up to 104 percent in non-EU western countries, and 113 percent in South Asia. It was agreed, however, that in the future the current access to domestic markets by foreign firms would remain at the current level and that new access will be created. Countries that imported more than five percent of their consumption agreed not to fall below that level of imports in the future. In the GATT jargon, that level is denoted as the current access. Other countries made commitments enabling imports to reach at least three percent of their domestic consumption (five percent by the end of the implementation period). This level was known as minimum access. Minimum and current access commitments are listed in each Member's Schedule.

Minimum and current access commitments are administered with tariff rate quotas (TRQ) which allow limited imports (five percent of consumption level in the 1986-88 base period) at a low in-quota tariff rate, while imports above the limit are subject to much higher out-of-quota bound tariff rates. TRQs must be administered in a non-discriminatory manner, which means that each exporter should have the same share of the domestic market as it would have without import restrictions. This means that if Slovakia supplied ten percent of all US imports of rapeseed, then it should have a 10 percent share of US imports of rapeseed after the application of US TRQ.

Many countries feared that imports following the Uruguay Round GATT agreement would surge causing damage to domestic farmers. Therefore, the GATT's Agreement on Agriculture also contains SSG provision. There were 39 countries that converted their import quotas into tariffs that were allowed to make use of the SSG provisions. They were allowed to limit imports by means of higher SSG tariffs if the level of imports increased above certain limits or prices fell below certain limits.

### Domestic support

Domestic agricultural support policies can have differential impacts on international trade. Some policies distort international trade heavily while others have only a minimal effect. For example, a price support leads to higher production and lower consumption, and has a strong impact on trade because exports increase or imports are reduced. On the other hand, direct income support distorts trade minimally. The Uruguay Round of the GATT attempted to reduce especially those domestic policies that are the most distorting in international trade.

Domestic policies have been divided into three boxes (amber, green, and blue). Amber box policies had to be reduced by 20 percent in developed countries and 13.3 percent in developing countries. The basis for reduction was the agricultural support in the base period, 1986-1988, as measured by the Aggregate Measurement of Support (AMS). Agricultural Supporting Tables were prepared for each country, each commodity, and each support program for that period. If domestic support for a commodity is lower than 5 percent (10 percent in developing countries) it is counted as zero. The level of 5 to 10 percent is called *de minimis* level. Policies that are commodity non-specific are measured as a percentage of their total value of production. They are counted only if they are higher than the *de minimis* level; otherwise they are treated as zero. The sum of all commodity-specific supports and non-commodity support programs is called the *Total AMS*. Only the Total AMS (not its individual parts) must be reduced by 20 and 13.3 percent, respectively, if it is greater than the *de minimis* level. Countries therefore have the freedom to redistribute support among commodities or programs as long as the commitment to reduce their Total AMS is fulfilled.

Policies from the green box need not be changed. These are the policies that do not distort international trade or create only minimal distortions. These are policies that are provided through publicly funded programs and do not have the impact of price support programs. Government policies supporting research, agricultural education, food inspection, or construction of rural infrastructure like roads, damns or electricity distribution systems all fall into the green box. Direct payments belong to the green box if they are not linked to current or future production. These are payments made to supplement farmers'

incomes and to provide relief in times of natural catastrophes. They also include payments made within regional and environmental support schemes.

The blue box contains policies that are not included in the AMS and are therefore excluded from the mandatory reduction. These are payments under programs that limit production. For example, payments that are made on fixed area, yield or number of animals do not increase production significantly and are not included.

### Export support

The original GATT agreement of 1947 banned the use of export subsidies, but agriculture was an exception to the rule. The Uruguay Round of the GATT permitted only 25 countries to use export subsidies for products listed in their Schedules; no additional subsidies can be introduced. Slovakia was one of the countries that could apply export subsidies in the post-Uruguay Round period. These 25 countries are committed, however, to reduce the volume of subsidised exports by 21 percent and their export subsidy expenditures by 36 percent within six years of signing the agreement (1995 – 2000). Developing countries became committed to reduce export subsidies by 14 percent in volume and 24 percent in value over ten years. No countries can introduce export subsidies other than the 25 countries that have made commitments to reduce them. Over 80 percent of the world's export subsidies were used in the base period by the European Union. In addition, a "Peace Clause" (that expired in 2003) was part of the Uruguay Round. The Peace Clause restricted actions against other member states of the GATT in market access, domestic support or export subsidies, if their levels did not exceed the level that existed in 1992.

An independent Sanitary and Phytosanitary Measures Agreement (SPS) was also passed within the Uruguay Round of the GATT. This agreement ensures the supply of safe food, and at the same time prevents countries from using safety measures to protect domestic producers. Countries can adopt their own SPS measures, however, if they are based on scientific grounds and do not discriminate against some producers. A similar agreement exists for technical regulations and the setting of industrial standards (Technical Barriers to Trade Agreement, TBT).

### Doha Development Agenda

The URAA committed WTO member states to launch new negotiations on agriculture within five years from the completion of the Uruguay Round. The first negotiation of the new round started in December 1999 in Seattle. Although it was a formal start of the new round of negotiations, not much happened until the Doha Ministerial Conference in November 2001 that took place in Doha, Qatar. The new round was labelled the Doha Development Agenda (DDA) to stress the orientation towards the support of economic growth in developing countries. According to the final declaration of the Doha Ministerial Conference, international trade should play a crucial role in the alleviation of poverty and in promoting economic development in the least developed countries. In agriculture, the objectives of the DDA were to significantly improve market access and to reduce, then subsequently eliminate domestic policies that distort trade. The final declaration of the Doha Ministerial Conference also stresses the special needs of developing countries in agricultural negotiations.

WTO negotiations within the DDA started slowly after the Doha Ministerial Conference. In 2003 the USA and EU tabled a joint proposal for the framework agreement in the forthcoming Cancun Ministerial Conference. The second proposal for the framework agreement was provided by the G20[39], a group of developing countries that are mostly net agricultural exporters. The two proposals contained formulas on how to liberalise international trade (how to reduce tariffs, export subsidies and domestic support), but did not include parameters on how much to liberalise.

[39] Argentina, Brazil, Chile, China, Cuba, Egypt, India, Indonesia, Mexico, Pakistan, Paraguay, Philippines, South Africa and Venezuela

Ministerial conference in Cancun failed, but agriculture was not the reason for the failure– agricultural negotiations had not started at all. The stone of contention were the four Singapore issues: (1) trade and investment – the creation of the framework for insuring stable, transparent and predictable conditions for long-term cross-border investments, (2) trade and competition policy, (3) transparency in government procurement, and (4) trade facilitation – insuring conditions for the efficient movement of goods and services across borders. The stalemate in the negotiations occurred because the African Union (a union of the poorest countries in the world) wanted none of the Singapore issues to be included in the negotiations, while South Korea and Japan were pushing all of them into the agenda. The EU held an intermediate position; they were willing to sacrifice the first two Singapore issues, which were the most controversial.

Cancun produced the first stalemate in negotiations caused by opposition between developed and developing countries. Previous conflicts involved mostly the USA and the EU, that is developed countries only. Over time the position of larger developing countries had improved substantially in the world economy giving them stronger bargaining power in trade negotiations. Meanwhile the EU and USA had not noticed the change and wanted to continue a business-as-usual approach.

After the Cancun failure negotiations on agriculture picked up slowly when the Singapore issues were set aside for a time. In 2004 on the initiative of the Five Interested Parties (USA, EU, India, Australia, Brazil), the General Council of the WTO cracked a framework agreement to re-start the negotiations. The agreement was, however, less ambitious than the joint proposal of the EU and the USA for the Cancun negotiation. In preparation for the Hong Kong Ministerial meeting in the autumn of 2005, the key players made efforts to avoid the failure of the upcoming Ministerial and to draw closer toward an ending for DDA. The lack of political will to offer concessions to trading partners, however, did not allow for substantial steps further. It was only agreed that the least developed countries would receive tariff- and quota-free access to developed country markets and that export subsidies would be terminated by end of 2013.

There were other efforts to revive the DDA negotiations that failed. In June 2007 a group of four countries (India, the USA, Brazil and the EU) met in Potsdam, Germany to find a way out of the stalled negotiations. The positions of the involved countries were not reconcilable, however. Negotiations broke down on agricultural issues as well as on non-agricultural market access (NAMA) issues. Finally, in 2008 the Geneva Ministerial Conference took place with the aim to find a compromise to end the DDA round. Some issues were resolved, but there were still many problematic issues remaining. Compromise was impossible to find in Special Safeguard Mechanisms, where net importers and mostly developing countries requested the option to use high tariffs if imports surged or prices fell. Net exporters and developed countries were not willing to agree with excessively generous SSM provisions that would limit their exports into lucrative markets in growing developing countries. Compromises were also not found in cotton trade, geographical indications, and sectoral-specific initiatives under NAMA.

# Chapter 12 AGRICULTURAL POLICY

Agricultural policy has a redistributive character. Developed countries subsidise agriculture while developing countries tax it. To subsidise means to transfer income from other sectors of the economy into agriculture, while taxation is to be understood as a net transfer of income from agriculture to other sectors of the economy. Apart from transferring income from taxpayers and consumers to producers, agricultural policy conducts a series of productive activities. A productive activity is a government policy that decreases transaction costs[40] in the economy. This type of policy reduces or eliminates market failure. Improvements in rural infrastructure, for example, is considered a productive policy by the government because free markets do not invest enough in the construction of public infrastructure like highways, bridges, railways, or basic education.

Productive and redistributive policies cannot be separated in many instances. A productive policy might be motivated by a redistributive effort. On the other hand, redistribution of income can either increase or decrease the productive capacity of the economy. Agricultural policy thus contains both elements: productivity enhancement and redistribution of income.

## 12.1 Government intervention in agriculture

There are basically four reasons for government intervention in agriculture in developed countries:

1. Externalities and public goods associated with agricultural production,
2. The short-term variability of prices and incomes,
3. The long-term trend in decreasing farm income, and
4. Developments in political markets.

### Externalities

An externality occurs when the consumption or production activity of one individual or firm has an unintended impact on the utility or production function of another individual or firm (Mueller, 1989)[41]. For example, keeping bees for honey by person A has an unintended positive impact on yields (an enhanced production function) in an apple orchard belonging to person B. This is an example of a positive externality. Agricultural production in the Spiš region of Slovakia unintentionally helps to maintain a traditional way of live and a beautiful countryside that is valuable to many people. Agricultural production therefore indirectly and positively affects the utility of many people; it is therefore a positive externality. On the other hand, smoking affects the utility of non-smokers negatively and is therefore a negative externality. Air and water pollution are significant negative externalities caused by both agricultural and industrial production, in that side effects of production in the form of pollution negatively affect consumers' utility or other producers' cost of production.

Externalities are examples of market failure. In the presence of externalities competitive markets do not work efficiently. Market prices do not reflect the intrinsic value of agricultural production because they do not take into account the positive or negative externalities associated with agricultural production. For example, the maintenance of rural settlements or beautiful views of the countryside are examples of positive externalities which are due to agricultural production, but are not reflected in prices of agricultural products

[40] Transaction costs are the costs of all resources required to transfer property rights from one economic agent to another. They include the costs of making an exchange (e.g., discovering exchange opportunities, negotiating the exchange, monitoring, and enforcement) and the costs of maintaining and protecting the institutional structure (e.g., judiciary, police, armed forces). Source: Pejovich, S. 1998. The coase theorem and transaction costs. New York : Springer science+Business media,llc. ISBN 978-94-010-6030-1.

[41] Mueller, D.C. 1989. Public Choice II: A revised edition of public choice. Cambridge : Cambridge university press, 2. ed. 544 p. ISBN 978-0521379526.

because there is no market for these external products of agriculture. Markets for these products did not develop because no one has property rights for air, water or beautiful views.

If farmers do not take into account the maintenance of the countryside because they are not paid for it then the countryside maintenance would be underprovided. To correct for this market failure the government might subsidise agricultural production and indirectly improve the countryside as well. This type of the policy is referred to as a *Pigouvian subsidy* after the famous British economist, Arthur Cecil Pigou. However, if we believe that agricultural production creates negative external effects like pollution, then Pigouvian taxes would correct for market failure. In such a case, the market price does not reflect all the costs of agricultural production and the government must increase the costs of production by taxes, which forces farmers to cut down on production.

Figures 12.1 and 12.2 depict Pigouvian subsidies and taxes, respectively. The market equilibrium is depicted in Figure 12.1 as the intersection of the supply of agricultural production ($S$) and the demand ($D$) for agricultural production. The demand for agricultural production is our normal demand for food that we buy at the market. Consumers also demand beautiful countrysides that are joint products with farming. A beautiful countryside, however, is not a tradable commodity and consumers do not pay for viewing it. The *marginal social benefit* ($MSB$) curve in Figure 12.1 denotes the vertical summation of the demand for food and the demand for beautiful countrysides. The $MSB$ represents the demand by society for all aspects of agricultural production, both the food and the countryside views. The intersection of $MSB$ and the supply curve represents the *social optimum*, the level of production that maximises social welfare. Private markets without government involvement would lead to production level $Q^M$ at market price $P^M$. Note that $Q^M$ is less than the socially optimal production, $Q^{SO}$. To achieve the social optimum the government can subsidise farmers to engage more in farming and concurrently to provide more beautiful countryside. $P^{SO} - P^M$ is the subsidy needed in this diagram to achieve the social optimum. Note that the government steps in and demands more agricultural production because the private demand for positive externalities is not realised due to non-existence of property rights for the positive externality.

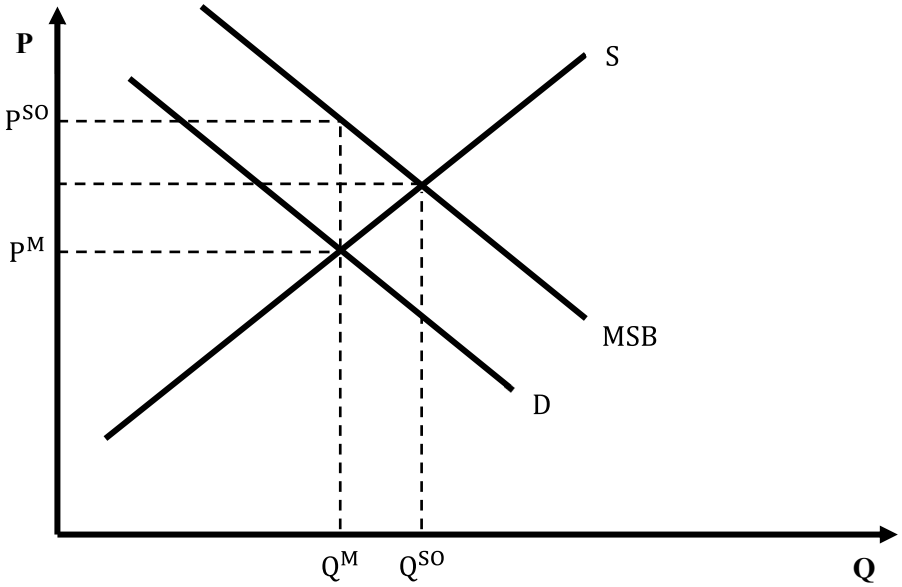



**Figure 12.1** Positive externalities and Pigouvian subsidies

Figure 12.2 depicts the situation when a negative externality exists. The $D$ Curve represents the demand for agricultural production while $MPC$ stands for marginal private cost, which is the standard supply curve, typically labelled $S$. $MSC$ is the *marginal social cost*. The difference between $MSC$ and $MPC$ represents the *marginal external cost*. $MPC$ would contain all costs that accrue to a farmer in a normal

production enterprise, like fertilisers, labour, land rent, and so on. The $MSC$ function contains the $MPC$, plus the additional costs that farming causes to the society and for which farmer does not pay (like damages from water and air pollution). The intersection of $MSC$ and $D$ represents the social optimum – the best choice for the society. From a societal point of view the optimum production level is $Q^{SO}$. Private markets would lead to the production $Q^{M}$, which is the intersection of $MPC$ and $D$. Without government intervention farmers produce more than the socially desirable level. The reason for this overproduction is that farmers are unaware of (or unconcerned with) the additional costs that are spread to other people and that do not accrue to them personally. The optimal Pigouvian tax that will establish the social optimum is $P^{SO} - P^{P}$.

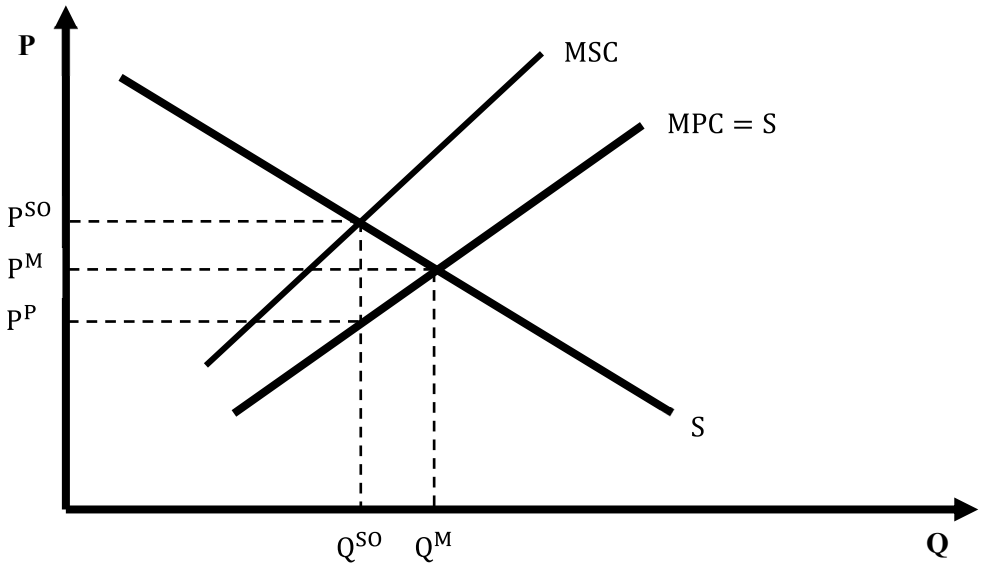



**Figure 12.2** Negative externalities and Pigouvian taxes

There are also other ways to deal with the problem of externalities in addition to Pigouvian taxes and subsidies. Governments can impose standards on the use of technology or on the level of pollution or assign property rights. These policies are outside the focus of this text and we do not deal with them.

## Public goods

Public goods have two salient characteristics: non-rivalry in consumption and non-excludability from consumption. Public defence, bio-diversity, clean air, basic research or a statue in the main square of the town are all examples of public goods. In the case of the statue in the main square it is difficult or almost impossible to exclude someone from viewing the statue (non-excludability). In addition, there is no need to exclude someone from watching the statue because if one person enjoys the statue other people can do it at the same time (non-rivalry). Most goods are private goods, not public goods. For example, bread is excludable from consumption because supermarkets can easily exclude people who do not pay for bread from consuming it. Without paying for the bread we cannot consume the bread. Additionally, if one person consumes the bread there is nothing left for other people. There is therefore rivalry in consumption because two people cannot consume the same piece of bread.

Many joint/secondary products of agriculture are public goods, as for example, the beautiful landscape formed by farming or the preservation of biodiversity by environmentally friendly production methods. Viewing beautiful landscape by one person does not detract from the enjoyment of the landscape by other people. That is, the beautiful landscape is non-rival in consumption. In other words, there is jointness of supply of the beautiful landscape – once produced for one person it is also produced for other people. At the same time, it is difficult or close to impossible to exclude people who do not pay from

viewing beautiful agricultural landscape. Therefore, agricultural landscape is also non-excludable. By analogy the preservation of biodiversity is also non-excludable and non-rival.

Because public goods are non-rival in consumption they should be financed collectively rather than by one person. Everyone who enjoys the public good should contribute towards paying for its production costs. All people that enjoy a beautiful agricultural landscape should contribute their share to cover the costs of production of the landscape by farmers. Or all town dwellers should pay their share for their enjoyment of the statue in the city main square. The efficient provision of public goods requires collective action.

However, non-excludability invites free-riding. Selfish people (and economics assumes that most people are selfish) maximising their own utility do not want to pay voluntarily for viewing a beautiful landscape or statue if they cannot be excluded from viewing. People normally think that it is good to have a beautiful landscape, but even better if they save their money and have others paying for farmers to provide the beautiful landscape. If all people are selfish and rational, no one will pay farmers to preserve the landscape or the biodiversity. Free riding therefore requires government action rather than voluntary contributions to ensure the provision of public goods. The government collects taxes and pays farmers from the taxpayers' money for the provision of public goods.

### The short-run variability of prices and incomes

The supply of and demand for agricultural products are both inelastic. The demand for food (in the aggregate) is stable and does not change significantly when prices increase. When food prices rise, consumers reduce purchases of other goods and keep their food bill relatively intact. In such a case, a small change in quantity supplied (due to weather conditions for example) causes significant fluctuation of prices and incomes. Farmers therefore face uncertainty that is larger than the uncertainty in other sectors. Accordingly, they want the government to reduce or eliminate that uncertainty. In other words, farmers want their uncertainty to be transferred to the government or to taxpayers. Historically both government officials and the citizens who elect them consider this policy to be fair.

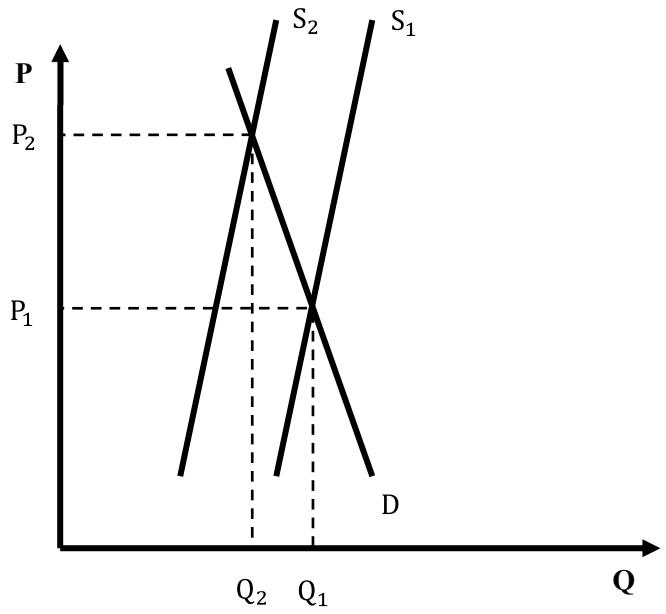



**Figure 12.3** Short-run variability of prices and incomes.

Figure 12.3 describes this situation graphically. In the diagram, when both supply and demand are inelastic a small change in supply from $S_1$ to $S_2$, due to bad weather, for example, causes a relatively small change in the equilibrium quantity (from $Q_1$ to $Q_2$) but a relatively large price change (from $P_1$ to $P_2$). Price

variability is then translated into income variability for farmers. A farmer's income is calculated as the price of the good multiplied by the quantity of the good sold. When the price is $P_1$ the farmer's income is $P_1$ times $Q_1$. We can see this income as an area designation on the diagram, enclosed by the dashed lines extending from $P_1$ and $Q_1$ to the Demand curve. Likewise, the farmer's income when the price is $P_2$ is the area designation on the diagram enclosed by the dashed lines extending from $P_2$ and $Q_2$ to the Demand curve. Clearly, the income (area) associated with the higher price is much greater than the income associated with the lower price. Along an inelastic demand curve, small changes in supply, both positive and negative shifts, can lead to large changes in the price of the good and in income for the farmer.

### The long-run declining trend in agricultural incomes

Due to technological progress, agricultural productivity has continually increased. Because of better fertilisers, pesticides and machinery fewer farmers can feed the same number of people that it took more farmers to do in the past. The demand for food grows slowly, however, especially in developed countries. Wealthier consumers in developed countries do not spend extra income on additional food consumption, but rather on other goods, especially luxury items. With rising income consumers might upgrade their diets by switching from pork to beef or from beer to wine, but they certainly do not increase their consumption per capita. The total demand for farm products is a product of per capita consumption and the number of people. Economic advancement therefore reduces the average household's food expenditures relative to its total expenditures. To avoid a painful restructuring of the sector that would have an impact on agricultural employees and owners of agricultural assets, the government steps in with protective measures.

Asset specificity worsens agricultural incomes. Agricultural inputs (including labour) cannot easily be transferred to other sectors, or if they are transferred a high loss of their value is typically incurred. A combine harvester cannot be used in industry, for example. And agricultural land has no other use. To convert farmland to industrial or government use is to remove it from agriculture altogether. Agricultural inputs are immobile and remain in the agricultural sector whether the returns from agricultural production are high or low.

### Development on political markets

Public Choice offers a different view on politics and agricultural policy. Public Choice is defined as the economic study of non-market decision making, or simply the application of economics to political science[42]. According to public choice economists, policies result as an outcome of the interaction of individuals (citizens, politicians, bureaucrats, lobbyists) in a political market. Public Choice assumes rational individuals maximising their individual welfare subject to their budget constraints and voting power. Citizens maximise their utility, politicians attempt to maximise voting preferences, bureaucrats try to strengthen their positions in the administration, and pressure groups want favourable tax or subsidy treatments. In political markets politicians provide the supply of policies and "formulate policies in order to win elections, rather than win elections in order to formulate policies".[43] The demand side of the political market consists of citizens maximising utility, either individually or in groups. Citizens often organise into common economic pressure (interest) groups. One major difference between political and economic markets is that the government has a monopoly on taxation and can support or tax these special groups.

Essentially, there are two predominant public choice approaches to the study of politics in general and agricultural policies in particular: pressure group theory and the politician-voter interaction model. Pressure group theory was advocated by Mancur Olson who stressed the importance of pressure groups (interest

[42] This definition is from Mueller, D.C. 1989. Public Choice II: A revised edition of public choice. Cambridge : Cambridge university press, 2. ed. 544 p. ISBN 978-0521379526.
[43] Downs, A. 1957. An economic theory of democracy. New York : Harper and Row. 310 p. ISBN 978-0060417505.

groups) in policy decisions.[44] Pressure groups further the interests of their members. For example, farm unions are expected to strive for favourable legislation for farmers. Pressure groups emerge because of the existence of public goods. Favourable legislation for farmers is a public good, in that high agricultural prices are good for all farmers (non-rivalry) and no farmer can be excluded from enjoying high prices (non-excludability).

The size of the group, homogeneity, and costs of communication among their potential members are crucial factors determining whether a pressure group (or more broadly, collective action) can be successful. Small groups tend to be privileged if the costs of providing the public good are lower than the benefits accruing to a single person or a compact coalition. Large (latent) groups can provide public goods only by enforcing members to act in a group-oriented way through selective private or social incentives. That is, sometimes a large company can devote its own resources into lobbying politicians for introducing or increasing protective tariff because the gain to the firm from a higher tariff outweighs the costs of lobbying. This is the case of a small "privileged" group. The other case is that the benefits from lobbying accruing to a single firm are less than the costs of lobbying. Then the lobbying is feasible only if several firms put funds and efforts together in a cooperative fashion. However, as we learned in the earlier section on public goods, people tend to free ride; they will make no contributions to funds for lobbying, knowing that they will benefit from the collective action of others anyway. In order to elicit contributions selective social or private incentives are provided to potential contributors.

In the case of lobbying by farmers, their interests are homogeneous. They all want higher prices and increased subsidies. Communication costs are low and there is a series of selective instruments for "forcing" farmers to contribute to creating pressure on politicians. Provision of market information or legislative documents to members of the farmers union or the agricultural chamber are some of the instruments. With increases in economic development the organising costs for farmers decline while the costs increase for consumers and taxpayers. The interaction between various pressure groups leads to a political equilibrium. The best-organised pressure groups get most advantages. Because farmers are well organised while taxpayers and consumers are not organised at all, agricultural policy tends to further the interests of farmers.

The other strain of the Public Choice literature focuses on the interaction of rational politicians and fully-informed voters in a political arena. Anthony Downs is accredited as the originator of this literature.[45] The theory considers politicians who maximise votes in elections. Support of voters is a function of the change in utility resulting from government policies. Downs introduces into economic literature the notion of rational ignorance. Voters are not motivated to learn platforms of politicians and/or political parties because of the high transaction costs for collecting this information. Moreover, the expected benefits from a single ballot are low because of the high number of voters. Downs explains the protection of agriculture through rational ignorance. Consumers are not informed about agricultural policy and are not organised because the costs of such activity would be higher than the benefits. The wealthier the consumers are and the lower the proportion of their income they spend on food, the less interested they are in agricultural policy. On the other hand, higher incomes generated by higher institutional prices of agricultural commodities are distributed among a smaller number of farmers. Small individual losses by consumers and taxpayers do not decrease their support for politicians and their policies nearly as much as the higher agricultural incomes increase farmer support for the same policies and politicians.

[44] Olson, M. 1967. The logic of collective action: Public goods and the theory of groups. USA : Harvard university press. 186 p ISBN 0-674-53751-3. Can be retrieved from <https://moodle.drew.edu/2/pluginfile.php/225050/mod_resource/content/2/Olson %20 %281967 %29 %20Logic %20of %20Collective %20Action %20 %28book %29.pdf>

[45] Downs, A. 1957. An economic theory of democracy. New York : Harper and Row. 310 p. ISBN 978-0060417505.

### 12.1.1 Measuring levels of support

There are many policy instruments that are used to protect domestic farmers. The most well-known include import tariffs, export subsidies, non-tariff measures, direct payments, deficiency payments, subsidies to agricultural inputs like fuel, bioenergy subsidies, and market price supports. Measuring the amount of support provided to farmers by governments is therefore not an easy task. The most comprehensive estimates of support to farmers are provided by the Organization for Economic Cooperation and Development (OECD). Since the 1980s the OECD has provided estimates of support given to farmers (PSE), support given to consumers (CSE), support of services in agriculture (GSSE), and total support of agriculture (TSE), in addition to a number of other derived measures (NPC, NAC,..) associated with agricultural policy.

The PSE calculation estimates the monetary transfers to farmers from all possible sources due to agricultural policy. The OECD classifies sources of support to farmers into three different categories:

a. Price supports – policy measures that keep domestic prices higher than prices at the country's borders.
b. Budgetary payments – government payments to farmers based on production, the use of inputs, areas cultivated, and historical entitlements.
c. Tax or payments reductions – governments do not collect some payments or taxes from farmers that it does collect from other sectors.

Some forms of support to farmers appear as budget expenditures and are easily visible to taxpayers. However, some support results from budget revenues foregone and does not show up in government accounting. Also, price supports have nothing to do directly with the government budget. Indirectly it appears as either tariff revenue or export subsidy expenditure, but it is first of all a transfer from consumers to farmers.

PSEs can be divided into absolute PSEs and percentage (relative) PSEs. The absolute PSE is expressed in national currency and in euros and U.S. dollars. Percentage PSEs measure the percentage of the value of gross farm receipts due to government policies. A percentage PSE of 20 % means that 20 percent of gross farm receipts is due to agricultural policies. From PSEs, we can derive the Producer Nominal Assistance Coefficient (producer NAC) and the Producer Nominal Protection Coefficient (producer NPC). The producer NAC is the ratio between the value of gross farm receipts and the gross farm receipts at border prices. The producer NPC is the ratio between the average price received by producers and the border price.

Agricultural policies also affect food consumers. The impact of agricultural policies on consumers is measured by the Consumer Support Estimate (CSE), which is the annual monetary value of gross transfers from (or to) consumers of agricultural commodities due to agricultural policies. In most countries, the CSE is negative, which indicates that agricultural policies implicitly tax consumers (income is transferred from consumers to farmers). This implicit taxation occurs with increased consumer prices brought on by imposing import tariffs or export subsidies or any number of alternative policy options.

It is very common that a government provides or subsidises services to agricultural producers. There is government involvement in research and development that benefits farmers, government provision of training to farmers, or marketing promotion for agricultural commodities. To measure the level of support for services collectively used by farmers OECD produces the General Services Support Estimate (GSSE), which is the annual monetary value of gross transfers to general services provided to agricultural producers collectively. Finally, Total Support Estimate (TSE) is the annual monetary value of all gross transfers from taxpayers and consumers arising from policy measures that support agriculture, net of the associated budgetary receipts.

**Table 12.1** Percentage PSE in selected countries/regions

| Year | EU | OECD | Japan | Australia | N. Zealand | USA |
|---|---|---|---|---|---|---|
| 1986-88 | 39 | 37 | 64 | 10 | 10 | 22 |
| 2007 | 24 | 22 | 46 | 5 | 1 | 10 |
| 2008 | 22 | 21 | 48 | 4 | 1 | 8 |
| 2009 | 24 | 22 | 48 | 3 | 0 | 10 |

Source: OECD: Agricultural policies in OECD countries (various years)

The above Table 12.1 shows that there are various approaches to agricultural policies in developed countries. Some countries like New Zealand and Australia are very liberal and provide little support to their farmers who must rely on world markets for revenues and profits. On the other hand, agricultural policies of Japan and also Switzerland or Norway (not shown in the table) are extremely protective. In Japan for example 48 percent of gross receipts of farmers come from government policies. The European Union is currently in this respect slightly above the average among the OECD countries, which indicates that the European Union supports its farmers more than the average OECD country.

**Table 12.2** Percentage CSE in selected countries/regions

| Year | EU | OECD | Japan | Australia | N. Zealand | USA |
|---|---|---|---|---|---|---|
| 1986-88 | -36 | -30 | -62 | -13 | - 6 | -3 |
| 2007 | -10 | -12 | -40 | -1 | -3 | 5 |
| 2008 | -8 | -10 | -42 | -1 | -2 | 11 |
| 2009 | -7 | -11 | -42 | -1 | -1 | 14 |

Source: OECD: Agricultural policies in OECD countries (various years)

The data in Table 12.2 show that agricultural policies in most developed countries harm consumers by increasing their food prices (negative CSEs). Some countries (note especially Japan) impose higher burdens on their consumers than others. Conversely, agricultural policy in the United States reduces market prices for consumers.

**Table 12.3** TSE as a share of GDP

| Country | 1986-88 | 2006 | 2007 | 2008 |
|---|---|---|---|---|
| Australia | 0.4 | 0.3 | 0.4 | 0.3 |
| Canada | 1.8 | 0.7 | 0.7 | 0.6 |
| EU | 2.7 | 1.0 | 0.9 | 0.9 |
| Japan | 2.4 | 1.1 | 1.0 | 1.1 |
| Korea | 9.0 | 3.3 | 2.1 | 2.4 |
| Mexico | 2.7 | 0.7 | 0.8 | 0.7 |
| New Zealand | 1.6 | 0.3 | 0.2 | 0.3 |
| Norway | 3.5 | 1.0 | 0.9 | 1.0 |
| Switzerland | 3.8 | 1.5 | 1.2 | 1.2 |
| USA | 1.3 | 0.8 | 0.7 | 0.7 |
| OECD | 2.48 | 0.96 | 0.88 | 0.84 |

Source: OECD: Agricultural policies in OECD countries (various years)

Table 12.3 depicts the overall burden of agricultural policy on the economy. The bigger the redistribution of income through agricultural policy, the more negative will be the impact on the growth of

economy, *ceteris paribus*. The OECD uses its total support estimate (TSE) to measure the overall burden of agricultural policy on the economy. The TSE is measured in percentage terms as a share of gross domestic product (GDP). The share of agricultural support in GDP is especially high in Switzerland and Korea. Switzerland is relatively wealthy in spite of its agricultural policy, not due to it. And high growth of the Korean economy would be even larger without agricultural redistribution policies.

Finally, some support to farmers is also provided through general services like government sponsored agricultural research. This support is relatively productive, since public goods are provided to farmers that would not be produced by private markets. In many instances, these public goods support increases in productivity in farming. A high share of GSSE in TSE is thus a sign of good agricultural policies.

**Table 12.4** GSSE as a percentage of TSE in selected countries/regions

| Year | EU | OECD | Japan | Australia | N. Zealand | USA |
|---|---|---|---|---|---|---|
| 1986-88 | 8 | 13 | 15 | 10 | 21 | 27 |
| 2007 | 11 | 21 | 17 | 34 | 63 | 43 |
| 2008 | 10 | 20 | 22 | 32 | 63 | 41 |
| 2009 | 9 | 21 | 20 | 28 | 69 | 46 |

Source: OECD: Agricultural policies in OECD countries (various years)

## 12.2 Instruments of agricultural support in developed countries

Various policies are used in developed countries to support farmers. The most important instruments are price supports, deficiency payments, production quotas, and direct income payments.

### Price supports

The effects of a price support program are illustrated in Figure 12.4. The government sets an administrative price $P_A$ above the world price $P_W$, which is the equilibrium market price. At price $P_A$, the government stands ready to buy all production that is unsold in the private market. Obviously higher prices benefit farmers, who respond by increasing their production. On the other hand, consumers are worse off; they reduce their purchases at higher prices. The result is a surplus on the market as consumers buy less and farmers produce more. Surpluses are either stored or exported. Traders can export created surpluses only with the assistance of an export subsidy, because the domestic price at which they buy is higher than the world price at which they sell.

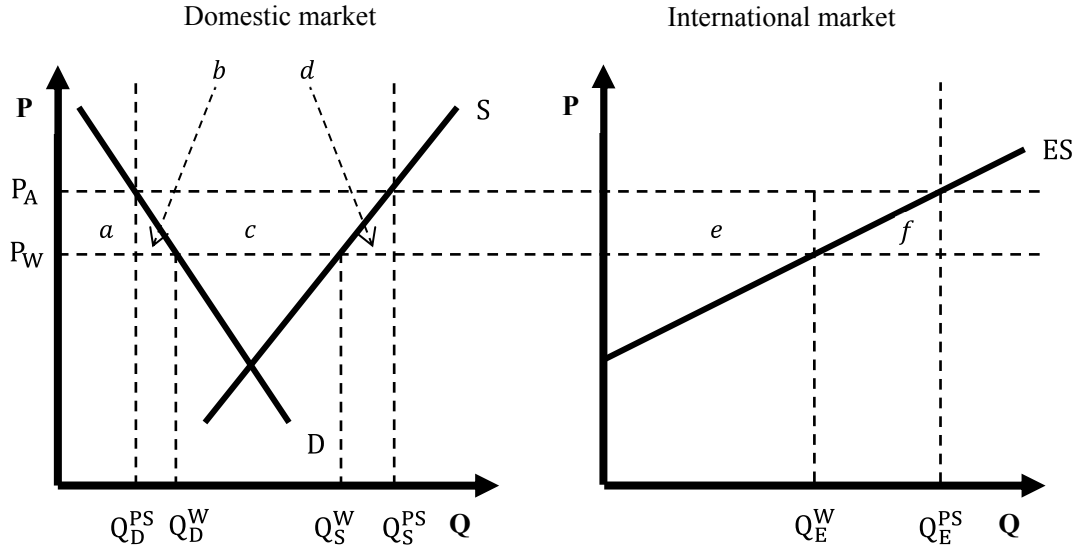



**Figure 12.4** Price support in a small country

When a small country like Slovakia (before its accession into the European Union) introduces a price support $P_A$, farmers respond by increasing production from $Q_S^W$ to $Q_S^{PS}$ while consumers reduce consumption from $Q_D^W$ to $Q_D^{PS}$. A surplus of $Q_E^{PS} = Q_S^{PS} - Q_D^{PS}$ is created that must be exported abroad. Exports requires a per unit subsidy equal to $P_A - P_W$ to cover the difference between high domestic purchasing price $P_A$ and low world selling price $P_W$. To avoid flooding the domestic market with production bought on the world market at the low world market price and sold at home at the higher support price, the government must also impose an import tariff equal to the price difference. World prices remain unaffected because the exporting country is relatively small and has no influence on world prices.

The welfare of farmers increases by $a + b + c$. This was the primary reason for installing the price support. By contrast consumer surplus declines by area $a + b$. The price support involves government expenditure equal to $(P_A - P_W).Q_E^{PS}$, which is $b + c + d$ in Figure 12.4. Total welfare of the society unequivocally declines by $b + d$, which represents deadweight cost in production and consumption.

In a large country case like the European Union, a price support also increases domestic production from $Q_S^W$ to $Q_S^{PS}$. Farmers respond to higher prices by increasing production in order to maximise profits. Again, domestic consumption decreases from $Q_D^W$ to $Q_D^{PS}$. As consumption decreases and production increases exports must increase from $Q_E^W$ to $Q_E^{PS}$. This increase in exports from a large domestic country,

however, reduces the world price from $P_W$ to $P_N$. This impact on the world market is the main difference between the small country case and the large country case.

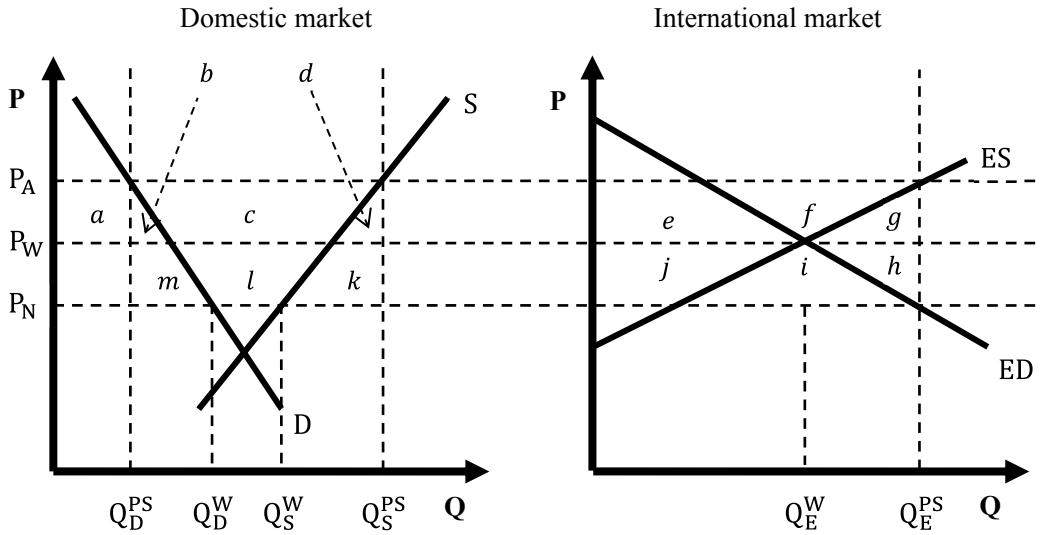



**Figure 12.5** Price support in a large country

Consumers are worse off due to the price support. Because of the higher prices consumer surplus declines by area $a + b$. Farmers' welfare increases. They enjoy higher prices and increase production. Producer surplus therefore increases by area $a + b + c$. Price support requires government budget expenditures. Traders buy at high domestic prices and sell at lower world prices. The government expenditure, in order to sustain the price support, amounts to $b + c + d + m + l + k$. The government expenditure to sustain the price $P_A$ is higher for the large country than for the small country because of the higher exports from the large country at lower world prices. This is beneficial for importers because now they buy at lower prices since there is more of the commodity on the world markets because of higher production in the large exporting country. By reducing world prices, the large country that introduces a price support transfers some of its income abroad to importers. This is the area $m + l + k$ which is equal to area $j + i + h$. Not all transferred income from domestic country abroad is a net gain for foreigners. Part of the transferred income is lost, a deadweight loss represented by area $h$. Area $h$ is a deadweight loss because the price abroad, which is lower than the free market world price invites consumption above the socially optimal level. The marginal cost of production is $P_W$ while the marginal benefit for importers is represented by the excess demand curve, which is lower when imports are higher than the free market level.

## Deficiency payments

Price supports transfer income to farmers from consumers who pay higher prices and taxpayers who finance export subsidies. Sometimes the government wants to support farmers without hurting consumers. For example, consumers might be people with relatively low incomes and the government does not want to increase prices for this segment of the population. In such a case, a deficiency payment can be used. This instrument is especially popular in the US agricultural policy while price supports were for a long time the key element of the Common Agricultural Policy of the European Union.

As with price supports the government sets an administrative target price that is above the world price. Then the market is allowed to determine the market price. If the market price for example is 90 $/t and the administrative (target) price is $120 farmers will sell their product at the market price of $90 and the government will cover the difference between $120 and $90. That is, farmers receive $90 from the market and $30 from the government. When the market price increases to 100 $/t, the government will pay

farmers only 20 dollars per tonne of production. There are no government payments if the market price is $120 or is above the target price level.

Deficiency payments lead to increased production because farmers respond to the higher target price. The lower market price is irrelevant for farmers; they still receive the target price. Furthermore, higher domestic production affects the world price if the country is large. The reduction in world prices benefits domestic consumers who increase their consumption. However, there is no free lunch. Both consumer and producer benefits are at the expense of domestic taxpayers. Unlike price supports, where the government spends money only on exported products, under deficiency payments the government pays a subsidy on all production, including that sold for domestic consumption. Deficiency payments therefore burden the domestic treasury more if the export percentage of production is only a small part of the overall production.

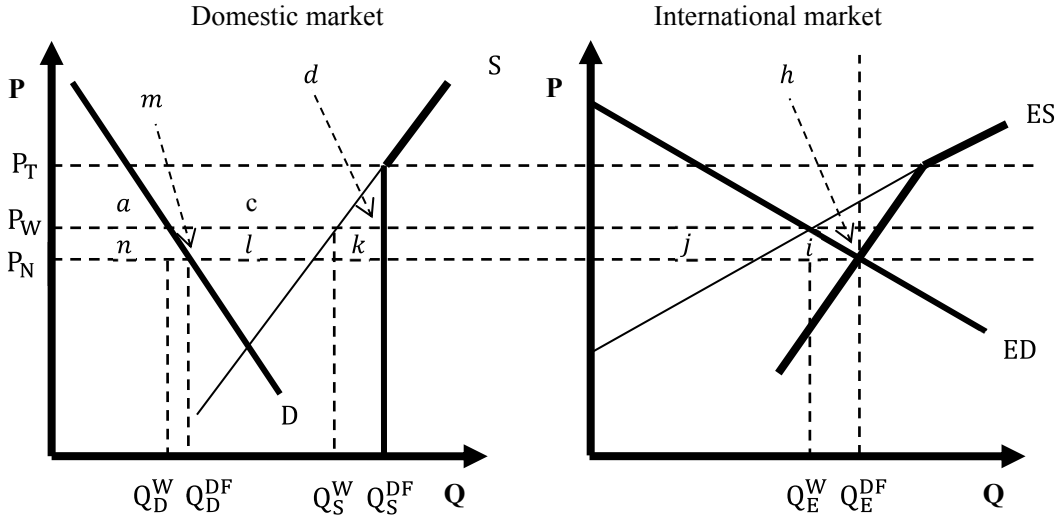



**Figure 12.6** Deficiency payment in large country

In Figure 12.6 above, domestic production increases due to the higher target price from $Q_S^W$ to $Q_S^{DF}$. Because the application of the deficiency payment in a large country reduces world prices from $P_W$ to $P_N$, domestic consumption increases from $Q_D^W$ to $Q_D^{DF}$. Exports increase from $Q_E^W$ to $Q_E^{DF}$. Consumer surplus increases by area $n$ because lower prices make consumers better off. Producer surplus increases by $a + c$. High producer and low consumer prices at the same time are only possible with massive government expenditures that are measured by $a + c + d + n + m + l + k$.

Together with lowering world prices a large domestic country applying deficiency payments also transfers some income abroad. This is measured by $j + i + h$. Some of the transferred income abroad, however, is deadweight loss (area $h$). Obviously, the redistribution of income through markets also involves a domestic deadweight loss, which is area $m + d$.

### Direct payments

Direct income support (known as direct payments in the European Union) is independent from current and future production. It is based on past production or the past use of inputs, like the area of cultivated agricultural land in a certain reference period. Changes in current or future production therefore do not affect the level of income support.

Under a direct payment support scheme, farmers receive paychecks every year. Since farmers cannot influence the amount of the paycheck, farmers are not motivated to increase (or decrease) production or to increase (or decrease) their use of inputs. Farmers simply react in their production decisions only to market prices. Thus, direct payments have no impact on production, consumption, or trade. Direct payments,

however, cause distortions in taxation, since people must be taxed at a greater rate in order to provide farmers with direct payments.

### Production quota

A production quota is often used in agricultural policy together with a price support. The government sets a high support price and then to reduce expenditures on export subsidies it establishes a production quota. The government therefore pays a high support price on a decreased level of production. In Figure 12.7 the production quota is denoted by $Q_S^{PQ}$ and the price support by $P_T$. Farmers are guaranteed to receive price $P_T$ or a higher market price in a stronger market. Additionally, there is a supply control in place, which means that high prices are paid only for production level $Q_S^{PQ}$. The domestic supply curve is represented by the vertical line at $Q_S^{PQ}$ and the domestic demand curve is a kinked line starting from $D$ and ending at $Q_D^{PQ}$. The excess supply curve associated with domestic conditions when the quota and the market price support are applied is the kinked line $Q_E^{PQ} ES^{PQ}$. Because of the lower supply limited by the quota, a smaller amount is exported. Therefore, the world price declines to $P_N$, which is the intersection of the $ES^{PQ}$ and $ED$ curves.

The welfare impact of the price support combined with the production quota is assessed relative to the free market. Consumer surplus declines by $-(a+b+i+j)$. Producer surplus increases by $a+b+c+i+j+k-h$. Government expenditures amount to $-(a+b+c)$. The total welfare impact is equal to $k-h-a-b$. The area $k$ is a domestic welfare increase due to the increase in the world price, which is the terms of trade effect. However, there is also deadweight cost in production $h$, because domestic production is reduced below the efficient level $Q_S^W$.

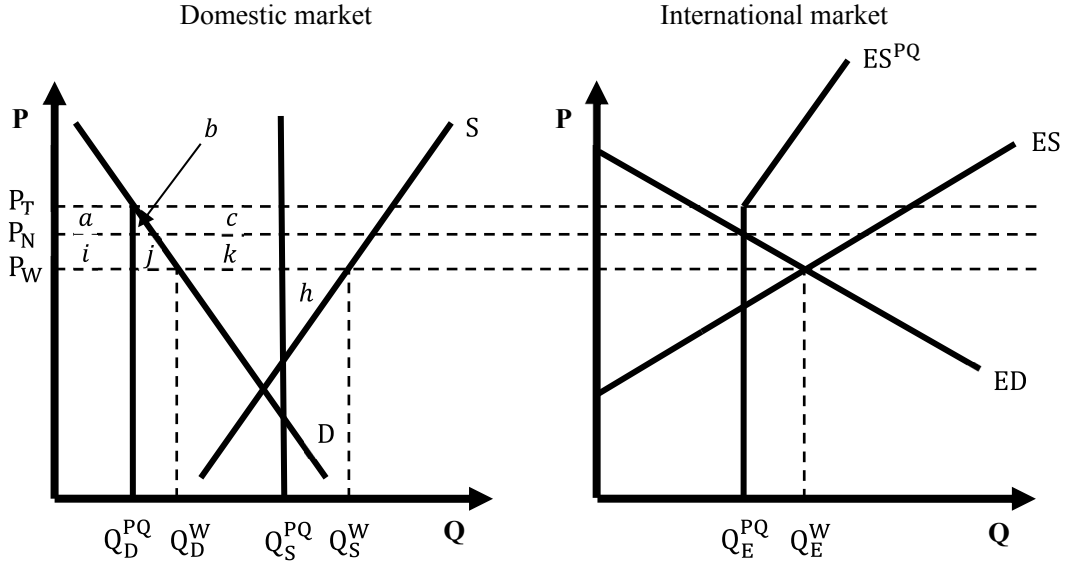



**Figure 12.7** Production quota and price support

## 12.3 Common Agricultural Policy of the European Union: from price supports to direct payments[46]

The Common Agricultural Policy of the European Union is an economic framework of agricultural production and marketing which is constantly developing and changing. The beginning of the Common Agricultural Policy dates back to the period of the formation of the European Economic Community (EEC) in 1957. The Treaty of Rome that established the EEC focused specifically on agriculture. According to the treaty, member states of the EEC removed the quantitative trade and tariff barriers on agricultural products. Trading with the rest of the world was subject to common external tariffs. Similar liberalization of intra-EU trade was also achieved in other sectors of the economy. However, since agriculture was highly supported in all member states prior to the creation of the EEC with the view to remaining protected in the future, there was a need to harmonise agricultural support policies in order to sustain agricultural free trade within EC borders. This was achieved by the formation of the common market organisation for cereals in 1962, which was later adopted also for other commodities. Common market organisations were based on commodity price supports with import barriers and export subsidies (along with output controls). High domestic prices and high border protection against foreign competition were guaranteed to farmers. The domestic price was usually set above the world price, while high tariffs were imposed on imports in order to avoid the import of cheap products to the common market from abroad. In commodities in which the EC/EU produced more than the domestic consumption level, export subsidies were used to eliminate the surplus.

The EU's price support mechanism implies a transfer of income from consumers and taxpayers to farmers. Consumers pay higher prices than they otherwise would pay without import tariffs, export subsidies, and occasional alternative forms of production controls, such as production quotas[47] or eliminating some land from production (set aside). Taxpayers finance production and export subsidies and other policy instruments that deal with excess production.

As a result of high price supports the EU was confronted with overproduction, growing budgetary expenditures, and pressure from WTO negotiations. These problems were seriously dealt with for the first time by the MacSharry reforms of 1992. In order to reduce market imbalances, the price supports were reduced and compensatory payments to farmers were paid instead. These were paid in the form of direct (budgetary) payments. The calculation of these direct payments was based on historical production, not current production, so that increases in current production would not increase direct payments. However, in order to be eligible for payments, farmers were obliged to produce certain agricultural commodities, but the payment did not depend on the current level of production. This was an important move for the CAP because a large portion of subsidies was partly decoupled (unlinked) from production. This in turn reduced the distortions in markets suffering from overproduction.

In theory, fully decoupled direct payments have no impact on production, consumption, and trade. They do not create distortions in production or consumption. Direct payments, however, cause distortions in taxation that are proportional to government expenditures on direct payments. Partially decoupled direct payments are conditioned on producing at least some commodities. They are more distortive than fully decoupled direct payments, but less so than fully coupled payments.

In practice, fully decoupled direct payments have some production effects. First, they are still linked to maintaining land in good condition. Second, risk averse producers increase production because of the wealth effect of direct payments. Third, direct payments may allow financing investment activities when

[46] This section is based on Ciaian P. – Pokrivčák J. 2007. Agriculture reforms and development in east-central Europe. In. Sergi, B. – Bagatelas W. – Kubicova J. (eds). Industries and markets in central and eastern Europe. Aldershot : Ashgate publishing company, pp. 117-133. ISBN 978–0754649182.

[47] The process of controlling output started in 1984 with the introduction of milk quotas. Controlling output for other products (e.g., cereals) involved high transaction costs and therefore could not be successfully implemented.

there are imperfect credit markets. Finally, there is a policy risk that the base for computing direct payments will be changed in the future.

Agenda 2000, an agreement by the European Council in Berlin in 1999, went further in the direction of replacing market price supports with direct payments. Additional price cuts were brought forward and more support to farmers was given in the form of direct payments. The MacSharry and Agenda 2000 reforms involved decreases in domestic prices which improved the market balance. As a consequence, there was less excess production in the domestic market that had to be sold in the world market. This in turn had a beneficial effect on EU consumers and also on world producers as the world price increased. However, the budgetary pressure was not removed. The EU budget still must finance a major part of the CAP costs, as the direct payments became one of the most important instruments within the CAP. Thus, overall there was a shift from the financing of agricultural support from consumers to taxpayers.

Another important factor that pushed the reformation of the CAP was the future enlargement of the EU by Central and Eastern European Countries (CEECs). Since agriculture absorbs around half of the EU budget, there were concerns that the integration of the agricultural sectors in the large CEECs could cause significant changes in budgetary expenditures. Also, there were two other important factors that had to be taken into consideration, lower agricultural prices in CEECs and lower levels of agricultural support in CEECs. Upon accession the adjustment of support levels and prices to the EU level was expected to cause a large increase in production. On the other hand, food demand was expected to decrease because of an increase in food prices. The overall effect, then, would be an accumulation of a huge excess supply which, it was feared, would flood markets in Western European countries.

The trend of replacing price support with direct income support continues. In 2003 Commissioner Fischler proposed further decoupling within the Mid-Term Review of the CAP, known also as Fischler's reform or the Luxembourg Agreement. A single farm payment independent from production was introduced, substituting most of the commodity-specific coupled payments, while the market price support was further reduced. The single farm payment is linked also to environmental, food safety, animal and plant health, and animal welfare standards, as well as the requirement to keep all farmland in good agricultural and environmental condition ("cross-compliance"). There are, therefore, two excuses for the direct farm payments. First, direct payments are used to increase farm incomes. Second, direct payments are viewed as payment for producing positive externalities, such as preserving the environment.

The decoupling of subsidies from production is expected to restore market balance by forcing farmers to react to market signals and to adapt their production structure in order to reflect consumers' preferences. The decoupling of subsidies will give freedom to farmers to produce or to be involved in any agricultural activity, because they will be granted direct payments irrespective of whether they produce or not. As a result, their decision will be based on the profitability of productive activities rather than on government decisions to subsidise certain commodities. It is expected that some of the agricultural land will not be used and will be abandoned, especially in mountainous regions with low soil quality, where agricultural production is not profitable.

In conclusion, the EU's CAP is being transformed from a highly distortive price support system to a less distortive income support system. There have been numerous reforms that involve changes in the policy instruments that are used to support farmers. On the other hand, the CAP still affords a high level of protection to the agricultural sector through direct income support which causes budgetary problems.

# Chapter 13 INTERNATIONAL MOBILITY OF CAPITAL AND LABOUR

In previous chapters we have focused mainly on the international movement of goods and services. A second important topic in international economics is the mobility of labour and capital across national borders. This topic is even more politically controversial than trade policies. Many countries ban or strictly limit the inflow of labourers from foreign countries. Workers from Ukraine or Mexico find it extremely difficult to obtain work permits legally in the EU or the USA. Legal obstacles hinder labour mobility across national border more than cultural and language barriers.

What is the engine of the international movement of labour? Income disparity is considered to be the major economic reason why people take pains and look for work in foreign countries. There is a well-documented empirical fact that people migrate from poor to rich countries. Other reasons for migration include political or religious discrimination at their home country or enjoyment from discovering distant places. Non-economic reasons for migration are not considered in this book.

Similarly, the international mobility of capital is studied from the economic perspective only. Returns to capital, risk, and liquidity differ between countries, providing incentives for an international flow of investment. *Ceteris paribus*, capital moves from countries with low returns, high risk, and low liquidity to countries with high returns, low risk and high liquidity. Recently obstacles to international movements of capital have been reduced to a minimum. Existing global capital markets enable investors to maximise their returns while keeping their risk low. Rational profit-seeking behaviour on the part of investors contributes to a reduction in the differences in the marginal productivity of capital between countries.

The factor price equalization theorem of the Heckscher-Ohlin theory asserts that international trade equalises relative and absolute returns to the factors of production. International trade alone insures that real interest rates and wages are equalised among countries in the long-run and therefore no mobility of labour or capital would be necessary. However, the factor price equalization theorem holds only when some prerequisites are met. For example, the theorem requires that all countries have access to the same technology, which obviously does not hold, in that developing countries are not able to utilise all the technology that is exported from developed countries.

## Foreign Direct Investment

Multinational corporations (MNC) play an important role both in international trade and international investment. MNCs are enterprises that operate (produce or provide services) in more than one country. Most MNC have headquarters located in developed countries (Tables 13.1 and 13.2). In 2008, of the 100 largest MNCs worldwide 58 were based in the European Union (of this 15 in France, 13 in Germany, and 15 in the United Kingdom), 9 in Japan, 18 in the United States and 7 in developing and transition economies. MNCs operate mostly in telecommunications, automobile, and pharmaceutical industries. A significant amount of international trade takes place between subsidiaries of MNCs. Products produced in one subsidiary are exported abroad where the MNC through its other subsidiary processes the goods further or sells them directly to consumers. In the USA, the value of international trade that is carried out through subsidiaries of the same MNC reaches about 40 percent of total US international trade. In 2005 the value of exports through branches of MNCs reached $4,214 billion.

**Table 13.1** The world's top 40 non-financial MNCs.

| | Corporation | Home Country | Industry | Foreign Assets * |
|---|---|---|---|---|
| 1 | General Electric | United States | Electrical & electronic equipment | 401,290 |
| 2 | Royal Dutch/Shell Group | United Kingdom | Petroleum expl./ref./distr. | 222,324 |
| 3 | Vodafone Group Plc | United Kingdom | Telecommunications | 201,570 |
| 4 | BP PLC | United Kingdom | Petroleum expl./ref./distr. | 188,969 |
| 5 | Toyota Motor Corporation | Japan | Motor vehicles | 169,569 |
| 6 | ExxonMobil Corporation | United States | Petroleum expl./ref./distr. | 161,245 |
| 7 | Total SA | France | Petroleum expl./ref./distr. | 141,442 |
| 8 | E.On | Germany | Utilities (Electricity, gas, water) | 141,168 |
| 9 | Electricite De France | France | Utilities (Electricity, gas, water) | 133,698 |
| 10 | ArcelorMittal | Luxembourg | Metal and metal products | 127,127 |
| 11 | Volkswagen Group | Germany | Motor vehicles | 123,677 |
| 12 | GDF Suez | France | Utilities (Electricity, gas, water) | 119,374 |
| 13 | Anheuser-Busch Inbev SA | Netherlands | Food, beverages and tobacco | 106,247 |
| 14 | Chevron Corporation | United States | Petroleum expl./ref./distr. | 106,129 |
| 15 | Siemens AG | Germany | Electrical & electronic equipment | 104,488 |
| 16 | Ford Motor Company | United States | Motor vehicles | 102,588 |
| 17 | Eni Group | Italy | Petroleum expl./ref./distr. | 95,818 |
| 18 | Telefonica SA | Spain | Telecommunications | 95,446 |
| 19 | Deutsche Telekom AG | Germany | Telecommunications | 95,019 |
| 20 | Honda Motor Co Ltd | Japan | Motor vehicles | 89,204 |
| 21 | Daimler AG | Germany | Motor vehicles | 87,927 |
| 22 | France Telecom | France | Telecommunications | 81,378 |
| 23 | Conocophillips | United States | Petroleum expl./ref./distr. | 77,864 |
| 24 | Iberdrola SA | Spain | Utilities (Electricity, gas, water) | 73,576 |
| 25 | Hutchison Whampoa Limited | Hong Kong | Diversified | 70,762 |
| 26 | Eads NV | France | Aircraft | 66,950 |
| 27 | Nestlé SA | Switzerland | Food, beverages and tobacco | 66,316 |
| 28 | BMW AG | Germany | Motor vehicles | 63,201 |
| 29 | Procter & Gamble | United States | Diversified | 62,942 |
| 30 | Wal-Mart Stores | United States | Retail & Trade | 62,514 |
| 31 | Roche Group | Switzerland | Pharmaceuticals | 60,927 |
| 32 | Mitsubishi Corporation | Japan | Wholesale trade | 59,160 |
| 33 | Sony Corporation | Japan | Electrical & electronic equipment | 57,116 |
| 34 | Nissan Motor Co Ltd | Japan | Motor vehicles | 57,080 |
| 35 | Grupo Ferrovial | Spain | Construction and real estate | 54,322 |
| 36 | RWE Group | Germany | Utilities (Electricity, gas and water) | 53,557 |
| 37 | Xstrata PLC | United Kingdom | Mining & quarrying | 52,227 |
| 38 | IBM | United States | Electrical & electronic equipment | 52,020 |
| 39 | Sanofi-aventis | France | Pharmaceuticals | 50,328 |
| 40 | Nokia | Finland | Electrical & electronic equipment | 50,006 |

Note: * in mill. $

Source: UNCTAD, Erasmus university database

**Table 13.2** The world's top 40 financial MNCs.

| | Corporation | Country |
|---|---|---|
| 1 | Citigroup Inc | United States |
| 2 | BNP Paribas | France |
| 3 | Allianz SE | Germany |
| 4 | Generali Spa | Italy |
| 5 | Societe Generale | France |
| 6 | UBS AG | Switzerland |
| 7 | Unicredito Italiano Spa | Italy |
| 8 | HSBC Holdings PLC | United Kingdom |
| 9 | Axa | France |
| 10 | Deutsche Bank AG | Germany |
| 11 | Zurich Financial Services | Switzerland |
| 12 | Credit Agricole SA | France |
| 13 | Credit Suisse Group AG | Switzerland |
| 14 | ING Groep NV | Netherlands |
| 15 | Morgan Stanley | United States |
| 16 | Swiss Reinsurance Company | Switzerland |
| 17 | The Bank of Nova Scotia | Canada |
| 18 | Banco Santander SA | Spain |
| 19 | Natixis | France |
| 20 | Nomura Holdings Inc | Japan |
| 21 | Muenchener Rueckversicherung AG | Germany |
| 22 | KBC Group NV | Belgium |
| 23 | American International Group Inc | United States |
| 24 | Standard Chartered PLC | United Kingdom |
| 25 | Dexia | Belgium |
| 26 | The Royal Bank of Canada | Canada |
| 27 | Bank of America Corporation | United States |
| 28 | Intesa Sanpaolo | Italy |
| 29 | Mitsubishi UFJ Financial Group | Japan |
| 30 | Old Mutual PLC | United Kingdom |
| 31 | Skandinaviska Enskilda Banken AB | Sweden |
| 32 | BBV Argentaria SA | Spain |
| 33 | Manulife Financial Corp. | Canada |
| 34 | Berkshire Hathaway Inc | United States |
| 35 | JPMorgan Chase & Company | United States |
| 36 | Barclays PLC | United Kingdom |
| 37 | Commerzbank AG | Germany |
| 38 | The Goldman Sachs Group | United States |
| 39 | Aviva PLC | United Kingdom |
| 40 | Nordea Bank AB | Sweden |

Source: UNCTAD, Erasmus university database

MNCs also conduct *foreign direct investment* (FDI), which is defined as acquisition or construction of physical capital by a firm from one (source) country to another (host) country. Horizontal FDI exists if an MNC produces in the host country an almost identical product to that produced at home. Japanese Toyota produces almost the same cars in France and in the USA as it produces in Japan, so Toyota conducts horizontal FDI. Vertical FDI occurs when some part of production takes place at home and the remaining production takes place abroad. Very often research and development or marketing is done in the home country in the developed world while assembly lines are located in developing or transition countries. Most

foreign direct investments are horizontal between developed countries. Developed countries are the largest source of as well as the largest destination for FDI (Table 13.3).

To serve foreign markets MNCs can either produce at home and export that production or place some production facilities in the home country and other production facilities abroad. Enterprises often invest internationally in order to use their knowledge and experience gained from domestic production and marketing in a lucrative foreign setting. In other words, enterprises take advantage of their knowledge capital. It holds also, vice versa, that firms buy foreign enterprises in order to obtain knowledge or experience. Decisions on foreign direct investment are influenced by the *ownership* of assets, the *location* of the potential investment, and the desire by the firm to have assets at its *internal* disposal. This is known as the OLI framework for international investment analysis.

**Table 13.3** FDI flows by region, 2007 – 2009 (mill. $)

| Region | FDI Inflows | | | FDI Outflows | | |
|---|---|---|---|---|---|---|
| | 2007 | 2008 | 2009 | 2007 | 2008 | 2009 |
| World | 2,099,973 | 1,770,873 | 1,114,189 | 2,267,547 | 1,928,799 | 1,100,993 |
| Developed economies | 1,444,075 | 1,018,273 | 565,892 | 1,923,895 | 1,571,899 | 820,665 |
| EU | 923,810 | 536,917 | 361,949 | 1,287,277 | 915,780 | 388,527 |
| Austria | 31,154 | 11,272 | 7,051 | 39,025 | 29,399 | 3,766 |
| Czech R. | 10,444 | 6,451 | 2,725 | 1,620 | 4,323 | 1,340 |
| Germany | 76,543 | 24,435 | 35,606 | 162,492 | 134,592 | 62,705 |
| Hungary | 71,485 | 61,993 | -5,575 | 66,787 | 59,815 | -6,886 |
| Poland | 23,561 | 14,689 | 11,395 | 5,405 | 2,921 | 2,852 |
| Slovakia | 3,581 | 3,411 | -50 | 600 | 258 | 432 |
| United Kingdom | 186,381 | 91,487 | 45,676 | 318,403 | 161,056 | 18,463 |
| USA | 265,957 | 324,560 | 129,883 | 393,518 | 330,491 | 248,074 |
| Japan | 22,550 | 24,426 | 11,939 | 73,548 | 128,019 | 74,699 |
| Developing economies | 564,930 | 630,013 | 478,349 | 292,147 | 296,286 | 229,159 |
| China | 83,521 | 108,321 | 95,000 | 22,469 | 52,150 | 48,000 |

Source: UNCTAD, World investment report (2010)

With respect to assets, enterprises that want to invest abroad need to have some assets that give them a competitive advantage over other firms. Reputation is such an asset, for example. If products produced by the firm have a reputation for high quality, the producer can ask higher price than his/her competitors. Also, the firm can have access to superior technology, which reduces the costs of production. Advantages like reputation or superior technology enable the enterprise to produce abroad with a profit and still outperform local firms that are more familiar with local conditions. Knowledge capital, especially, is easily transferable abroad at low cost. It is difficult and costly to create a reputation for high quality products or to develop technology that makes production costs lower, but once reputation or technology is developed, it is relatively easy to transfer such knowledge capital abroad. For example, Coca-Cola has a reputation for a certain high-quality product that it uses in almost every country in the world.

The ownership of assets is a necessary but not sufficient condition for foreign direct investment. The advantages from superior assets can be utilised by exporting products while still producing only at home. In order to invest abroad, a firm has to weigh the pros and cons of a foreign location. Oil drilling companies with superior technology, like British Petroleum, Exxon or Shell invest in Azerbaijan or Kuwait because these are the right locations containing oil. By the same token foreign companies are interested in extracting gold near the city of Kremnica, or Sony wants to use its technology by assembling DVDs in China where the right location is characterised by cheap labour. Research and development of DVDs takes place in Japan or the USA, which are capital abundant countries, while the assembling of parts is carried out in labour

intensive countries like China or Vietnam. KIA has a good reputation and the necessary technology to produce high quality cars, but it is more profitable to produce some cars in Europe, namely in Žilina, SK, because imports from Korea would be too expensive. Coca Cola exports syrup to Slovakia and adds excellent Slovak water to its beverages so as to produce its world-renowned product.

If the enterprise has advantages from ownership of some assets and production abroad has some advantages, like saving costs, it is still possible to license production to foreign companies or to form an alliance with foreign companies. In such an alliance, the home firm will provide technology and the foreign firm will manage production abroad utilising location and labour advantages. For foreign direct investment to take place there is a need to internalise production. Many firms prefer to invest abroad rather than provide its assets (like reputation or technology) to other companies because there is a chance that their assets could be devalued by actions of foreign firm. A foreign firm maximising profits might reduce the quality of products, which would hurt the home firm. If KIA provided its technology to a Slovak company to produce cars in Slovakia and agreed to share profits, the Slovak company might save money by reducing effort and quality control, which would have a long-term devastating effect on KIA. It is safer for KIA itself to control production of cars in Slovakia. Also, the Slovak company can choose to use some technological secrets of KIA to its own advantage, thereby causing harm to KIA.

### Evaluation of impact of capital flows on the economy

We assume that the domestic country has $K_0$ of capital which means that the interest rate at home is $r_0$ (Figure 13.1). From microeconomic theory we know that in equilibrium the marginal product of capital is set equal to the (real) interest rate. We assume further that there is an inflow of foreign direct investment in the amount of $K_F = K_1 - K_0$. An increase in capital in the home country will reduce the domestic interest rate to $r_1$. The area under the marginal product of capital curve represents total production, which means that the inflow of FDI increases domestic production (domestic GDP) by the area $B + C$. Area $C$ represents payments from the domestic country to foreign investors for services provided by foreign capital (area $C = K_F \cdot r_1$). Area $B$, the increase of wages in the domestic country, is a net gain for the domestic country. The inflow of FDI increases the marginal product of labour because workers have more capital to work with, which increases their productivity. Because the marginal productivity of labour is equal to the wage in equilibrium, the inflow of FDI leads to higher wages. Area $A$ in Figure 13.1 represents a redistribution of income from owners of capital to owners of labour (workers), because the inflow of FDI reduces interest rates and increases wages.

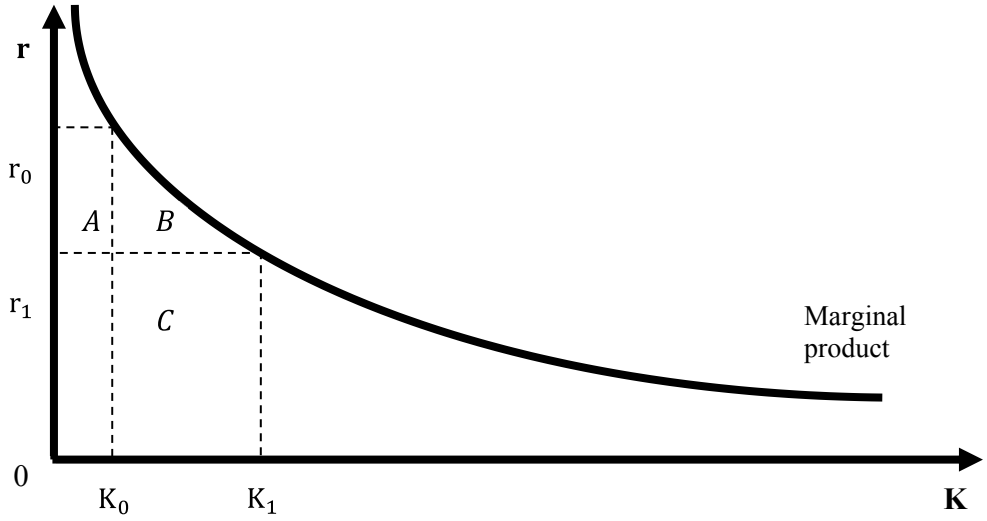



**Figure 13.1** Impact of inflow of FDI

**Evaluation of the mobility of the factors of production**

Suppose we consider two countries, Home and Foreign. Both countries produce with labour and capital. Figure 13.2 depicts the marginal product of capital ($MPK$). For Home, the $MPK$ is drawn from left to right while for Foreign it is drawn from right to left. The origin for the Home is 0 while the origin for Foreign is $0^*$. The length of the line $00^*$ represents the total amount of capital in both countries.

Originally at Home the amount of capital is $0K_0$ while the original amount of capital in Foreign is $0^*K_0$. The return to capital at home is lower ($r_0$) than in Foreign ($r_0^*$) because Home has more capital than Foreign. Domestic investors are motivated to move some capital to Foreign because there is a higher return on capital in Foreign. The transfer of capital from Home to Foreign will increase the return on capital at Home and reduce the return on capital to Foreign. In equilibrium, the return on capital in both countries will be equal, which happens at interest rate $r_1$. In equilibrium, the amount of capital at Home is $0K_1$ while the amount of capital in Foreign is $0^*K_1$. $K_0K_1$ is the amount of capital that was transferred from Home to Foreign.

Now, Foreign has more capital which increases its production by $EAK_0K_1$. Home production, however, will go down by area $ECK_0K_1$ because it has less capital. Total production in both countries increases by $EAC$, however, because the rise of production in Foreign is greater than the decline of production at Home. The global production increases because of the improved allocation of resources. The total gain $EAC$ is divided between Home and Foreign, Home receives $EBC$ while Foreign receives $EAB$. The net gain at Home ($EBC$) is calculated as the return from capital invested in Foreign ($EBK_0K_1$) minus the loss of domestic production due to the outflow of some capital to Foreign ($ECK_0K_1$). The net gain in Foreign ($EAB$) is the difference between the increases in domestic production $EAK_0K_1$ and the returns from foreign capital $EBK_0K_1$.

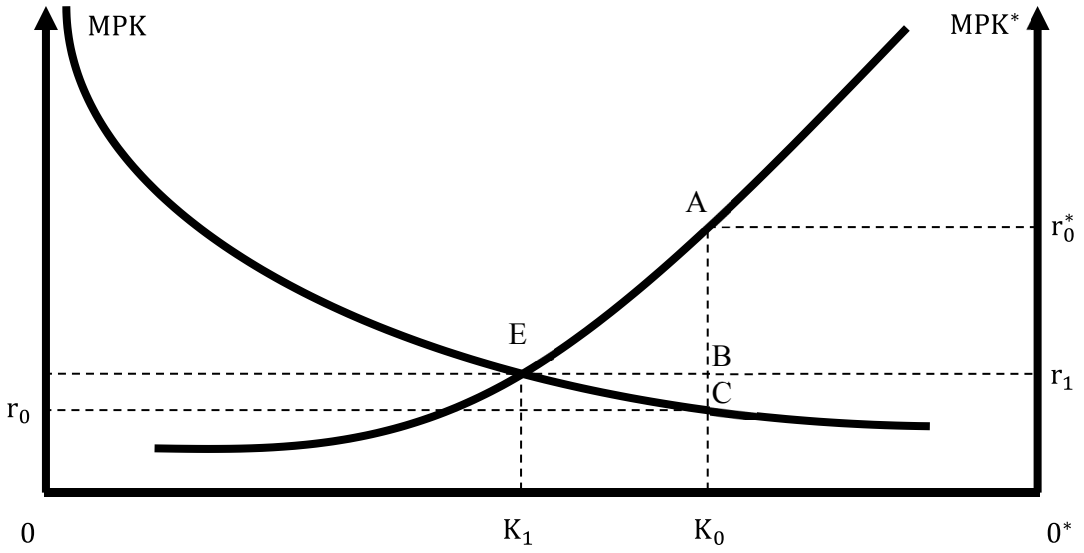



**Figure 13.2** Impacts of the international mobility of capital

Figure 13.3 denotes the impacts of the international mobility of labour. The $MPL$ curve represents the marginal product of labour at Home, while $MPL^*$ denotes the marginal product of labour in Foreign. The vertical axes measure the real wage. The total labour force in both countries is $00^*$. The original amount of labour is $0L_0$ and $L_00^*$ in Home and Foreign, respectively. The domestic wage is $w_{0H}$ and $w_{0F}$ at Home and in Foreign, also respectively. The higher domestic (real) wage and the free movement of labour attracts Foreign workers to Home. The flow of workers from Foreign to Home continues until the real wages are equalised in both countries. In equilibrium, the wage in both countries will be $w_1$ and Home will employ $L_0L_1$ workers from Foreign. Domestic production will increase by $ECL_0L_1$. Of this $L_0L_1EB$ are the wages

of foreign workers. The net gain in the Home country is represented by the area $ECB$. Area $ECB$ is the gain by domestic owners of capital, who in addition gain some income from the domestic workers due to the decline of the real wage (area $w_{0H}w_1BC$). Wages in Foreign will increase from $w_{0F}$ to $w_1$. If workers work at Home and live in Foreign (cross-border commuters) then welfare in Foreign goes up by area $EBA$, which is the difference between the wages of Foreign workers in the Home country ($EBL_0L_1$) and the decline of production in Foreign country, caused by the emigration of workers to Foreign $AEL_0L_1$. If migrants from Foreign work and live at Home, then $EBL_0L_1$ is part of the GDP of the Home country. Foreign loses income represented by the area $EDA$, which is the loss of capital for owners from migration of workers to the Home country.

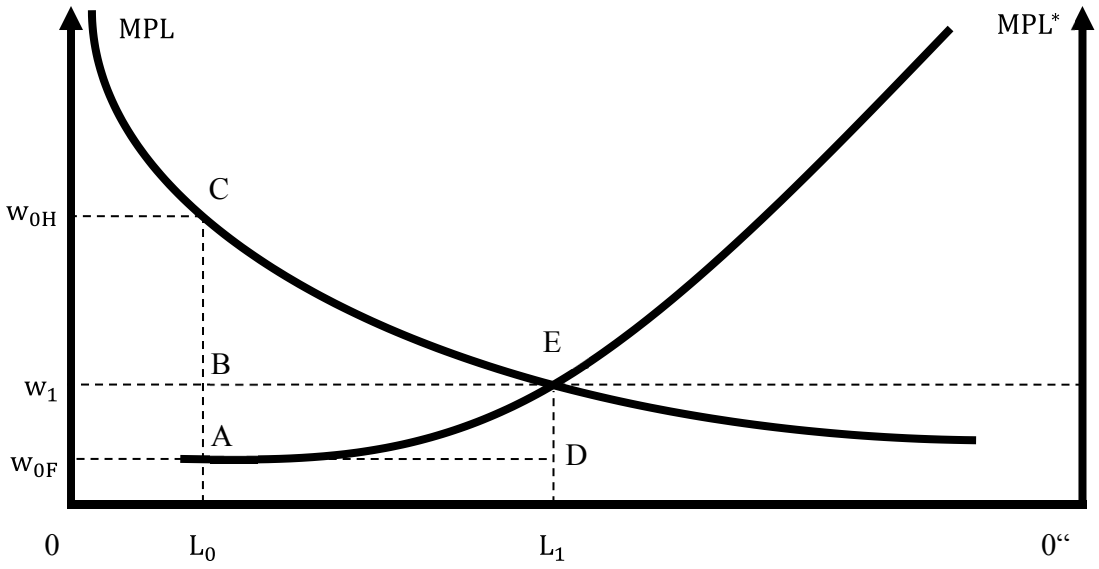



**Figure 13.3** International mobility of labour

# Chapter 14 INTERNATIONAL TRADE AND DEVELOPMENT

What is it in someone's life or background that results in a life of wealth or poverty? What are some of the reasons you can think of that lead to an individual or a family being relatively wealthy or relatively poor?

Let's start from the beginning. How does life begin for someone? That is, what is the initial endowment a person receives when s/he enters this world? Some people are born into wealth, some are born into poverty. Some are born in wealthy countries, like the United States, while others are born in poor counties, like Haiti, only a few hundred miles from the wealth that is the United States. Even within wealthy countries, however, there are poor regions of the country. For example, the United States has a mountainous region known as Appalachia, where history and geographical features have left many families in deep poverty. There are also many Native Americans living on reservations, where the average incomes are among the poorest in the country. Being born in a wealthy country does not guarantee one wealth, nor does being born in a poor country make one automatically poor.

A person's endowment is more than simply the country or region of one's birth. It may be only a few kilometres that separate two children, one born into a wealthy family and the other born into a poor family. The poor family may be a minority or a struggling young couple, while the wealthy family may have generations of inherited wealth. It is often the case that someone is wealthy because his/her family is also wealthy, or poor because poverty has been in the family for generations.

Endowment is not the only determinant of a person's relative wealth or poverty. It is often the case that a person born into a relatively poor family can rise to a very wealthy or prestigious state. Likewise, people born wealthy can squander their family's inheritance and find themselves begging for food. Beyond endowment, one of the most important determinants of a person's status is his or her educational level. The more education a person receives, in general, the better s/he will do in life. Medical doctors get paid a handsome salary in return for their investment of years in school. We will return to the topic of education later.

Luck also plays a role in one's life. Sometimes being "in the right place at the right time" or "knowing someone" can make the difference between earning a handsome salary or just getting by. Many people play the lottery in countries where it is available, hoping to hit it big and not have to work so hard. Likewise, bad fortune can result in peoples' lives, even when they do everything right. Why do bad things happen to good people? One need only consider the Hitler Holocaust to know the truth of this claim. Health-related factors can also result in the unfortunate loss of one's income or wealth. The untimely death of the family's major income earner, a major disease like cancer, or a disabling automobile or industrial accident – any of these happenings can bring an otherwise wealthy family to near ruin.

Finally, many people can blame their financial situation on their own decisions. A young man or woman chooses to marry his or her sweetheart instead of continuing in school, forever forgoing the opportunity for a high school diploma or a college degree. Many couples these days endure painful divorces and harsh divorce proceedings, often leaving single mothers with the responsibilities but not the means for raising their children. An "unexpected" pregnancy, drinking and driving, extreme sports, drug use, petty theft – all these and countless other choices individuals make can lead to a life of poverty.

## 14.1 Why are nations poor/rich?

As with individuals, entire nations can also be considered rich or poor. Canada, the United States, and many of the nations of Western Europe would be considered relatively wealthy by many standards. On the other hand, many of the countries in Sub-Saharan Africa and South Asia would be considered relatively poor. The poorer countries are often referred to as Less (or Lesser) Developed Countries (LDCs), while the wealthier countries are known as the Developed Countries (DCs) or Industrialised Economies (IEs). Countries falling in between LDCs and DCs are known as Middle Income Countries (MICs), Newly Emerging Economies (NEEs), and Newly Industrialised Countries (NICs).

So, what are some of the characteristics that make some nations better off than other nations? As with individuals, a nation also has an endowment within which it operates. Its endowment consists of its geography, its culture and heritage, and its history. Many would argue as to which of these is the most important. Without taking a position, we will simply focus mostly on those items which are typically considered economic in nature.

A country's geography – its resource endowment – is certainly a major determinant of its relative wealth. A country's geography includes its location, its landscape, its natural resources and soil conditions, and its water resources. A country's geographic location is very important. In general, nations in temperate zones tend to be wealthier than nations in the tropics or those further north and south. Most of the world's economic wealth is located between the 30$^{th}$ and 60$^{th}$ parallels in both the northern and southern hemisphere. The reasons for this outcome are fairly clear: the atmosphere contributes to soil conditions and water availability that are better in these areas than outside these areas. Adequate rainfall contributes to better soil conditions, but also provides for more internal waterways that can be used for power generation and commercial transport. Naturally, an external port contributes even more to a nation's commercial possibilities, as international trade can enhance a nation's wealth.

There are many exceptions to this general "location" rule. There are many countries that lie between the 30$^{th}$ and 60$^{th}$ parallels which are not wealthy. For example, Afghanistan lies almost completely between the 30$^{th}$ and 40$^{th}$ parallels, but the mountain terrain of that country has made for a hard life for its people. Likewise, the countries of northern Africa lie mostly north of the Tropic of Cancer, but the giant Sahara Desert makes large portions of their countries almost uninhabitable. On the other hand, many of the oil-rich nations of the Arabian Peninsula lie below the 30$^{th}$ parallel, including Saudi Arabia, Kuwait, and the United Arab Emirates.

For many years, economists have classified a country's resources into four categories: Land, labour, capital, and entrepreneurial/managerial abilities. These resources are also known as *factors of production* or "inputs". That is, these resources are the building blocks for all production activities. The paragraphs above relate to the resource, land, which we often refer to as *natural resources*. Land naturally consists of the dirt and rocks that constitute our earth, but it also refers to water, minerals, and other natural resources. The other factors of production also contribute to a nation's relative wealth. Labour is often referred to as human capital or *human resources*. Thus, it refers not only to the collection of salaried and hourly workers available to a country, but also to the education and skill levels these workers possess. A more educated nation with workers possessing higher skill levels typically has a population living at a higher level than a similar country with lesser skilled workers.

Capital refers to both financial assets and to physical buildings and machinery. In many senses, the rich get richer. The more financial resources, the more computers and communications equipment, the more high-tech machinery a nation possesses, the more productive is the labour using those capital assets and the wealthier will be its population. Finally, entrepreneurship is a resource that cannot be easily defined or quickly taught. In a sense, entrepreneurship emerges when conditions are favourable. While it might be difficult for us to understand why entrepreneurship develops so readily in the capitalist system of the United

States, it is not so difficult for us to realise that entrepreneurship was not favourably treated under the old central planning system of the Soviet Union. In recent years, we have seen more and more entrepreneurship in China – its birthright might be traced to the decision by the government some twenty years ago to allow Chinese farmers to produce whatever amounts they wished, so long as they brought a fixed amount to the authorities. The surplus produced then was sold in the market, giving rise to an emerging entrepreneurial class.

A country's culture, heritage and history are also important, often not so much for what they contribute directly, but for what these items have contributed over time to bring a country to where it is today. That is, where a country has come from leads to its legislative, executive and judicial foundations, its property rights structures, its rule of law, its economic freedoms, its voting processes – all of which contribute to the well-being of its citizens.

### Is Slovakia a rich nation or a poor nation?

If we were to ask this question in class, few students would claim that Slovakia is a rich nation! Students tend to reserve the term "rich" for the United States and the wealthier countries of Western Europe. But less than half of the students would say that Slovakia is a poor nation. They reserve the term "poor" for the nations of South Asia and Sub-Saharan Africa. Most of the students would say that Slovakia is "in-between" rich and poor? So, then we ask an alternative question, "Is Slovakia rich or poor compared to its border nations?". Again, the answers vary somewhat, but most agree that Slovakia is poor compared to Austria, somewhat poor compared to the Czech Republic, somewhat rich compared to Poland and Hungary, and quite rich compared to Ukraine. They also recognise that all people in the Czech Republic are not better off than most of Slovakia, and that all people in Poland and Ukraine are not worse off than Slovakians. That is, because regions of a country differ in many respects, it is difficult to discuss an entire nation's wealth or poverty. Still, we find it necessary to label entire countries as rich or poor so that resources can be appropriately devoted to reducing or eliminating poverty and hunger in those nations most in need. Thus, we must first consider the question, "How do we measure a nation's wealth?"

## 14.2 Measures of poverty

### Monetary measures

The most common measure of a nation's income is a measure of its output, gross domestic product per capita (GDPPC). A country's GDP is the total monetary value of all final goods and services produced within the country in a year's time. This is a big definition, and some of the terms used in the definition need to be amplified. First, GDP is measured in monetary terms. It would be impossible to add the number of units of output directly. That is, we do not routinely add the number of automobiles produced and the number of bushels of wheat produced. As they say in the United States, "You can't add apples and oranges." Instead, we evaluate each item in its domestic monetary value, and then add together all the monetary values. For international comparisons, we then use any of a number of official exchange rates to convert domestic currency values to a common external currency, such as the dollar or the Euro. A list of national GDPPCs can be found at a number of web locations, including the World Bank and the United Nations.

Items produced in the economy are typically known as *goods and services*. Goods are physical items, those items that we can see, feel, taste, touch, etc., such as automobiles, books, clothing, and food. Services, on the other hand, are activities undertaken by individuals and firms for the benefit of society, items such as banking, insurance, teaching, janitorial services, garbage collection, and so forth. Typically, the more advanced the economy, the greater will be the proportion of services in total output. Economists often speak of individuals "consuming" goods and services, although the term consuming does not refer to an intake of food or drink, but rather to the purchase and use of a good or service. Thus, an individual "consumes" an automobile when s/he buys it from a dealer.

Goods and services can be for either final or intermediate use. Intermediate goods and services are those items which are themselves inputs into a later production process. The distinction is important because it eliminates the problem of counting some items twice in GDP calculations. For example, automobile tires produced in a rubber factory can go to either a Skoda assembly plant or to a retail tire store. If all the tires produced by the rubber factory were counted, then those that were placed on a Skoda (intermediate goods) would be counted twice, when they left the rubber plant and when they left the Skoda plant, while those that went to the retail store (final goods) would be counted only once. To avoid the problem of double-counting, only final goods and services are counted in GDP calculations.

We mentioned earlier that GDP is a measure of a nation's output. An entirely different concept yielding roughly the same monetary value is its National Income per capita. National Income is, by definition, a measure of the total income received by individuals for the production of output. This includes wages received for their labour input; interest, dividends and other returns received for their monetary investments; rent for land and buildings; and profit for their entrepreneurial and managerial activities. Other related terms and concepts that are often used include household income, personal income and disposable personal income (income less taxes). Each nation has a vast system of *national income accounts* to keep track of these data.

There are a couple of problems associated with using GDP or National Income per capita as measures of a nation's economic welfare. One of these has to do with the level of income inequality in a country. In some countries, the distribution of income is heavily skewed in favour of a select few individuals. For example, in a number of the Arab sheikdoms, most of the wealth is owned by only a few families. Although they may be generous with their wealth, in truth the income disparity is enormous. When the distribution of income is heavily skewed, a few wealthy individuals can seriously bias the results. For example, if there are 99 people each earning only 10,000 euro per year, one millionaire nearly doubles their average household income, and one billionaire results in an average household income of over one million euros each. A better measure of a nation's "average" income is the median household income – the income that the "middle" income earner makes.

Another pseudo-monetary measure of a nation's economic welfare is its poverty level. That is, what percent of the nation's people live in poverty? Typically, a standard measure of poverty, such as the United Nations Human Poverty Index would be used. The question is, what percentage of the population falls below a designated poverty line? In either of the examples in the previous paragraph, the poverty level would be 99 percent.

### Non-monetary measures

Income, wealth, and national output data are all reasonable measures of a country's standard of living. However, due to the problems noted above (and other issues not noted above), there are other measures that might be preferred. These measures can be grouped into four categories: Health, Education, Infrastructure, and Consumption. Health measures are particularly important in assessing a nation's well-being. Some of the more common health measures are life expectancy, infant and maternal mortality rates, and doctors or hospitals per 10,000 inhabitants. Life expectancy is probably the most highly-regarded of these health indicators. Naturally, the higher the life expectancy, the higher will be the quality of life for a nation's citizens. A lower life expectancy can often be attributed to war, famine and disease. Infant mortality is a measure of the percentage of live-born children who survive through their first year. Maternal mortality is a measure of the percentage of mothers (or mothers-to-be) who die either during pregnancy or in the first few months after they have given birth. Higher numbers on either of these measures are indicative of lower levels of well-being. Finally, the greater the number of doctors or hospitals per 10,000 inhabitants, the higher is the measure of well-being. Often the average number of miles/kilometres to the nearest hospital or clinic provides a good substitute measure for the same statistic.

Education levels are positively related to economic development. The most common measure of educational attainment is the adult literacy rate – the percentage of persons aged 21 and over who can read in his/her native language. Two other measures are the number of secondary school or college graduates per 1000 and the average grade level attainment. The former of these is the better measure, in that secondary and post-secondary schools are able to provide an exact count of the number of graduates. It takes a good data system to be able to distinguish between a student who moves on to another school in another district or province and a student who drops out of school prior to finishing

Although very different from monetary, health, or education data, information on a nation's internal structure – its *infrastructure* – can also provide good insight into its population's well-being. A nation's infrastructure is its transportation, communications, and utilities networks. Items belonging to transportation data include miles/kilometres of railways, paved and unpaved roads, and navigable waterways, together with the number of airports and water ports and harbours. Automobiles per capita or per 1000 population could also be included in transportation data, but is typically included in consumption data (below). The extent of a nation's public transportation system, both within and between cities, is not a good indicator of economic development. Both rich and poor nations often have well-developed internal public transportation, the richer nations to avoid downtown congestion and the poorer nations because of a lack of privately-owned automobiles. A nation's communications system can be measured by the number of radio and television broadcast stations and the number of Internet users and cellular and land-line telephones per capita. Items included in utilities data include electricity consumption and production data, plus production, consumption, and trade data on oil, natural gas, and coal.

Finally, consumption data can paint a reasonable picture of the level of comfort – items like automobiles, radios, telephones, and televisions per 1000 population; the number of computers or Internet subscribers per 1000 population; or the number of people in privately-owned homes as compared to rental apartments. Some of these consumption items are necessities while others are more on the order of luxury goods. This breakdown is often culture-specific – an automobile may be viewed as a luxury in a lesser developed country and a necessity in a more advanced country. Still, consumption data can provide good comparisons for living standards between countries.

### United nations Human Development Index (HDI)

As we can readily see from the text above, no single measure provides a clear indication of a particular country's level of economic development. We can compare countries on various measures, but some countries may be high on monetary measures and low on health or education measures, like South Africa and Botswana, while other countries may be just the opposite, like Cuba and a number of the former Soviet republics. Thus, it seems reasonable to use a number of measures together or to use some compilation of alternative measures as a more accurate assessment of the standard of living in the various countries of the world. One such estimate is the Human Development Index (HDI), first published by the United Nations Development Programme in 1990. [48]

The HDI is a summary composite index that measures a country's average achievements in three basic aspects of human development: longevity, measured by life expectancy at birth; knowledge, measured by a combination of the adult literacy rate and the combined primary, secondary, and tertiary gross enrolment ratio; and the standard of living, measured by GDP per capita (expressed in U.S. dollars using purchasing power parity exchange rates). Higher values on each of these measures lead to a higher HDI calculation and a general sense of a more advanced country. The use of comprehensive measures of health, education and income goes a long way to providing some the most relevant information needed to evaluate a country's well-being. Unfortunately, the HDI is not a perfect measure. It does not include important aspects of human development, such as the ability to participate in the decisions that affect one's life or to enjoy the respect of others in the community. The HDI also does not reflect political participation or gender inequalities. This index, as with other composite indices can only offer a broad proxy on the issues of human development and human poverty. A fuller picture of a country's level of human development requires a more complete analysis of all available human development indicators and available information.

[48] UNDP. 2017. National human development Report 2017: Brazil. PNUD. 392 p. ISBN 978-85-88201-49-1. Retrieved from <http://hdr.undp.org/en/reports/global/hdr2010/>

## 14.3 How does a nation move from being poor to being rich?

Nations that might now be considered relatively wealthy were not always so. The process of economic development is not an overnight occurrence. It takes time, often centuries or millennia, for a nation to overcome initial obstacles on its road to success. Economic historians and development economists have been able to catalog a standard model of economic development. This model is a "stylised" model, in the sense that it does not work for all nations for all times, and probably not exactly so for any nation at any time. It is also not a guarantee that a nation will steadily advance through particular patterns. However, there are certain sequences that countries typically go through, and we will run through those patterns as a model for economic development.

Economists maintain that agriculture is the "first sector". Humans need food to survive. We can get by for quite some time without adequate clothing or housing, but we will perish without an adequate diet. Hundreds of thousands of people around the world live in homeless conditions. Eking out a minimal existence means searching or begging for food. Early civilizations have been described as "hunter-gatherers". They hunted meat and gathered available fruits and vegetables. Clothing was minimal and housing was makeshift, often nomadic. As ancient civilizations developed, mankind became more permanent. Houses were built and villages sprang up. Humans became gardeners instead of gatherers. The soil was cultivated, planted and harvested. Increases in knowledge brought increases in food production. Guaranteeing an adequate food supply was no longer such a major issue, unless poor weather conditions led to a poor harvest. Over time mankind moved from subsistence to abundance, and with excess food production labour was released to other uses, to ends that made life more comfortable. Better tools led to skilled craftsmen – workers who became less concerned with food self-sufficiency (providing all your own) and more reliant on food security (being able to purchase what you are not able to provide). Although we recognise that industrial production began much earlier, historians typically date the Industrial Revolution as beginning in the early 1800's with the development of the steam engine by James Watt. We are now almost two centuries removed from the beginning of the Industrial Revolution, yet there are many nations on this earth for whom food security is still a major problem.

As noted above, a village generating food surpluses leads to labour being released to other activities. As these other activities become more and more profitable, manufacturing becomes the leading sector, eventually occupying the position as the leading employer in the nation. Manufacturing is therefore known as the "second sector". Early stage manufacturing typically involves the production of necessities– those items such as clothing, building materials, and tools that make food production and general living much easier. But as manufacturing becomes even more profitable, entrepreneurs begin to manufacture small items that are targeted for export to wealthier nations – items such as toys, clothing, and textiles. Later stage manufacturing involves more complex operations, such as the manufacture of electronics and auto parts. Even more advanced manufacturing involves automobiles, heavy equipment, and steel. Japan has followed this pattern since the end of world war II. South Korea has recently moved to the advanced manufacturing stage, with exports and foreign production of Kia and Hyundai automobiles. China has lately been moving along this same manufacturing path, having advanced from toys, shoes, and clothing to electronics and auto parts.

Services is the "third sector" in economic development. At this stage, very few individuals in a nation are self-sufficient. In fact, a services economy can be informally defined as one in which much of our work is done for us by others. It is not uncommon in many lesser developed countries to have a few service industries, such as transportation, education, legal services, and banking and financial services. However, in more advanced economies one sees a variety of other services, including childcare, insurance

and investment agencies, fast food restaurants, gardening and landscaping, and even janitorial services and housecleaning agencies. In fact, one of the better measures of the extent of economic development is the percentages of agriculture, manufacturing and services in overall GDP. In the more industrialised countries, the services sector typically occupies about two-thirds of the non-governmental economic activity. And one could intelligently argue that almost all government activity is services related!

## 14.4 Special problems of international trade for lesser developed countries

We saw in earlier chapters that international trade benefits both producers and consumers. The market equilibrium price for one particular commodity occurs where the excess supply in a low-price country is equal to the excess demand in a high-price country. Producers in the low-price country benefit, as do consumers in the high-price country, while consumers in the low-price country and producers in the high-price country suffer welfare losses. However, there is a net welfare gain in each country, in that the gains for the producers exceed the losses for the consumers in the low-price country, while in the high-price country the gains for the consumers exceed the losses for the producers.

This equilibrium price analysis presumes that markets are working "perfectly", in that there are no market imperfections that distort or bias market activity. In reality that is seldom the case. In most commodities and products, there are a number of factors that leave the pure market price unattainable, factors such as government policies, market power, economies of scale and size, and production and consumption externalities. There are a number of other special problems that exist when lesser developed countries (LDCs) are involved in international trade, both with export and import commodities and products.

The import side problems are less pronounced. One major item on the import side is a country's over-reliance on particular imports, whether that over-reliance is product-specific (dependence on one import item) or source-specific (dependence on one import source). When smaller nations are too heavily dependent on imports for food or manufacturing inputs, they can suffer greatly when prices rise substantially, or their sources dry up. Grain prices have risen substantially in recent years with excessive ethanol production, both raising prices and reducing available supplies. Nations dependent on corn and other grains as food face serious malnutrition and even starvation in the face of this global phenomenon. Import substitution industrialization is a second import-related item. Smaller LDCs facing trade deficits may attempt to moderate those deficits by producing their own import-competing products. Unfortunately, this action negates the gains from trade that we discussed in earlier chapters. If an LDC has been importing a product, it is likely that the product can be purchased on world markets at a lower opportunity cost than would be its production cost in the importing country. The LDC would be better off looking for alternative export opportunities.

The export side presents particular problems for LDCs. One of the major issues is their focus on exports of primary commodities, such as food crops (rice, bananas, cacao, nuts), minerals (bauxite, crude oil, coal) and forest products (timber, rubber), instead of finished products. With primary commodities, both the import demand by other nations and the LDC export supply are often inelastic. Import demand is inelastic for primary commodities for all the standard reasons. They are necessity goods, they have few substitutes, and they often represent low percentages of standard household budgets, especially for food items in more advanced countries. LDC export supply is also inelastic. For many LDC export products, there are no production alternatives. Minerals fall clearly into this category. A country either mines its coal or does not mine its coal. There is no other use for that land where coal is found. Likewise, perennial food crops, like nuts, cacao, and coffee are inelastic in supply. These products are tree-grown, with life spans ranging from a few years to decades. Once a tree is planted and harvests begin, there is no economic basis to justify any other use of that land until its production ability subsides.

Although both import demand and LDC export supply tend to be inelastic, these demands and supplies can vary erratically. Bumper crops in import and export nations can lead to reduced import demand or increased export supply. And this inelastic demand together with fluctuating supply leads to high price instability, as shown earlier in Figure 12.3. A relatively small shift in supply can result in substantial price movements. Because harvests and yields vary considerably from year to year, price instability is the rule for many primary commodities.

A second item affecting LDC trade is their over-specialisation on one export item. Many LDCs are

relatively small, with much of their land situated in a relatively homogeneous environment. In such circumstances, is it not surprising that they would focus on only one or two crops to generate export revenues. Production of coffee and cocoa are prime examples. Serious problems can result from this lack of diversity. First, a poor harvest leads to substantially diminished revenue, when there is no other crop to serve as a backstop. Second, weakened or shifting world demand also leads to price instability, especially in the case of primary commodities, as noted above.

Compounding this problem of over-specialisation is the reality that agriculture is a declining sector in any growing economy. Fundamentally, agricultural products are income inelastic – food is a necessity item. As incomes grow, consumers purchase more and more luxury items, but their purchase of foodstuffs remains relatively constant. Thus, agriculture grows with a growing economy and a growing population, but its share of that growing economy diminishes. In fact, we often see in nations that are more developed that as an economy grows beyond middle-income levels, agriculture often needs subsidization to survive! This contrasts dramatically with the situation in lesser developed countries where agriculture, the most successful sector, often bears the brunt of taxation policies.

Export-led growth is another item that can have negative impacts on LDCs where trade is concerned. Export-led growth has been a very successful development strategy, particularly in the case of the "Asian Tigers". However, as with other LDC trade issues, it has its problems. Naturally, problems result when export markets weaken, as already noted twice above. But export-led growth has another major problem, one that created serious problems for the Southeast Asian nations during the Asian Currency Crisis of the late 1990s. That problem was competition from China. According to Ruppel and Handy,

> "China's export growth averaged 27 percent a year between 1985 and 1995. Their export growth was down somewhat in 1996 but increased 21 percent in 1997. China's $33 billion in increased exports between 1996 and 1998 more than offset the loss of $27 billion in those six East Asian countries whose exports were suffering. The export led development that had brought the East Asian miracle growth in the 1980s and early 1990s had become the victim of China's active entry into world markets, especially the small manufacturers that had been the backbone of these countries' merchandise exports. China, a low-wage but relatively educated country of 1.2 billion people (three times the size of the seven smaller Asian nations), was able to exert its comparative advantage at a time when these other nations could ill afford to lose their markets." [49]

The advice to countries that are considering export-led growth is to develop their internal markets first. Then, when external markets weaken, due either to weakened demand or increased competition, a domestic market will still exist.

Finally, declining terms of trade hinder LDC export markets, with high prices for manufactured goods overwhelming historically low prices for agricultural commodities. Part of the problem here is the relatively weak bargaining power of many LDCs. It is often the case that smaller nations with relatively few export commodities are bargaining with large monopsony or oligopsony buyers. Worldwide production of products using cocoa, rubber, and bauxite is controlled by relatively few large companies: Mars, Nestle, and Hershey; Michelin, Bridgestone, and Goodyear; Rusal, Alcan, ALCOA, Reynolds, and Kaiser. According to monopsony theory, if these few buyers are able to exert market pressure, they may be able to drive their purchase price below the prevailing competitive market price, especially in the case where there are a number of competing suppliers. International commodity agreements, when they are in force and enforced, tend to mitigate low prices and enhance price stability. However, they are difficult to negotiate, with buyers and sellers (obviously) working toward opposing objectives.

---

[49] Ruppel, F.J. – Handy, C.R. 2000. Transition, transformation, and turmoil: Global economic impacts on U.S. food exports. In Journal of food distribution research, 31(1), pp. 73-82.

# Part III
# Macroeconomics

Macroeconomics is concerned with national economic data and national economic policies. Microeconomics, on the other hand, is concerned with individuals and firms and how they optimise their decisions and operations subject to market constraints. So, we can think of Macroeconomics as the aggregate, the "big picture" while Microeconomics is the smaller set of vignettes.

Much of what we study in Macroeconomics has Microeconomic foundations. For example, we typically consider the interest rate to be a Macroeconomic variable. However, we will see that there are a variety of interest rates and that these interest rates are mostly determined by market activities, essentially the demand for and the supply of loanable funds. In the "big picture", however, we will see that governmental decisions regarding the supply of money can cause all interest rates to increase or decrease. So, Macroeconomics and Microeconomics are intricately tied together. In the next chapter, we will provide an overview of Macroeconomics, focusing mainly on those data that we typically consider to be Macroeconomic variables. These include various measures of economic activity (or inactivity), price levels and changes in price levels, government finance data, and international economic activities.

# Chapter 15 PRODUCTION AND INCOME

## 15.1 Gross domestic product

For almost any country, the primary measure of its overall economic activity is its gross domestic product (GDP), often reported on a per capita basis (GDPPC). In a sense, *gross domestic product* represents the sum of all the quantities of goods and services produced in a country multiplied by the various prices at which they are valued,

$$\text{GDP} = \sum(Q_i P_j), \tag{15.1}$$

and then,

$$\text{GDPPC} = \frac{\sum(Q_i P_j)}{\text{population}}. \tag{15.2}$$

In the above equations $i$ refers to all the products (goods and services) produced in a country, $Q$ stands for quantities of those goods produced, $P$ and $j$ stand for the various prices at which these products are valued, and population is the number of inhabitants or number of employed people.

GDP is typically stated more explicitly as the "total market value of all final goods and services produced within a country in a given time period". A number of words and phrases in this definition need further explanation.

Two phrases in this definition are relatively straightforward. *Goods and services* is a fairly standard way of referring to output from a production process. The word *products* is another common synonym used here. However, using the goods and services phrase reminds the reader that not all output is physical – items that we can see, smell, touch, taste, or feel. Some output is work that is done for us, like transportation, banking, insurance, and education. The second phrase that is easily understood is *in a given time period*. Typically, this given time period is one year, most commonly a calendar year, but many governments report GDP on a *fiscal year*, often July 1 through June 30 or October 1 through September 30. Even though GDP is often reported on a quarterly basis, when reported as such it is still expressed on a calendar year basis.

The phrase *total market value* implies that a country's GDP is calculated, not as a quantity measure, but as a monetary value in its domestic currency (or a conversion to another currency). It is often said that

we cannot add apples and oranges; it's even more difficult to add apples and automobiles! Five tonnes of automobiles might include only two mid-size vehicles, but it would include more than 35,000 average apples. We simply cannot add quantities! The value approach does not eliminate all problems involved in evaluating a country's economic activity, but it does allow for a standard approach across countries.

The word *final*, however, requires some explanation. The phrase "final goods and services" contrasts directly with "intermediate goods and services". *Intermediate outputs* are goods and services that serve as inputs into other goods and services, whereas *final products* are the end result in a consumer or business purchase. For example, tires produced at a tire manufacturing plant are intermediate products when they are shipped to Skoda and put on a new Octavia. However, they are final products when they are sold to a customer at a retail tire outlet who needs to replace old, worn-out tires. If we counted intermediate goods in GDP, we would be guilty of "double-counting", in that we would count the tires when they are sold to Skoda and count them again when they are included in the value of the Octavia that is sold to a customer. To avoid double-counting, only final products are included in GDP.

The word "produced" contrasts with the word "sold". Although a great deal of economic activity is often involved in the sale of a product, it is typically the case that a greater amount of activity goes into the production of a good or service. Since GDP is intended to be a measure of economic activity, "produced" makes more sense than "sold". One of the issues inherent in this context is the role of inventories. If more goods are being produced than are being sold, a GDP calculation could be high when actual purchase activity is low. Thus, an inventory build-up may keep current GDP high, but could signal a future GDP shortfall, especially if large inventories cause manufacturers to lay off workers.

Finally, the word "in" – a small word that is loaded with importance for some countries! The contrast is with the word "by". Gross domestic product, GDP, is output produced *in* a country, no matter who owns the production facility. *Gross national product*, $GNP$, is output produced *by* the citizens of a country. That is, with GNP, no matter where the goods and services are produced, the output is credited to the owners of the facility. For many countries, GDP and GNP are very similar. However, particularly in lesser developed countries, GDP is typically much larger than GNP, because the owners of the means of production are often foreign nationals who have invested their savings into the country. Thus, the output of firms owned by foreign national counts as GNP for the investing country and GDP for the recipient country. So, all production within a country counts as GDP, but only that portion owned by its citizens counts as GNP. All of the countries of the world now use GDP instead of GNP in their national income Accounting.

Table 15.1 contains GDP and GDPPC data for Slovakia and the other "Visegrad" countries (Czech Republic, Hungary, and Poland), with European Union and United States data provided also for reference purposes. EU28 stands for all EU member states while EU27 refers to all member states without Croatia, which joined the EU as the last country. EU15 refers to old member states from Western Europe, excluding Central and Eastern European countries that joined the EU in 2004 and also excluding Cyprus and Malta, which also accessed the EU in 2004. Euro-18 stands for EU countries that are members of the Economic and Monetary Union (Eurozone) while Euro-15 is the Eurozone countries without the countries that joined Eurozone as the last.

Although Slovakia has the smallest GDP value and the smallest population of all the Visegrad countries, it is second only to the Czech Republic in GDPPC. Still, however, its GDPPC is only about half of the EU-27 overall average. Even the Czech Republic, with the highest GDPPC of the Visegrad countries, is only about half the GDPPC of the Euro-18 countries. Slovakia's real GDP[50] growth rate is above that of the Czech Republic in 2013 and 2014 and is right in line with the other Visegrad countries in 2013 and the USA in 2014.

[50] Real GDP is nominal GDP adjusted for inflation.

**Table 15.1** GDP, population, GDPPC, and GDP growth for various countries and regions

| | Current GDP | | Population | | GDP per capita | | Real GDP growth rate | |
|---|---|---|---|---|---|---|---|---|
| | (trillion €) | | (in millions) | | (€) | | (annual %) | |
| | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 |
| EU-28 | 13,542 | 13,944 | 506.0 | 507.4 | 26,762 | 27,480 | 0.2 | 1.4 |
| EU-27 | 13,498 | 13,901 | 501.7 | 503.2 | 26,903 | 27,626 | - | - |
| EU-15 | 12,447 | 12,820 | 396.7 | 398.4 | 31,373 | 32,177 | - | - |
| Euro-18 | 9,918 | 10,091 | 333.8 | 334.8 | 29,716 | 30,136 | -0.3 | 0.9 |
| Euro-15 | 9,802 | 9,972 | 325.0 | 318.2 | 30,161 | 31,334 | - | - |
| | | | | | | | | |
| Czech Rep. | 156.7 | 154.7 | 10.51 | 10.53 | 14,926 | 14,702 | -0.5 | 2 |
| Hungary | 100.9 | 103.2 | 9.89 | 9.86 | 10,162 | 10,465 | 1.5 | 3.6 |
| Poland | 396.1 | 413.1 | 38.04 | 38.01 | 10,413 | 10,869 | 1.7 | 3.4 |
| Slovakia | 73.6 | 75.2 | 5.41 | 5.42 | 13,595 | 13,881 | 1.4 | 2.4 |
| | | | | | | | | |
| USA | 16,768 | 17,419 | 315.5 | 318.9 | 52,980 | 54,630 | 2.2 | 2.4 |

Source: Eurostat, World Bank[51]

When GDP is calculated at current market prices, a comparison across countries is sometimes difficult. Prices in some countries are much higher, in other countries much lower. Every Slovak who has travelled in and around and beyond Slovakia knows that hotel prices are much higher in Bratislava than in smaller cities in Slovakia, and that hotel prices in Vienna and Paris are even higher yet. Although products that are internationally traded tend to equilibrate in price across countries and across currencies[52], non-traded goods and services do not have such a market equilibrating mechanism and prices can differ substantially across countries and within countries. Because of these differences in internal prices, governments and international institutions often calculate estimates of purchasing power across countries so that meaningful comparisons can be made. We will discuss this issue more fully below.

**Table 15.2** GDP per capita in PPS (purchasing power standard), EA=100

| Country | 2000 | 2008 | 2013 | Change 2013/2000 |
|---|---|---|---|---|
| **Slovakia** | 43 | 65 | 70 | 27 |
| **Czech Republic** | 62 | 74 | 77 | 14 |
| **Hungary** | 46 | 57 | 62 | 15 |
| **Poland** | 41 | 50 | 63 | 22 |
| | | | | |
| **Germany** | 102 | 106 | 114 | 12 |
| **Italy** | 103 | 96 | 92 | -10 |
| **EU28** | 87 | 91 | 93 | 7 |

Note: Euro area (EA) – changing composition

Source: Eurostat

[51] Eurostat database, various tables. Retrieved from <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat /home/> and World Bank. Retrieved from <http://data.worldbank.org>

[52] the law of one price

## 15.2 Growth of GDP, nominal and real GDP

In analysing GDP data over time, it is important to distinguish between nominal GDP and real GDP. *Nominal gross domestic product* (nGDP) is the actual level of GDP measured at any given point in time. Hence, it is often referred to as "current GDP". *Real gross domestic product* (rGDP) is nominal GDP adjusted for inflation. That is, GDP is measured in "constant prices", hence its common name, "constant GDP". Looking back at equation (15.1), it is clear that we could divide that GDP term by a price level index ($PLI$), with a value of 1.0 in the base year and increasing or decreasing values as prices rise or fall. Then we have eliminated the price component of GDP and are left with only a "quantity" component, real GDP:

$$rGDP_t = \frac{nGDP_t}{PLI_t} \tag{15.3}$$

$t$ - year

In Figure 15.1, the year 2000 is the so called *base year*, when both nominal and real GDP are equal to €31,352 million. Now, we can compare nominal GDP (the vertical bars) in the figure with real GDP (the blocked line). Nominal GDP is strong every year from 1995 to 2008, falling only in 2009 during the worldwide recession. Nominal GDP growth averaged 10.1 %/year, with a low of 7.4 % in 1999 and a high of 11.8 % in 2007. Real GDP growth, however, looks much different, averaging only 4.3 %, with a low of 0.0 % (no growth) in 1999 and a high of 10.6 % in 2007. The diagram shows the cumulative effect of inflation over time, equal to the difference between the vertical bars and the blocked line. For individual years, however, the gaps between the two measures are largest when inflation is highest and smallest when inflation is lowest. The average gap (per year) is 4.8 %, ranging from a small gap of 1.2 % in 2007 to a large gap of 9.5 % in 2000. Both nominal and real GDP fell in 2009, nominal falling 5.8 % and real falling 4.7 %.

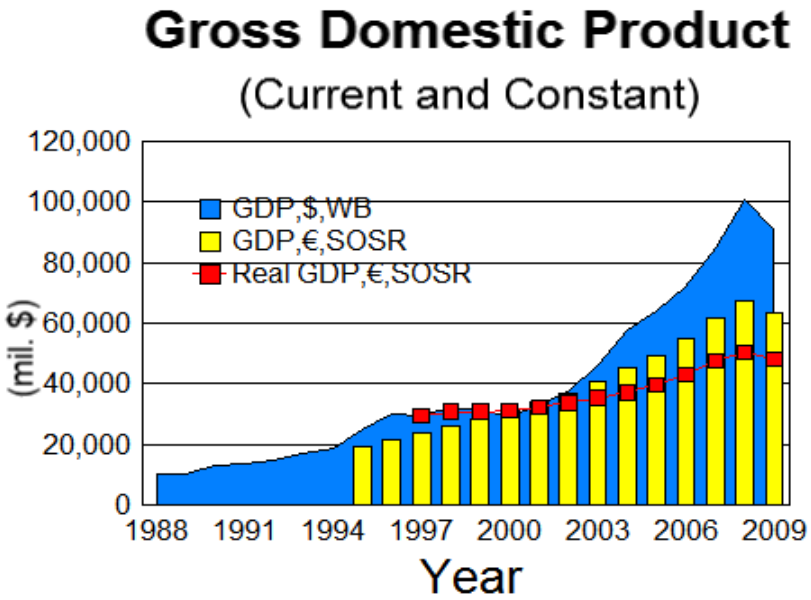



**Figure 15.1** Gross domestic product in Slovakia, Current and Constant, in $ and €.
Source: World Bank[53], SOSR[54]

The data in Figure 15.1 are expressed in three different ways. The solid "area" representation depicts 1988-2009 GDP data from the World Bank (WB), measured in dollars. The vertical bars reflect 1995-2009

[53] Retrieved from <http://data.worldbank.org/country/Slovak-republic>
[54] Retrieved from <http://www.statistics.sk/pls/elisw/MetaInfo.explorer?obj=291&cmd=go&s=1003&sso=3&so=81>

GDP data from the Statistical office of the Slovak Republic (SOSR), measured in euros. The blocked line running through the data is an SOSR measure of real GDP, 1997-2009, again in euros.

The most striking feature of the data in this diagram is the enormous gap between the WB data measured in dollars and the SOSR data measured in euros. Whereas these two measures are approximately equal in 2000 and 2001, after this point, the WB data measured in dollars grow much faster than the SOSR data measured in euros. The WB data show that the Slovak economy nearly tripled in that time frame, while the SOSR data show the Slovak economy only doubling. How can two sets of data, measuring the same economic activity have such dramatically different results? The answer comes in understanding exchange rate movements. After 2001 the euro strengthened and the dollar weakened. After 2002, the euro was at a "premium" with respect to the dollar, meaning that it had crossed above the 1.00 dollar per euro value. From that point on, it takes more and more dollars to buy the same amount of euros. When that reasoning is applied to GDP data, the divergence becomes clearer. Multiplying Slovak macro data measured in euros or SKK (Slovak crowns) by a higher dollar factor (a stronger exchange rate) results in higher numbers. Thus, the WB data overstate the growth of the Slovak economy in the first decade of this new millennium. The WB data have the Slovak economy growing at a 24.3 % average annual rate during this time period, while the SOSR data show only an 11.9 % rate.

So naturally, it's fair to ask which data set is better to use. And the answer to that question will depend on your perspective. If someone is looking for inter-country comparisons of data for a given year, data measured either in euros or dollars would be equally appropriate. Perspective becomes more important for a person who is traveling or who is looking at data over longer time periods. A person whose major currency is dollars should look at dollar data, while a person more connected to the euro should look at euro data. For this reason, most of the rest of the data in these chapters will be presented in euros.

## Growth of GDP

A very important variable, which is closely watched by investors, businesses or media, is the *growth of GDP* ($g$). Growth of GDP is related to the growth of income and wellbeing of people; it is measured as follows:

$$g = \frac{(GDP_t - GDP_{t-1})}{GDP_{t-1}} \tag{15.4}$$

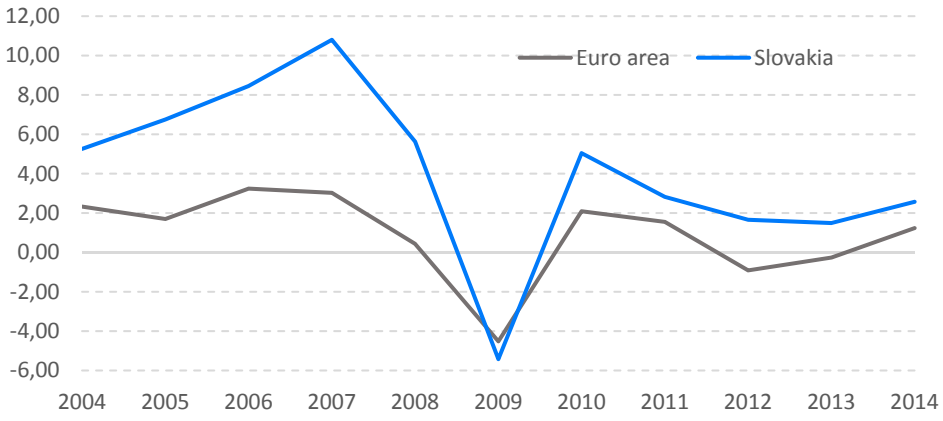



**Figure 15.2** Real GDP growth (%) 2004-2014
Source: World development indicators[55]

[55] Retrieved from <http://databank.worldbank.org>

Exercise

Suppose that country Z produces only gasoline and hamburgers. Prices and amounts of products produced by the country are displayed in Table 15.3. Calculate the value of nominal and real GDP in years 2012-2014, where 2012 is the base year.

**Table 15.3** Prices and quantities of products produced in country Z

| Year | $P_g$ (€/unit) | $Q_g$ (units) | $P_h$ (€/unit) | $Q_h$ (units) |
|---|---|---|---|---|
| **2012** | 1.2 | 200 | 2 | 100 |
| **2013** | 1 | 350 | 3 | 80 |
| **2014** | 1.5 | 280 | 3.5 | 70 |

*Solution*

To calculate GDP, we use the equation (15.1). Nominal or current GDP in 2012 is obtained as the amounts of goods produced in 2012 multiplied by their prices in this current year. Nominal GDP in 2012 has a value of $nGDP_{2012} = 200 \cdot 1.2 + 100 \cdot 2 = €440$. Next, $nGDP_{2013} = 590$, $nGDP_{2014} = €665$.

For real or constant GDP, the value of goods produced is expressed in base-year prices. In general, there are two methods for computing the real GDP values. The first method uses a price level index, which is a ratio of average level of current prices ($P_t$) of all goods included in GDP and average of base-year prices ($P_0$) of these goods:

$$PLI_t = \frac{P_t}{P_0} \tag{15.5}$$

To determine real GDP, we would divide the nominal GDP by the $PLI$, (15.3). We will discuss this method further when we look at prices and inflation in a later chapter.

Another method of calculating real GDP is to multiply the amounts of goods produced by an economy and included in GDP by the prices of the base year. So in the base year $rGDP_{2012} = €440$; that is the real and nominal values of GDP are equal. In following years, $rGDP_{2013} = 350 \cdot 1.2 + 80 \cdot 2 = 580$ and $rGDP_{2014} = 280 \cdot 1.2 + 70 \cdot 2 = €476$. Thus, we see that while nominal GDP grew in both 2013 and 2014, real GDP grew in 2013 but fell in 2014. Nominal GDP with its substantial inflation had overstated the real activity in the economy.

## 15.3 Components of GDP

GDP is a measure of the output of an economy. We can also measure economic activity as the sum of all the returns to the inputs in an economy. Many economics textbooks feature a diagram known as the *circular flow of goods and services*, Figure 15.3 below. In that diagram, the inner circle represents the flow of inputs and outputs while the outer circle represents the flow of money. The bottom half of that inner circle, from firms through the product market to households represents the physical flow of goods and services, while its outer circle, from households through the product market to firms represents the monetary value of that output (expenditures).

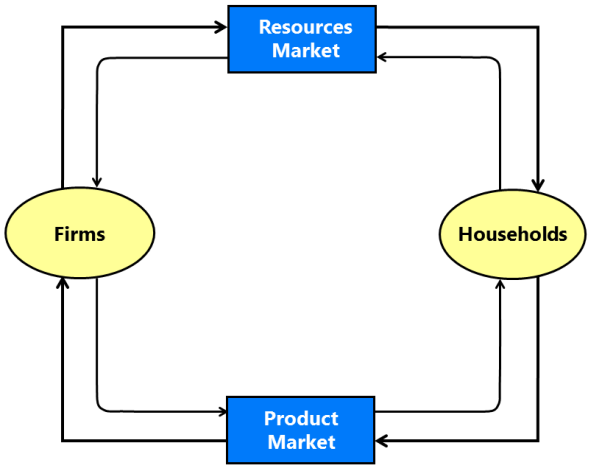



**Figure 15.3** Circular flow of goods and services

All output is produced through a combination of inputs (resources or factors of production – land, labour, capital, and entrepreneurship). The owners of these resources receive payment (income) for their materials or their activities. In the figure, the top half of the inner circle, from households through the resources market to firms, reflects the physical movement of these resources, while its outer circle, from firms through the resources market to households, represents incomes accruing to the owners of these resources. The sum of all these input payments in a year's time is known as *national income* (*NI*). In the simple economy in Figure 15.3, if there are no changes in inventory levels during the year, GDP and NI would be equal. In reality, they often differ by small percentages. This simplified circular flow diagram shows that there are two ways to measure GDP: *expenditure method* and *income method*. Thus, GDP can be measured by expenditures of households on final goods and services or by income of households obtained for providing services of the factors of production to firms.

According the first method, the total value of gross domestic product equals expenditures of consumers (consumption, $C$), firms (investment, $I$), government ($G$) and foreigners ($EX - IM$), which is expenditures of foreigners on domestic goods and services minus expenditures by domestic residents on foreign goods, that is, net exports.

$$GDP = C + I + G + (EX - IM) \tag{15.6}$$

Each of these components is seen as part of the demand for the output of the economy. Households purchase goods and services for their personal use. Firms invest in buildings, machinery, and software, and either increase or decrease their inventories depending on their production and overall demand. National and local governments spend billions of euros on purchases for the public good and for the services of thousands of employees. Finally, exports reflect other countries' demands for goods and services produced by the home country, while imports

substitute for domestic production and thereby reduce the demand for domestically produced goods and services. Thus, net exports constitutes yet one more (positive or negative) demand for domestic production.

Net exports constitutes a smaller percentage of GDP than the other components. Between 1987 and 2009, net exports for Slovakia averaged -4.5 % of GDP, ranging from a high of 2.3 % (a trade surplus in 1995) to a low of -10.8 % (a trade deficit in 1998). Because the net demand in international trade is typically smaller than the other three components and because net exports can be either positive or negative, an alternative measure of economic activity known as *domestic expenditures* (*DE*) is sometimes used. DE is equal to GDP minus the international sector:

$$DE = C + I + G \tag{15.7}$$

A diagram of GDP and DE and their components from 1995 to 2009 is included in Figure 15.4 below. The three major components (consumption, investment, and government spending) are shown as stacked vertical bars. Together they add up to domestic expenditures. The contribution of net exports is shown as the dotted line running through the top of the stacked vertical bars. Net exports show up as a surplus (an addition to DE) only in 1995 and as a deficit (a subtraction from DE) in all other years. When net exports are included, this dotted line also reflects nominal GDP.

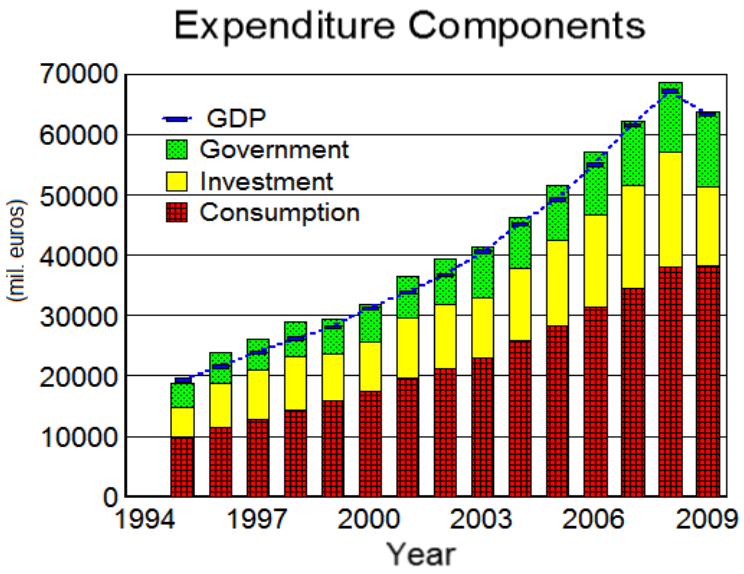



**Figure 15.4** GDP and its expenditure components
Source: Statistical office of the Slovak Republic (SOSR)[56]

Now, let us look closer at each of the expenditure components of GDP.

## Consumption

In national income accounting, the term *consumption* carries two different meanings. In one sense consumption is household spending. For the Statistical office of the Slovak Republic (SOSR), this understanding of consumption is known as *household final consumption expenditure*. A second definition, however, presents a bigger picture of consumption as consisting of government expenditures added to household expenditures. The SOSR refers to this definition as final consumption expenditure. Unless otherwise stated, in our analyses we will use the former understanding of consumption reflecting household spending.

[56] SOSR. Slovstat. Retrieved from <http://www.statistics.sk/pls/elisw/MetaInfo.explorer?obj=291&cmd=go&s=1003&sso=3&so=81>

Even this definition, however, does not clear up the picture completely, in that household final consumption expenditure is composed of two parts, a final consumption of households and a final consumption of non-profit institutions serving households. This latter term is quite small compared to the former, however, averaging only 1.5 % of the combined total over the 1995-2009 time frame. For our purposes, these two items will be combined, and consumption will reflect household final consumption expenditure. Formally, the World Bank defines this term as "the market value of all goods and services, including durable products (such as cars, washing machines, and home computers), purchased by households. It excludes purchases of dwellings but includes imputed rent for owner-occupied dwellings."[57]

Slovak data analysts follow a European Union standard known as the ESA 95 methodology, which itself follows "the revision of the International system of national accounts" which was published in 2009 as a joint product of the International Monetary Fund, the Organization for Economic Cooperation and Development, the United Nations, the World Bank, and Eurostat[58]. Thus, the Slovak data are consistent with other published international data.

## Investment

Investment is also composed of two sub-components, the first known as *gross fixed capital formation* and the second as *change in inventories*. According to the World Bank definition, the former "includes land improvements (fences, ditches, drains, and so on); plant, machinery, and equipment purchases; and the construction of roads, railways, and the like, including schools, offices, hospitals, private residential dwellings, and commercial and industrial buildings" plus the "net acquisitions of valuables"[59]. It is worth noting here a repetition item from the consumption definition above. Private residential dwellings are referred to as investment, not consumption.

Changes in inventories seems straightforward enough. Again, the World Bank definition: "Inventories are stocks of goods held by firms to meet temporary or unexpected fluctuations in production or sales, and 'work in progress'" (World Bank, 2016). This definition reinforces the initial definition of GDP introduced at the beginning of this chapter, where the word "produced" was contrasted with the word "sold". Inventory accumulation or depletion is often a good indication of business expectations. If firms are accumulating inventories during normal periods of economic activity, then there is some sense that the business sector expects continued growth of the economy. However, if inventories are not being replenished, it could mean that firms are expecting an economic downturn. Thus, changes in inventories serve as one indicator of future economic activity.

## Government spending

*Total government spending* is the sum of all government spending at the national, regional, and local level, such as infrastructure provision, health care, education, and national defence, together with a huge investment in record keeping and data gathering and analysis. According to the World Bank definition, government spending "includes all government current expenditures for purchases of goods and services (including compensation of employees). It also includes most expenditures on national defence and security, but excludes government military expenditures that are part of government capital formation." (World Bank, 2016). There are routine expenditures that governments make to maintain a certain level of public services. Other expenditures are more discretionary, such as stimulus spending when economic activity from the private sector is weak or military expenditures for international peacekeeping activities.

---

[57] Retrieved from <http://data.worldbank.org/country/Slovak-republic>

[58] Retrieved from <http://eur.lex.europa.eu/Notice.do?mode=dbl&lang=en&ihmlang=en&lng1=en,sk&lng2=bg,cs,da,de,el,en,es,et,fi,fr,ga,hu,it,lt,lv,mt,nl,pl,pt,ro,sk,sl,sv,&val=553962:cs&page=)>

[59] World Bank. 2016. Retrieved from <http://data.worldbank.org/country/Slovak-republic>

Most government agencies are locked into budgets set by legislative bodies. They rely on tax revenues to support their expenditures. If revenues exceed expenditures budgets are in surplus. If expenditures exceed revenues, budgets are in deficit. The Slovak government budget has been in deficit for the past many years. That deficit averaged 6.0 % of GDP during 2008-2010[60]. Clearly the largest portion of government spending is for "social contributions", such as health care and retirement benefits. By one calculation, these items averaged 46.0 % of total government spending in 2008-2010 (EU, 2011a). However, there are substantial revenues paid to the government that are targeted to these social contributions, so the net impact of social contributions on government expenditures averaged only 13.8 % during this time period. The second largest government spending item is employee compensation, which averaged 19.3 % of government spending in 2008-2010 (EU, 2011a).

### Net exports

The final component of GDP is net exports, which is equal to exports minus imports. Net exports, as noted above, had been in deficit (imports greater than exports) every year since 1996, but more recently have generated substantial surpluses. Slovakia's main export items are vehicles and related parts, 25 % of total exports; machinery and electrical equipment, 21 %; nuclear reactors and furnaces, 12 %; iron and steel, 5 %; and mineral oils and fuels, 5 %. The major destinations for their exports are Germany, 23.3 % of total exports; Czech Republic, 13.6 %; Poland, 8.8 %; Hungary, 6.6 %; Austria, 6.5 %; the UK, 5.4 %; France, 5.2 %; and Italy (4.8 %). Their major import items include machinery and electrical equipment, 19 % of total imports; vehicles and related parts, 13 %; nuclear reactors and furnaces, 12 %; and fuel and mineral oils, 11 %. They import mainly from Germany, 19 % of total imports; Czech Republic, 16.9 %; Austria, 9.3 %; Russia, 7.9 %; Poland, 6.2 %; Hungary, 6.2 %; South Korea, 4.2 %; China, 4 %.[61]

### Component percentages of GDP

Although the diagram of stacked data in Figure 15.4 offers a good overall picture of how the individual components combine to form nominal GDP, they do not allow us to assess the contribution of each of the components. Figure 15.5 provides that visualization, with percentage contributions of the three components that constitute domestic expenditures (net exports has been omitted, due to its consistently negative contribution). Except for the mid-90s, consumption constituted 50-60 % of DE, averaging 53.8 % from 1995 through 2009. Through all fifteen years government spending has stayed consistently at 20 % of DE, plus or minus only one or two percentage points. Investment has been the most variable, averaging 26.9 % of DE between 1995 and 2009, but ranging from 20.6 % of DE in 2009 to 31.3 % in 1997.

[60] EU. 2011a. Government finance statistics. Luxembourg : Publications office of the European Union. 45 p. ISSN 1725-9819. Retrieved from <http://ec.europa.eu/eurostat/documents/3217494/5732437/KS-EK-11-001-EN.PDF/45fd5ccb-e909-4da0-a17a-8bce7f59fc58>

[61] Source data for this paragraph are from the U.S. CIA Factbook, 2014 estimates. Retrieved from <https://www.cia.gov/library/publications/the-world-factbook/geos/lo.html>

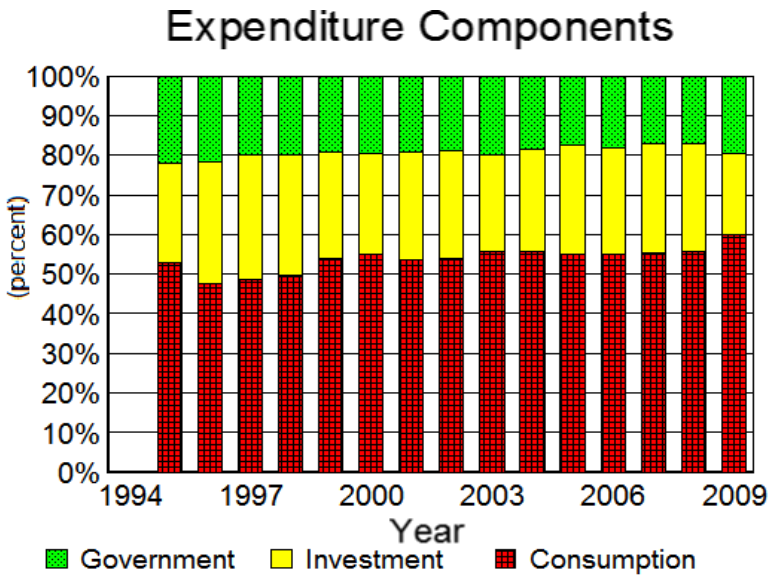



**Figure 15.5** Contributions of nominal GDP components to domestic expenditure
Source: SOSR, Slovstat

There are two very striking reversals in investment, at the very beginning of this data series and at the very end (investment is the middle set of bars in Figure 15.5). Investment was 24.9 % of DE in 1995, but jumped to 30.8 % in 1996. At the other end, investment at 27.4 % of DE in 2008 dropped to 20.6 % in 2009. The drop from 2008 to 2009 is clear – the worldwide recession had investors nervous to add new plant and equipment or to build inventories when it was very uncertain what the future level of consumer demand might be. The front end needs more explanation. According to World Bank data[62] investment had been steady at 30-31 % of GDP during the last years of Communist influence, 1987-1991. With negotiations and the eventual agreement to split Czechoslovakia into two countries, investment fell substantially in the next few years, hitting a low of 21.7 % of GDP in 1994. However, a population increasingly looking to the European Union and an increase in the number of western-leaning politicians began to turn investment around, rising to 25.0 % in 1995 and 30.8 % in 1996. So, the increase in the investment percentage of GDP at the beginning of the data series in Figure 15.5 actually reflects a continuing trend of activity that had begun few years earlier.

[62] Retrieved from <http://data.worldbank.org/country/Slovak-republic>

## 15.4 Slovak GDP structure

Slovak GDP from the expenditure side consists mainly from consumption. The share of investments on GDP was getting smaller in recent years (from ca. 30 % to 20 %). Before 2012, Slovak imports exceeded exports, but from that year, the net trade is positive (Figure 15.6). According to data from the Macroeconomic database of the National Bank of Slovakia (NBS), 56 % of Slovak GDP in 2014 was constructed from private consumption, capital investments constituted 21 % of GDP, and public consumption 19 %. Only a small share of GDP (approx. 4 %) was the product of net trade and inventories.

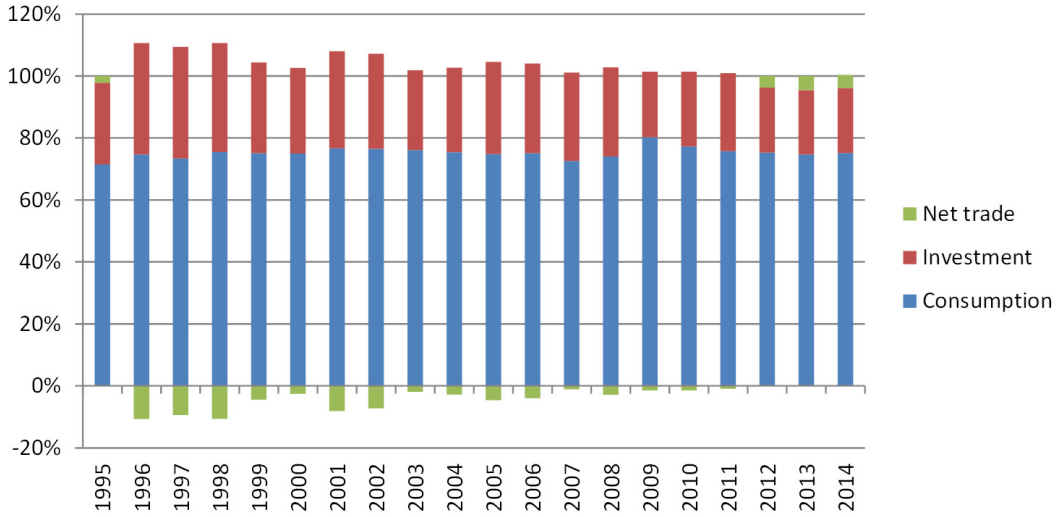



**Figure 15.6** Development of Slovak GDP by demand components (% share of GDP, current prices)
Source: Macroeconomic database of NBS (National Bank of Slovakia)

The key sector in Slovakia is industry (Figure 15.7), which accounted for 25 % of economy's *gross value added* (GVA) in 2014, which is equivalent to 22 % of GDP (the difference between GDP and GVA is net taxes from products). The share of industry is matched only by the combined shares of trade, transport, hotels and restaurants sectors. Agriculture in Slovakia accounts for around 3 percent of the GDP.

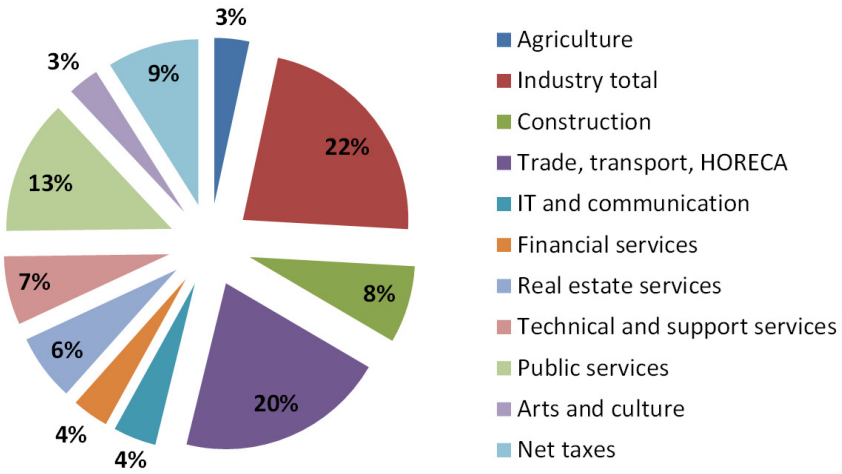



**Figure 15.7** Structure of GDP by sectors (in %, 2014, current prices)
Source: Macroeconomic database of NBS

Over the years, the shares of different sectors vary only slightly; the share of agriculture on GDP has a decreasing trend (Figure 15.8).

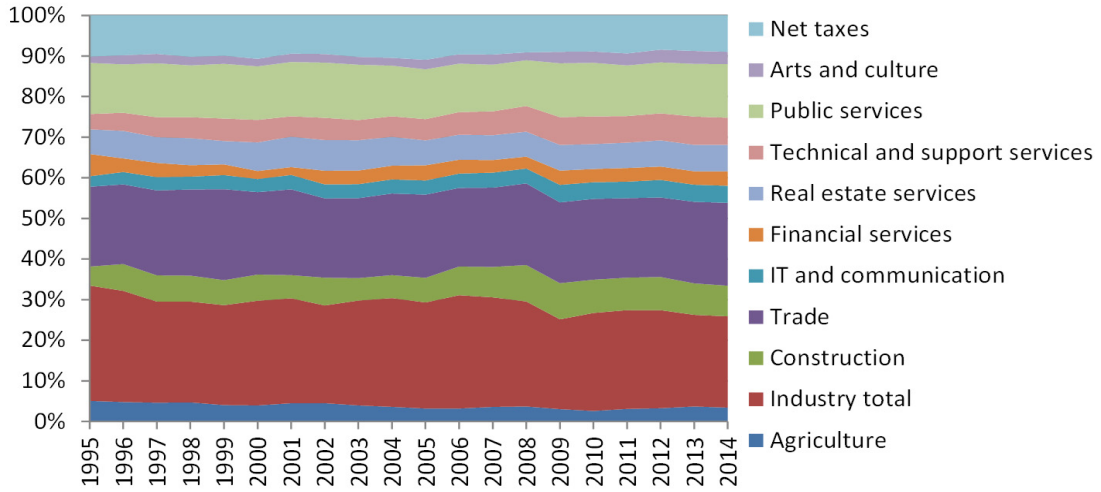



**Figure 15.8** Development of GDP by sectors (% share of GDP, current prices)
Source: Macroeconomic database of NBS

Within industry, manufacturing is the key segment, accounting for 85 % of industry's total (Figure 15.9). The other two industrial sectors, mining and utilities are minor. Within manufacturing, the key sectors are engineering in nature, comprising mainly sectors related to the production of cars and their parts.

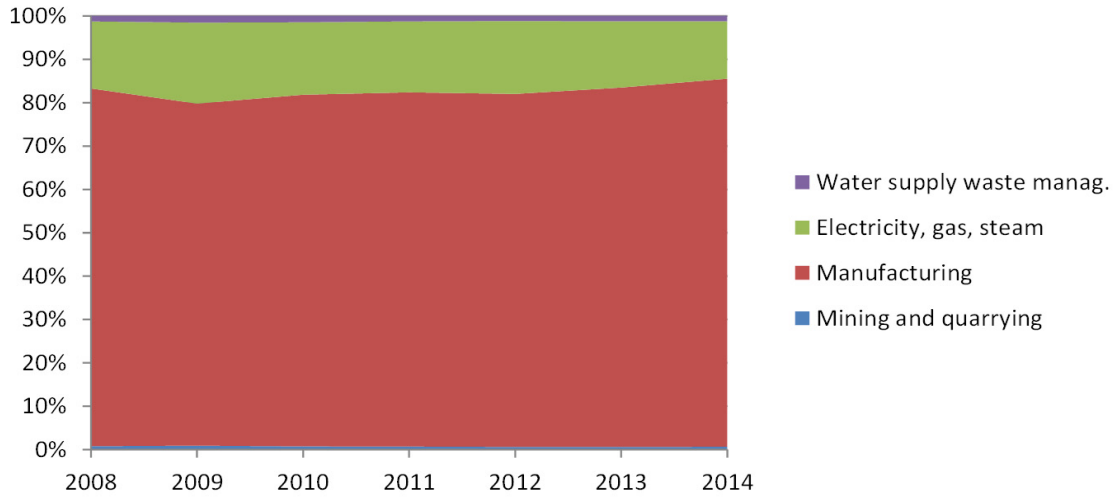



**Figure 15.9** Development of industry by sectors (% share of total industry, sales at current prices)
Source: Macroeconomic database of NBS

Indeed, engineering industry is traditionally strong in Slovakia. Historically – in the socialist Czechoslovak era – it was heavy-industry based around arms production. It then suffered a decline in the early years after the fall of Communism and the demise of armaments production in Slovakia. Recently though, it is growing again in importance, thanks primarily to the development of the automotive industry. The share of the engineering sector (defined as manufacture of cars and transport equipment, the manufacture of machinery, and the manufacture of basic metals and metal products) has been increasing steadily in the past five years and now accounts for more than 50 % of total manufacturing sales (Figure 15.10 and Figure 15.11). As of 2014, these sectors employed over 200 thousand people, or more than 8 % of total employment in the country.

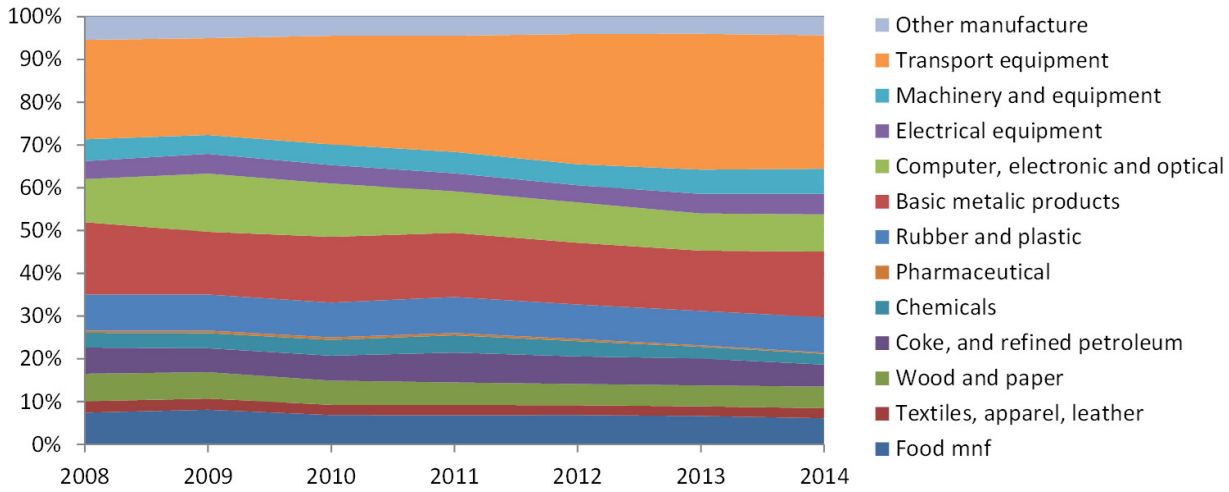



**Figure 15.10** Development of manufacturing by sectors (% share of manufacturing total, current prices)
Source: Macroeconomic database of NBS

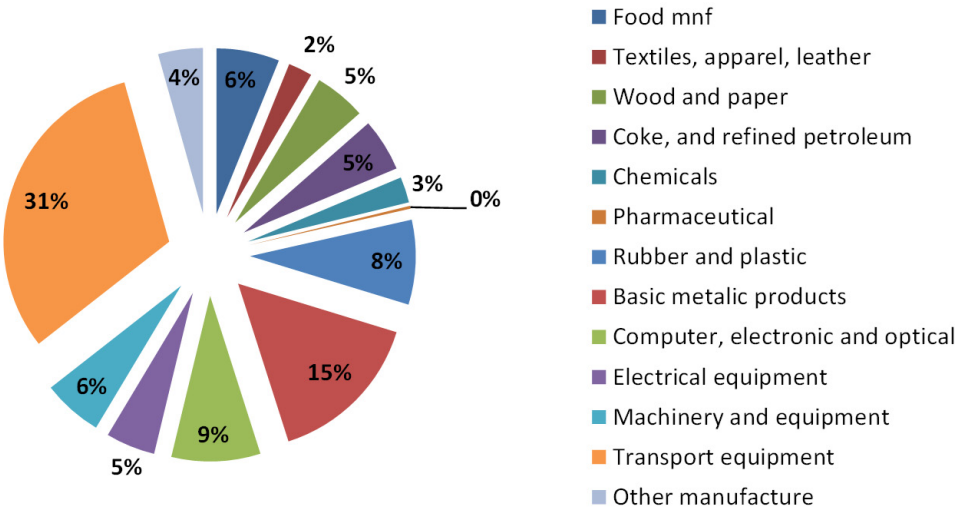



**Figure 15.11** Structure of manufacturing by sectors (in %, 2014, sales at current prices)
Source: Macroeconomic database of NBS

Agriculture is a key sector in the national economy of Slovakia. It provides resources for the food industry and other sectors of the economy. Agriculture contributes to development of Slovak regions and creates jobs in rural areas. The share of agriculture on gross value added, gross production of the Slovak economy, total employment and investment has been declining (as it is shown by data in Table 15.4). The impact of agriculture on the rural economy therefore declines too.

**Table 15.4** Share of agriculture on indicators of national economy in % (current prices)

| Indicator | 2002 | 2003 | 2004 | 2005 | 2006 | 2007 | 2008 | 2009 | 2010 |
|---|---|---|---|---|---|---|---|---|---|
| Gross value added | 4.1 | 3.7 | 3.3 | 2.9 | 2.8 | 3.2 | 3.2 | 2.4 | 2.3 |
| Gross production | 3.1 | 2.9 | 2.9 | 2.7 | 2.5 | 2.2 | 2.0 | 2.0 | 2.1 |
| Intermediate cons. | 3.5 | 3.2 | 3.1 | 2.8 | 2.6 | 2.6 | 2.5 | 2.1 | 2.2 |
| Gross fixed capital | 3.1 | 3.4 | 2.9 | 2.9 | 1.4 | 2.8 | 2.2 | 2.5 | 2.1 |
| Export | 3.7 | 3.1 | 3.8 | 4.7 | 4.2 | 4.2 | 4.1 | 4.8 | 4.4 |
| Import | 5.6 | 4.8 | 5.3 | 6.2 | 5.2 | 5.5 | 5.7 | 7.1 | 6.4 |
| Employment | 4.0 | 3.6 | 3.4 | 3.1 | 2.9 | 2.6 | 2.5 | 2.3 | 2.2 |

Source: SOSR

The share indicators do not reflect the real importance of Slovak agriculture, however, in that it produces a significant number of positive externalities, which are not valued by market prices. These positive externalities are landscape maintenance, rural services, preservation of traditions and rural culture, and environmental public goods. Citizens are interested in these services provided by agriculture and would be willing to pay for them. However, these services are public goods and therefore government involvement is needed to insure their provision.

## BOX
## Agriculture and economic growth

To think about the importance of economic growth we begin with assessing the long-term performance of the Slovak economy. The real per capita GDP in Slovakia grew from €4,100 from 2004 to €13,300 in 2013. This increase in per capita GDP corresponds to an average growth rate of 4.0 percent per year. To appreciate the consequences of apparently small differentials in growth rates we can calculate where Slovakia would have been in 2013 if it had grown since 2000 at only 3.0 percent per year, one percentage point below its actual average rate. If Slovakia had reached in 2000 a real per capita GDP of €4,100 and had then grown at an average of 3.0 percent per year over the next 14 years, its per capita GDP in 2013 would have been €6,021, only 1.47 times the value in 2000 and 45.27 percent of the actual value in 2013 of €13,300. Then instead of ranking 39th in the world in 2013, Slovakia would have ranked 120th near Nigeria and the Republic of Congo. This contrast between 3.0 and 4.0 percent growth helps us to highlight the importance of economic growth, not only in the case of Slovakia, but across the whole world as well. As we consider the region of Central and Eastern Europe (CEE), the GDP per capita and the level of development also differ between countries, where Slovenia and the Czech Republic are among the most developed within the region and Romania and Bulgaria lag behind.

The agricultural sector will play an important role in feeding the growing world population, despite its lower economic weight of primary sector. The economic importance of agriculture is historically much greater in the eastern and southern regions of Europe than it is in the western and northern part of Europe. The agriculture of the Central and Eastern European countries (CEEc) had significantly changed after the transition toward market economy. Among the main causes of the output decline in the agricultural sector of CEEc were worsening terms of trade as the consequence of price liberalization, farm restructuring and privatization and a statistical bias in reporting agricultural output before the reform. The share of agriculture, forestry and fishing sector in GDP has been decreasing over time. The average share of agriculture in the CEE region in 2000 was 5.40 %, while in 2014 it fell to 3.40 % GDP. The agricultural sector has been the most prominent as the percentage of GDP in 2013 in Romania, Latvia and Bulgaria, while the least represented was in Slovenia and Czech Republic. The CEE region in average exceeds the EU-28 in the share of agricultural sector. Moreover, the region experienced a significant decrease (by 45 percent) of labor force in terms of annual working units during the years 2000-2014. A statistical analysis of the GDP per capita and the share of agriculture in GDP revealed a significant negative correlation of -0.9342. Twenty years have passed from the change in regime and agriculture of CEEc is still considerably behind the original EU15 in terms of performance. Even though the policy regimes have changed and shifted toward market economies, it seems the sector of agriculture in CEEc cannot break the issue of inefficient input use. This can be partly attributed to the legacies of former regimes, but also to failure in adapting efficient policies and support systems in agriculture.

## 15.5 GDP and national income

The bottom half of the circular flow diagram (Figure 15.3) essentially described GDP – households purchasing output from firms in the product market, while the top half of the diagram reflected national income – returns to the factors of production through the resources market. In this simple diagram, with no government sector and no international sector, if there were no change in inventory accumulation, we suggested that GDP would be equal to NI.

GDP reflects the output/expenditure side of national economic activity, while national income focuses on incomes accruing to the factors of production (inputs, resources). We typically consider four factors of production: labour, land, capital, and entrepreneurship. Payments (incomes) to these resources are typically classified, respectively, as wages, rent, interest, and profit. Thus, in analysing economic activity from an income perspective, we consider the returns to these resources.

The Statistical office of the Slovak Republic presents national income statistics in three categories: (1) *compensation of employees*, (2) *gross operating surplus and mixed income* (GOSMI), and (3) *net taxes on production and imports*. The first of these three categories is straightforward, the total wages paid to workers. The third is also not difficult to understand – net taxes simply refers to total taxes paid by households minus subsidies received. The second of these categories, GOSMI, is more complicated.

Eurostat defines *operating surplus* as "the surplus (or deficit) on production activities before account has been taken of the interest, rents or charges paid or received for the use of assets"[63]. This portion of the second category embodies most of what would be contained in rents, interest and profit. The second portion of the second category, *mixed income* is defined by Eurostat as "the remuneration for the work carried out by the owner (or by members of his family) of an unincorporated enterprise. This is referred to as mixed income since it cannot be distinguished from the entrepreneurial profit of the owner" (EU, 2011b). By this definition, some portion of mixed income might be considered wages for self-employed workers and the remaining portion as profit to the enterprise.

Employee compensation consistently averaged around 40 % of national income during 1995-2009, ranging from a low of 36.3 % in 2007 to a high of 42.9 % in 1997. That said, however, that percentage has been dropping over time. Employee compensation averaged 41.5 % of national income from 1995 to 1999, dropped to 39.1 % from 2000 to 2004, and dropped again to 37.1 % from 2005 to 2009. Net taxes remained static during these same time frames, ranging from 9.4 % to 9.9 % of national income. The loss in employee compensation was taken up by the GOSMI category. GOSMI returns averaged 48.9 %, 51.0 %, and 53.5 % of national income during 1995-1999, 2000-2004, and 2005-2009, respectively. Thus, the returns to land, capital, and the owners of the enterprises were increasing while returns to labour were decreasing. Given that these last three resource categories are held, to a large extent, by wealthier citizens, it is quite likely that the distribution of income in Slovakia became more skewed in favour of the wealthy during the past 20 years.

Another relevant measure of economic activity is the *gross national product* (GNP) defined as "total market value of all final goods and services produced by national factors of production in a given time period":

$$GDP - \text{payments of factors income to foreigners} + \\ + \text{payments of factors income from foreigners} = GNP \qquad (15.8)$$

Depreciation is reflected in GNP, but it is not an income for anybody as it represents wear and tear of machines in the production process.

$$GNP - \text{consumption of fixed capital (depreciation)} = \text{net national product } (NNP) \qquad (15.9)$$

[63] EU. 2011b. Europe in figures. 2011. Luxembourg : Publications office of the European Union. 699 p. ISNN 1681-4789. Retrieved from <http://ec.europa.eu/eurostat/documents/3217494/5729317/KS-CD-11-001-EN.PDF>

Then,

$$NNP - \text{statistical discrepancy} = NI. \tag{15.10}$$

Statistical discrepancy exists because NNP is obtained in practice by adjustment of gross domestic product while NI is obtained by adding up all incomes (wages and salaries, rent, interest, and profits). If no measurement error occurs there would be no statistical discrepancy.

## 15.6 Business cycles

The natural expectation is that GDP and NI will increase over time. Unfortunately, however, as we have seen in the past few years, any economy is subject to market and environmental activities that can cause real GDP to fall. In general, we think of an economy as following a *business cycle of economic activity*, with both positive and negative real growth periods. Figure 15.12 shows a diagram of a reasonable growth path that an economy might take. The three positively-sloped portions of the curved function are known as the *expansion* phases of the business cycle, where the economy is growing in normal fashion. The top of each growth period is known as a *peak*. Two peaks are shown in this diagram. These peaks are then followed by negative growth periods known as *contractions*, with the bottom of each contraction known as a *trough*. After each trough, a new business cycle begins with a new expansion period. The period of time from one peak to the next peak is one business cycle.

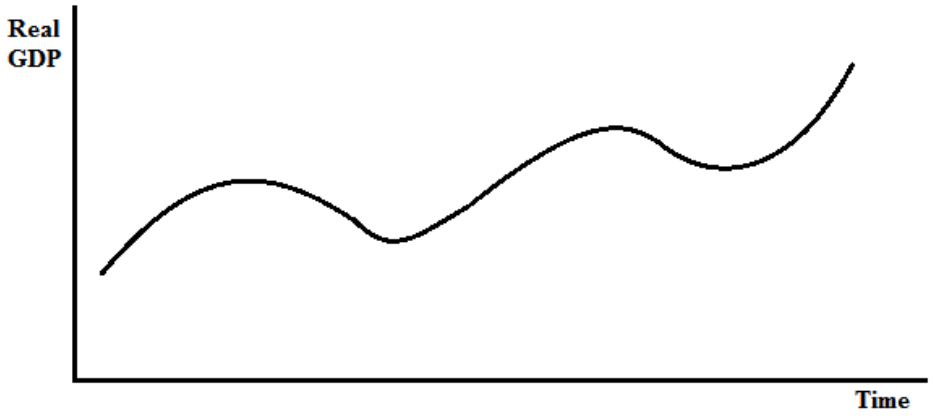



**Figure 15.12** Business Cycles

There is no standard period of time from one business cycle to the next, or a standard length of time for each expansion phase or each contraction phase. In addition, although we have shown the second peak as greater than the first peak, it is not necessarily the case that a later peak exceeds the former. An expansion period can be short-lived, leading to a lower second peak. Likewise, a second trough can be even lower than its preceding trough. This outcome is quite common when expansion periods are short. In recent years, worldwide economic activity took a long time before it attained to the peak of economic activity that it had enjoyed prior to the worldwide economic collapse in 2007.

## 15.7 Employment

Thus far we have focused mainly on GDP and other measures of aggregate economic activity in the Slovak Republic. GDP and national income measures allow for historical analyses, cross-country comparisons, and evaluations of structural changes in an economy. Unfortunately, GDP and national income data are reported only quarterly. Occasionally three months is a long-time period for firms looking to the future and seeking the latest and best economic forecast. The good news is that two other macroeconomic variables, the unemployment rate and the inflation rate are reported on a monthly basis and allow for intermediate data analyses when official GDP data are still months away from being reported. These next sections will examine those two variables in greater detail.

### 15.7.1 Unemployment and real GDP

In one sense, unemployment is easily understood – someone is not working who would like to be working. If you have ever been unemployed and looking for a job, you know that unemployment is not just a calculation of numbers. There are real emotional and psychological impacts associated with a person being unemployed, whether the unemployed person is completely new to the work force or is the head of a household and raising a family. Although they are important, these emotional and psychological impacts are well beyond the level of this text. We will focus simply on numerical calculations of the unemployment rate.

There is a link between GDP and employment. Higher levels of GDP are associated with higher employment and lower unemployment, while lower levels of GDP are associated with lower employment and higher unemployment.

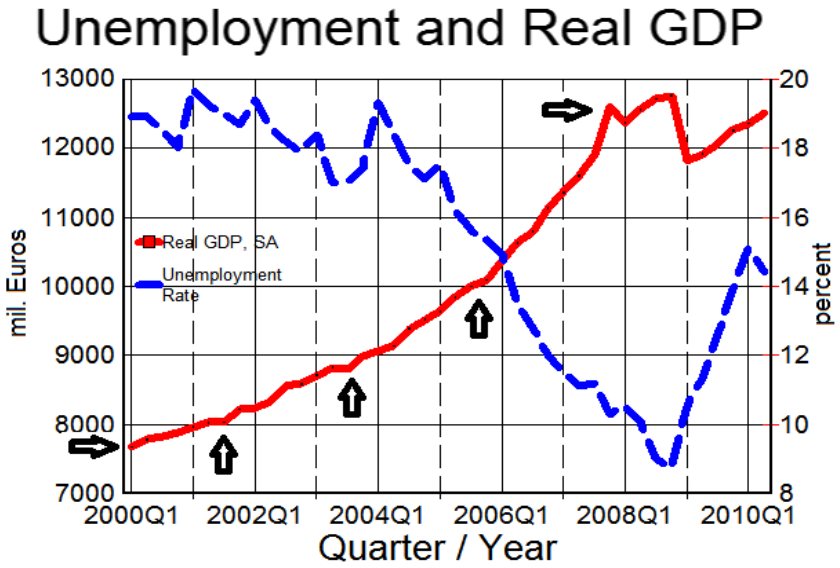



**Figure 15.13** The unemployment rate and real GDP
Source: SOSR[64], Slovstat

In Figure 15.13, real GDP and the unemployment rate are plotted, from the first quarter of 2000 to the second quarter of 2011. Real GDP (dashed line) is plotted with respect to the left vertical axis, with the unemployment rate (solid line) plotted with respect to the right vertical axis. Immediately we can see a strong negative relationship between real GDP and the unemployment rate, especially between 2004 and 2008.

[64] Retrieved from <http://www.statistics.sk/pls/elisw/MetaInfo.explorer?obj=63&cmd=go&s=1002&sso=2&so=15>

A more in-depth look at the data strengthens that negative relationship. There are five arrows noted on the real GDP data, each pointing to beginning and ending quarters when the real GDP growth rate was positive, and where that real GDP growth rate consistently increased (the lines connecting the data plots grow at a steeper slope). Table 15.5 summarises the results between these arrow points. Moving along the real GDP data path (reflecting consistent positive growth), the real GDP growth rate grows larger and larger and the unemployment rate drops lower and lower. During the period of strongest growth (2.6 % per quarter between 2005Q3 and 2007Q3) the unemployment rate experienced its sharpest decline, from 17.1 % to 12.5 %. This negative relationship is repeated in the recent worldwide recession, with real GDP dropping substantially from 2008Q4 to 2009Q1, and the unemployment rate rising – and continuing to rise in spite of later real GDP growth.

**Table 15.5** The unemployment rate and real GDP

| Period | Real GDP growth rate | Unemployment rate |
|---|---|---|
| 2000Q1 - 2001Q2 | 0.8 % | 18.9 % |
| 2001Q2 - 2003Q2 | 1.0 % | 18.2 % |
| 2003Q2 – 2005Q3 | 1.4 % | 17.1 % |
| 2005Q3 - 2007Q3 | 2.6 % | 12.5 % |

Source: SOSR

In order to calculate the unemployment rate in Slovakia, data analysts employ an approach recommended by the International Labour Organization and Eurostat[65]. A scientific "Labour Force Sample" (LFS) survey is conducted. Each quarter more than 10,000 randomly selected dwellings are sampled – approximately 0.6 percent of the total number of permanently occupied dwellings in Slovakia. Once selected, a household remains in the sample for six quarters. Questions are asked about age, gender, education and employment status for all members of the household who are 15 years of age or older.

The *unemployment rate* is then calculated as the number of unemployed persons in the LFS divided by the economically active population. Each of these terms needs some explanation. For the numerator, to be *unemployed* is to be not employed, where *employed* means working at least one hour per week in full- or part-time employment. An officially unemployed person must also be actively seeking employment during the previous four weeks and must be available for work within two weeks, if hired. For the denominator, the *economically active population* includes those persons aged 15 and over who are unemployed, civilian employed, or members of the armed forces. The category of people who are not economically active includes students, pensioners, children under 15 years of age, and people who choose to stay at home and not work. "Discouraged workers" – people who are unemployed, but have given up looking for work – are also excluded from the economically active population.

A person can be classified as employed, but still be underemployed, if s/he is working in a job below his or her skill level or is working one or more part-time jobs when s/he would prefer full-time work. The definition for *part-time workers* is common – someone not working full-time. However, the available data in SOSR do not fit the formal definition for underemployed, as given above. In the SOSR database, the percentages of full-time and part-time workers sum to 100 percent, with underemployed as an additional category. Hence the *underemployed in the LFS* survey must be workers who have identified themselves as either working below their skill levels or as part-time workers who would rather be full-time. That is, the number of part-time workers includes those who choose to be part-time instead of full-time and those who would rather be full-time and consider themselves to be underemployed.

[65] Retrieved from <http://www.statistics.sk/pls/elisw/utlData.htmlBodyWin?uic=81>

In Figure 15.14 we show plots of part-time workers and underemployed workers from the fourth quarter of 1998 to the fourth quarter of 2010. The numbers in both categories are rather small, compared to the overall unemployment rate numbers in Figure 15.13 above. The percentage of part-time workers stays completely in the 2-3 percent range until the third quarter of 2008, compared to the 9-20 percent range for the overall unemployment rate. When the overall unemployment rate begins its upward climb, the percentage of part-time workers also rises, climbing to 4.8 percent by the end of the 2010. The percentage of underemployed follows a similar, but lower pattern. The underemployed rate stays around one percent until the third quarter of 2008 when it also begins to rise. Its high mark in the data is also in 2010, when it rises to 3.2 percent.

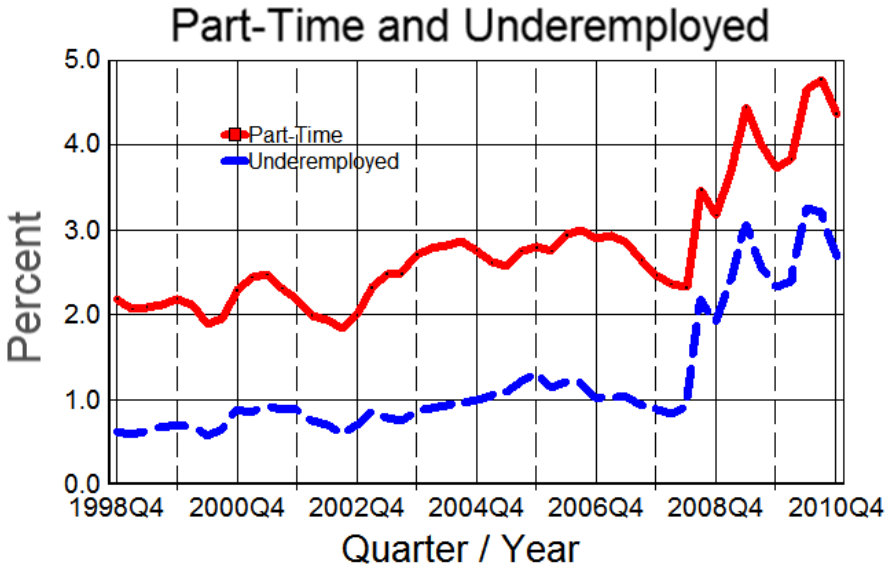



**Figure 15.14** Part-time and underemployed workers
Source: SOSR, Slovstat

So we see that the unemployment rate provides an imperfect, but somewhat reasonable measure for the level of economic activity in Slovakia. Moreover, because these data are released on a monthly schedule, data on unemployment can provide information to individuals, firm managers and government decision makers in between the quarterly releases of official GDP data. Data on price movements, which we will explore later in Chapter 15.12, are also released on a monthly basis and can provide further information on national economic activity.

### 15.7.2 Types of unemployment

Economists and policy makers are not interested simply in the numbers or percentages of people unemployed. They also want to know why people are unemployed – in a sense, what causes unemployment. Economists typically recognise three different types of unemployment – *structural, frictional, and cyclical*. Each of these types of unemployment has a root word that suggests the type of unemployment we are considering.

**Structural unemployment** occurs when the structure of the economy changes, as when agricultural workers are displaced by machines or when computer skills are needed for today's advanced service jobs. With structural unemployment, jobs may exist, but peoples' skills are not sufficient to fill the available positions.

**Frictional unemployment** relates to friction in the system, specifically in the information system that connects unemployed people with available positions. In this situation, unemployed persons have the

necessary skills and there are available positions in their field, but the unemployed persons don't know about the jobs and the hiring entity does not know about the potential applicant. With so much information readily available on the Internet, however, frictional unemployment is much less a problem than it used to be, especially for workers who are computer literate. For the unemployed who are older and less educated, newspaper want ads and knocking on doors remain the standard methods for job searching.

**Cyclical unemployment** is connected with economic business cycles. When economic activity is weak and the unemployment rate is high, much of the unemployment problem can likely be due to cyclical unemployment. Figure 15.13 together with Table 15.5 show how cyclical unemployment is associated with economic activity. As the real GDP curve gets steeper and steeper, indicating stronger growth, corresponding to peaks in the business cycle, the unemployment rate falls more quickly. But when real GDP growth slows and the curve flattens, the unemployment rate rises. Mostly we think of cyclical unemployment on a national scale, associated with real growth in the overall economy. But economically stressed regions of the country can also have much higher unemployment rates than the overall economy. That is, cyclical unemployment is not limited to the national economy.

Finally, there are two other unemployment-related terms that we need to mention, full employment and the natural rate of unemployment. *Full employment* occurs when the economy is strong and there is no cyclical unemployment – all unemployment is due to structural or frictional unemployment. The *natural rate of unemployment* is a closely related concept. Economists and government officials expect that there will always be a certain percentage of the population that is structurally or frictionally unemployed, simply because either their skills are lacking or job information is not available to them. That is, we expect at any point in time a natural rate of unemployment. Firms routinely lay off workers, cut back production, adopt more technologically advanced production methods, or move to new locations, all of which contribute to additional structural or frictional unemployment. We already noted that economists often suggest this natural rate of unemployment to be on the order of four to six percent. Full employment corresponds to this natural rate of unemployment. It is calculated as 100 percent minus the natural rate of unemployment. The economy is at full employment when the rate of cyclical unemployment is zero and all unemployment can be attributed to structural or frictional unemployment.

Finally, it should be noted that there is a natural rate of unemployment for other factors of production. That is, land and buildings can go "unemployed" when firms shut down or transfer their operations to another location. Whether retail or manufacturing or simple office space, it is expected that any local or regional or national economy will experience periods of reductions in business activity. Expressed in a positive sense, this unemployment rate for physical space is known as the *capacity utilization rate*. For a growing economy, an acceptable capacity utilization rate is 85 percent.

### 15.7.3 Employment and unemployment rate

Although GDP is the main statistic that is used to assess economic activity within a country or region, GDP is typically published only quarterly. By contrast, employment and unemployment data are obtained more easily (by surveys) and are published more often, typically monthly. However, in Slovakia unemployment data is also available on a quarterly basis only. When GDP is strong, a country's employment level is high and its unemployment rate is low. Thus, employment and unemployment data become very important in assessing economic activity in between the quarterly releases of GDP data.

Although employment and unemployment data are published as absolute levels (number of people employed or unemployed), they are better understood and more informative when expressed as percentages of the work force or of the overall population. The published data are estimates obtained from scientific representative surveys. According to Eurostat[66]: "The *employment rate* is calculated by dividing the number

[66] Eurostat is the statistical office of the European Union situated in Luxembourg. Its mission is to provide high quality statistics for Europe.

of employed persons aged 15 to 64 by the total population of the same age group. The indicator is based on the EU Labour Force Survey. The survey covers the entire population living in private households and excludes those in collective households such as boarding houses, university residence halls, and hospitals. The employed population consists of those persons who during the reference week did any work for pay or profit for at least one hour, or were not working, but had jobs from which they were temporarily absent."

Table 15.6 provides information on employment and unemployment rates in 2013 and 2014 for the Visegrad counties, the European Union, and the United States (where available).

**Table 15.6** Employment, unemployment, and under-employment

| | Employment rate | | Unemployment rate | | Part-time employment | | Second job? | | Long term unemployed | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (%) | | (%) | | (% of total employed) | | (%) | | (%) | |
| | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 |
| EU-28 | 64.1 | 64.9 | 10.9 | 10.2 | 20.4 | 20.4 | 4.0 | 4.0 | 5.1 | 5.1 |
| EU-27 | 64.2 | 64.9 | 10.8 | 10.2 | 20.5 | 20.5 | 4.0 | 4.0 | 5.1 | 5.0 |
| EU-15 | 65.0 | 65.6 | 11.1 | 10.5 | 23.7 | 23.8 | 4.0 | 4.1 | 5.2 | 5.2 |
| Euro-18 | 63.4 | 63.9 | 12.0 | 11.6 | 22.2 | 22.4 | 3.8 | 3.8 | 6.0 | 6.1 |
| Euro-15 | - | - | 12.0 | 11.6 | - | - | - | - | - | - |
| | | | | | | | | | | |
| Czech Rep. | 67.7 | 69.0 | 7.0 | 6.1 | 6.6 | 6.4 | 2.3 | 2.4 | 3.0 | 2.7 |
| Hungary | 58.1 | 61.8 | 10.2 | 7.7 | 6.8 | 6.4 | 2.6 | 1.7 | 4.9 | 3.7 |
| Poland | 60.0 | 61.7 | 10.3 | 9.0 | 7.8 | 7.8 | 6.9 | 6.4 | 4.4 | 3.8 |
| Slovakia | 59.9 | 61.0 | 14.2 | 13.2 | 4.8 | 5.2 | 1.2 | 1.0 | 10.0 | 9.3 |
| | | | | | | | | | | |
| USA | 63.3 | 62.9 | 7.4 | 6.2 | - | - | - | - | 1.9 | 1.4 |

Source: Eurostat[67] various tables, and U.S. Bureau of Labor Statistics[68]

The calculations of employment rates in the table show a great deal of variability, from a low of 58.1 percent in Hungary in 2013 to a high of 69.0 in the Czech Republic in 2014. Very likely this variability is due to the base group used to calculate the employment rate. The wider the age spread that is used as the denominator, the lower will be the employment rate. Furthermore, the employment rate reflects the level of economic activity in the country and institutional factors (15.11):

$$e = \frac{\text{Number of employed}}{\text{Work force}} \times 100 \tag{15.11}$$

The *unemployment rate* ($u$), however, is typically more standardised, most often calculated as a percentage of a country's work force, equation (15.12), where the work force does not include people who are retired, disabled, or otherwise "unfit" for work. In addition, to be unemployed a person must be available for work and must be actively seeking employment.

$$u = \frac{\text{Number of unemployed}}{\text{Work force}} \times 100 \tag{15.12}$$

Economists often suggest a *natural rate of unemployment* on the order of four to six percent. That is, we expect at any point in time that a certain percentage of the population will be unemployed due to firms laying off workers or cutting back production, or to individuals newly entering the labour force or moving to new locations. From the table, we see that unemployment was relatively high in all reported

[67] Retrieved from <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>
[68] Retrieved from <http://www.bls.gov/home.htm>

countries and regions in 2013 and 2014, in many cases more than double any natural rate of unemployment, owing in large measure to the slow recovery from the worldwide economic downturn that began in 2007/2008. The lowest unemployment rate in Table 15.6 was 6.1 percent in Czech Republic in 2014, while the highest rates were in Slovakia at 14.2 and 13.2 percent, in 2013 and 2014, respectively.

Unemployment rates, however, tell only part of the story. Many workers who are counted as employed are actually *underemployed* because they are working only part-time. Table 15.6 shows the percentage of employed workers who are actually working only part-time. These percentages for the European Union as a whole are much greater than for the Visegrad countries. The Visegrad countries range from about five percent to eight percent part-time employment, while the corresponding percentages for the European Union are on the order of twenty percent. Another indicator of underemployment is the percentage of people who hold a second job, presumably to enhance their full-time or part-time "first job" income. These percentages in the Visegrad countries range from about one percent in Slovakia to more than six percent in Poland.

Finally, the number of people who have been *long-term unemployed* gives yet another indication of the extent of economic activity (or inactivity!) within a country or region. These data are also provided in Table 15.6, where *long-term* is a period of one year or longer. People who have been long-term unemployed are initially short-term dismissals or layoffs who expect to find new employment within weeks or months. Unfortunately, either their lack of transferrable skills or an extended period of weak economic activity extends this short-term expectation to a long-term problem. The data in the table show that a great deal of the unemployment in Slovakia and Hungary is long term – more than two-thirds in Slovakia and just under half in Hungary. The EU also has about half of the unemployment rate as long-term unemployed, while those numbers for the United States are on the order of twenty to thirty percent. A second striking feature in this table is that long-term unemployment is lower in every country and region in 2014 as compared to 2013, again reflecting the long recovery from the Great Recession of 2007-2009. Note also that higher unemployment rates in 2013 as compared to 2014 are also associated with higher long-term unemployment. As unemployment increases, long-term unemployment increases – a double-edged sword!!

### Exercise

In 2014, Slovakia's work force as 2,722,000 people. How many Slovakians in 2014 were unemployed when we know the unemployment rate in that year (Table 15.6)?

*Solution*

By adjusting equation (15.12) we get that number of unemployed people equals the ratio $\frac{u \times \text{Work force}}{100}$. Substituting the known data, we get the specific number of unemployed Slovakians in 2014 as $(13.2 \cdot 2{,}722{,}000)/100 = 359{,}354$ people.

## 15.8 Slovak labour market

Over the past decade, the Slovak economy grew at the highest rate in the region. In real terms it increased by nearly 50 %. Despite such an impressive growth of GDP, Slovakia still faces a huge jobs deficit. The job market in the past decade underperformed economic growth – the unemployment rate is thus currently the fifth highest among the European countries. So, what were the key factors that led to a huge wedge between trends of GDP and the labour market? Primarily, there are two factors identified – the transformation of the economy towards high-productivity sectors, and the marked optimization of the demand for labour after the global financial crisis in 2009.

**Basic facts**

Population of SR: 5.42 mil. persons
Labour force (LFS): 2.71 mil. persons
Number of employed (LFS): 2.35 mil. persons
Average nominal wage in 2014: ~ 860 €/mo.
54.4 % of registered unemployed got stuck in unemployment for more than 12 months
Youth unemployment exceeds 33 %, seventh highest in the EU
*(LFS: Labor Force Survey)*

**The transformation towards high-productivity sectors and the optimization of labour after the financial crisis in 2009 put a downward pressure on job creation.**

The increase of GDP in the past decade was driven primarily by sectors with a high growth of productivity. Growing output, thus, did not need a proportional increase of job numbers. While Slovak GDP increased the most in the region (Figure 15.15), the increase of job numbers in the same period was surpassed by 11 European countries. This trend was visible mainly in industry. In the past decade, it contributed to the overall growth of economy by nearly two-fifths, while the number of jobs in this sector in the corresponding period decreased by nine percent. During the period 2003-2013, a 2.4 percent year-on-year growth of GDP was a minimum threshold needed for job creation. As shown in the chart below, this was one of the highest thresholds in the European region.

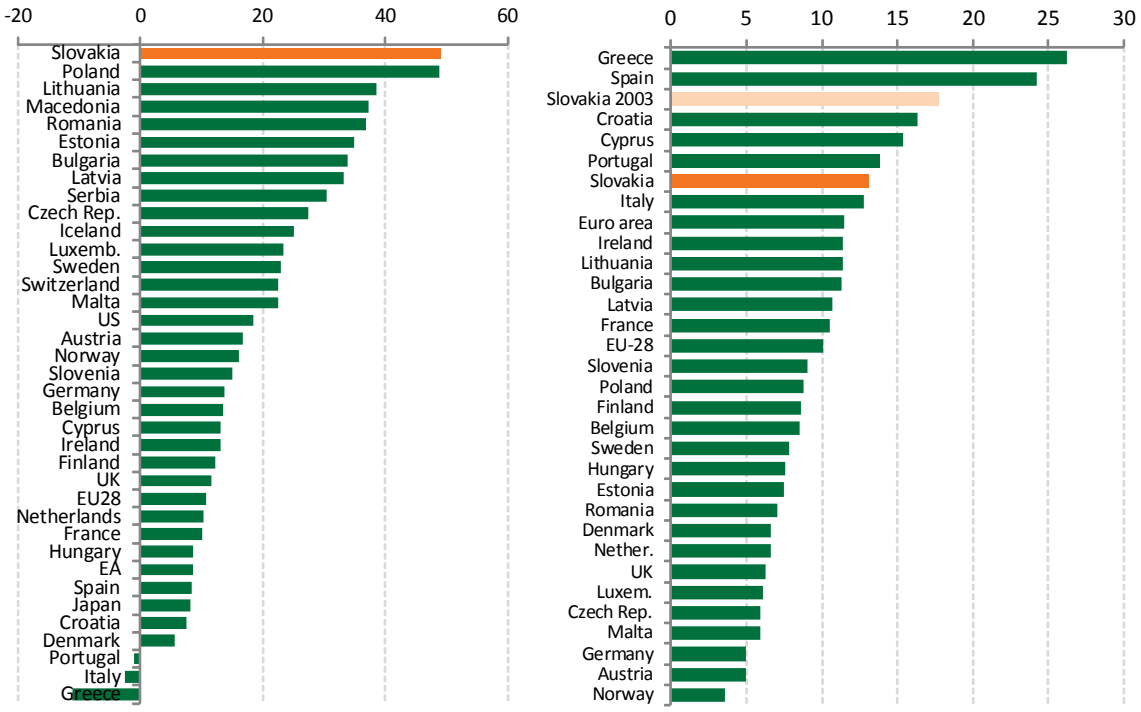



**Figure 15.15** Real GDP % growth 2003-2013, and unemployment rate %, 2014Q3
Source: OECD database

The development of the domestic labour market in the past decade can be basically divided into two periods. In the first period 2003-2008 (Figure 15.16), before the negative impact of global financial crisis, employment increased well above the European average pace. In the following five years, by contrast, employment sharply decreased, more than on average elsewhere in Europe.

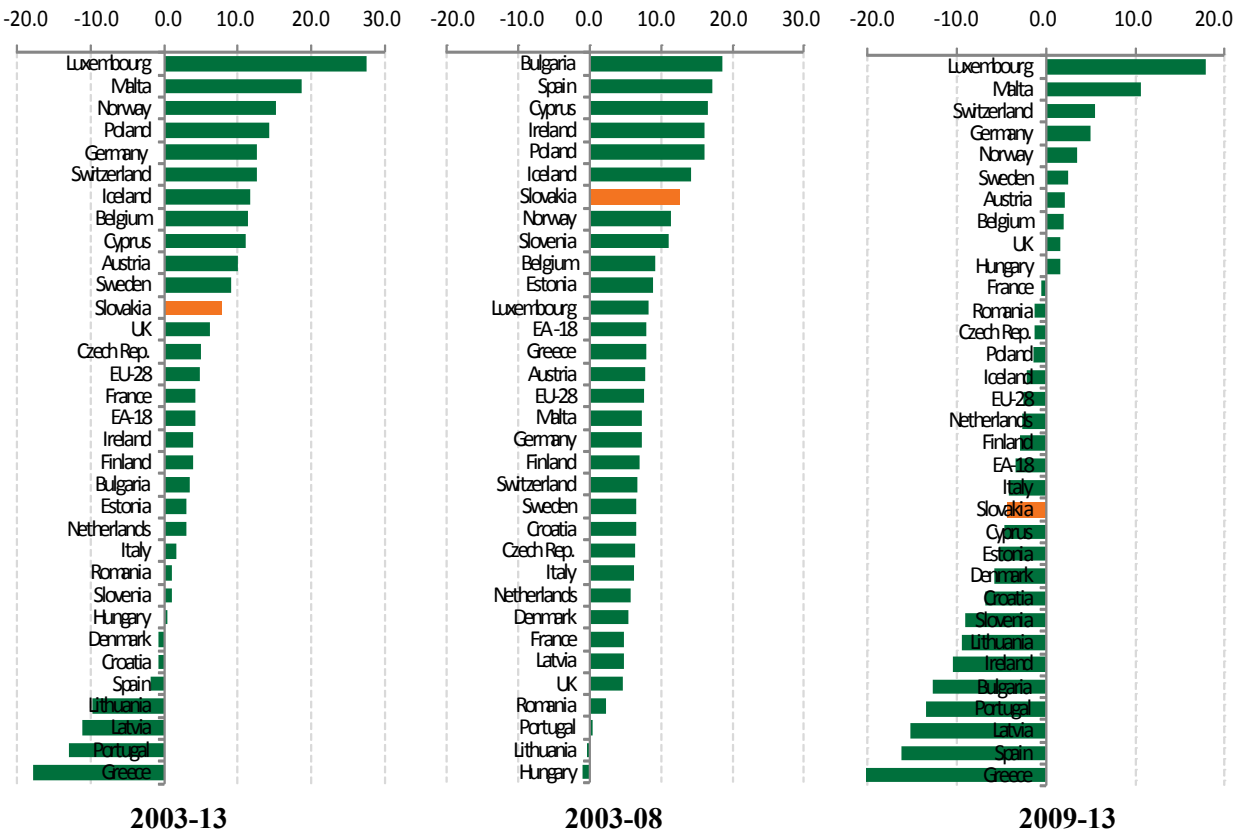



**Figure 15.16** Growth of employment (%)
Source: OECD database

The domestic job market has undergone a notable optimization. While GDP in real terms has already increased well above its pre-crisis level, the labour market has lost some 50,000 jobs from its pre-crisis peak (Figure 15.17).

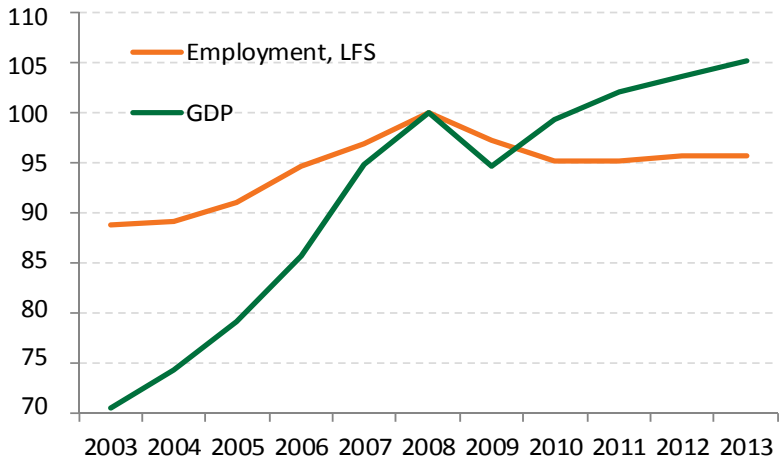



**Figure 15.17** Employment vs GDP in Slovakia, index 2008=100
Source: Macroeconomic database of NBS

**The latest trend is more favourable, with a positive correlation also with wages.**
Since its latest peak at 14.8 % in January 2013 (Figure 15.18), the registered unemployment rate (measured by labour offices claimants) decreased to 12.29 % in December 2014, the lowest December reading since 2008. Positively, the bulk of this improvement was due to the domestic job market.

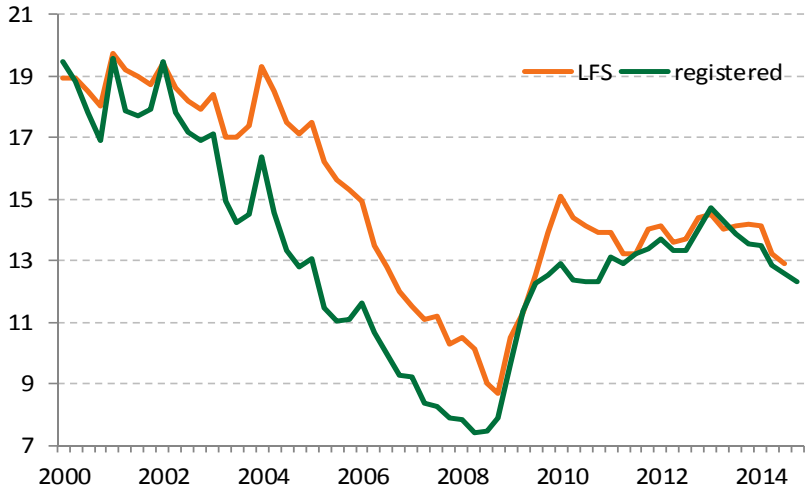



**Figure 15.18** Slovak unemployment rate, LFS vs. registered claimants
Source: Macroeconomic database of NBS

Apparently, the labour market has responded to recent economic growth better than on historic norms. The development of high-productivity sectors slowed down relative to previous periods which allowed the number of jobs to grow even in a slower growth economy. As shown in the charts below, while in 2001-2009 at least 3.5 percent year-on-year GDP growth was needed for unemployment reduction, in recent years this threshold notably decreased to slightly below 3 %. This change also holds globally.

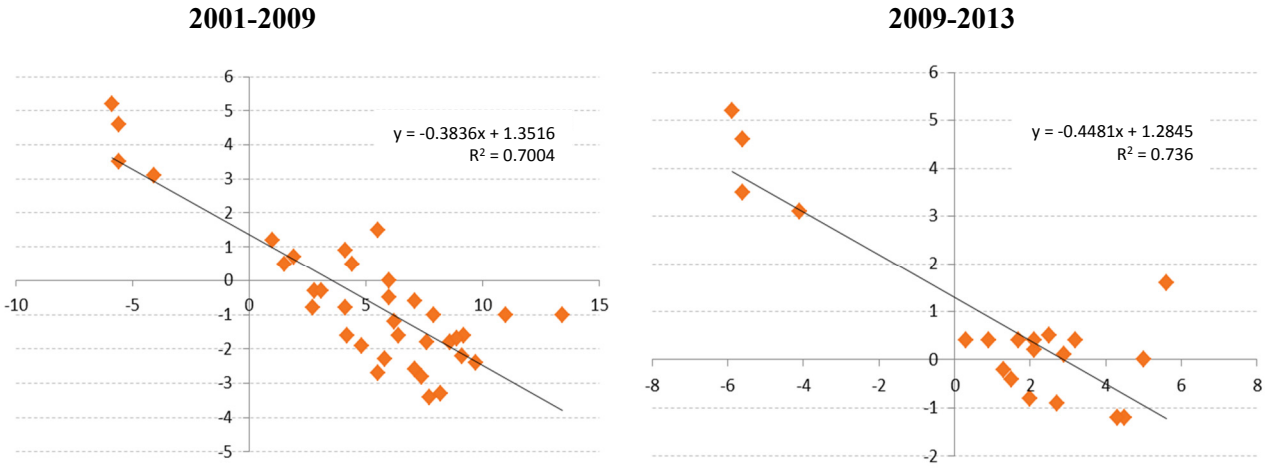



**Figure 15.19** Slovak unemployment vs GDP growth in two different periods
(LFS statistics, UR lagged 2 quarters)
Source: Macroeconomic database of NBS

Global unemployment recently decreased in 2010-2012 despite an anaemic growth of the world economy (Figure 15.20). This can be explained primarily by anaemic growth of labour productivity and labour supply.

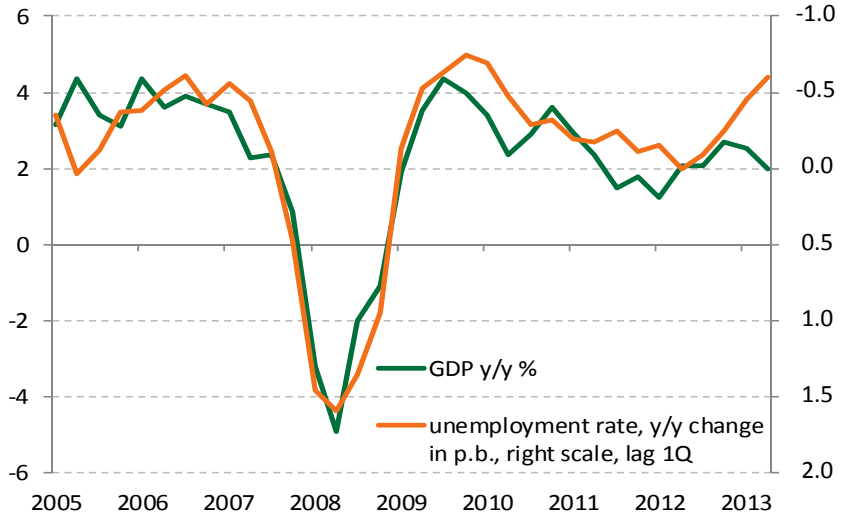



**Figure 15.20** Global economic growth vs change of global unemployment rate
Source: Eurostat

In 2014, the growth of wages outperformed expectations. The full-year growth in nominal terms reached approximately 4.3 percent, posting payback for previous anaemic growth of 0.9 % in 2013 and decreases in the previous two years, -1.2 % in 2012 and -1.6 % in 2011, respectively. Adjusting for price decreases in 2014, real wages increased in the previous year even by 4.4 %, the first time in the post-crisis period that wages surpassed the growth of productivity. In following years, the growth of nominal wages will likely be partially weighed down by low inflation, but on the other hand boosted by further increases in productivity. Taking into consideration the most likely scenario of zero inflation, real wages were expected to follow a fairly favourable trend in 2015.

**Current trends - Slovak jobless rate approaches EMU average.**

As of late 2015 (Figure 15.21), the Slovak unemployment rate is declining, approaching the Eurozone average, which is quite a positive development, given that Slovak unemployment rates tend to be among the highest in the EU.

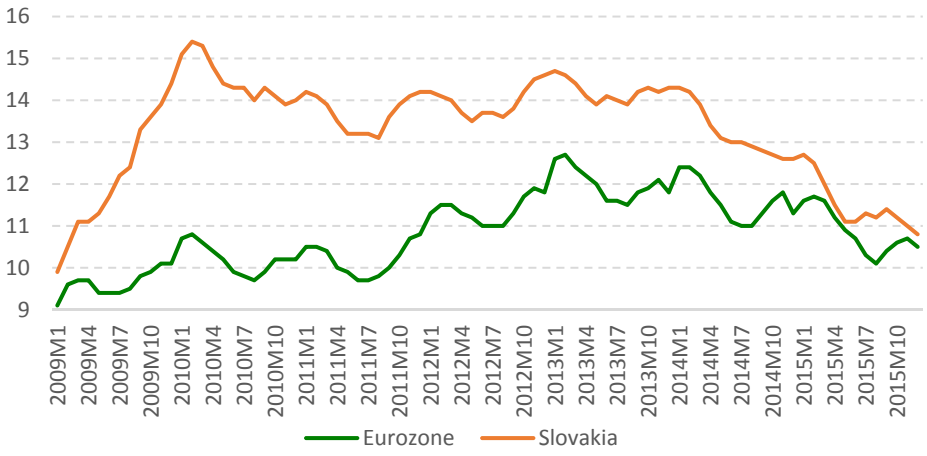



**Figure 15.21** Unemployment rate – SR vs. EU (%, ILO measure)
Source: Eurostat

### Structural unemployment

In Table 15.7, we introduce information on the sectorial structure of employment in Slovakia. Besides high unemployment, a shortage of high proficiency employees may be observed, especially in the Information Technology, automotive and healthcare sectors. During the peak growth year of 2008, a large number of employees were imported to Slovakia from abroad (e.g. Romania, Bulgaria...), while the jobless rate would remain stubbornly over 8 %.

A large part of unemployment in Slovakia is associated with the (mostly Roma) population living in remote segregated villages with close to 100 % unemployment. Prevailing basic education, accompanied with the remoteness meant that fighting unemployment in these locations proved hard even in the 2006-8 boom.

**Table 15.7** Structure of employment by sectors

| Sectors | Employment in thousand people | % share |
|---|---|---|
| **Economy in total** | **2 334** | **100** |
| Agriculture | 77 | 3 |
| Mining and quarrying | 11 | 0 |
| Manufacturing | 535 | 23 |
| Electricity, gas, stream | 24 | 1 |
| Water supply, sewerage | 26 | 1 |
| Construction | 237 | 10 |
| Trade | 302 | 13 |
| Transport and storage | 149 | 6 |
| HORECA | 116 | 5 |
| IT | 48 | 2 |
| Financial services | 51 | 2 |
| Real estate activities | 17 | 1 |
| Professional activities | 70 | 3 |
| Administrative services | 66 | 3 |
| Public administration | 199 | 9 |
| Education | 166 | 7 |
| Healthcare | 167 | 7 |
| Arts & entertainment | 31 | 1 |
| Other services | 35 | 2 |

Source: SOSR, VÚB

### Long term unemployment

Another big challenge for the Slovak economy is long-term unemployment. 54.4 % of registered unemployed workers were stuck in unemployment for more than 12 months at the end of 2014. While down from its latest peak of 54.9 % in 3Q14, the current rate still exceeds the levels of the pre-crisis period by wide margin. See Figure 15.22 for details.

### Unemployment of youth

As with overall unemployment, youth unemployment is a big problem for the Slovak economy. Unemployment among 15-24 year-old group reached 33.7 % at the end of 2013, which is the seventh highest reading among EU countries, similar to the ranking in overall jobless statistics. In fact, despite being much lower in the pre-crisis boom period, youth unemployment in Slovakia has been one of the highest in EU for a long time. A recent minimum of 19 % unemployment in the boom period in 2008 was similarly

still the seventh highest reading in EU. That is the same position that Slovakia holds also in the unemployment rate in the 15-29 year-old group. From November 2012 to September 2015 the SK government spent €200 mil. in an effort to reduce unemployment among young people. Along with the overall improvement of the labour market, recent months have already delivered some improvement in the youth unemployment rate, edging down from the maximum of 34 % in 2012. And judging by labour offices statistics, a moderate decline in youth unemployment continued also through 2014.

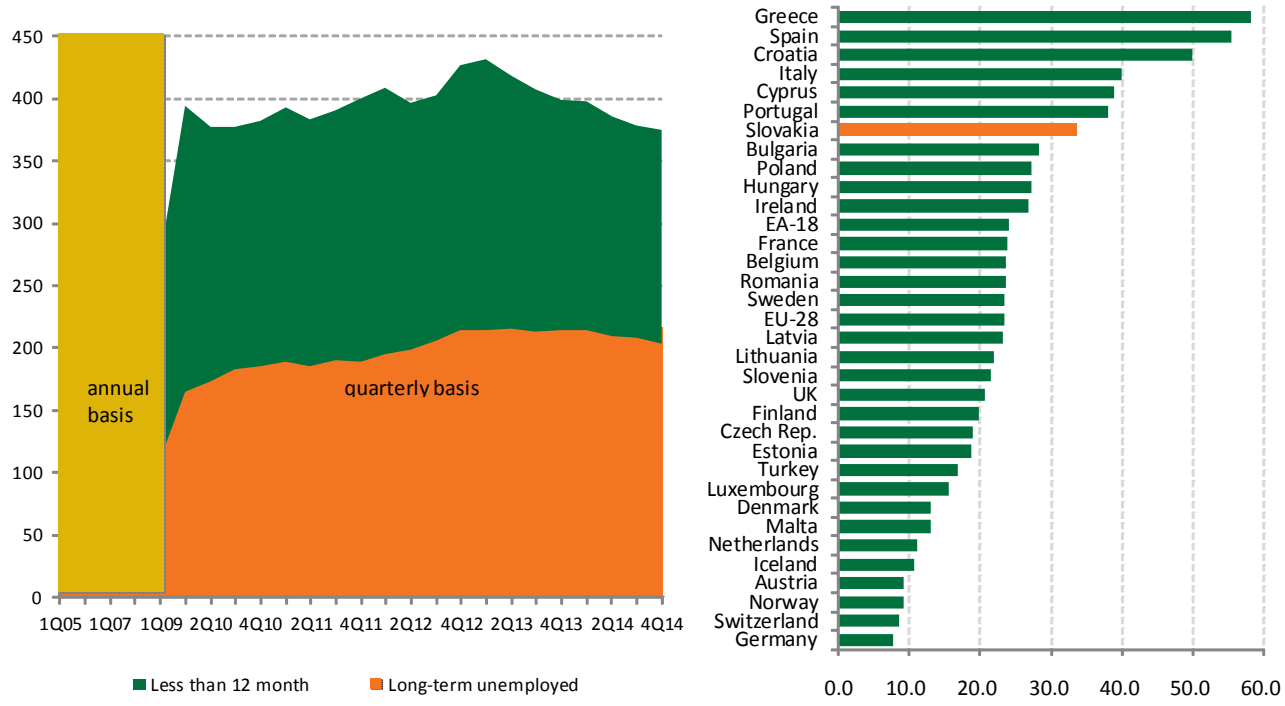


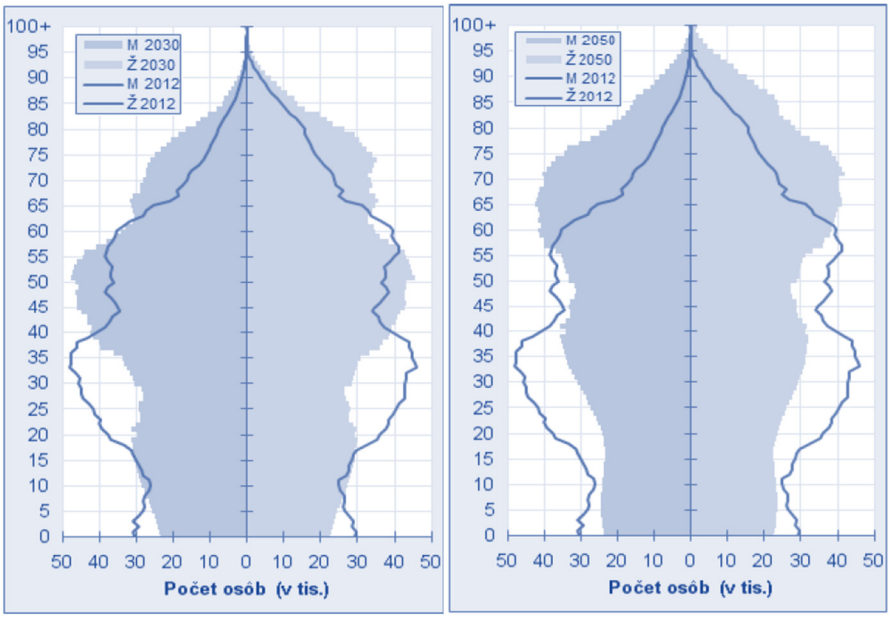

**Figure 15.22** Long-term unemployment in SR (thousands of persons registered by labour offices)

Youth unemployment in SR (%, 15-24-years-old)

Source: OECD database

## Ageing of the Slovak population

At the moment, Slovakia has one of the youngest populations in Europe. In 40 years, its population will be the oldest in Europe. This demographic shift will imply unprecedented pressure on the labour market, the pension system, and health care. The expected development of the age structure in the population of SR over the next decades is depicted in Figure 15.23. By the year 2060, the population of Slovakia is expected to shrink from the current 5.4 mil. to 4.6 mil. inhabitants. The portion of 65-year-olds is expected to grow. Today, the number of old persons equals 13 % of the total Slovak population; in 2060 it will be more than 35 %. The portion of very old people aged 80 years and more, will grow even faster, from 3 % to 13 %.




**2030** **2050**

Note: M – male, Ž – female

**Figure 15.23** Age structure of Slovak population, thousands of people
Source: Bleha, Šprocha, Vaňo (2013)[69]

[69] Bleha, B. – Šprocha, B. – Vaňo, B. 2013. Prognóza populačného vývoja Slovenskej republiky do roku 2060. Bratislava : INFOSTAT. 81 p. ISBN 978-80-89398-23-2.

## BOX
## Methodology of the labour market[70]

The methodology of the Labour Force Survey (LFS) indicators fully corresponds to the ILO recommendations and the Eurostat definitions.

**Economically active population (labour force)** - persons aged 15 and over that are employed or unemployed. From the 1st quarter 1997 to the 4th quarter 2005, conscripts on compulsory military service were included in the LFS.

**Employed** persons are defined as all persons aged 15 and over who during the reference week:
- worked at least one hour of work for pay or profit (full-time or part-time job, permanent, temporary, casual or seasonal job) including employed persons working abroad up to 1 year, cross-border commuters, persons working under agreements on work performed outside employment relationship and persons who performed activation works,
- had a job but did not work due to illness, holiday, maternity leave, training, bad weather conditions, strike and lock-out except for persons on long-term unpaid leave from work and persons taking parental leave,
- the employed persons also include unpaid contributing family workers.

**Employees** - persons who work for a public or private employer and who receive compensation in the form of wage, salary or another remuneration, including members of productive co-operatives.

**Members of productive co-operatives** - persons who are members of agricultural and productive co-operatives and have formal job attachment in the co-operatives.

**Self-employment jobs** - self-employed with employees (employers), self-employed without employees (own-account workers) and contributing (unpaid) family workers.

**Underemployed** - persons who are working part-time, wishing to work more and available to start a new job within two weeks.

**Unemployed**[71] - all persons aged 15-74 who were
1. not working for pay or profit during the reference week,
2. actively seeking work during the last four weeks or who found a job to start within a period of at most 3 months,
3. able to start work in the next two weeks following the reference week.

The following are considered as active search methods: contact with the public employment office or with a private agency to find work, asking among friends or relatives, using job advertisements, applying to employers directly, taking a recruitment test or examination or being interviewed, looking for land, premises or equipment, applying for permits, licenses of financial resources.

**Duration of unemployment** - is defined as the shorter of the following two periods: the duration of search for work, or the length of time since the last employment.

[70] SOSR. Retrieved from <http://www.statistics.sk/pls/elisw/utlData.htmlBodyWin?uic=80>
[71] The Eurostat definition of unemployment is harmonised under Commission Regulation (EC) N° 1897/2000.

**Economically inactive population (persons out of labour market) aged 15 and over** - all persons aged 15 years and over who are not classified as economically active. They are defined as persons who were not working for pay or profit during the reference week and were not actively seeking work during the last four weeks or who were actively seeking work during the last four weeks but were not able to start work in the next two weeks following the reference week (students, apprentices, pensioners, persons keeping household, persons on parental leave, persons in re-training course, discouraged workers).

**Economically inactive population in total** - economically inactive population aged 15 and over and children aged up to 15 years.

**Economic activity rate** (participation rate) - economically active persons as a percentage of the population aged 15 and over.

**Economic activity rate by age** - the percentage of persons aged 15 and over in certain age group who are economically active.

**Employment rate** - persons in employment as a percentage of the population aged 15 and over.

**Employment rate by age** - the percentage of the population in certain age group who are employed.

**Employment rate by education** - the percentage of the population with concrete level of education who are employed.

**Unemployment rate** - unemployed persons as a percentage of the economically active population.

**Unemployment rate by age** (specific unemployment rate) - the percentage of economically active persons in certain age group who are unemployed.

**Unemployment rate by education** (specific unemployment rate) - the percentage of economically active people with concrete level of education who are unemployed.

**Enterprise statistics on labour**
Data sources concern all economic activities and cover:

- enterprises with 20 and more employees incorporated in the Business register; in organisations of financial intermediation and in all non-profit organisations irrespective of the number of employees, as well as enterprises with less than 20 employees which have a turnover of €5 million and more (quarterly questionnaires: Prod 3-04, Pen P 3-04, Pin P 3-04, Poi P 3-04, Práca 2-04 and Práca 3-01);
- enterprises up to 19 employees incl. incorporated in the Business register (quarterly questionnaire Prod 13-04);
- estimates of the number of entrepreneurs unincorporated in the Business register conducting business in the main activity and their employees.

**Average number of employed persons** covers employees and entrepreneurs.

**Average registered number of employees** includes permanent and temporary employees who are in working relationship to the organisation (in cooperatives where working relationship is part of the membership), irrespective of their presence or absence in work, e.g. due to sickness, holiday and also employees who did not work e.g. due to downtime, strike, lockout. Short-time workers are covered as well. Persons on maternity leave, apprentices and trainees, persons working on the basis of the special non-employee agreements are excluded.

**Job vacancy rate** is calculated according to the formula:

Job vacancy rate in % =

number of job vacancies / number of occupied posts + number of job vacancies *x* 100

**Job vacancy** is defined as a paid post (newly created, unoccupied or about to become vacant) for which the employer is taking active steps to find a suitable candidate from outside the enterprise concerned and is prepared to take more steps and for which the employer intends to occupy. Active steps to find a suitable candidate include are as follows: notifying the job vacancy to the public employment services, contacting a private employment agency/head hunters, advertising the vacancy in the media (internet, newspapers, public notice board); direct recruitment of possible candidates and use of trainees for job vacancy.

**An occupied post** that becomes vacant due to long-term absence (regular and additional maternity leave) and long-term sickness (more than 4 weeks) is considered to be the job vacancy as well. In the case of a reservation of the job vacancy for a concrete candidate, who has not started work yet, this is no longer a job vacancy but this is not still considered as an occupied post. An occupied post is a paid post within an organisation to which its employee has been assigned. Usually, the number of occupied posts is equal or less comparing to the registered number of employees in physical persons. Posts in the user firms, which have hired employees from temporary-work agencies, are considered to be occupied and/or vacant in those agencies. In the branches with a multi-shift operation (e.g. manufacturing, trade, services) the working post occupied by several employees is counted as the one post. If the working post is occupied partly (e.g. two shifts occupied in a tripleshift operation, the third shift is unoccupied) and employer intends to take active steps to occupy it, this post is considered to be vacant. Otherwise, that working post is occupied.

**Average number of occupied posts or job vacancies (unoccupied posts)** per quarter is calculated as an arithmetic average of number of job vacancies or occupied posts of the last day of each month in the reference quarter. Example of the calculation: as of January 31, the organisation had 100 occupied posts, as of February 28 it was 120 occupied posts, as of March 31, the organisation had 101 occupied posts. In the first quarter, the average number of job vacancies was according to formula (100 +120 +101)/3 = 107.

## 15.9 Key factors of demographic changes

### Life expectancy

Slovakia is trying to converge up to western standards; the quality of life in Slovakia continues to improve and the average life-span has increased also. Life expectancy at birth for males is predicted to increase by 9.7 years over 2013 -2060. The projection for females anticipates a 7.5 years life-span increase.

**Table 15.8** Projection of the expected life-span in the SR and EU, 2060 projection

| Country | Men | Women |
|---|---|---|
| SR | 82.3 years | 87.4 years |
| EU | 84.8 years | 89.1 years |

Source: European Commission (EC), 2014[72]

So, the good news is that on average the current generation will live more than 8 years longer than its grandparents. Slovak life expectancy is growing even faster than the EU average. However, even in 2060 Slovak men and women will die earlier than their average European counterparts, as shown in Figure 15.24.

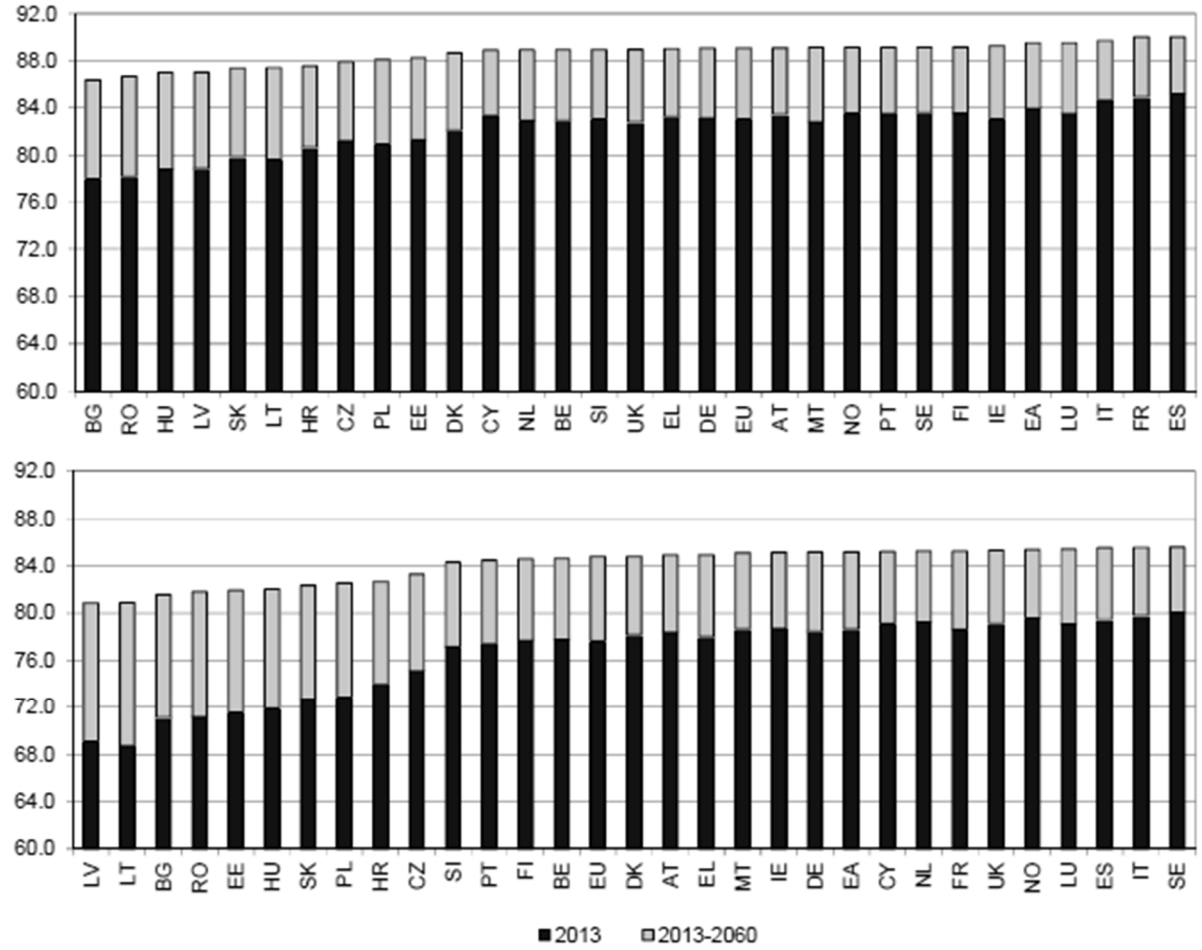



**Figure 15.24** Projection of the expected life-span in the EU countries for the 2013 – 2060 time period
Source: EC, 2014

[72] EC. 2014. The 2015 ageing report: Underlying assumptions and projection methodologies. ISSN 1725-3217. Retrieved from <http://ec.europa.eu/economy_finance/publications/european_economy/2014/pdf/ee8_en.pdf>

### Low fertility

It seems that Slovaks are not so good in mating - in Slovakia, the fertility rate is currently extremely low even if compared with the already low EU average as it is shown in the figure below.

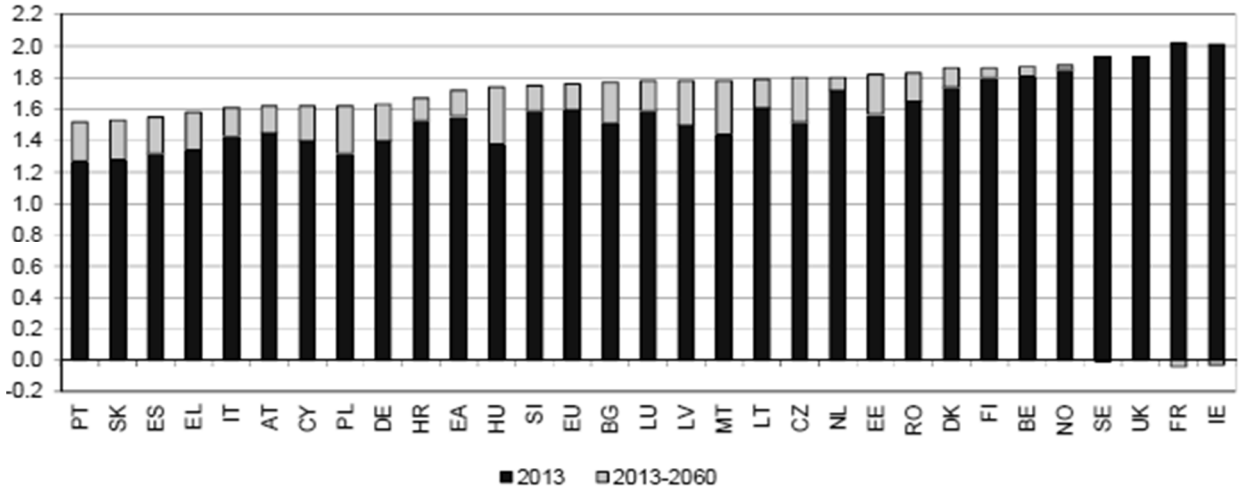



**Figure 15.25** Projection of the fertility in SR for the 2013 – 2060 time period
Source: EC, 2014

While the basic primary fertility rate should be at least 2.1 children per woman in order to maintain the size of the population, in Slovakia this number is far lower. In 2014, on average there were 1.37 children born to a Slovak woman. The projection expects a slight increase, but not enough to reach the EU average (1.76 in 2060; EC, 2014). It is predicted that there will be 1.53 children born per woman in 2060 in Slovakia. However, this number is still low, and will lead to the decrease in the size of the Slovak population.

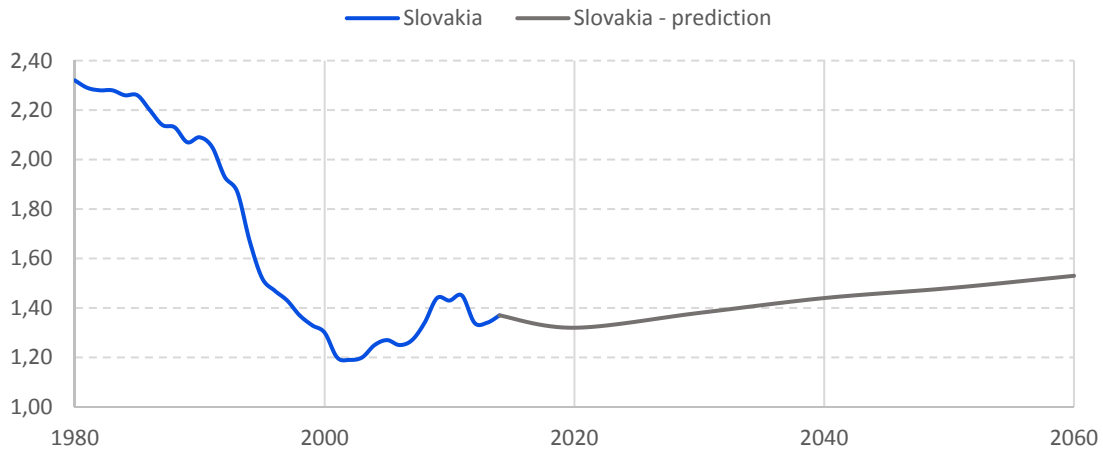



**Figure 15.26** Number of childbirths per woman (SR)
Source: EC, 2014 and SOSR

### Aversion to immigration

Slovaks live longer, bring up fewer children, and do not like immigrants. When compared with the rest of Europe (Figure 15.27), Slovakia is among the countries with lowest net migration, and this trend does not seem likely to change.

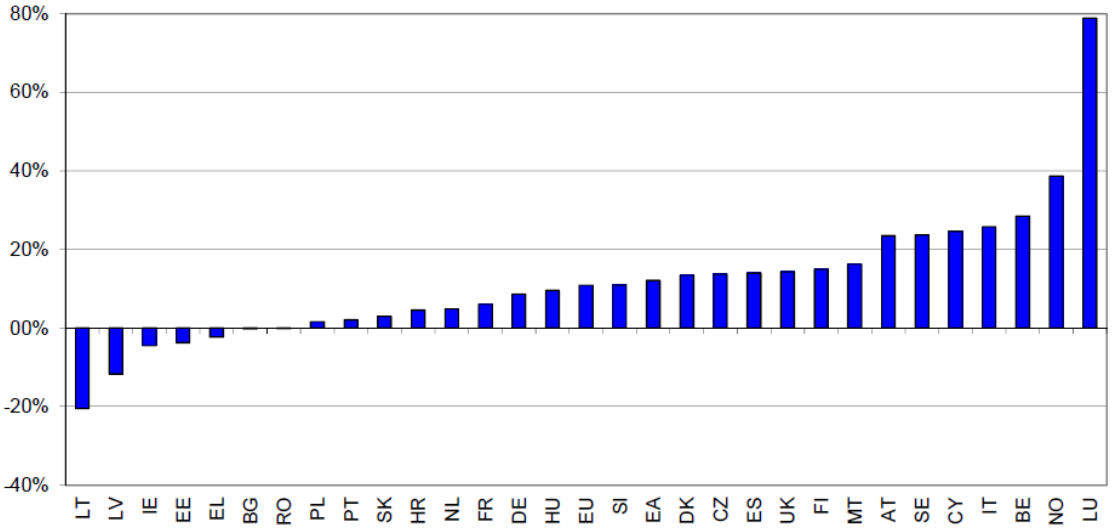



**Figure 15.27** Net immigration in the EU countries estimated for the period of 2013 – 2060, % of population
Source: EC, 2014

The population-aging problem is common throughout Europe; however, in Slovakia it is getting even more serious. In the coming decades, fewer people will enter the workforce every year because of the low fertility rate. But since people live longer, there will be even fewer young people caring for even more old people, approaching a point where almost half the population will be over 65 years old (Figure 15.28).

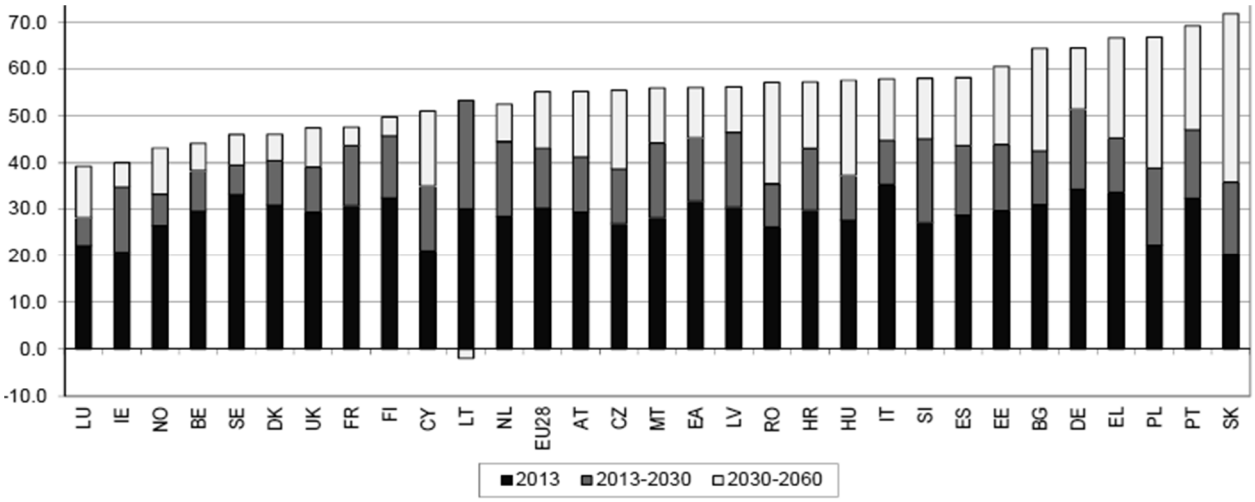



**Figure 15.28** Older age dependency index: Number of 65+ year old population to the working age population ratio
Source: ECF, 2014

## 15.10 Impact of demographic changes on the economy

By 2060, the number of the working age people will decrease by 1.4 mil. in Slovakia (Figure 15.29). The workforce will shrink from 2.7 mil. people now to 1.7 mil. people in 2060 (not shown).

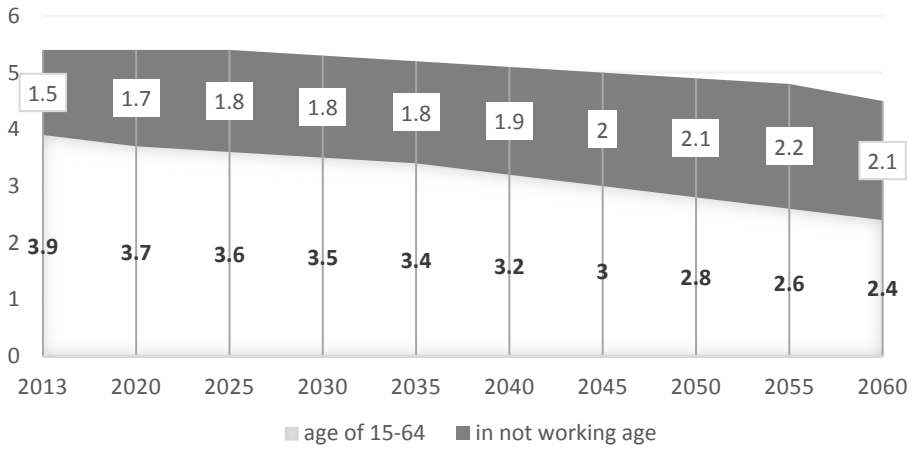



**Figure 15.29** Expected population change in SR (mil. people)
Source: EC, 2014

### Pension system expenditures

The SK pay-as-you-go system as we know it now will not be sustainable for much longer. By 2060, the average number of workers financing one retired will shrink from current 1.75 worker per 1 retired person to 0.98 worker per pensioner (Figure 15.30).

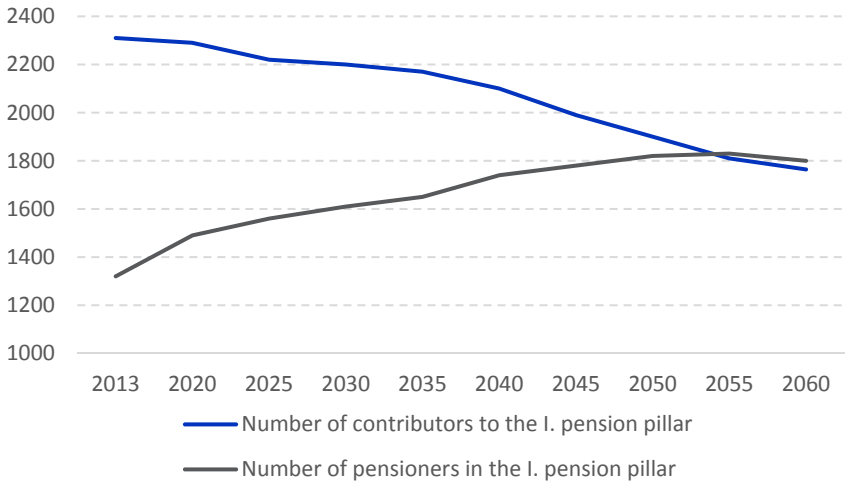



**Figure 15.30** Expected number of workers and pensioners in SR (thousands of people)
Source: EC, 2014

However, this is already an improvement compared to the projection three years ago, where it seemed there would be only 0.74 workers per one pensioner (two workers were expected to care for three pensioners). This 'improvement' was reached mainly by parametric changes in the state pension system: the Pay-As-You-Go (PAYG) system was reformed in 2012, with the working age extended by 5 years and retirement delayed. These changes will become a trend in coming years. The generation entering the workforce now will have to work until a higher age (their number of years of working and saving for

pension will grow and exceed 40 years spent at work) and will finance more pensioners (the number of pensioners will grow and exceed the size of the workforce).

### Healthcare expenditures

An ageing population will create an even bigger burden on the healthcare budget than on the pension system, as shown in Table 15.9.

**Table 15.9** The income and expenses sensitive to the population aging (% of GDP)

| | 2014 | 2020 | 2030 | 2040 | 2050 | 2064 | 2064-2014 |
|---|---|---|---|---|---|---|---|
| **Social security and health insurance contributions** | **13.7** | **13.2** | **13.2** | **13.4** | **13.6** | **13.7** | **0.1** |
| **Expenditures:** | **18.6** | **18.4** | **18.3** | **18.5** | **19.3** | **21.4** | **2.8** |
| Pension benefits | 8.3 | 8.2 | 7.7 | 7.6 | 8.1 | 9.7 | 1.3 |
| Retirement pensions policemen and soldiers | 0.4 | 0.3 | 0.4 | 0.4 | 0.4 | 0.4 | 0.1 |
| Health care | 5.2 | 5.4 | 5.9 | 6.2 | 6.5 | 6.7 | 1.5 |
| Long-term care | 0.3 | 0.3 | 0.4 | 0.5 | 0.6 | 0.7 | 0.4 |
| School system | 4.1 | 3.9 | 3.8 | 3.6 | 3.7 | 3.8 | -0.4 |
| Unemployment benefits | 0.2 | 0.1 | 0.1 | 0.1 | 0.1 | 0.1 | -0.1 |

Source: Council for Budget Responsibility (RRZ), 2015[73]

The demography changes will put a high pressure on public finance. According to the Fiscal watchdog, if Slovakia maintains current policies without any structural changes, Slovakia will face state bankruptcy in three electoral cycles. This fact is supported also by data of the Council for Budget Responsibility (see Figure 15.31).

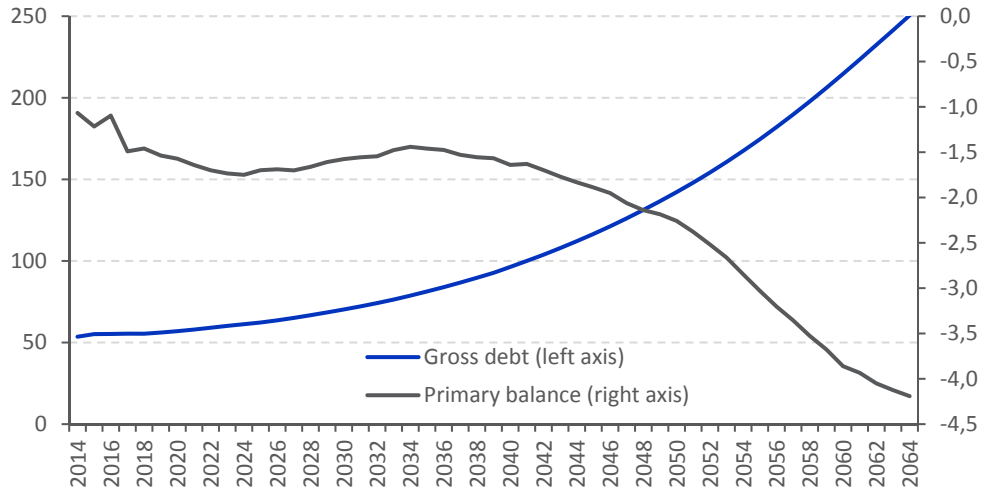



**Figure 15.31** Public finance of the SR: Development of debt and primary balance
Source: RRZ, 2015

[73] RRZ. 2015. Správa o dlhodobej udržateľnosti verejných financií. Retrieved from <http://www.rozpoctovarada.sk/download2/sustainability_report_2015_final.pdf>

### 15.10.1 What are the solutions?

**Fertility increase**

Governments have had several experiences with policies supporting fertility increases or decreases. Some were more successful than others. The most recent baby boom in our country was observed during the 1970s. It accompanied massive urbanisation and blocks of flats construction, kindergartens and other facilities for families.

**Workforce size enhancement**

*In Japan, low fertility has gone so far, that the state engages in organising dating sites for singles. : )*

The workforce may be enhanced by higher participation of the population in work, such as integrating the unemployed into the workforce, longer working age, higher retirement age, more part-time jobs, and special groups of potential workforce participants, including mothers of young children, students at universities, and retired people. Another option for work force enhancement is immigration. Persons from abroad may join our work market and supply the missing workforce. However, our society is not very open to accepting immigrants.

**Workforce productivity increase**

In some fields, we already see rather substantial productivity increase. A great deal of this occurs thanks to science, technology, computers, the Internet, and robots, among others. However, not all human activities may be subject to productivity increases. In fact, the jobs directly interconnected with the problem of the ageing population are the ones least affected by the science and technology inventions - caring for old and ill people requires as much human workforce in the future as it did in the past.

**Changes in the Pay-As-You-Go system**

The (first) public pension pillar will have to change to a flat social benefit, equal for everyone, and covering only basic needs. The pensioners will have to maintain their living standard using private pension schemes or continuing to work as long as possible. At the same time, the pension system will put substantial pressure on tax increases. High taxation, however, has a potential of declining worker motivation and overall leads to social tensions.

**Private pension schemes**

Workers need to take part of the responsibility for their old age. The importance of the second and third pillars of pension systems (private mandatory and voluntary schemes) will grow.

**Healthcare check-up**

In the current system, the public healthcare is financed through a system of mandatory health insurance that in fact is more like a tax. The amount of contribution to the system is strictly dependant on the amount of the worker's salary. However, the entitlements are the same for all. This system suffers from over-demand and ill-management. Soon, reductions of coverage will prove inevitable. It is necessary to fix leakages in the meantime. Demand for private health insurance schemes will emerge, in order to obtain better-quality healthcare.

### 15.10.2 Implications for the financial sector

Demographic trends will have inevitable implications also for the financial sector. First of all, the ageing population and pressures on the pension system will lead people to save for their pensions on their own. Besides the compulsory second pillar, people will have to engage in voluntary pension schemes. These will include the voluntary third pension pillar, co-founded by the employers, but also individual long-term saving schemes. Clearly, the state pension from the Pay-As-You-Go system will not provide adequate pension payments on its own. Banks will be eager to take part in these voluntary pension schemes by providing new long-term saving products.

Besides private pension savings, demands for private healthcare insurance will also emerge, as people will realise that the state will not be able to provide adequate healthcare for the increasingly older population. The insurers will join new trends of the silver-hair economy and provide private healthcare insurance schemes.

Income in the pension age could also be provided by capitalising of personal assets. For example, an individual may generate an income stream from his own housing property. One option could be through a reverse mortgage, in which a bank takes ownership of a pensioner's property and provides to him an agreed monthly payment.

Besides new products, banks will be affected by the ageing population also in other ways. The older population will probably decrease the potential growth of the economy and therefore the need for financial intermediation. On the other hand, older people typically are wealthier and likely to demand unique wealth management services and advisory. Those will offer opportunities for banks to earn fees and commission income.

## 15.11 Financial sector

Three macroeconomic variables that typically move together in a given country are prices, inflation rates, and interest rates. Price levels in countries and regions differ markedly due to a variety of influences, including differences in the demands for good and services and in the currencies and currency values associated with different countries and regions. The change in the overall price level in an economy over time, calculated on a percentage basis, is known as the *inflation rate*. Inflation rates are calculated in many countries on a monthly basis and are then aggregated to quarterly or annual data. Finally, *interest rates* reflect the cost of borrowing money or the return from saving money.

Prices, inflation rates and interest rates move together because they are all tied to the overall level of economic activity. When the economy is strong, the increased demand for products and for resources drives up the overall price level in the economy. Likewise, in a strong economy, businesses are more willing to invest in new ventures, typically through an increased demand for loans, thereby driving up the interest rates also. Inflation rates and interest rates are also related to the amount of money in circulation but in contrasting fashion. An increase in the money supply brings about higher inflation, but lowers the cost of borrowing money.

Table 15.10 provides information on prices, inflation rates, and interest rates in 2013 and 2014 for the Visegrad counties, the European Union, and the United States (where available). The price data is from the Organization for Economic Cooperation and Development (OECD) database, while the other data are from Eurostat. The prices data are *purchasing power parity* data; they need a bit of explanation. Earlier in Chapter 15.1, we referred to hotel price differences in Vienna or Paris, Bratislava, and smaller cities and villages in Slovakia. A traveller with €150 might get one night in a nice hotel in Paris or Vienna, two nights in a similar hotel in Bratislava, and three or four nights in a smaller city in Slovakia. Sit-down meals at the hotels, likewise, would be more expensive in the larger cities. In essence, the *purchasing power* of your €150 is greater in the smaller cities because prices are lower in those cities.

The first column of Table 15.10 offers purchasing power price levels. It shows, for the various countries, how much it would take in U.S. dollars in each country to buy the equivalent of a $100 purchase in the average of the 34 OECD countries. The last entry in each of the first two columns shows us that the United States is approximately "on par" with the average of the 34 OECD countries. It would take $100-$101 in the United States to buy a $100 OECD average "item". The Euro-15 countries are the most expensive. It would take $109 in 2013 and $110 in 2014 to buy that same item. Poland and Hungary come in as the least expensive of the Visegrad countries, while Slovakia and the Czech Republic have the higher prices. Prices in all the Visegrad countries, however, are on the order of only 50-60 percent of prices in the rest of Western Europe and the OECD countries. Clearly the purchasing power of a dollar or a euro is greater in the Visegrad countries than in Western Europe. That is, dollars or euros will buy much more in the Visegrad countries than in most of the rest of Western Europe.

The second column in the table gives the inflation rate in various countries. Average prices growing at a rate of 2-3 percent is considered ideal. This rate allows for increases in productivity of 1-2 percent and similar increases in wages. All of the inflation rates in Table 15.10 are below this standard, owing in large measure to the slowdown in economic activity over the previous few years. The last three columns in the table report on three different interest rates in 2013 and 2014. The first two of these columns look at savings and borrowing rates. As everyone knows, banks charge much more to borrow than they offer to save. With deposit rates at near-record lows in all of the OECD countries in 2013-2014, the loan rates in the table are much greater than the deposit rates, with the Czech Republic's factor of six being the lowest reported.

The last column in Table 15.10 looks at *long-term interest rates*, typically identified as the buying and selling of 10-year bonds in the secondary market. Bonds are financial instruments issued by governments and corporations as a means of borrowing. At issue, they are sold directly to the public at market prices. However, an individual (or firm) who loans money to a government or corporation in this

fashion now has a valuable asset – money owed to them – which they can now offer for sale in a secondary market. Thus, this secondary market reflects the buying and selling of previously issued bonds. Thus, this long-term interest rate is not a deposit or loan rate; rather, it is the market rate for long-term transactions. The main item to note about long-term interest rates is that long-term interest rates are higher than short-term. The longer a borrower wants to hold someone else's money, the greater will be the cost of that privilege! The two countries worth noting in these last columns are Hungary and Poland, where Hungary's long-term interest rates are approximately double those in the EU and Poland's are thirty to forty percent higher.

**Table 15.10** Prices, inflation rates, and interest rates

| | Purchasing power parity price levels | | Inflation rate | | Interest rates, household deposits* | | Interest rates, household loans | | Interest rates, long term | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (U.S. $) | | (%) | | (%) | | (%) | | (%) | |
| | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 |
| EU-28 | - | - | 1.5 | 0.6 | n/a | n/a | n/a | n/a | 2.96 | 2.2 |
| EU-27 | - | - | 1.5 | 0.6 | n/a | n/a | n/a | n/a | 2.95 | 2.2 |
| EU-15 | 109 | 110 | - | - | n/a | n/a | n/a | n/a | - | - |
| Euro-18 | 103 | 104 | 1.3 | 0.4 | 0.3 | 0.2 | 8.2 | 7.9 | 2.99 | 2.0 |
| | | | | | | | | | | |
| Czech Rep. | 68 | 65 | 1.4 | 0.4 | 1.0 | 0.8 | 6.0 | 5.6 | 2.1 | 1.6 |
| Hungary | 58 | 57 | 1.7 | 0.0 | n/a | n/a | n/a | n/a | 5.9 | 4.8 |
| Poland | 57 | 59 | 0.8 | 0.1 | n/a | n/a | n/a | n/a | 4.0 | 3.5 |
| Slovakia | 68 | 67 | 1.5 | -0.1 | 0.4 | 0.3 | 13.75 | 13.60 | 3.2 | 2.1 |
| | | | | | | | | | | |
| USA | 100 | 101 | 1.3 | 1.3 | | | | | 2.4 | 2.5 |

Source: The World Bank[74], U.S. Bureau of Labour Statistics[75], Euro area statistics[76], Eurostat[77], and the OECD[78]. For the Czech Republic (average data in the Table 15.10), KurzyCZ[79].

[74] Retrieved from <http://databank.worldbank.org/>
[75] Retrieved from <www.bls.gov/cpi/>
[76] Retrieved from <https://www.euro-area-statistics.org>
[77] Retrieved from <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>
[78] Retrieved from <http://www.oecd.org/eco/outlook/External %20Trade %20and %20Payments.xls>
[79] Retrieved from <http://eng.kurzy.cz/cnb/ekonomika/ind1-1-deposits-from-households-interest-rate-pa/> and from <http://eng.kurzy.cz/cnb/ekonomika/ind9-3-loans-to-households-interest-rate-pa/>

## 15.12 Price movements and inflation

Inflation is defined as a general movement in prices, essentially the extent to which prices increase (inflation) or decrease (deflation) from one time period to the next. However, there are many ways to analyse these general price movements. At one level, we could examine the price movements for one particular product (milk or beef prices, for example) or for a group of similar products (dairy products or meat prices). Or we might choose to look at food or energy prices in the aggregate. Or, at the highest level, we might choose to examine the movement of prices in the overall economy. Typically, when we think of inflation, most often we are considering this last level, price inflation at the national level.

However, there are still other levels at which we might wish to examine price movements. One of these would be urban compared to rural price movements, or price movements in different cities or in different regions of the country. We might also wish to consider price movements for domestic products compared to imported goods which are affected by exchange rate movements. Finally, we may wish to examine prices from a consumer (household) perspective where the focus is on prices of final products or from a producer (firm) perspective where the focus might be on input prices. Unless otherwise specified, most inflation analysis in this chapter is from a consumer perspective.

### The harmonised index of consumer prices

We begin our inflation analysis by examining a "price index", in this case the Harmonised index of consumer prices (HCIP). An index is a numerical construction that creates an aggregate measure, essentially a weighted average, from a disparate set of individual items. A common example well known around the world is the Dow Jones industrial index ("the Dow"), which is an aggregate measure of stock values for thirty leading U.S. firms. The Dow is a weighted average of the stock values of these firms that began with a value of 40.94 back in 1885[80]. The firms in the index have changed over time, but the Dow has continued with a consistent calculation of aggregate stock values and is widely disseminated throughout the world. Similar measures of stock values exist for the Euro Stoxx 50, the Japanese Nikkei, the London FTSE 100, and the German DAX.

For consumer prices, a similar approach is taken. Dieticians, statisticians, demographers, economists and government officials agree upon a typical *market basket* of reasonable goods and services that might be purchased by a typical household in a given month or year. They then calculate the total expenditure value of this market basket, divide that number by itself and then multiply the result by 100 to set an index value of 100. This is the procedure to use to create a *base year*, the time frame for which the value of the index will be equal to 100. Index calculations for all other years will use the expenditure level in the base year to calculate a price index number for that year. So, in general,

$$PI(BY) = (EV(BY, €) / EV(BY, €)) \; x \; 100 \qquad (15.13)$$

and

$$PI(AY) = (EV(AY, €) / EV(BY, €)) \; x \; 100 \,,$$

where $PI$ is the price index, $BY$ is the base year, $AY$ is any other year, and $EV$ is the expenditure value in a given year. This method is used to create a Harmonised index of consumer prices (HICP) throughout the European Union. According to Eurostat: "The *HICPs* are economic indicators constructed to measure the changes over time in the prices of consumer goods and services acquired by households. The HICPs give comparable measures of inflation in the euro-zone, the EU, the European Economic Area and for other countries including accession and candidate countries. They are calculated according to a harmonised approach and a single set of definitions. They provide the official measure of consumer price inflation in

[80] More information at Kennon, J. 2017. Understanding the Dow Jones industrial average (DJIA). Retrieved from <https://www.thebalance.com/understanding-the-dow-jones-industrial-average-djia-357912>

the euro-zone for the purposes of monetary policy in the euro area and assessing inflation convergence as required under the Maastricht criteria."

Statisticians and economists throughout the European Union gather HICP data every month according to a strictly scientific sampling survey. Current prices are applied to the market basket of goods, total expenditure values are calculated, and new HICP values are generated.

Once the HICP structure is created for any country, it remains mostly unchanged, except for changes in the market basket, which occur irregularly over time. For example, with cell phones and wireless Internet connections more readily available, books and newspapers are less important today and have been replaced in market basket calculations by these other communications devices. Likewise, small shops for goods and services have been replaced by supermarkets as the primary locations where goods and services are purchased.

### Calculating inflation from HICP data

After prices data have been collected and converted to HICP numbers, inflation rates can now be calculated. For a given data set spanning multiple years, inflation rates can be calculated month-to-month, year-to-year, or for any time period in the data set. The calculation is simply the HICP increase or decrease between the two points of interest, divided by the starting point. So,

$$INFL_t = (PI_t - PI_{t-1})/PI_{t-1}\,, \tag{15.14}$$

where $INFL_t$ is the inflation rate between time period $t$ and time period $t-1$ and $PI$ is as noted above. Multiplying the result by 100 will convert the result to a percentage calculation.

The most common inflation calculation is annual rates of inflation, or a month-to-month inflation rate calculation expressed in annualised terms. For the latter, if we have consecutive months of HICP data, we simply multiply the result in equation (15.14) above by 12 to get an annualised rate. If the calculation is not for consecutive months of HICP data, then the result in $A$ above is multiplied by $12/N$, where $N$ is the number of months between observations. So, for example, if we wanted to examine the rate of inflation for the first half of a calendar year, we would find the HICP values for December and June (or January and July, depending on the reporting date), do the calculation in $A$ above, and multiply by 12/6. Likewise, if we wished to calculate the annualised inflation rate over a longer period of time, say three years, then we would do the calculation in $A$ above, and multiply by 12/36. Over longer periods of time, these calculations give us average annual inflation rates, not the actual monthly or annual growth rate – but that distinction is far beyond the level of this text.

### Inflation and HICP data

HICP price level and inflation data from the first quarter of 2002 to the fourth quarter of 2010 are charted in Figure 15.32, using December 2000 as the base month for HICP calculations. Unless there is deflation in the economy, as in the second quarter of 2002 and the first quarter of 2009, the price index is constantly rising, from 108.8 in the first quarter of 2002 to 155.9 in the first quarter of 2011 (not shown). This 43.2 percent increase over these nine years represents an annual average inflation rate of 4.8 percent. Compared to the unemployment rate data shown in Figure 15.13 (chapter 15.7), the inflation rate is much more variable. For this nine-year period, the inflation rate ranges from a low of -0.46 in the second quarter of 2002 to a high of 6.04 percent just two quarters later, then three consecutive quarters of lower inflation before another spike at 4.76 percent. After that, the inflation rate is mostly steady, however, staying in the 0-2 percent range.

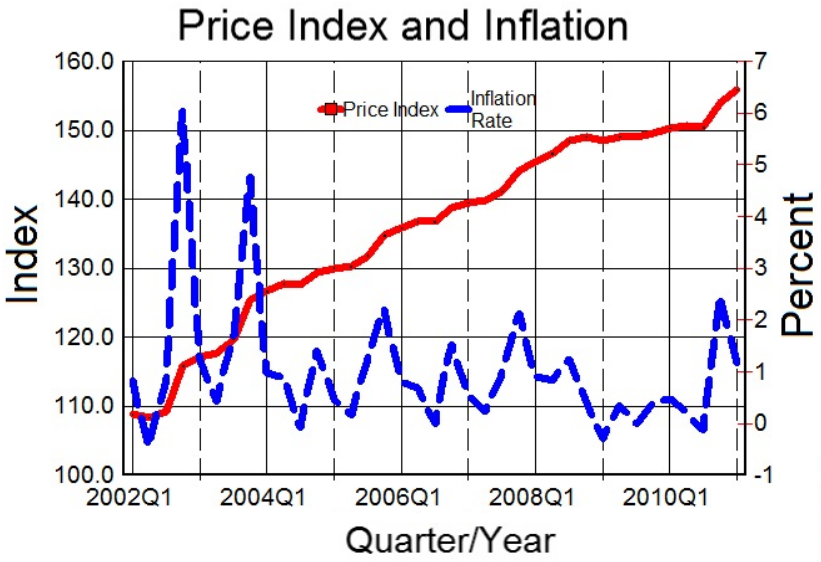



**Figure 15.32** HICP data and inflation rates
Source: SOSR[81]

### Inflation impacts

Inflation affects both consumers and businesses. Some individuals and firms are hurt by inflation, while others benefit. Very few people are affected when inflation is low, on the order of one to two percent. It's when inflation is high that people feel the impacts. The group most commonly recognised as being hurt by high inflation is that group of people who are living on fixed incomes. With rising prices, your fixed income simply buys less than it did before. Just a couple of years of double-digit inflation can lower the purchasing power of someone on a fixed income by 25-30 percent. Typically, people living on fixed incomes are less well-to-do than the average citizen, so this decrease in their real income can seriously affect their purchases of life's necessities, leaving them with a choice as to whether to buy food or medicine or pay the rent or their utility bills.

By contrast, a second group that is hurt by high inflation is a group at the opposite end of the income spectrum, the wealthy. If the assets held by the wealthy are not growing at the same rate as inflation, then the value of those assets diminishes over time. Assets held by the wealthy typically include stocks, bonds, real estate, and other financial investments. Inflation and interest rates tend to move together, so in general, bonds and financial investments are not seriously affected by high inflation. However, stocks and real estate values are tied to "real value" markets, as opposed to financial markets. Hence their values are not tied to inflation or interest rates. Inflation could be quite detrimental for major holders of stocks and real estate if these markets are in substantial decline.

Surprisingly, two groups at opposite poles benefit from high inflation. The first group is net debtors, who see their real indebtedness decline when inflation is high. Home owners with fixed mortgages are prominent in this group. If a monthly house payment is fixed, that "real payment" (the fixed payment adjusted for inflation) declines over time if inflation is growing. For a twenty- or thirty-year mortgage, someone's house payment as a percentage of his/her growing income could drop from thirty and forty percent to ten or fifteen percent. Again, by contrast, this same group of relatively young home owners can benefit in another way by high inflation if interest rates are also high. As young men and women save for retirement, their investment in mutual funds (heavily diversified stocks and bonds) grows at a faster rate when inflation and interest rates are high.

[81] Retrieved from <http://www.statistics.sk/pls/elisw/MetaInfo.explorer?cmd=go&s=1003&sso=3&so=16>

## Exercise

In the next table, we deliver information on goods and services an average citizen of country W yearly buys – their market basket. Calculate the inflation from HICP data when the year 2012 is considered to be the base year.

**Table 15.11a** Market basket of country W's citizens

| | Unit price in € | Unit price in € | Unit price in € |
|---|---|---|---|
| **Market basket** | **2012** | **2013** | **2014** |
| 120 loaves of bread | 0.3 | 0.3 | 0.4 |
| 80 litres of beer | 2.1 | 2.15 | 2.3 |
| 5 movie tickets | 6.0 | 6.5 | 6.5 |
| 1 pair of boots | 85.0 | 80.0 | 75.0 |

*Solution*

For all calculations, we use equations (15.13) and (15.14). Table 15.11b contains the results. At first, we calculate total money spent on the items in the market basket in each year. For example, in 2013, $EV = 120 \cdot 0.3 + 80 \cdot 2.15 + 5 \cdot 6.5 + 1 \cdot 80.0 = 320.5$. We get the HICP in the same year by dividing the expenditure value in the current year by the expenditure value in base year: $HICP = 320.5/319.0 \times 100 = 100.5$. Then, the inflation rate in 2013 has a value of $INFL_{2013} = (100.5 - 100.0)/100.0 = 0.5\ \%$.

**Table 15.11b** Calculated inflation rate in the country W

| | 2012 | 2013 | 2014 |
|---|---|---|---|
| Total expenditure value of market basket | 319.0 | 320.5 | 339.5 |
| HICP | 100.0 | 100.5 | 106.4 |
| **Inflation rate (%)** | **x** | **0.5** | **5.9** |

## 15.13 Interest rates

Simply stated, any particular interest rate is the price of money in a market where there are lenders who supply money and borrowers who demand money. As with markets described earlier in this text, the equilibrium interest rate is that interest rate that is found at the intersection of the supply of money and the demand for money. There are literally hundreds of thousands of interest rates in the Slovak Republic – interest rates for auto loans, home mortgages, and home improvements; for university and technical school study; for credit card balances and household items purchased on long-term payment plans – and thousands of interest rates for each of these aforementioned categories! There are relatively low interest rates for saving money and higher interest rates for people who want to borrow money. The safer the investment, the lower will be the interest rate for savers. Higher returns are available only for riskier investments. Likewise, low-risk borrowers are able to enjoy lower interest rates on loans, while people with criminal records or poor credit histories can borrow money only at higher rates.

Because Slovakia joined the European Union in 2004 and adopted the Euro in 2009, the "reference rate" for interest rates in the Slovak economy is determined by monetary authorities in the European Union. The European Central Bank (ECB) sets and publishes a "base interest rate ... for main refinancing transactions performed by the Eurosystem within the European System of Central Banks"[82]. Essentially this base interest rate is consistent with ECB estimates of the demand for money in the European Union and the goals they have set for the amount of money in circulation (the "money supply"). Because the base interest rates that are set by the ECB are rates at which banks and governments can borrow from the ECB, other market interest rates tend to follow along with those base interest rates. Much greater detail on ECB activities, money supply, money demand, and interest rate determination will be provided in a later chapter.

Typically, the longer the length of repayment for a requested loan, the higher will be the rate of interest. In general, "short-term" loans are those that are repaid within one year. Often these loans are "overnight" loans, but it is more common that governments and major banks negotiate in short-term increments of 30-, 60-, 90- and 180-day loans. At the other end of the spectrum we have "long-term" rates, where the time period for repayment can be 10, 20 or 30 years or even longer. According to the OECD (Organisation for Economic Co-operation and Development), "In general, 'overnight' and 'short term' rates relate to money market instruments, while 'long term' rates are secondary market yields of long term (usually 10 year) bonds."[83]

### Bonds and bond markets

Someone who wishes to invest his or her savings must choose between physical investments or financial investments. Common physical investments include land, buildings, and rental housing. In this section, we are more interested in financial investments. Here the major choice is between stocks and bonds. Stocks reflect ownership, while bonds reflect lending. That is, someone who purchases stocks has taken some percentage of ownership in the company represented by the stock purchase. Stock purchases and stock ownership are straightforward and are not discussed here. Bonds, however, reflect lending activities. Someone who has purchased a bond has made a loan to the corporate or government entity offering the bond. An understanding of bonds is not straightforward.

Bonds typically have three components – a purchase price (the "face value"), a maturity date, and a coupon payment. Each of these three components is easily understood. The purchase price (or face value) is the amount of money the original bond purchaser has loaned the government or corporate entity. The maturity date is the date when the holder of the bond can redeem the bond for the full-face value. Finally, the coupon payment is an amount of money that is paid to the owner of a bond during the life of the bond,

[82] Retrieved from <https://www.nbs.sk/en/statistics/financial-markets/interest-rates/interest-rates-of-the-ecb>
[83] Retrieved from <http://stats.oecd.org/index.aspx?querytype=view&queryname=86#>

typically every six months. So, a €10,000 (face value) bond with a €300 coupon payment every six months is yielding a six percent return per year (€300 paid twice a year, divided by the €10,000 face value).

For bonds, there is a primary market and a secondary market. The primary market is the market in which bonds are initially purchased, always at their face value. Bonds become confusing only when the secondary market is considered. A secondary market is a market in which a bond holder can sell his or her bond at any price above or below the face value. If an individual purchases a bond in a secondary market at a price below the face value, then the bond purchaser has negotiated a return that is greater than the return associated with the original coupon payment. That is, if a €10,000 bond is purchased for €9,900, the rate of return is now €600 divided by €9,900, or 6.06 percent, a rate somewhat greater than the rate associated with the original coupon payment. Conversely, a purchase price of €10,100 in a secondary market generates a return of only 5.94 percent.

Market interest rates are largely determined in primary and secondary bond markets. Bond prices increase or decrease depending on existing market conditions, especially expectations of market movements on the part of larger market participants. A strong economy with low unemployment and strong consumer and business demand for goods and services is typically associated with higher interest rates. A firm is more willing to borrow money for a business investment if it feels that the "business climate" is strong and that the return on its investment will be greater than the cost of borrowing, whether that borrowing is a straight-up loan or the sale of bonds. Bond sales are attractive to investors only if the return on the bond is greater than current market rates. Thus, the firm's bond offering will be attractive to investors only if its coupon payment is high enough to generate that higher return. Hence, strong market conditions lead to higher interest rates for new bond sales.

### Interest rate data

Finally, to close this topic and this chapter, we present a graph of short- and long-term interest rates for Slovakia and the Euro-17 for the first decade of the 21st century (Figure 15.33), the time period before and after Slovakia joined the European Union in 2004 and the euro in 2009. Those dates have had an impact on SK interest rates. Interest rates were relatively high in the earlier years on this chart, with SK rates typically 3-4 percentage points higher than Euro-17 rates.

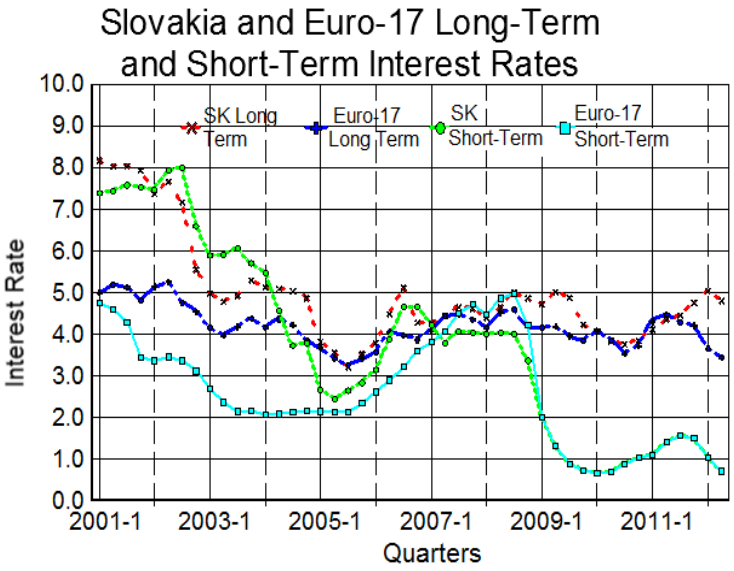



**Figure 15.33** Long-term and short-term interest rates
Source: OECD[84]

[84] Retrieved from <http://stats.oecd.org/index.aspx?querytype=view&queryname=86>

After 9-11-2001 interest rates began to fall as the entire world fell into a mini-recession. They began to climb again after hitting bottom in 2005, but began to fall again with the worldwide difficulties from the financial markets' collapses in 2007/2008.

Short-term rates are lower than long-term rates for the entire Euro-17 data series, although by less than a percentage point at a number of quarters on the chart. For Slovakia, that is not the case. In order to gain accession into the European Union, Slovakia had to attain to monetary requirements known as "convergence criteria", discussed more fully in a later chapter. One of these convergence criteria stated that long-term interest rates had to fall to lower levels to meet the euro standard. So, during 2002-2003, SK long-term interest rates were lower than short-term rates. After gaining EU accession in 2004, the normal pattern of long-term rates exceeding short-term rates resumed.

The gap between SK and Euro-17 long-term interest rates started wide in the earlier years, but has narrowed over time, although SK long-term rates are typically greater than Euro-17 long-term rates. The pattern for short-term rates, however, has changed much more dramatically over time. The data begin with SK short-term rates exceeding Euro-17 short-term rates by three to five percentage points in the earlier years. That gap narrowed substantially by 2005, as more and more banks from western European countries established a major presence in Slovakia. In 2009, with Slovakia's accession to the Euro, the chart shows that the short-term gap completely disappeared. That observation is somewhat misleading, however, in that the data set uses the 3-month "European Interbank Offered Rate" for Euro area countries, from the date the country joined the euro[85]. Still, however, the short-term interest rate gap between Slovakia and other Euro countries is small.

[85] Retrieved from <http://stats.oecd.org/index.aspx?querytype=view&queryname=86#>

## 15.14 Deficits

Thus far we have looked at macroeconomic data from the perspective of the overall economy. This "big picture" look includes spending, borrowing and saving from individual households and a variety of firms, industries, and government entities. Now we turn our attention to federal governments and their economic activities. Federal governments are involved at many levels and undertake many tasks, including maintaining law and order, overseeing and regulating market participants, providing public goods and social services, overcoming market failures, and managing economic policy and international affairs. Naturally, there are various perspectives as to the extent to which governments should be involved in these many activities, especially in overseeing market activities and providing social services and public goods. These activities are costly and must be funded by the country's citizens. Striking a balance between taxpayer revenues and governmental expenditures remains a challenge for governments at all levels and in all countries.

Tables 15.12a and 15.12b present recent data on government revenues and expenditures in 2013 and 2014 in the European Union, the Visegrad countries, and the United States. In Table 15.12a these data are presented in four columns as percentages of GDP and in one column as an overall statistic. In Table 15.12b these data are presented in per capita values.

Table 15.12a shows that a substantial percentage of GDP is devoted to government activities. Federal government expenditures account for almost half of GDP in any of the EU groupings and amount to forty to fifty percent in the Visegrad countries. We can also see that government revenues were much lower than expenditures in all these countries and regions in these two years, resulting in budget deficits. These deficits were mostly on the order of two to three percent of GDP, with the Czech Republic coming in somewhat lower and Poland's debt-to-GDP ratio being somewhat higher. Surprisingly, the highest debt-to-GDP ratio in the table is the United States (2013) at 5.6 percent. During the Euro negotiations of the early 1990's, one of the five agreed-upon "convergence criteria" was that government budget deficits should not exceed three percent of GDP. Except for the United States and Poland, all of the nations and regions in Table 15.12a meet this standard in 2014, although Poland is only slightly off the mark. These low ratios were not the case just a few years earlier, when countries were coming out of the Great Recession. Back in 2009 and 2010 debt-to-GDP ratios were on the order of four to ten percent of GDP. This outcome is not uncommon during a recession. When GDP and incomes are low, tax revenues fall due to decreased incomes and lower spending by households and firms, while government expenditures rise due to increased social services costs, like unemployment insurance and other welfare services.

A government budget deficit (or surplus) is calculated on a yearly basis – the amount of revenue minus the amount of expenditures. The accumulation of deficits over time is a country's overall indebtedness, or simply, debt. The last two columns of Table 15.12a report on federal government debt in these countries and regions, both as absolute values and as percentages of GDP. The numbers are, unfortunately, quite large!! In the convergence criteria noted above, a second item was that total government debt could be no more than sixty percent of GDP. At the time of the countries being accepted into the euro in 1997, only four of the fifteen countries met these criteria, although another six countries were less than seventy percent and a seventh was at 72.1 percent[86]. The overall indebtedness of the Euro countries is now on the order of 80-90 percent! The United States is even higher, at almost 120 percent. By contrast, the Visegrad countries, Hungary excepted, look much better, with the Czech Republic, Slovakia and Poland ranging from 42.6 percent to 55.7 percent. The overall indebtedness numbers are also staggering. The EU-28 grouping had overall debt in 2014 of more than twelve trillion euros, while the United States was over twenty trillion euros.

[86] Ruppel, F.J. – Handy, C.R. 2000. Transition, transformation, and turmoil: Global economic impacts on U.S. food exports. In Journal of food distribution research, 31(1), pp. 73-82.

**Table 15.12a** Federal government revenues, expenditures, deficits and debt (as % of GDP)

| | Federal government revenues | | Federal government expenditures | | Federal government deficit | | Federal government debt | | Federal government Debt | |
|---|---|---|---|---|---|---|---|---|---|---|
| | (% of GDP) | | (% of GDP) | | (% of GDP) | | (billion €) | | (% of GDP) | |
| | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 |
| EU-28 | 45.4 | 45.2 | 48.6 | 48.1 | -3.2 | -2.9 | 11,565 | 12,095 | 85.5 | 86.8 |
| EU-27 | 45.4 | 45.2 | 48.6 | 48.1 | -3.2 | -2.9 | 11,527 | 12,058 | 85.5 | 86.8 |
| EU-15 | 46.0 | 45.8 | 49.2 | 48.7 | - | - | 11,004 | 11,515 | - | - |
| Euro-18 | 46.6 | 46.7 | 49.5 | 49.1 | -2.9 | -2.4 | 9,030 | 9,293 | 91.1 | 92.0 |
| Euro-15 | - | - | - | - | - | - | 8,865 | 9,226 | - | - |
| | | | | | | | | | | |
| Czech Rep. | 40.8 | 40.1 | 41.9 | 42.0 | -1.2 | -2.0 | 67.1 | 65.5 | 45.0 | 42.6 |
| Hungary | 47.6 | 47.3 | 49.8 | 50.1 | -2.5 | -2.6 | 77.7 | 77.7 | 77.3 | 76.9 |
| Poland | 38.2 | 38.6 | 42.2 | 41.8 | -4.0 | -3.2 | 222.9 | 202.8 | 55.7 | 50.1 |
| Slovakia | 38.4 | 38.9 | 41.0 | 41.8 | -2.6 | -2.9 | 40.2 | 40.3 | 54.6 | 53.6 |
| | | | | | | | | | | |
| USA | 33.2 | - | 38,7 | - | -5.6 | - | 19,686 | 20,798 | 117.4 | 119.4 |

Source: Eurostat[87] and OECD[88]

The data in Table 15.12b place these numbers in clearer perspective, in that they are reported on a per capita basis. Again, the US and the EU numbers are huge, the EU especially within the EU-15 grouping. The Visegrad countries have managed to keep their per capita indebtedness mostly in the 5,000-8,000 euro-range, on average only 18.5 percent of the EU-28 overall per capita debt. Hungary has larger debt, but even their per capita debt is only slightly above twenty percent of the EU-28 overall per capita debt. The United States' per capita debt load is staggering, at more than sixty thousand euros per capita!

**Table 15.12b** Federal government revenues, expenditures, deficits and debt (per capita)

| | Federal government revenues | | Federal government expenditures | | Federal government Deficit | | Federal government debt | |
|---|---|---|---|---|---|---|---|---|
| | ( € per capita) | | ( € per capita) | | ( € per capita) | | ( € per capita) | |
| | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 |
| EU-28 | 12,132 | 12,419 | 12,997 | 13,214 | -864.9 | -796.4 | 34,677 | 36,357 |
| EU-27 | 12,198 | 12,487 | 13,066 | 13,285 | -860.7 | -791.4 | 34,785 | 36,471 |
| EU-15 | 14,400 | 14,714 | 15,414 | 15,649 | -1,006 | -930.1 | 33,895 | 35,552 |
| Euro-18 | 13,820 | 14,051 | 14,677 | 14,788 | -856.0 | -738.5 | 18,005 | 18,544 |
| Euro-15 | 14,057 | 14,641 | 14,932 | 15,409 | -872.7 | -751.0 | 26,646 | 27,487 |
| | | | | | | | | |
| Czech Rep. | 6,098 | 5,898 | 6,271 | 6,190 | -172.8 | -291.8 | 6,380 | 6,221 |
| Hungary | 4,810 | 4,982 | 5,059 | 5,250 | -249.8 | -268.5 | 7,856 | 7,880 |
| Poland | 3,976 | 4,198 | 4,394 | 4,545 | -417.9 | -347.3 | 5,860 | 5,335 |
| Slovakia | 5,226 | 5,399 | 5,577 | 5,797 | -351.4 | -398.1 | 7,421 | 7,437 |
| | | | | | | | | |
| USA | 17,589 | - | 20,503 | - | -2,967 | - | 62,198 | 65,219 |

Source: Calculated from data in Table 15.1 (chapter 15.1) and Table 15.12a.

[87] Retrieved from <http://epp.eurostat.ec.europa.eu/portal/page/portal/eurostat/home/>
[88] Retrieved from <https://data.oecd.org/gga/general-government-debt.htm#indicator-chart>

Slovakia keeps a close watch on its debt. Beyond the European requirements, Slovakia approved in 2011 a constitutional fiscal responsibility law, which specifies a set of penalties once the debt surpasses set thresholds. Households' debt ratio stands at a favourable level too, as documented in Figure 15.34.

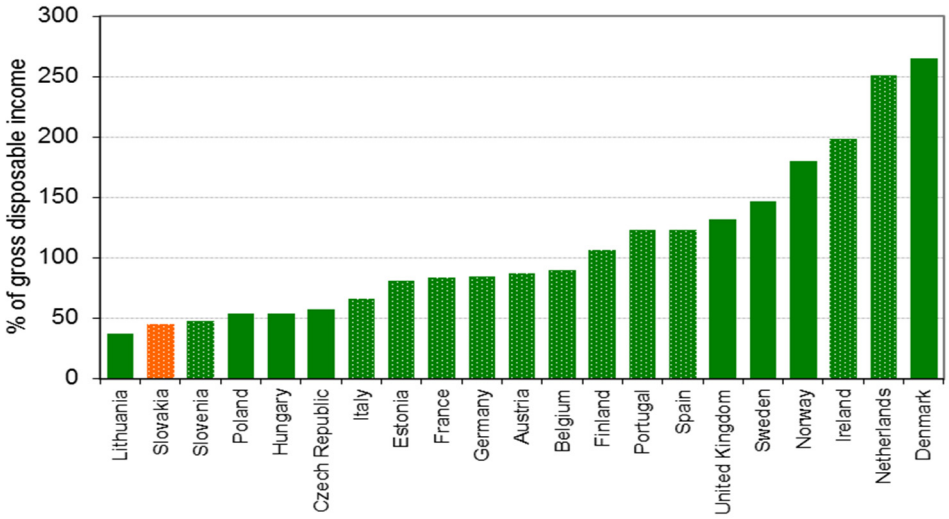



**Figure 15.34** Household indebtedness within EU countries
Source: Eurostat, VÚB, as of 2013

# Chapter 16 MONETARY POLICY

## 16.1 Conventional monetary policy

In the classic, standard world of monetary policy, the central bank sets official interest rates to shape expectations and market interest rates and through them households and firms' borrowing and saving behaviour so as to alter the development of inflation, the central banks' key objective.

Officially, the mechanism by which the central bank affects the economy is called the *monetary policy transmission mechanism*. It works through various channels (interest rate channel, the credit channel, exchange rate channel and the wealth channel) as depicted in the chart below.

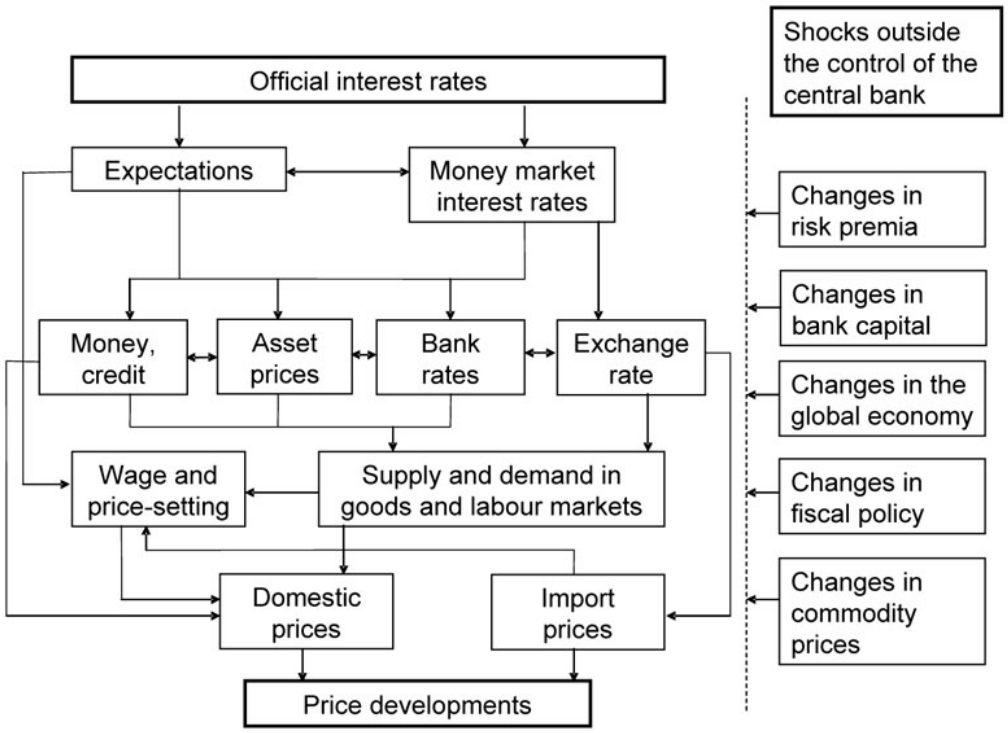



**Figure 16.1** The monetary policy transmission mechanism
Source: ECB[89]

Because Slovakia is part of the Eurozone, official interest rates are set and monetary policy in general conducted by the ECB, the European Central Bank, which is based in Frankfurt, Germany. The role of the National Bank of Slovakia as a member of the Eurosystem is to participate in the common euro area monetary policy. All monetary policy decisions within the Eurosystem are taken by the Governing Council. NBS Governor participates in the decision-making on monetary policy. Each member of the Governing Council has one vote. After Lithuania joined the common currency on January 1, 2015, voting system was adjusted and so-called *rotation system* was introduced, which is similar to the one used by the Fed in the US.[90]

The primary objective of the ECB's monetary policy is to maintain price stability, which is defined as "a year-on-year increase in the Harmonised Index of Consumer Prices (HICP) for the euro area of below

[89] ECB. Transmission mechanism of monetary policy. Retrieved from <https://www.ecb.europa.eu/mopo/intro/transmission/html/index.en.html>
[90] ECB. 2014. How voting rights rotate on the ECB Governing Council. Retrieved from <http://www.bundesbank.de/Redaktion/EN/Topics/2014/2014_09_19_rotation_system.html>

2 %. And because inflation has in the recent crisis years fell well below this level (see Figure 16.2), the ECB was reducing official interest rate quite dramatically. The key-2-week refinancing rate was brought to near zero (0.05 %), while the deposit rate was set even to below zero (-0.20 %).

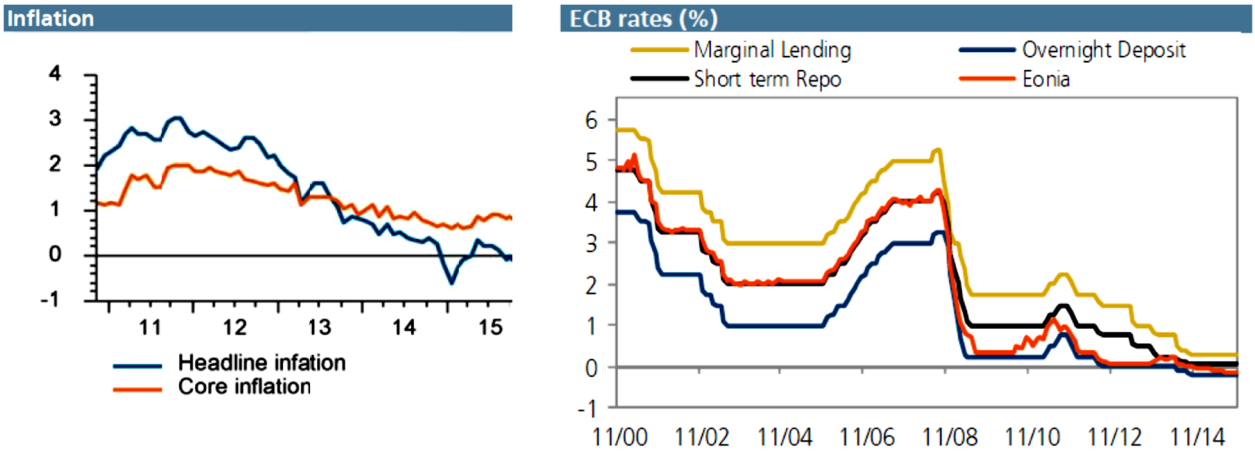



**Figure 16.2** Inflation changes in SR (%) and ECB interest rates (2011-2015)
Source: Thomson Reuters datastream, Intesa Sanpaolo

## BOX
## Conventional Policy Tools

Basically, to achieve its objectives, the Eurosystem (the ECB and participating member national banks) uses three monetary policy instruments: it conducts open market operations, offers standing facilities and requires credit institutions to hold minimum reserves on accounts with the Eurosystem.

The first tool, **open market operations** is used to set interest rates and manage liquidity. The most important instrument is the reverse transaction, which is used in the main refinancing operation, so-called *MRO*, which provides the bulk of refinancing of the financial sector. These operations are on a frequency and maturity of normally one week. The rate used in this transaction is the key policy rate set by the ECB, the refinancing rate, currently set at almost zero, 0.05 %. In Slovakia, MRO is executed by the NBS on the basis of standard tenders.

Besides MROs, the Eurosystem uses also longer-term refinancing operations, so called *LTRO*, which are liquidity-providing reverse transactions with a monthly frequency and a maturity of normally three months. In the crisis times, nonetheless, there also have been used LTROs with 3-yeat maturity.

The second tool, **standing facilities,** is used to manage overnight liquidity and corresponding overnight market interest rates. Two standing facilities are available: one to allow banks to borrow overnight (the marginal lending facility) and the other one to deposit funds overnight (the deposit facility). In normal times, there are no restrictions on access to these facilities (apart from collateral of eligible assets to borrow against). Yet, at present, the ECB wants to discourage banks from depositing funds with it (to use them instead in the real economy) and so is charging banks a negative rate of -0.20 % when taking deposits from banks. The rate of marginal lending facility is set at 0.30 %.

The third tool, **minimum reserves**, aims to stabilise money market interest rates and to manage structural liquidity. Holdings of minimum required reserves, so called *MMR*, are remunerated at the main refinancing rate (currently 0.05 %). Reserve holdings exceeding the MMR are not remunerated.

## 16.2 Unconventional monetary policy

Decline in official interest rates, however was not sufficient to prevent inflation from falling further down, away from the 2 % ECB' target and even below zero. This really spook central bankers, who are afraid deflation (falling price level) could lead to debt-deflation spiral. To prevent such a scenario, the ECB embarked on non-standard, unconventional monetary policy tools.

Rather than being "passive", moving rates and hoping markets, banks and other economic agents would respond in a "conventional" way, the ECB decided to intervene on the markets directly, buying assets from market participants (private asset purchases) and providing them with cheap multiyear funding (LTRO). Neither these measures were enough to really make Eurozone economy going. The ECB therefore decided to follow the policies of the Fed, Bank of England, and Bank of Japan and launch in early 2015 so called *Quantitative Easing* (QE), that is, direct purchases of state bonds and other public sector assets onto its balance sheet.

**Table 16.1** Overview on unconventional policy measures employed by the ECB

| Instrument (2 Oct. 2015) | Holding (bn €) 2 Oct. 2015 | Share on GDP 2 Oct. 2015 | Historical maximum (bn €) |
|---|---|---|---|
| VLTRO (3-year) - liquidity | 0.0 | | 1018.7 |
| TLTRO (4-year) – credit easing (CE) | 399.6 | 4.1 | 399.6 |
| SMP | 127.9 | 1.3 | 219.5 |
| Private asset purchases (ABS, CBPP, CBPP2) | | | |
| ABSPP | 13.2 | 0.1 | 3.6 until QE beginning |
| CBPP | 22.0 | 0.2 | 61.1 |
| CBPP2 | 10.4 | 0.1 | 12.8 |
| CBPP3 | 122.8 | 1.3 | 54.2 until QE beginning |
| Public sector purchase programme (PSPP) | 346.3 | 3.6 | |
| **QE (=CBPP3+ABSPP+PSPP) from 9 Mar. 2015** | **424.5** | **4.4** | **1140.0 planned** |

Note: VLTRO – Very longer-term refinancing operations; TLTRO – Targeted longer-term refinancing operations; SMP – Securities market program; ABSPP – Asset-backed securities purchase programme; CBPP- CBPP3 – Third covered bond purchase programme; PSPP – Public sector purchase programme

Source: NBS, 2015

### Controversy

These QE purchases (officially known as Expanded Asset Purchase Program or EAPP) are rather controversial because by buying public debt, the ECB helps the individual governments of the Eurozone countries to lower their debt costs. This could be viewed as a sort of fiscal transfer, which is forbidden in the conventional monetary policy framework of the ECB (Eurozone operates as a monetary and economic union, not a fiscal union). To sooth such concerns, the ECB decided that government bond purchases will be done proportionately to individual countries share in the ECB capital as shown in the Table 16.2. The volume of purchases of bonds between 2 and 30-year maturity was set at 60 billion €/month and should last from March 2015 until at least September 2016.

**Table 16.2** Expanded Asset Purchase Program, distribution by country (bn €)

| | Sov. Bonds ex T-bill | 2-30Y Bonds ex T-bill | Capital keys | Total PSPP Mar 15-Sep 16 |
|---|---|---|---|---|
| AT | 191 | 162 | 2.9 % | 23 |
| BE | 312 | 254 | 3.6 % | 29 |
| CY | 2 | 1 | 0.2 % | 2 |
| DE | 1,114 | 803 | 26.3 % | 208 |
| EE | 0 | – | 0.3 % | 2 |
| ES | 736 | 551 | 12.9 % | 102 |
| FI | 82 | 64 | 1.8 % | 15 |
| FR | 1,429 | 1,133 | 20.7 % | 164 |
| IE | 125 | 111 | 1.7 % | 13 |
| IT | 1,665 | 1,232 | 18.0 % | 142 |
| LT | 3 | 2 | 0.6 % | 5 |
| LU | 6 | 6 | 0.3 % | 2 |
| LV | 1 | 1 | 0.4 % | 3 |
| MT | 5 | 4 | 0.1 % | 1 |
| NL | 329 | 257 | 5.9 % | 46 |
| PT | 103 | 87 | 2.6 % | 20 |
| SI | 16 | 12 | 0.5 % | 4 |
| SK | 31 | 22 | 1.1 % | 9 |
| GR* | 52 | 47 | 2.9 % | – |
| **Total** | **6,202** | **4,750** | **–** | **791** |

Note: * Country currently excluded from the PSPP. T-bill means Treasury-Bill

Source: Bloomberg, ECB, Intesa Sanpaolo

### Elephant in China shop

In such a proportionate way, the ECB could not be accused de jure that it helps selected countries to lower their debt costs by buying a lot of their bonds while punishes some other countries by not buying their debt at all. Still, the bond markets vary in size and liquidity and for Slovakia in particular, the ECB acts like an elephant in China shop. This is because the local bond market is very small and shallow, and any big purchase of bonds pushes their price up a lot and conversely pulls interest rates down a lot. It thus happened that after the ECB launched QE, the yields on Slovak government bonds fell even below Austria (see Figure 16.3), which boasts superior credit rating. In fact, Slovak bonds up to three-year maturity are as of October 2015 priced to yield negative returns. This is clearly a market distortion brought about solely by the ECB's bond purchases. Concerns over market distortions and fiscal implication will nonetheless not stop the ECB from continuing with the QE. After all, relative to their peers in US, UK, and Japan, they still are rather conservative.

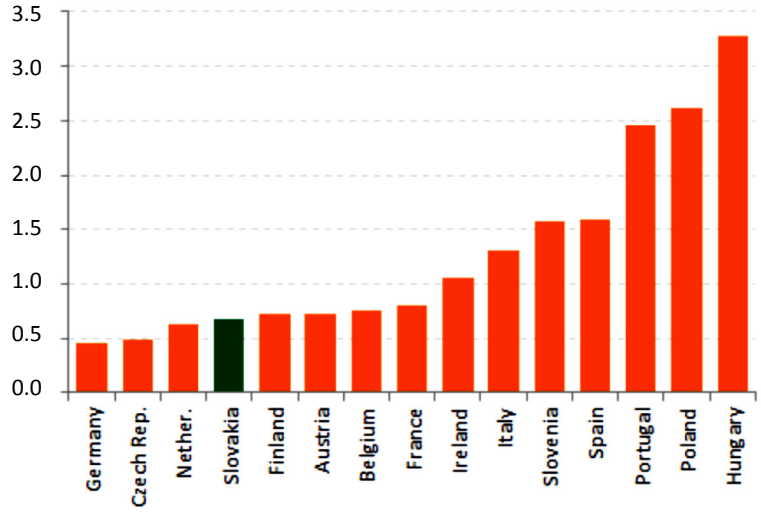



**Figure 16.3** Slovak yields in cross-country comparison (10 y, % p.a., as of Oct 27, 2015)
Source: Bloomberg, VÚB

# Chapter 17 OVERVIEW OF SLOVAK FINANCIAL SECTOR

## 17.1 Banks dominate Slovak finance

In general, the financial sector consists of businesses that manage money. In the US, financial sector is mainly represented by capital market (stock exchange, asset management, investment funds etc.), banks present a minor part. In Europe, banks prevail, with their share in the financial system around 50 %. In Slovakia, financial sector is even more bank dominated: banks account for over 70 % of the financial sector assets (Figure 17.1). Yet, in absolute terms and even relative to GDP, Slovak banking sector is tiny relative to the other member countries of the Eurozone (see Figure 17.2).

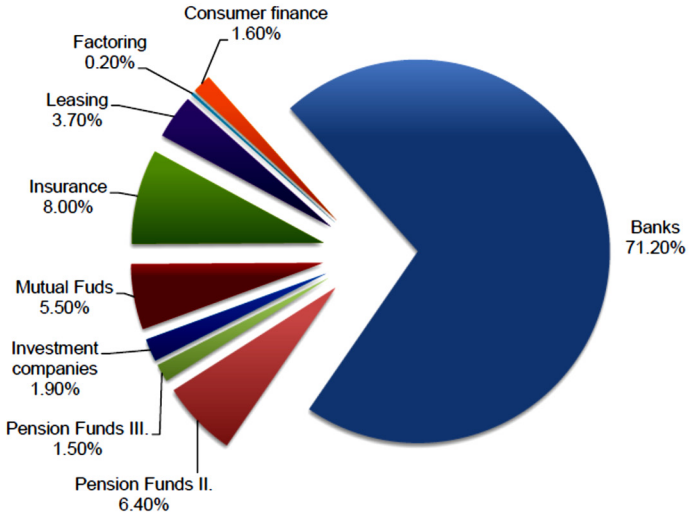



**Figure 17.1** Slovak financial sector by segments (% of assets)
Source: NBS, 2014

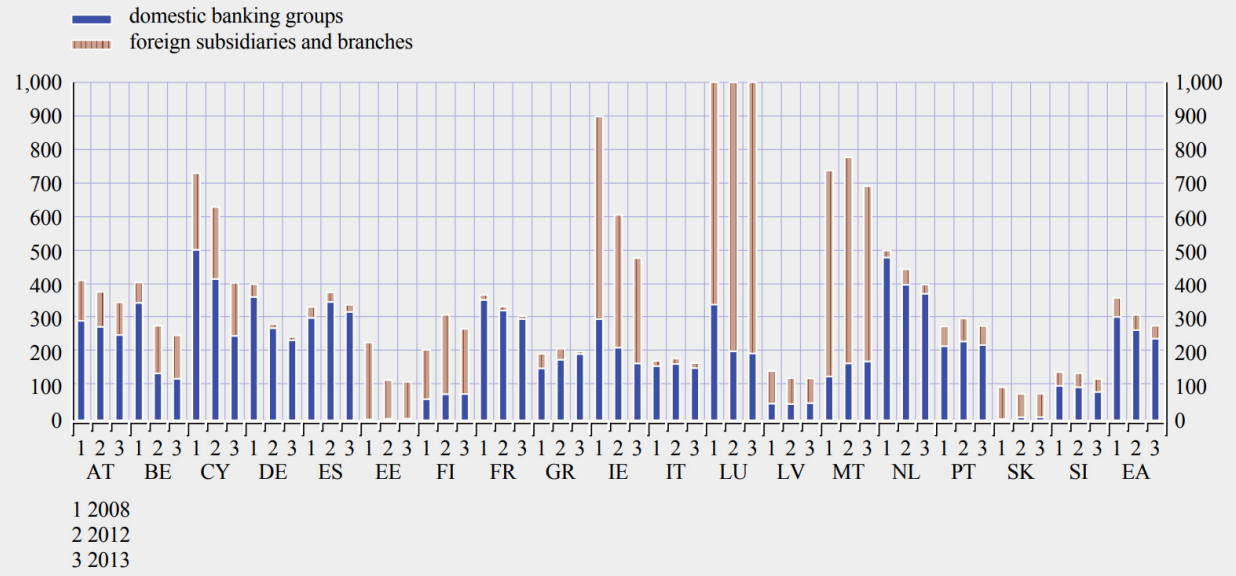



**Figure 17.2** Total assets of banks in the Eurozone countries (% of GDP, 2008, 2012, 2013)
Source: ECB/Financial stability committee, Consolidated banking data statistics and ECB calculations[91]

[91] ECB. 2014. Banking structures report. 63 p. ISBN 978-92-899-1459-8. Retrieved from <https://www.ecb.europa.eu/pub/pdf/other/bankingstructuresreport201410.en.pdf>

## 17.2 Why there is no real capital market in Slovakia

There have been many attempts to create Slovak capital market to provide non-bank finance to the economy, as an alternative to banking finance. Those attempts, however, to a large extent failed. First, the privatization process post socialism in the early 1990s which gave initial boost to the stock exchanges in Poland or Hungary was botched in Slovakia. It was done through vouchers – claims on privatised companies' equity. Vouchers were distributed to population for free and partly due to this, people did not really appreciate them much. Vouchers were quickly picked up from them by investment companies and speculators, who took control over the companies, stripped them of valuable assets and left to minority investors-people worthless entities. Only handful of companies privatised in the voucher privatization made it to the stock exchange and from them just a fraction remained there until these days. More recently, there have been attempts to revive the Slovak capital market by some domestic investors who raised capital by IPOs of their development projects (e.g. TMR, BHP), but the trading never really took off, and the *Bratislava stock exchange* (BSSE) remains dwarfed by neighbouring countries. Instead of Bratislava, prospective Slovak companies looking for capital financing choose much more liquid and accessible Warsaw or Prague instead. Trading on BSSE thus remains all about state bonds (see Figure 17.3).

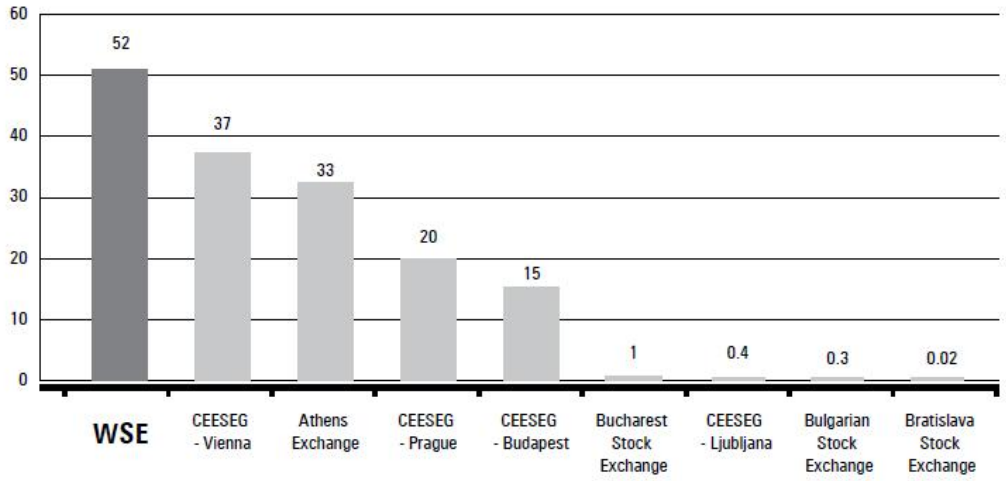



**Figure 17.3** Trading with shares on stock exchanges in the region (bn €, 2010)
Source: BSSE

Bratislava Stock Exchange was founded in 1991 by banks and insurance companies. The actual trading on the BSSE started on April 6, 1993. Its activities are dominated by trading of bonds, primarily government bonds. The Stock Exchange Index (SAX) comprises few companies (see table below).

| The SAX companies | Share in % |
|---|---|
| Biotika | 15.16 |
| OTP Banka Slovensko | 8.92 |
| Slovenské energetické strojárne | 0.74 |
| Slovnaft | 16.32 |
| Všeobecná úverová banka | 21.06 |
| Tatry mountain resorts | 19.42 |
| Best Hotel Properties | 18.38 |

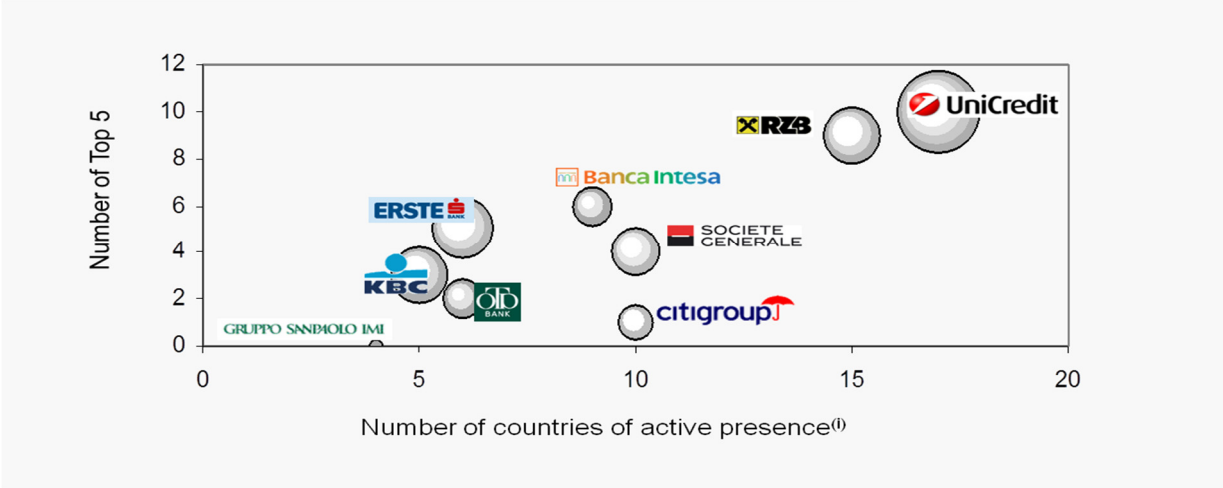
**Table 17.1** The SAX companies, basket as of Dec 31, 2014
Source: BSSE, 2014[92]

[92] BSSE. 2014. Retrieved from <http://www.bsse.sk/Portals/2/Resources/statistics/year/Factbook-2014-BSSE.pdf>

## 17.3 Banking evolution in Slovakia

Commercial banking in Slovakia, much as in other Central and Eastern European (CEE) countries originated after the fall of communist regime, alongside transition from planned to market economy in early 1990s. 2-tier banking systems were introduced by separation of commercial banking from the National Bank (Czechoslovak State bank). Generally, for each major industrial sector and/or region a state-owned commercial bank was founded. In addition, pre-existing specialised banks (e.g. savings banks, export-import banks etc.) affiliated with a National bank in the respective country were granted licenses. Foreign banks entered CEE banks gradually, either via small green-field investments or later on through privatization of state-owned banks. In privatization, Hungary was a successful early example, followed by Poland in mid 1990s. Czech and Slovak banks were privatised to strong foreign names rather late, around the turn of the millennium. Despite various timing and methods of privatization (e.g. IPO, voucher, direct sale etc.) in CEE countries, the key players were rather similar, originated primarily from core Eurozone countries such as Austria, Italy, France and Benelux countries. Presence of overseas and UK players in the region was and still is rather marginal.

Roughly ten years ago, strategic positioning of international groups in CEE region has broadly stabilised: some groups got focused, some widespread in their presence.




Note: size of a group represents its total assets controlled in the region

**Figure 17.4** Strategic positioning of international groups in CEE region, 2008

Source: Unicredit

Foreign ownership varies from country to country, Central Europe and Baltics lead, Russia and Turkey lags in this respect. The share of bank assets controlled by foreign owners in CEE region is currently circa 43 %. In Central European and Baltic countries, though, this share is even twice as high, well over 90 % for some countries. After the Lehman collapse and ensued financial crisis since 2008, nonetheless, the role of domestic players is increasing as some foreign players had to consolidate and revaluate their presence outside their home countries, selling their stake also to local investors rather than to their international peers.

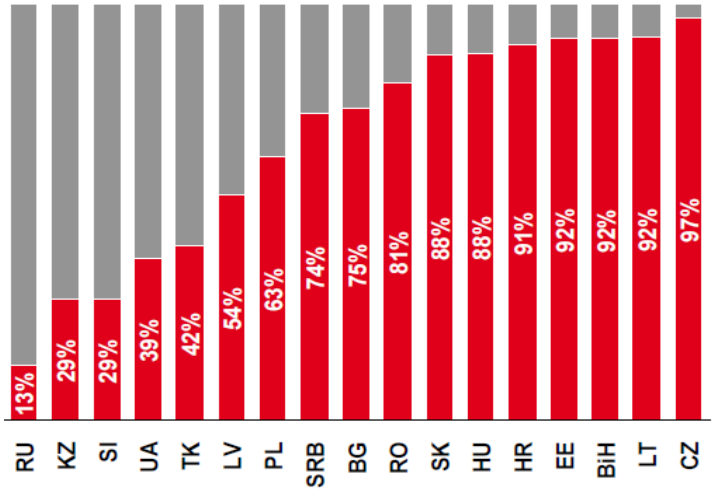



**Figure 17.5** Market share of foreign-owned banks in CEE countries (% of total banking system assets), 2008
Source: Central banks, Unicredit

For western banks, CEE region presented excellent growth opportunity:

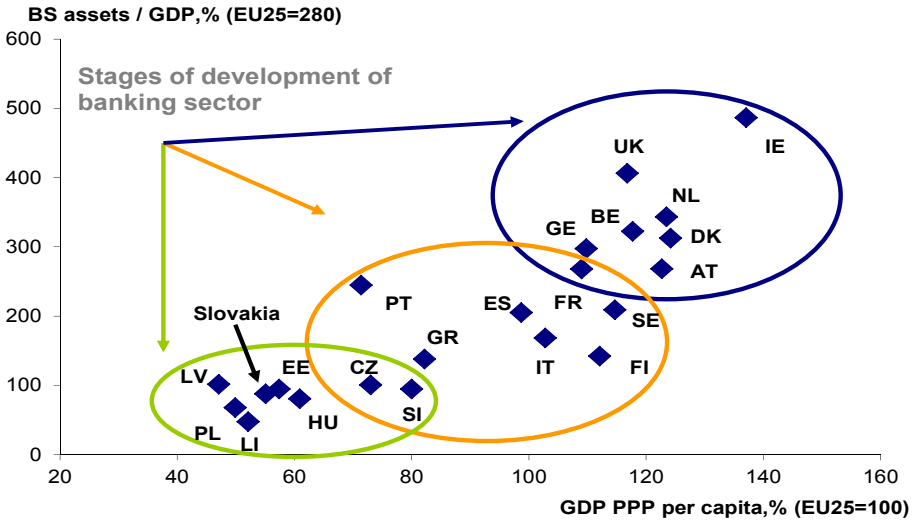



**Figure 17.6** Stages of development of EU-25 banking sectors, 2008
Source: Eurostat, VÚB

The growth continued even during the crisis years:

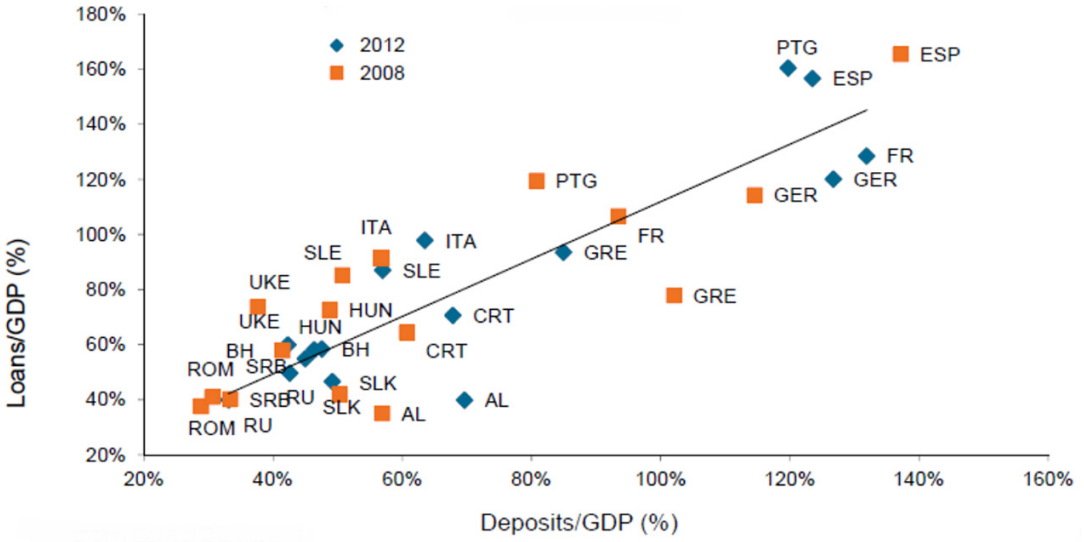



**Figure 17.7** Performance of EU banking sector in 2008 and 2012
Source: Central banks, EIU (Economist intelligence unit)

There is still room for growth going forward in the deposits:

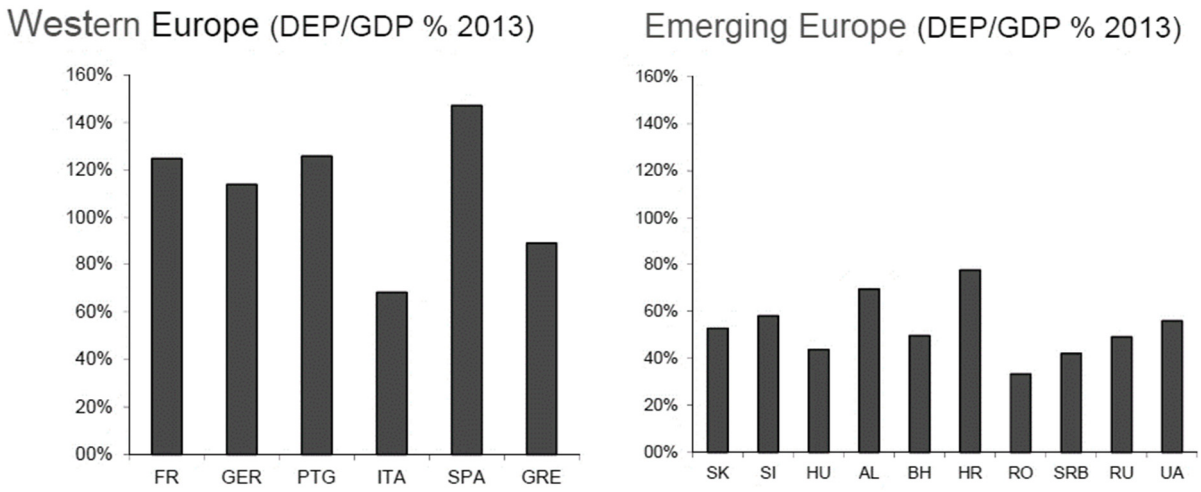



**Figure 17.8** Level of deposits on GDP in 2013 (%)
Source: Thomson Reuters, Credit Suisse

There is even more room for growth in lending volumes. In Eurozone, bank loans to private sector amount on average circa 140 % of GDP. In Central and Eastern Europe, it is less than half that. Room exists especially in retail segment. Household debt to gross disposable income in Eurozone is nearly 100 %, in Slovakia, for example, only about 55 %, Figure 17.9.

Demand for loans is driven by population demand for better lifestyle:

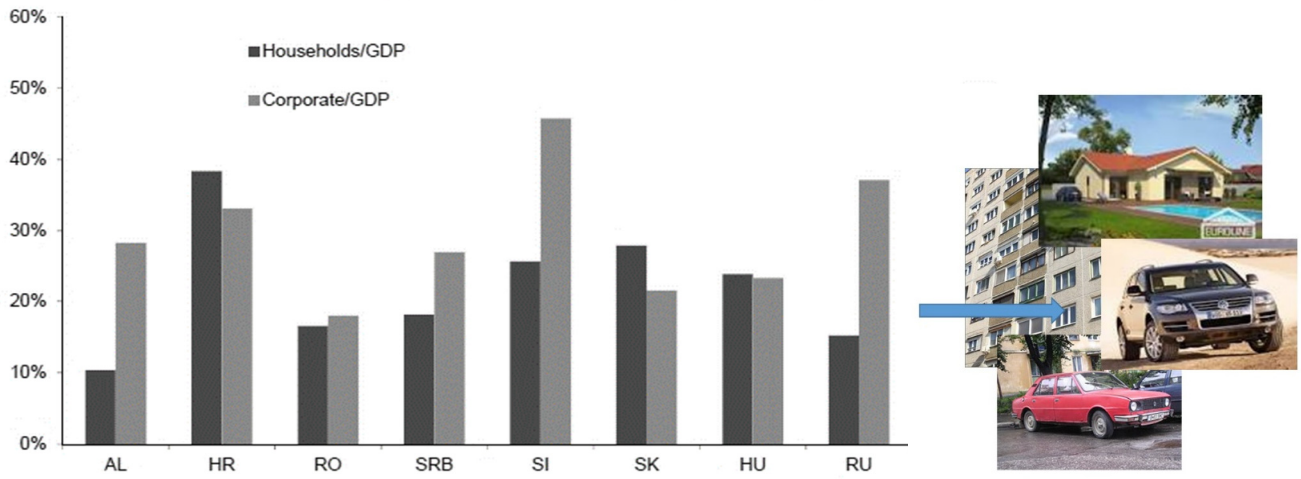



**Figure 17.9** Level of household and corporates loans on GDP in 2013 (%)
Source: Intesa Sanpaolo

Corporates in CEE are even more dependent on bank financing than in Western Europe, let alone US, so banks clearly play a crucial role in driving economic growth in the region.

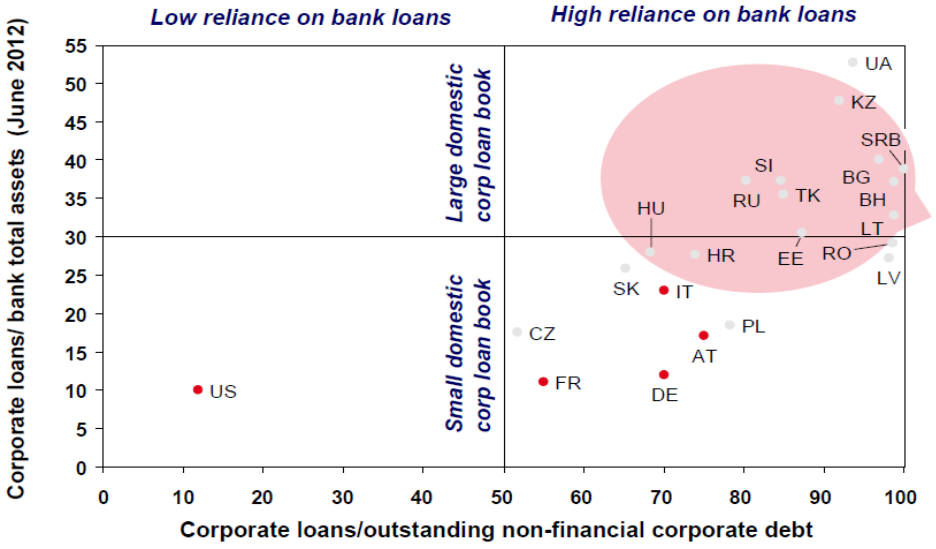



**Figure 17.10** Level of corporates dependence on bank financing, 2012
Source: Unicredit

## 17.4 Position of the Slovak banking sector at present

Slovak banking sector is liquid, it traditionally carries excess liquidity. Loan to deposit ratio as of September 2015, was 92 % (see Figure 17.11), excess of deposits over loans was about €4 billion. Relative to other countries in the region, Slovak position is favourable, especially vis-à-vis Hungary and Poland whose banking systems' loans exceed deposits (This has historic origins because when socialism fell in 1989, huge inflation followed in Hungary and Poland and wiped out people' bank savings in those countries. In Czechoslovakia, there was no such hyperinflation and so people's saving were not devalued as much and trust in banks deposits largely preserved).

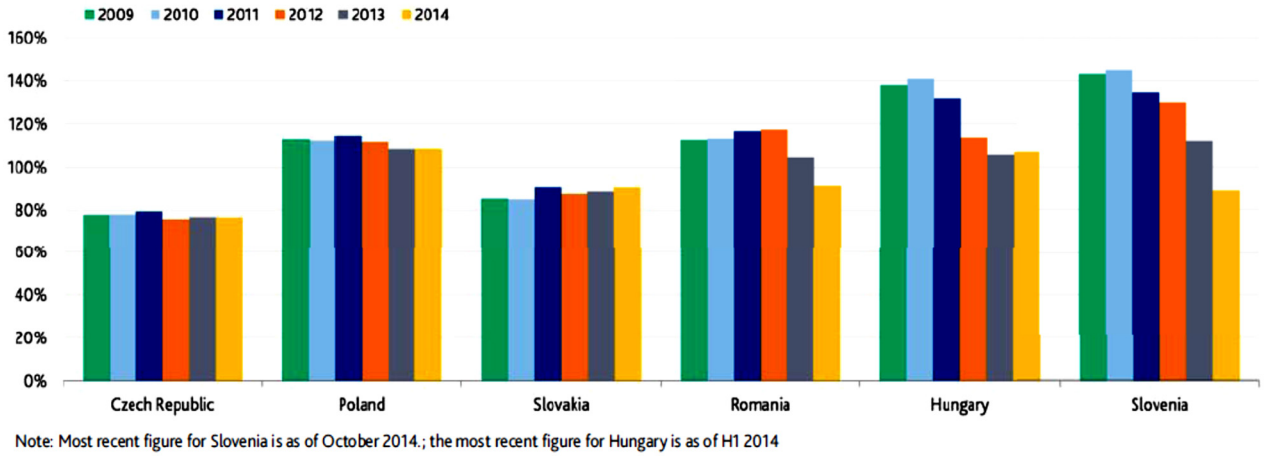



**Figure 17.11** Loan to deposit ratios (%) in CEE6 banking systems
Source: Moody's

Indeed, funding of Slovak banks is relatively stable, dominated by retail and corporate deposits. Wholesale (funding from other banks) or parental funding are minor vis-à-vis peers in the region.

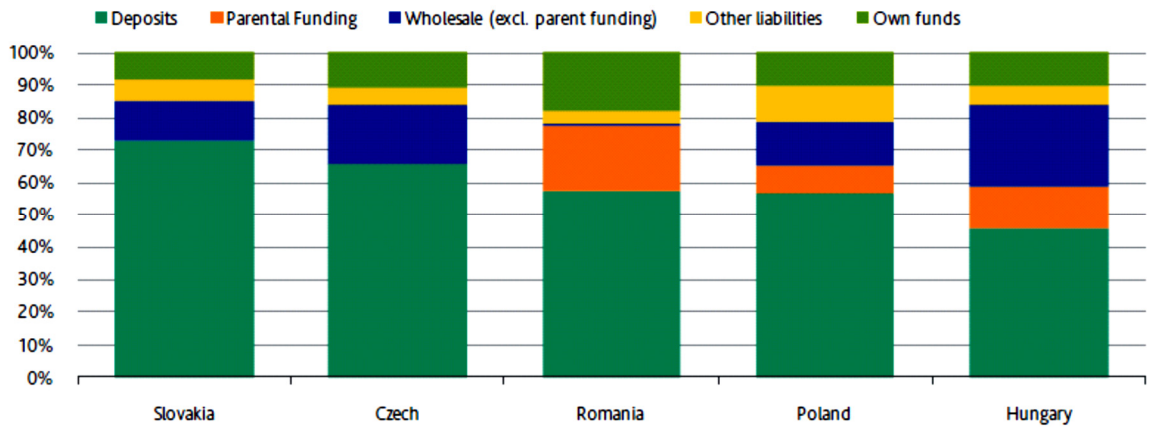



**Figure 17.12** Principal funding sources of the CEE5 banking systems, 2014
Source: Moody's

Slovak banks are quite profitable, especially vis-a-vis western European countries, Figure 17.13. Banks used these high profits not only to pay nice dividends to shareholders but also to build their own capital. Indeed, historically, Slovak banks retained half of their profits to boost their capital. Thus, unlike

in Western Europe, Slovak banking sector is well capitalised, and capital is not really an issue. The key indicators of capital adequacy, CAR and TIERI ratio are both in comfortable levels of ca. 17 % and 16 %, respectively (Figure 17.14). Recall that in recent history, 8 % was considered adequate.

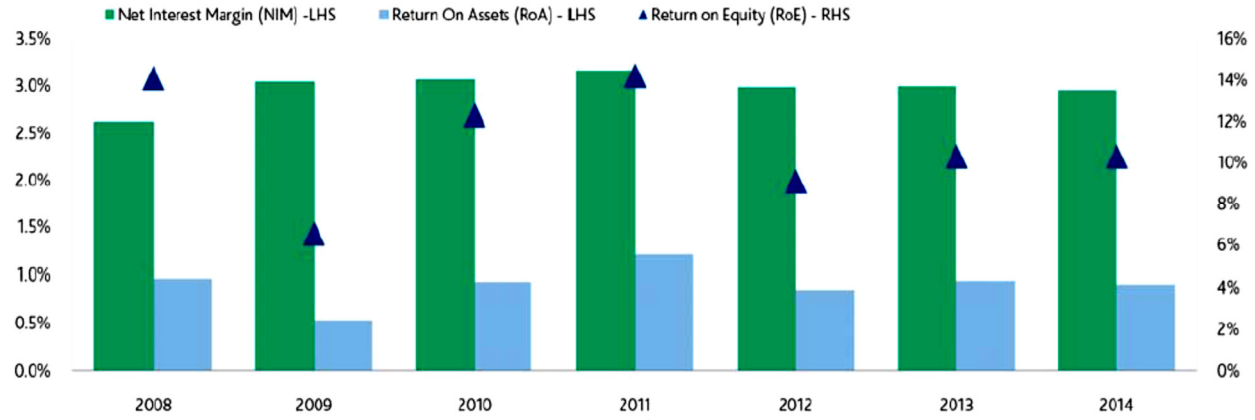



**Figure 17.13** Profitability of Slovak banking system
Source: Moody's

Slovak banks have been profitable, with return on equity (that is net profits over bank capital) in double digit figures (Figure 17.14).

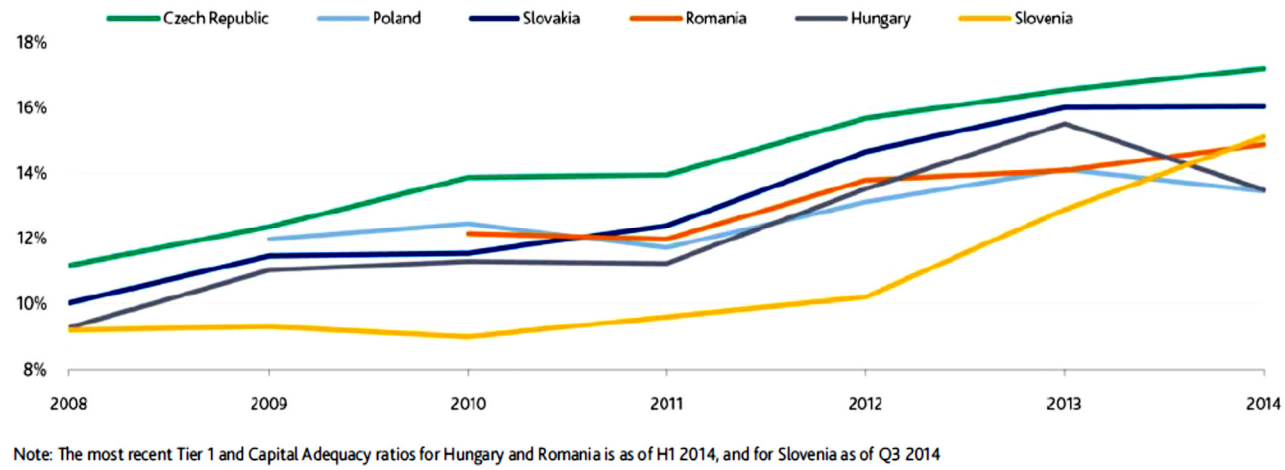



**Figure 17.14** Capital ratios in CEE6 banking systems
Source: Moody's

In recent years, though, profitability came under pressure due to low interest rate environment (see Chapter 16 on monetary policy) and even more so due to a special Slovak bank levy introduced in 2012. Even so, Slovak banks remain more profitable than many peer countries, except the Czech Republic and Poland, who have bigger domestic markets and banks, they benefit from economies of scale (see Figure 17.15).

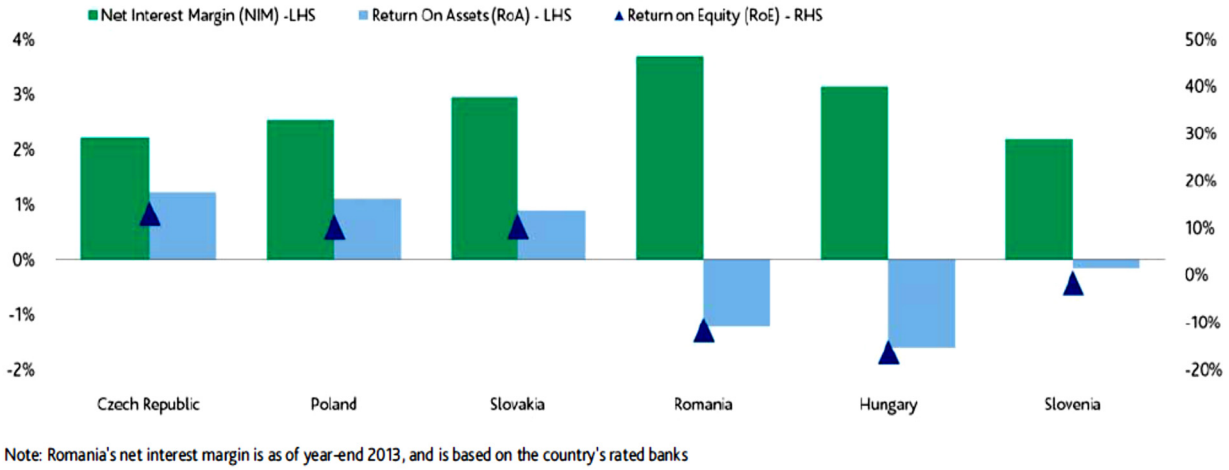



**Figure 17.15** Profitability of CEE6 banking system in 2014
Source: Moody's

Slovak banks feature good asset quality: Non-performing loans (NPL) in Slovakia are currently 5.5 % of total loans. Even during the crisis, the peak in 2010 was still relatively modest 6.3 %. NPLs are lower for households than enterprises (ca. 4 % vs 8 % resp.). As the Figure 17.16 documents, asset quality of Slovak banks is the best in the region, second only to the Czech Republic.

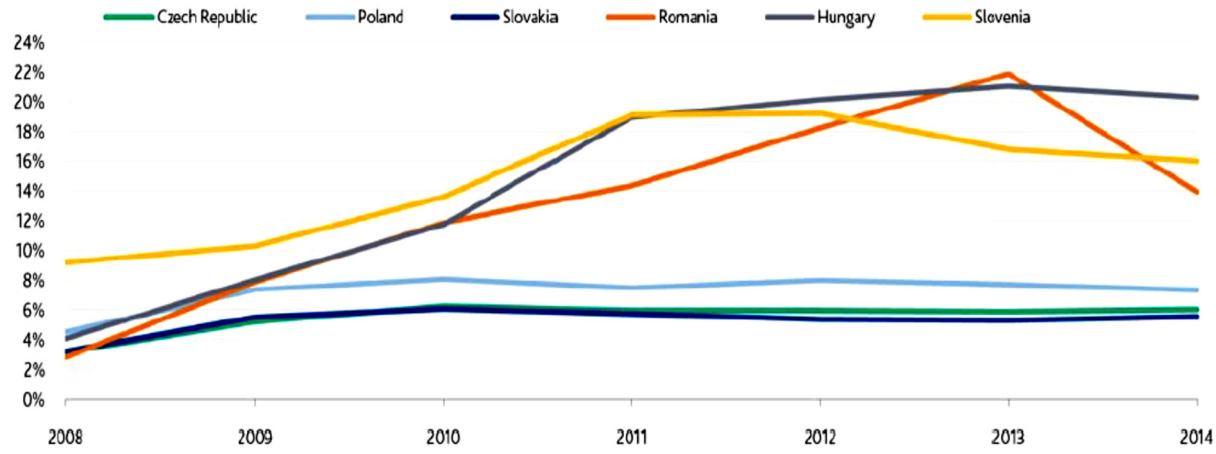



**Figure 17.16** NPL ratios CEE6 banking system
Source: Moody's

Slovak market features 20+ banks, which may be too many for the small €70 billion economy. Competition therefore is very intense, Figure 17.17. There has been much talk and expectations of the consolidation in the sector, but not much action yet. This may be due to the fact that the sector, even is small, still generates nice profits for the shareholders or to the fact that those who want to sell may not find potential buyers because of the poor financial situation of the European banks in general.

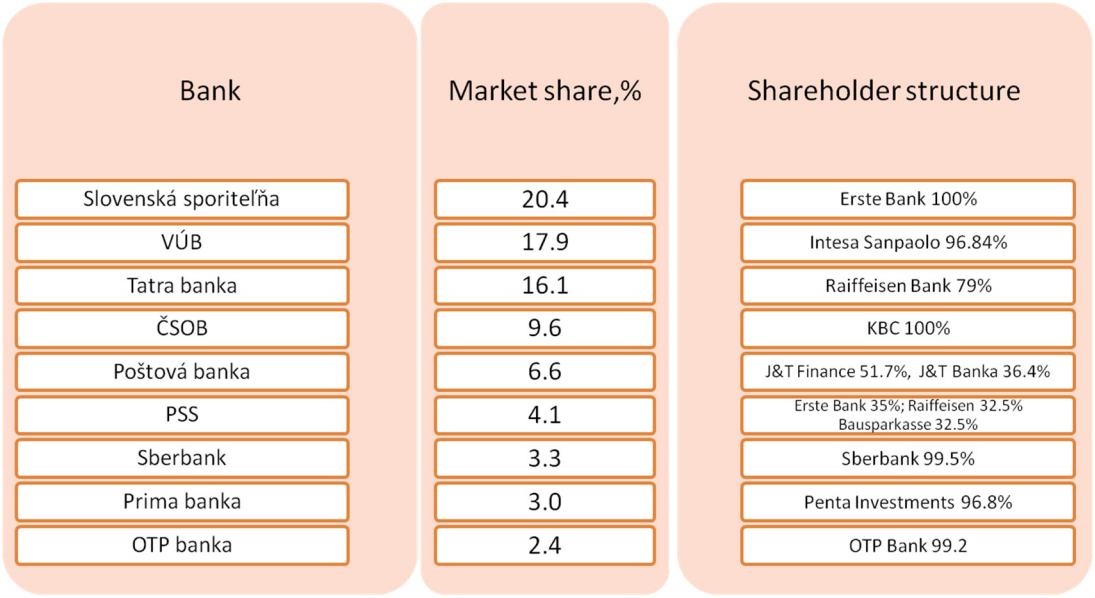



**Figure 17.17** Slovak banking market is saturated and highly competitive
Source: NBS, financial statements, as of March 2015

## 17.5 Insurance companies and other players on the Slovak financial sector

The insurance sector in Slovakia evolved since 1919, when *Slovenská poisťovňa* was founded, later it was nationalised after 1945 and state owned until the fall of the communist regime in 1989. In 1991 the law allowed for insurance companies privatisation. *Slovenská poisťovňa* was privatised by *Allianz SE*, a major worldwide insurance company headquartered in Germany. Other local and foreign insurance companies eventually entered the insurance market, now counting 15 providers.

**Insurance companies licensed in the Slovak Republic:**

- AEGON Životná poisťovňa, a.s.
- Allianz - Slovenská poisťovňa, a.s.
- ČSOB Poisťovňa, a.s.
- ERGO Poisťovňa, a. s.
- Generali poisťovňa, a. s.
- NN Životná poisťovňa, a.s.
- KOMUNÁLNA poisťovňa, a.s., Vienna Insurance Group
- NOVIS Poisťovňa a.s.
- Poisťovňa Cardif Slovakia, a.s.
- Poštová poisťovňa, a. s.
- Poisťovňa Slovenskej sporiteľne, a.s. Vienna Insurance Group
- Rapid life životná poisťovňa, a.s.
- Union poisťovňa, a. s.
- UNIQA poisťovňa, a.s.
- Wüstenrot poisťovňa, a.s.

The insurance sector is highly regulated. After the 2008 crisis, a tendency for more unification across EU can be observed. The Solvency II project, starting from January 1, 2016, aims on recodification of the 13 existing directives regulating the insurance sector in the EU. The new harmonised rules control capital requirements for insurance undertakings and reinsurance undertakings operating in member countries of the European Union. The uniform application of Solvency II across the whole European Union should create an integrated market of insurance services and provide more protection for customers.

**Insurance regulation - Three pillars of Solvency II:**

I. Capital requirements of insurance undertakings with respect to risks (underwriting, credit, market and operational)
II. Requirements for governance and the methods of supervision.
III. Disclosure and transparency requirements

## 17.6 Pension funds

The pension system in Slovakia consists of three pillars:

I. The state (non-commercial) Social Insurance Agency, which operates the Pay-As-You-Go system of old-age pensions (first pillar);
II. Mandatory old-age pension saving system provided by Pension funds management companies (second pillar);
III. Voluntary saving in Supplementary pension funds (third pillar).

### The second pillar of the pension system – the old-age pension saving scheme

The old-age pension saving system ensures an income to savers in their old age. Since 2005, Pension funds management companies (PFMC) were established to provide management of savers' pension assets, besides the state Pay-As-You–Go system. Mandatory pension contributions, determined as a percentage rate of savers' income, are transferred to the saver's personal pension account. From September 1, 2012 to December 31, 2016, this rate is 4 % of the assessment base; subsequently, up to and including 2024, the rate will rise by 0.25 percentage points per year, and then remain at 6 %.

Pension funds differ in terms of their investment strategy and the degree of investment risk they undertake. Funds with higher risk, such are investments in equity pension funds and index pension funds, offer the possibility of higher returns. On the other hand, at the same time, there is higher probability of returns being lower or negative. When savers reach 50 years of age, the PFMC is required to begin gradually shifting their pension assets into a guaranteed bond pension fund, associated with lower risk (but also lower returns).

**Pension funds management providers (DSS):**

- Allianz - Slovenská dôchodková správcovská spoločnosť, a.s.
- NN dôchodková správcovská spoločnosť, a.s.
- VÚB Generali dôchodková správcovská spoločnosť, a.s.
- AEGON, d.s.s., a.s.
- Dôchodková správcovská spoločnosť Poštovej banky d.s.s., a.s.
- AXA d.s.s., a.s.

The market shares of the above-listed DSS companies are depicted in the Figure 17.18.

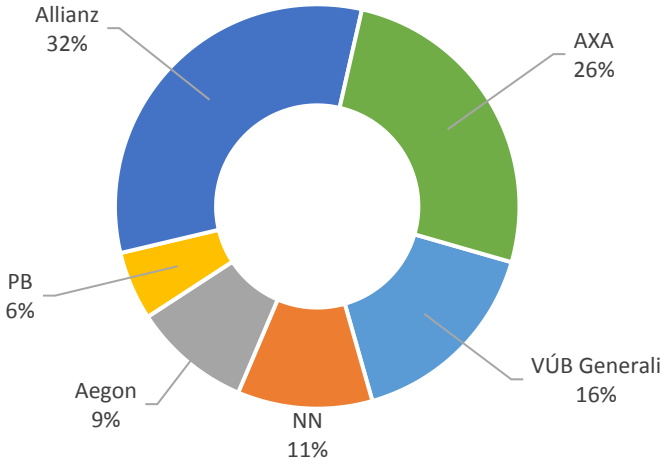



**Figure 17.18** Market shares of mandatory pension funds providers (% of assets, Sep 2015)
Source: NBS

**Supplementary pension funds: The third pillar of the pension system**

The system is based on optional monthly saving scheme of employees and additional monthly contribution of an employer, based on an agreement. In this system, most participants make contributions on a voluntary basis, with their employer providing additional contributions.

In 2005 and 2006 the supplementary pension insurance companies that had been active in the supplementary pension sector since 1996 were transformed *into supplementary pension management companies* (SPMC). At present, there are four SPMCs operating in Slovakia. These companies establish and manage contributory supplementary pension funds that are differentiated by their investment policy. Participants use the contributory funds during the accumulation phase. SPMCs also manage pay-out supplementary pension funds, which are used solely to pay out supplementary pensions for a temporary period. A participant who wishes to have an annuity supplementary pension must transfer his supplementary pension savings to an insurance company and purchase a life annuity.

**The supplementary pension scheme providers (DDS):**

- AXA d.d.s., a.s.
- NN Tatry -Sympatia, d.d.s., a.s.
- STABILITA, d.d.s., a.s.
- Doplnková dôchodková spoločnosť Tatra banky, a.s.

Much as for the banks, in absolute size, insurance companies and pension funds are very small in the Eurozone context as it is seen from Figure 17.19.

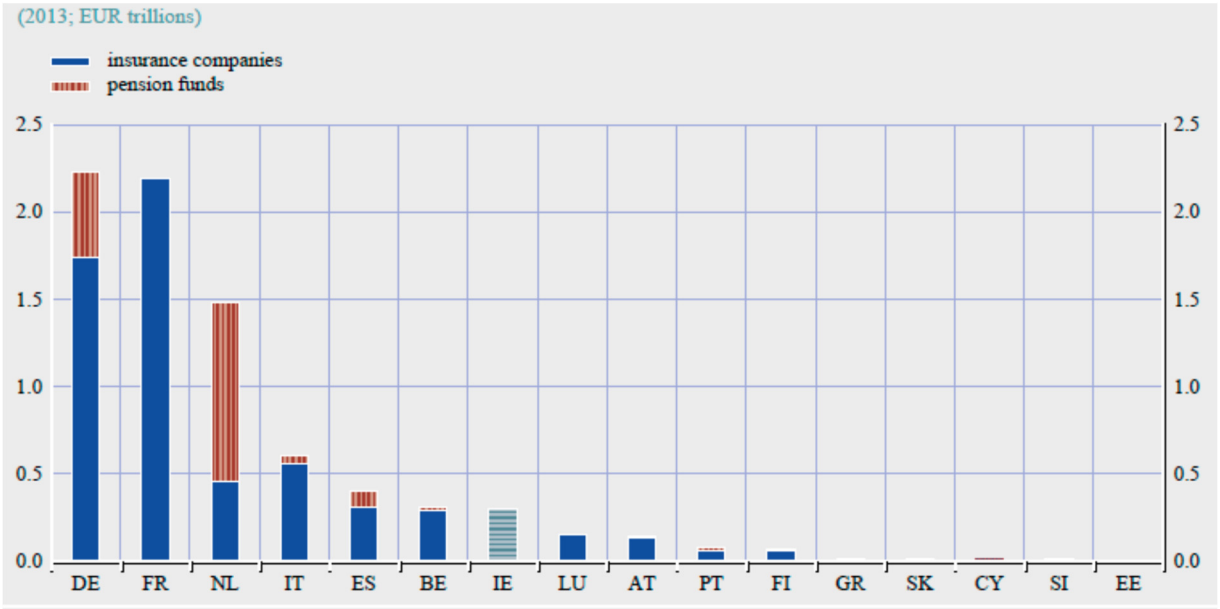



**Figure 17.19** Total assets of insurance companies and pension funds in comparison, 2013
Source: ECB data

## 17.7 Collective investment

Banks and foreign bank branches, Asset management companies, Investment firms: all of them can provide the management of customers' assets through various tools of collective investment. Asset management providers collect financial assets of several individuals – investors. The financial means of investors create a mutual fund. The financial means are invested in different classes of assets in compliance with the investment strategy of the respective mutual fund (e.g. Real estate funds, Money market and bond funds, Alternative Mixed funds, Equity funds, investment funds...). Costs related with transaction per one security upon purchase or sale of larger volume of securities, are markedly lower than upon purchase of one security by individual investor, that's why it is more convenient to invest through a mutual fund instead of an individual transaction. Mutual funds offer a possibility of reaching attractive yields, compared to regular bank deposits.

**Asset management providers licensed in the Slovak Republic:**

- Sandberg Capital, správ. spol., a.s.
- Alico Funds Central Europe správ. spol., a.s.
- Asset Management Slovenskej sporiteľne, správ. spol., a.s.
- IAD Investments, správ. spol., a.s.
- PRVÁ PENZIJNÁ SPRÁVCOVSKÁ SPOLOČNOSŤ POŠTOVEJ BANKY, správ. spol., a.s.
- Tatra Asset Management, správ. spol., a.s.
- VÚB Asset Management, správ. spol., a.s.

## 17.8 Exchange rates and the international sector

Thus far, our study of macroeconomics has focused on a country's domestic data, specifically GDP, inflation, employment, unemployment and interest rates. When we are looking only at our domestic market, our market prices are determined by the interaction of demand and supply, producers and middlemen set prices relative to those market prices and local conditions, and buyers and sellers negotiate from those quoted prices. When goods are sold between two countries that have different national currencies, the domestic market price for an item in one country must undergo a currency transformation if those items are to be sold in another country. That is, there is a second price that needs to be considered, the *exchange rate* between the two currencies.

### 17.8.1 Exchange rate and its determination

**The dollar-to-euro exchange rate**

The most important exchange rate in the world today is the dollar-to-euro rate ($/€), typically expressed as the number of dollars it takes a person to buy one euro. Both dollars and euros are valuable assets. Any rational individual would prefer to have more dollars or more euros, as compared to having fewer dollars or fewer euros. Because the euro and the dollar are assets, we can treat them like any other market-based asset, in quantity-price, supply-demand space. Corn, for example, has become a valuable commodity in recent years, in part due to increased ethanol production. With corn as the major input into ethanol production, as the demand for corn has grown, its market price has increased, whether measured in dollars per bushel or in euros per metric ton.

The euro also has a market price that increased for many years, but which has been in decline in recent years. That price can also be expressed in dollars. Likewise, the dollar can be expressed in terms of how many euros it can buy. As the euro becomes more valuable, its dollar-to-euro price rises. In formal terms, we would say that the euro had appreciated and that the dollar had depreciated. The euro was introduced on January 1, 1999 as an electronic currency and became a cash currency three years later. Its initial dollar value was approximately $1.18, but it quickly fell in value during its early years, to around $0.85 during the summer of 2000. The euro began a steady rise in 2001 and for a few months in 2002 the euro and the dollar were "at par". That is, they exchanged on a one-to-one ratio. For almost a decade after that the euro increased in value while the dollar decreased. That is, the dollar-to-euro rate rose, and the euro-to-dollar rate fell. Recent years, however, have not been kind to the euro. The euro hit its peak in late April 2011, when it took approximately $1.47 to buy one euro. The euro then began an unsteady slide, dropping to $1.22 in late July 2012. It then rose to another peak at $1.39 in March 2014 before it began a major slide, dropping to $1.06 one year later, in early March 2015. The euro then rebounded somewhat, but has recently had a series of gains and losses. As of this writing (early-November 2017), the value of the euro stands at $1.1585, meaning that it would take $115.85 to buy €100. Conversely, it would take €86.32 to buy $100. In this present situation, we refer to the euro as the "premium currency" (it would take more than one dollar to buy one euro) and the dollar as the "discount currency" (it would take less than one euro to buy one dollar).

**Exchange rate determination**

What are the factors that affect currency values? How are market exchange rates determined? We first need to understand that any currency is a "good" (as opposed to a "bad", like pollution). With any good, more is better. We would rather have more euros or more dollars than fewer euros or fewer dollars. Even with a weak currency, having more of that currency is preferred to be having less of that currency. Because every foreign currency is a good, as with any other good, we can analyse currency values in a supply-demand framework, with a quantity measure of the currency on the horizontal axis and a price for the currency on

the vertical axis. If our concern is with the value of the euro, then we can measure its price on the vertical axis in U.S. dollars, in British pounds, in Swiss francs, or in any other currency we choose.

In Figure 17.20 we measure the value of the euro in U.S. dollars. It will be easier, for pedagogical reasons, if we assume initially that there are only two regions, the United States and the European Union. US citizens will want to buy euros when they want to buy European items. So, their demand for euros will be a function of their demand for European goods, services, and physical and financial investments. Naturally the US demand for European goods and services (commodities and products, tourism, insurance, banking services, etc.) will be a function of US tastes and preferences, the prices of substitutes and complements, and relative prices between the two regions, while the US demand for European physical and financial assets will be a function of expected profits, interest rates, taxes, and a whole host of other considerations. That is, the demand for euros reflects the US import demand for European goods.

The supply of euros is similar to the demand for euros, except that it originates with the European demand for US goods, services, and physical and financial investment. That is, if Europeans wish to buy US items, they must offer their euros in exchange for dollars so they can use the dollars to buy American goods. Thus, the supply of euros reflects the European demand for US goods, services, and physical and financial investment. The intersection of the US demand for euros and the European supply of euros then determines dollar price of the euro, shown as $1.5 in the diagram. That is, it is the buying and selling of currencies that determines exchange rate levels.

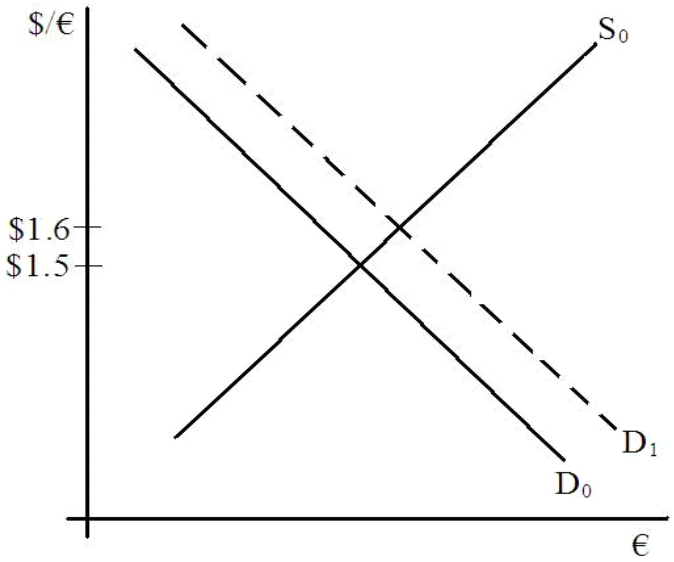



**Figure 17.20** Exchange rate determination

In the bigger picture, it is not only the US demand for and the European supply of euros that determines the value of the euro. Citizens throughout the world are constantly buying and selling euros and other foreign currencies for immediate purchases, for future purchases (forward markets), for speculation on currency values, and sometimes simply as a "safe haven" for their own financial assets. It is the interaction of all the demands and all the supplies that determines the value of any foreign currency.

Shifts in these demand and supply functions then lead to changes in foreign currency values. An increase in the demand for euros, as shown in Figure 17.20, or a decrease in the supply of euros (not shown) leads to an increase in the price of the euro (an increase in the dollar-to-euro rate from $1.5 to $1.6), which reflects an appreciation of the euro and a depreciation of the dollar. The euro has appreciated in the sense that Europeans would now receive more dollars in exchange for their euros (160 instead of 150 for every €100), and if Europeans wanted to buy dollars, they would have to offer fewer euros in exchange for a fixed amount of dollars (only €62.5 for $100 instead of €66.67). In similar fashion, a decrease in the demand for

the euro or an increase in the supply of euros leads to a decrease in the price of the euro (a decrease in the dollar-to-euro rate), which reflects a depreciation of the euro and an appreciation of the dollar.

Example

When the euro has appreciated, as shown by its value increasing from $1.5 to $1.6 (see Figure 17.20), US goods are cheaper for European citizens. Suppose, for example, that on Monday a Slovak student found the price of a particular US textbook on Amazon.com to be $64.82, with the exchange rate at the initial 1.5 $/€. This textbook would cost the student €43.21. If one week later the euro had strengthened to $1.6, even though the textbook price remained at $64.82, that book would now cost the Slovak student only €40.51. The textbook is now cheaper, even though its listed price has not changed.

## Multilateral exchange rates and arbitrage

There are hundreds of different currencies worldwide, although only a dozen or so are significant to a large number of people. When two currencies are quoted with respect to one another, they form what is known as a "bilateral" exchange rate. When a third currency is also considered in the context of the first two currencies, then we engage in what is known as *multilateral* exchange rate determination. Suppose we assign to the euro a value of $1.50. Then we introduce a third currency, the British pound sterling (£), and assign it a dollar value of $2.00. With these two values, we can calculate the exchange rate between the euro and the pound. We simply divide the $/€ ($1.50/€1) rate by the $/£ rate ($2.00/£1). If we invert and multiply, the dollar sign cancels out, resulting in a £/€ exchange rate of £0.75/€1:

$$\frac{\$1.50}{€1}\cdot\frac{£1}{\$2.00}=\frac{£1.50}{\$2.00}=\frac{£0.75}{€1}$$

By convention, we typically express the premium currency in the discount currency's terms, so the quoted exchange rate would be 1.33 euro per pound. Multilateral exchange rate determination works for any three currencies where one currency rate is quoted with respect to the other two. For $N$ currencies, the number of bilateral exchange rates is calculated as $[N.(N-1)]/2$. So, for four currencies, there are six bilateral exchange rates; for five currencies, there are ten bilateral rates, and so on.

Unfortunately, there is no giant magical calculator in the sky that keeps all these multilateral exchange rates at their appropriate levels. In fact, exchange rates are constantly changing. It would not be difficult at any one point in time to find two posted exchange rates ($A/B$ and $B/C$) that do not calculate to the exact posted rate for the third relationship ($A/C$). The mechanism that keeps multilateral exchange rates in line is known as *arbitrage*. For three currencies relating to one another, this is known as *triangular*, or three-point, *arbitrage*.

We can best understand triangular arbitrage by examining a disequilibrium exchange rate situation. The diagram in Figure 17.21 shows how currency traders and market mechanisms correct disequilibrium exchange rates.

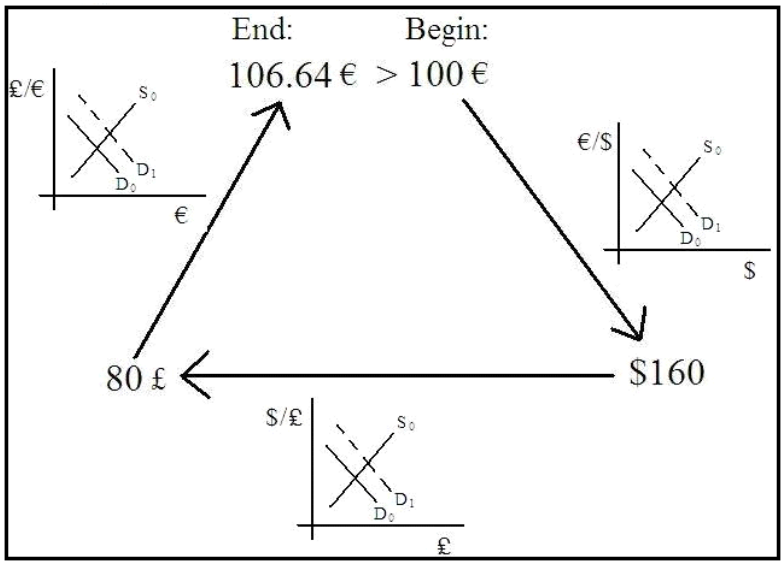



**Figure 17.21** Triangular arbitrage

Suppose we use the exchange rates noted above, except that we list the dollar-to-euro exchange rate at a disequilibrium $1.60 instead of the equilibrium $1.50. Suppose a trader starts with €100. If s/he moves clockwise around the triangle, s/he trades the €100 for $160, then trades to $160 for 80 £, then trades the 80 £ back into euros and receives €106.64, netting a profit of €6.64, if the exchange rates do not change before s/he can make the transactions. This is a dynamic world, however, and in this process three exchange rates would be equilibrated, as noted on the diagram. In the first transaction, dollars are being purchased (demanded) and euros are being sold (supplied). In so doing, this activity would increase the demand for dollars and the value of the dollar, thereby lowering the euro value, possibly back to the correct $1.50/€1 rate. Arbiters would be selling their euros to get undervalued dollars, thereby bidding up the value of the dollar and driving down the value of the euro, moving both currencies in the direction needed.

In the second transaction, pounds are being demanded and dollars are being supplied, appreciating the pound and depreciating the dollar. Note that a $2.133 for 1£ exchange rate would correct the disequilibrium situation. Finally, in the third transaction, pounds are being sold and euros are being bought, raising the value of the euro from €0.75/£1 to €0.80/£1, again a new equilibrium exchange rate. As an aside, it is worth noting that a trader moving the wrong way around the triangle would lose euros in the process instead of profiting. This provides a double-check on the process. The two final opposite-direction results, in euros, when multiplied by each other should equal 10,000 (equal to 100 x 100). Finally, it would seldom be the case that only one exchange rate would change. It would be more likely the case that each of the three exchange rates would move in the directions notes, each moving to a different equilibrium rate.

## Fixed exchange rates

Not all currency values are market determined. Some currency values are *fixed* or *pegged*. These exchange rates are rates that are set with respect to another currency or to a basket of currencies and do not change, except by government order. For example, every currency within the euro system has a value that was determined at the time the euro was adopted for that country. Individuals who still have cash denominated in that currency can trade that currency for euros, at the rate that was established at the time of adoption. The exchange rate was "fixed" at the time of the euro adoption. When Slovakia went to the euro in 2009, its SKK value was set forever at 30.15 SKK/€. For the next twenty years, individuals would have the right to exchange their SKK for euros at that set price.

The above paragraph points to only one type of fixed exchange rates, but these rates are not so relevant in a dynamic world. There is another set of fixed exchange rates, currency values that are in effect

for countries that are currently trading on world markets. Many smaller countries fix the value of their currency with respect to a larger currency (for example, the euro or the dollar) and that value does not change in the face of changing market conditions. For these smaller countries, fixed exchange rates reduce the risk and instability of market fluctuations and reduce transactions costs for international trade. In the extreme, some smaller countries do not even have a national currency, but use another international currency. The recently independent nation of Kosovo is an example here – the currency in circulation in Kosovo is the euro.

When a currency value is fixed, there is always the possibility of balance of trade deficits and surpluses. When these imbalances become too pronounced, it may be necessary for the country to increase the value of its currency in the face of consistent trade surpluses (revaluation) or to reduce its value in the face of trade deficits (devaluation). Fixed exchange rate changes are not frequent, in that too many changes in too short a time frame can signal economic instability within the country. Balance of payments surpluses are less troublesome to a country than are balance of trade deficits. A surplus country is increasing its store of foreign exchange, while a deficit country is losing its foreign exchange holdings and/or increasing its indebtedness.

A country with a fixed exchange rate has a need to react in the face of persistent deficits. There are a few corrections that countries can take in the face of balance of payments deficits. For temporary deficits, when a fixed exchange rate is allowed to vary within a certain band, a government can intervene in foreign exchange markets, either buying back its own currency or selling foreign currencies. Either action strengthens the currency, although it does not reduce the external deficit. For more persistent deficits, more rigorous policies are needed. Raising interest rates can attract foreign capital, but it also makes borrowing more expensive for citizens of the deficit country. Reducing aggregate demand with restrictive monetary and fiscal policies can reduce the demand for imports and thereby reduce deficits, but at the risk of bringing on a recession. Naturally, price deflation in the deficit country could cure a deficit by promoting exports, but prices are seldom prone to fall. Finally, governments can institute controls on trade (import restrictions), on foreign currency transactions, or on long-term capital flows. In general, most economists are not in favour of controls as a means of correcting market conditions. When all else fails, for persistent deficits devaluation may be the only reasonable solution.

A July 2006 IMF breakdown of currency regimes listed 25 countries with independently floating exchange rates, including Iceland, Norway, Poland, Sweden, Switzerland, Turkey and the United Kingdom.[93] There were 51 countries with managed floats, including Croatia, the Czech Republic, and Serbia; six countries with pegged exchange rates with limits, including Cyprus, Denmark, Hungary, Slovenia, and the Slovak Republic; 52 countries with conventional fixed peg exchange rate arrangements, including Latvia, Macedonia, and Ukraine; seven countries with currency board arrangements, including Bosnia and Herzegovina, Bulgaria, Estonia, and Lithuania; and twelve countries in the euro area, itself a floating exchange rate regime.

[93] Note that only selected Western and Central European countries are listed in this paragraph.

### 17.8.2 Exchange rate impacts on international trade

Changes in currency values affect domestic and international prices and quantities produced, consumed and traded in international markets. As inferred from what we saw above, a euro depreciation means a decrease in EU imports and an increase in EU exports. Naturally, the reverse would be true for a euro appreciation, an increase in EU imports and a decrease in EU exports. Let us consider a euro depreciation for a two-region case, with only two currencies, the euro and the dollar. The EU price of imported US goods is the dollar price in the United States multiplied by the €/$ exchange rate (plus transportation costs, but we ignore those for now). Since a euro depreciation is an increase in the €/$ exchange rate (it takes more euros to buy the same amount of dollars), that increase in the €/$ exchange rate means a higher euro import price for EU citizens. In similar fashion, a euro depreciation means an increase in EU exports. The US import price (in dollars) that US citizens would pay is the euro price multiplied by the $/€ exchange rate. Again, a euro depreciation (a higher €/$ exchange rate) is by identity a lower $/€ exchange rate. Hence a constant euro price multiplied by a lower $/€ exchange rate means a lower dollar import price and increased EU exports.

Although the prices and quantities traded in the domestic market may change, the underlying supply and demand functions are fundamentally unchanged. To see this outcome, we introduce two new tools, first a three-panel trade diagram, then a four-panel trade diagram. The four-panel trade diagram extends the three-panel diagram to take into account exchange rate changes. The basic three-panel trade diagram is shown below as Figure 17.22, with dozens of eggs as the item being traded between Slovakia and Austria. The first and third panels show the isolation interactions of demand and supply for eggs in Austria (AU) and Slovakia (SK), respectively. Austria is the high-price country (the first panel), with a no-trade (autarkic or isolation) price of 3 euro per dozen and 10 dozen eggs produced and consumed. Slovakia is the low-price country (the third panel), producing and selling 30 dozen eggs on their domestic market at 1 euro per dozen.

The second panel, known as the trade panel, is a plot of the excess demand or excess supply associated with various prices for each of the two countries. For either country, any price other than its equilibrium isolation price results in an excess supply or an excess demand situation. At high prices, an excess supply is available as exports to other nations, while at low prices the excess demand in one country is obtained as imports from other nations. The isolation prices in each country form the vertical intercepts of the excess demand and excess supply curves in the center panel. At each country's isolation price, there is no excess of either demand or supply. That is, at the isolation price the quantity offered for trade is zero in SK and the quantity demanded for trade in AU is zero.

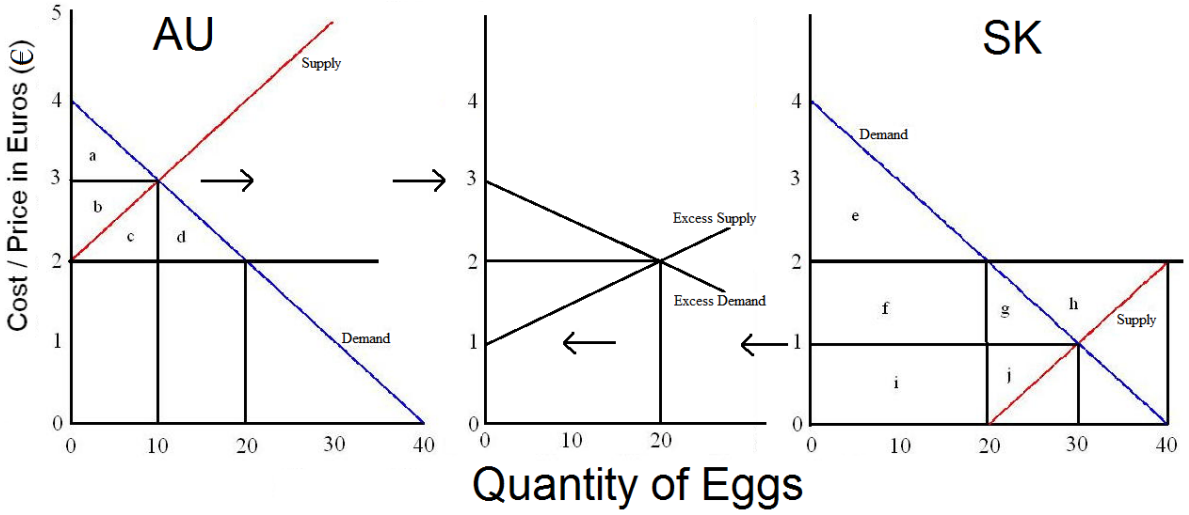



**Figure 17.22** A Three-panel trade diagram

When trade is initiated between Austria and Slovakia, the equilibrium price settles at 2 euro per dozen, the price where the excess supply of 20 dozen in Slovakia is equal to the excess demand of 20 dozen in Austria. The isolation price in Austria drops from 3 to 2 euro per dozen, while the isolation price in Slovakia increases from 1 to 2 euro per dozen. Producers in Austria cut back their production from 10 dozen to zero, while consumers in Austria increase their purchases from 10 dozen to 20 dozen. The reverse is true for Slovakia – Slovak producers increase their production from 30 dozen to 40 dozen, while their consumers reduce their purchases from 30 dozen to 20 dozen.

At non-equilibrium prices in each country, excesses of demand or supply develop. As prices rise above the isolation price in SK an excess supply develops. More meat is being produced at that price than is being demanded. Thus, an excess supply curve for SK is obtained by subtracting SK's domestic demand from its domestic supply for various price levels above the isolation price. This excess supply that results from these prices is then plotted in the trade panel. An excess demand curve for AU is obtained in similar fashion, but with its domestic supply subtracted from its domestic demand for prices below its isolation price. The excess supply in SK at the world equilibrium price is the amount exported from SK while the excess demand in AU is the amount imported by AU at that price. Furthermore, these two quantities are equal to one another, as they must be if they are the only countries participating in trade, and are equal to the amount traded (20 dozen) in the center panel. Thus, the world market price is the one price that clears both domestic and foreign markets and sets the excess supply in the one country equal to the excess demand in the other country.

At the world market price, there are no surpluses or shortages. SK producers supply eggs to both SK and AU consumers, while AU producers supply only to AU consumers. Where the excess supply and the excess demand curves intersect in the trade panel, two triangles are created. The upper triangle, formed by the excess demand curve and the price line, is the gain from trade in the importing country, exactly equal to area $cd$ in AU, because they have the same base (20 dozen eggs) and the same height (€1). The lower triangle, formed by the excess supply curve and the price line, is the gain from trade in the exporting country, exactly equal to area $h$ in SK. Note that an excess demand curve for SK and an excess supply curve for AU could also be developed (for prices below and above their isolation prices, respectively), but would not be relevant in the current case. However, if an even higher-priced third country were to appear, an excess supply for AU could become relevant. Likewise, a low-priced fourth country could make SK an importer from that fourth country and an SK excess demand could result.

Thus, with the opening of trade between the countries (and assuming zero transportation costs), there is one price at which the excess supply from SK and the excess demand from AU are equal. This price, the world equilibrium market price, is reflected back into both the AU and SK country panels. In the SK panel producers increase their production from 30 to 40 dozen eggs at this price, while consumers decrease their consumption from 30 to 20 dozen eggs, resulting in an excess supply in SK. Conversely, AU producers decrease their production from 10 to zero dozen eggs and AU consumers increase their consumption from 10 to 20 dozen eggs, resulting in an excess demand in AU.

Now we expand our model a bit and imagine the entire European Union (EU) and the United States (US) as trading partners, with the EU as the net exporter and the US as the net importer. Figure 17.23 has the low-price EU exporting region in the left-hand panel, with the high-price US importing country in the right-hand panel. The EU excess supplies and the US excess demands are plotted in the trade panel for all prices between the two regions' domestic isolation prices. The intersection of the EU excess supply and the US excess demand is the equilibrium world trade price ($P_w$), with the excess supply in the EU equal to the excess demand in the US.

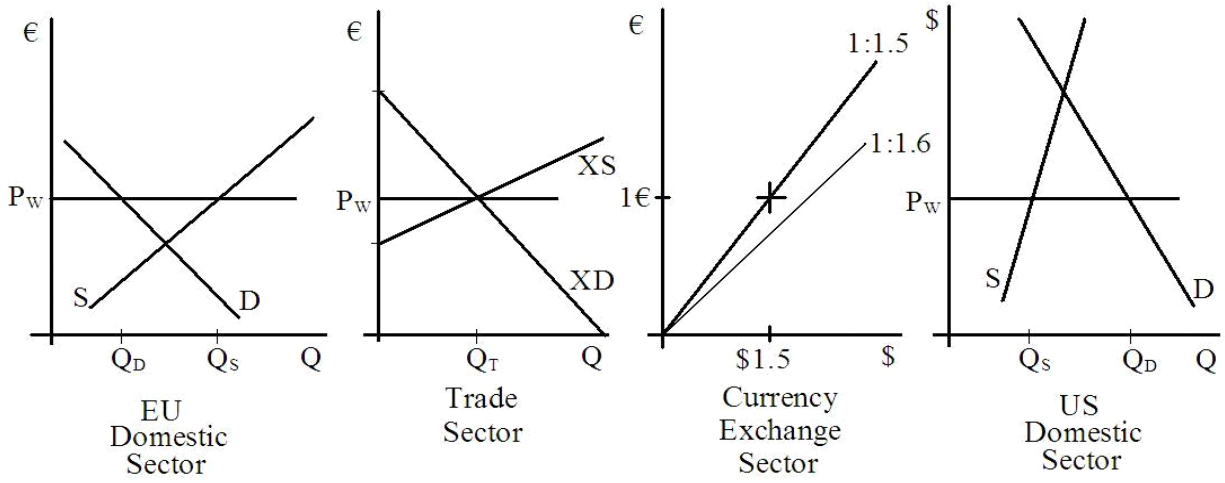



**Figure 17.23** A Four-panel trade diagram

A four-panel trade diagram accommodates two different currencies. A fourth panel, a currency exchange sector, has been placed between the middle trade panel and the right-hand US import panel in Figure 17.23. The currency exchange sector converts prices denominated in one currency into prices in the second currency. The EU panel and the trade panel are denominated in the EU currency (€), with the US panel denominated in the US currency ($). The currency exchange panel is labelled € on the vertical axis and $ on the horizontal axis. The thicker line in this panel performs two functions as a currency exchange line: (1) it depicts an initial exchange rate level, and (2) it reflects horizontal dollar prices into vertical euro prices, and vertical euro prices into horizontal dollar prices. For example, if €1 initially exchanges for $1.5, an item costing €2 in the European Union costs $3 in the United States. An EU currency appreciation rotates the currency exchange line clockwise (shown), so that €1 now trades for more dollars (e.g., $1.6). Likewise, an EU currency depreciation rotates the currency exchange line counter-clockwise (not shown), with €1 now trading for fewer dollars (e.g., $1.4).

The impact of exchange rate changes is shown in the trade panel. A change in the exchange rate rotates the US excess supply or excess demand function. The US excess function always rotates through its horizontal intercept, since the horizontal intercept shows the quantity outcome that is associated with a zero price. If the US is an importing nation (as shown), a euro appreciation rotates the excess demand function counter-clockwise. This can be seen by following the US domestic no-trade price to the left to the €1 = $1.5 line in Figure 17.24, then up or down to the new currency exchange line (which in this case is below the initial currency exchange level), then to the left to the new (lower) vertical intercept of the US excess demand function. With the horizontal intercept remaining unchanged, the euro appreciation has rotated the US excess demand function counter-clockwise. The intersection of the unchanged EU excess supply function with the new US excess demand function results in a lower EU euro price and a decrease in the quantity traded.

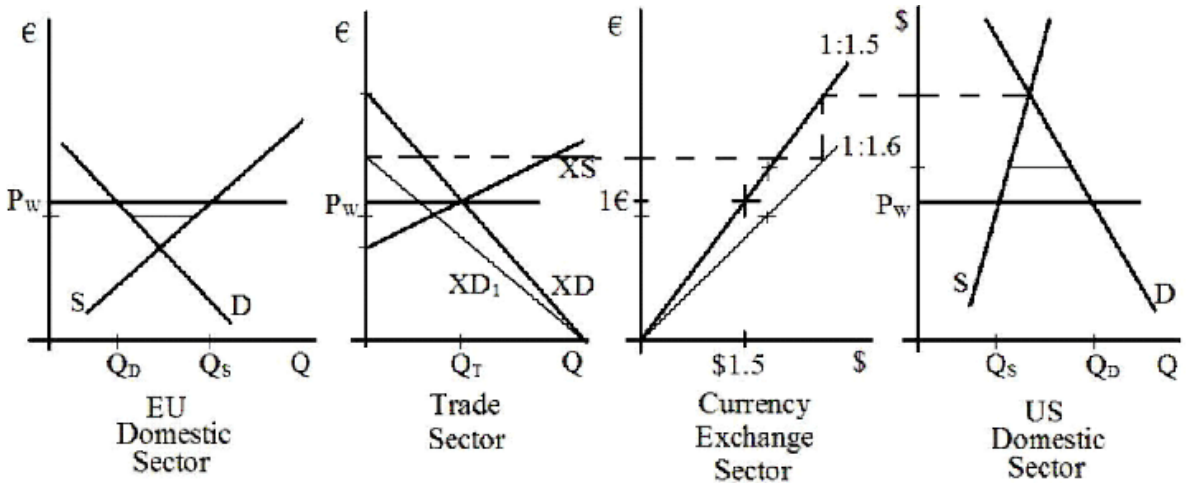



**Figure 17.24** Euro appreciation

The lower euro price, however, converts to a higher dollar price in the US domestic market – follow the euro price to the right to the new (€1 = $1.6) currency exchange line, then up to the original (€1 = $1.5) line, and right to a higher US price), resulting in a decrease in US consumption and an increase in US production. In similar fashion, a euro depreciation would rotate the US excess demand function clockwise, resulting in a greater quantity traded.

If the EU were the importing nation, a euro appreciation or depreciation would rotate the US excess supply function clockwise or counter-clockwise, respectively, through its negative horizontal intercept. A euro appreciation would rotate the US excess supply function clockwise through its negative horizontal intercept, resulting in a greater quantity traded, a lower EU euro price, and a higher U.S. dollar price. A euro depreciation would rotate the US excess supply function counter-clockwise through its negative horizontal intercept, resulting in a lesser quantity traded, a higher EU euro price, and a lower U.S. dollar price.

The bottom line to this exercise is that exchange rate changes do not have impacts on domestic demand and supply functions, but only in the currency exchange sector and in the trade sector. The currency exchange sector simply shows a rotation clockwise or counter-clockwise through the origin for a depreciation or appreciation (respectively) of the currency on the vertical axis. In the trade sector, excess demand and excess supply functions rotate clockwise or counter-clockwise through their positive and negative horizontal intercepts, resulting in increased or decreased international trade. Although prices change in both nations, the underlying supply and demand functions remain unchanged. Importer currency appreciation is equivalent to export currency depreciation and leads to expanded trade. Importer currency depreciation, equivalent to export currency appreciation, would lead to a decrease in trade.

### 17.8.3 International trade data

**Intra- and extra-EU international trade**

The last bit of macroeconomic data that we will introduce in this chapter is international trade data. Slovakia and the other Visegrad countries are all members of the European Union. As such, they conduct most of their external trade with other EU countries. Although their geographic location naturally suggests external trade to the east, the stronger economies in the European Union allow for greater export opportunities to EU countries. In addition, higher quality products from the EU countries also contribute to more imports from EU countries than from countries of the former Soviet Union.

Aggregate data on exports and imports in 2013 and 2014 for the Visegrad countries and the EU-28 are reported in Tables 17.2a and 17.2b. The data are reported in two categories, Intra-EU28 and Extra-EU28. The former of these two reflects trade with other EU countries; the latter reports on trade with countries outside the European Union. It may be that some of the Extra-EU28 trade could be with other European countries that are not in the European Union, like Switzerland or Norway, but the aggregate data provided in the tables do not allow for that level of analysis. In Table 17.2a we see that trade within the European Union dominates trade outside the EU28 for all the Visegrad countries and for the EU28 as a whole. Intra-EU28 exports are 72.3 percent higher than Extra-EU 28 exports for the European Union as a whole (2014). That ratio ranges from 3.4 to 5.4 in 2014 for the Visegrad countries, with Slovakia and the Czech Republic having the higher ratios. On the import side, the Intra-EU28 to Extra-EU 28 ratios are quite a bit smaller for the Visegrad countries, ranging from 2.2 to 3.4 in 2014. Again, Slovakia and the Czech Republic have the highest ratios on the import side also.

**Table 17.2a** Intra-EU and extra-EU international trade

| | Intra-EU28, exports | | Intra-EU28, imports | | Extra-EU28, exports | | Extra-EU28, imports | |
|---|---|---|---|---|---|---|---|---|
| | (bn €) | | (bn €) | | (bn €) | | (bn €) | |
| | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 |
| EU-28 | 2,842 | 2,935 | 2,772 | 2,851 | 1,737 | 1,703 | 1,685 | 1,681 |
| | (mil. €) | | (mil. €) | | (mil. €) | | (mil. €) | |
| Czech Rep. | 99,119 | 107,520 | 83,457 | 88,652 | 23,066 | 23,359 | 25,164 | 26,110 |
| Hungary | 63,004 | 66,588 | 54,060 | 59,143 | 17,941 | 16,810 | 21,319 | 19,832 |
| Poland | 115,755 | 125,663 | 107,822 | 114,293 | 38,588 | 37,406 | 48,497 | 51,215 |
| Slovakia | 53,557 | 54,986 | 45,727 | 47,018 | 11,009 | 10,175 | 15,815 | 14,820 |

Source: Eurostat[94]

In Table 17.2b we see positive trade balances for the Visegrad countries within the European Union but negative trade balances with countries outside the EU28, whereas the European Union as a whole has positive trade balances with the rest of the world. In the last four columns of that table, we see that Slovakia and the Czech Republic have higher exports and imports per capita than the overall EU28, this in spite of having lower incomes per capita. Either the older countries of the European Union are more traditional in their trade or the Czech Republic and Slovakia are hungry for openings with the rest of Europe.

[94] Retrieved from <http://epp.eurostat.ec.europa.eu/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tet00039&language=en> and from <http://epp.eurostat.ec.europa.eu/tgm/refreshTableAction.do?tab=table&plugin=1&pcode=tet00038&language=en>

**Table 17.2b** Trade balances and total trade, intra-EU and extra-EU

| | Trade balance, intra-EU28 | | Trade balance, extra-EU28 | | Total exports per capita | | Total imports per capita | |
|---|---|---|---|---|---|---|---|---|
| | (mil. €) | | (mil. €) | | (€) | | (€) | |
| | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 | 2013 | 2014 |
| EU-28 | 70,643 | 84,610 | 51,564 | 22,383 | 9,049 | 9,140 | 8,808 | 8,929 |
| | | | | | | | | |
| Czech Rep. | 15,662 | 48,868 | -2,098 | -2,751 | 11,621 | 12,435 | 10,331 | 10,903 |
| Hungary | 8,944 | 7,445 | -3,378 | -3,022 | 8,182 | 8,455 | 7,619 | 8,007 |
| Poland | 7,933 | 11,370 | -9,909 | -13,809 | 4,057 | 4,290 | 4,109 | 4,354 |
| Slovakia | 7,830 | 7,968 | -4,806 | -4,645 | 11,927 | 12,025 | 11,368 | 11,412 |

Source: Calculated from Table 17.2a.

Finally, we offer a few more comments on exchange rates. As we noted earlier, an exchange rate reflects the value of one currency, expressed in terms of a different currency. Slovakia is one of 17 countries in the European Union that operate on the euro. They were the 16th country to join, adopting the euro on January 1, 2009, just 56 months after joining the European Union on May 1, 2004. The other three Visegrad countries still maintain their own currencies. However, to maintain stability in trade and international relations, these other three countries try not to let their currency values vary much with respect to the euro.

Currency values affect the prices of imported and exported goods. If the euro is gaining in value, goods and services from other countries become less expensive, in that more of another currency can be purchased with fewer euros. By contrast, exported goods become more expensive for people who are buying goods that are euro-priced, in that foreigners have to give up more of their currency to get the same amount of euros. A decline in euro values has just the opposite effect on imports and exports. The American author of these chapters spent a year in Slovakia in 2004/2005. He rented a flat for his family with a set price of 13,000 SKK per month. In September 2004 that translated into just under 400 dollar per month. As the dollar weakened against the SKK and the euro during the ensuing year, however, by March 2005 his rent had risen to more than 450 dollar per month, even though the original contract terms had not changed!

Currency values affect more than just international purchases, however. Financial portfolios denominated in various currencies increase or decrease in value as currency values change. A Slovak who has dollar-denominated assets sees a reduction in his/her overall wealth if the dollar weakens. Likewise, international macroeconomic data can carry very different meanings, depending on which currencies are being used as the base currency.

### International trade openness of Slovakia

Earlier we introduced the concepts of absolute advantage and comparative advantage. We showed that gains from trade were possible for nations that specialised in producing goods and services where they had a comparative advantage, if they then exchanged those products with other nations operating in their own comparative advantages. That is, a country could consume goods and services beyond its isolation production possibilities frontier. In doing so, there are net gains from trade on both the export side (producers gain more than consumers lose) and on the import side (consumers gain more than producers lose). In addition, international trade leads to lower domestic prices through increased/enhanced international competition; adds to the variety of products available to consumers; can break monopoly power in the domestic market; and in general, makes for better overall relations between trading partners.

The first questions we ask have to do with the volume of trade and whether Slovakia is a net importer or net exporter of its goods and services. A graph that partially answers these question is shown in Figure 17.25.

On that graph, the solid line is the value of Slovakia's imports, the dashed line is the value of its exports, and the dotted, more jagged line is the trade balance, which is equal to the value of Slovakia's exports minus the value of its imports. The import and export values are measured on the left axis, while the trade balance is measured on the right axis. The first item we see is that the total volume of trade, both imports and exports, has expanded by a factor of almost six in the seventeen years of data reported, from almost 22 billion euros in total trade in 1995 to more than 121 billion euros in 2011. Both imports and exports have grown at an annual rate of approximately 11.3 percent during this time period.

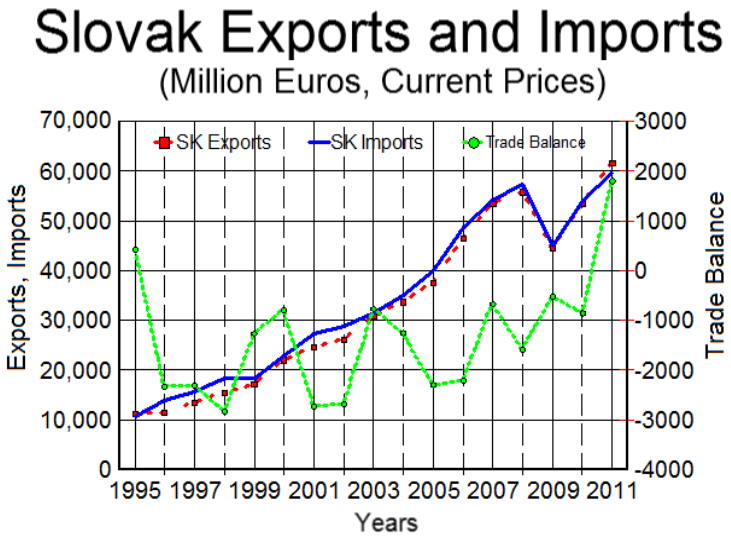



**Figure 17.25** Slovakia's import and export values and trade balance
Source: SOSR[95]

According to one measure, "openness", Slovakia's volume of trade is quite large. Openness is calculated as the sum of a country's imports and its exports, divided by its gross domestic product,

$$\text{openness}_i = \frac{IMP_{ij}+EXP_{ij}}{GDP_i} \cdot 100, \qquad (17.1)$$

where $i$ represents the country for which we calculate the openness and $j$ is the trade partner of country $i$. Researchers at the World Bank calculate measures of openness for all the countries of the world for which data are available. Their calculations for Slovakia during 2008-2011 are 169.32, 142.59, 163.80, and 175.5, respectively. That is, the sum of Slovakia exports plus imports has been, on average, more than sixty percent greater than Slovakia's GDP. During this time period, there were only a dozen or so countries with higher openness calculations, and most of these were island nations and nations with major seaports (e.g., Hong Kong, Singapore, Ireland, Malaysia, Malta, and Puerto Rico). The only landlocked countries with measures of openness larger than Slovakia were Luxembourg and Hungary. Other than these last two nations, there were no European countries with larger openness measures than Slovakia.

Now we look at the trade balance. When the trade balance is negative, Slovakia has a trade deficit – it is a net importer. When the trade balance is positive, Slovakia has a trade surplus and is a net exporter. We can see graphically that in the examination period, Slovakia was mostly a net importer (the jagged, dotted line in Figure 17.25 is below zero on the right axis scale). The only years that Slovakia was a net exporter were in 1995 and 2011. In recent years, however, Slovakia has become a net exporter, with trade surpluses of $5.44 billion in 2013 and $6.16 billion in 2014. The amount of the trade deficits and surpluses is relatively small, averaging only 3.3 percent of the total volume of trade (exports plus imports) over the seventeen years of data in Figure 17.25, ranging from 0.6 percent in 2009 to 9.2 percent in 1996.

[95] Retrieved from <http://www.statistics.sk/pls/elisw/objekt.send?uic=4206&m_sso=3&m_so=81&ic=363>

Exercise

Slovakia's GDP in 2014 had the value of €75.2 billion. Calculate the trade openness of Slovakia in regard to Hungary. Data on international trade with Hungary can be find in Table 17.3.

*Solution*

Substituting relevant data into equation (17.1) we get the value of openness of Slovakia in trade with Hungary: $\text{openness}_S = \frac{3.9548+2.8167}{75.2} \cdot 100 = 9.0$.

In this chapter, we will also examine the major countries with which Slovakia trades. These data are listed in Table 17.3, first by economic groupings, then by geographic regions, then by country. Slovakia's total trade, the sum of its exports plus its imports, amounted to more than 423 billion euros in 2014. Countries in the European Union dominated that trade, accounting for almost three-fourths of Slovakia's total trade. Much of the remainder of Slovakia's trade is with Russia, China, and South Korea.

Geographically, Europe also dominates, accounting for almost eighty percent of Slovakia's total trade, including more than ninety percent of Slovakia's exports and just under two-thirds of Slovakia's imports. Asia accounted for fourteen percent of Slovakia's total trade in 2014 and almost one-fourth of its total imports. Slovakia's negative trade balance with Asian countries was the largest of any region, with much of it accounted for by South Korea, China and Japan. The nations of North and South America account for only two percent of Slovakia's total trade, with the United States responsible for almost three-fourth of that trade.

Germany and the Czech Republic clearly dominate as Slovakia's major trading partners, together accounting for more than 30 percent of Slovakia's total trade, including 35 percent of Slovakia's exports and 25 percent of Slovakia's total imports in 2014. Other former Soviet Bloc countries make up the next largest trading partners – Russia, Poland and Hungary. Nine of the next twelve largest trading partners are fellow European Union members – France, Austria, the United Kingdom, Netherlands, Spain, Romania, Belgium, and Sweden. Interspersed in that list are China and South Korea, which contribute more to Slovakia's trade as import sources than as export destinations. The list of countries in Table 17.3 includes only those countries that are responsible for 0.5 percent or more of Slovakia's total trade. Together these 23 countries account for 85.6 percent of Slovakia's 2014 total trade. Countries that are not included in this list, but who constituted 0.2 percent or more of Slovakia's total imports or total exports in 2014 include Canada, Malaysia, Finland, Egypt, Ireland, Greece, Bulgaria, Croatia, Portugal, and Norway[96].

[96] Retrieved from <http://countries.bridgat.com/Slovakia_Trade_Partners.html>

**Table 17.3** Slovakia's import and export trade partners, 2014

| Country of origin or Destination | Imports Jan-Dec (mil. €) | % of total | Exports Jan-Dec (mil. €) | % of total | Balance Jan-Dec (mil. €) | Trade Jan-Dec (mil. €) | % of total |
|---|---|---|---|---|---|---|---|
| | | | | | | | |
| TOTAL | 185,787.6 | 100 | 237,590.1 | 100.0 | 51,802.5 | 423,377.7 | 100.0 |
| | | | | | | | |
| OECD | 37,636.6 | 62.6 | 56,290.5 | 86.9 | 18,653.9 | 93,927.1 | 75.2 |
| EU – 28 | 38,319.2 | 63.7 | 54,493.1 | 84.1 | 16,173.9 | 92,812.3 | 74.3 |
| | | | | | | | |
| EUROPE | 38,166.0 | 63.4 | 58,781.9 | 90.7 | 20,615.9 | 96,947.9 | 77.6 |
| ASIA | 14,006.8 | 23.3 | 3,386.7 | 5.2 | -10,620.1 | 17,393.5 | 13.9 |
| AMERICA | 964.5 | 1.6 | 1,682.1 | 2.6 | 717.6 | 2,646.6 | 2.1 |
| AFRICA | 271.0 | 0.5 | 627.5 | 1.0 | 356.5 | 898.5 | 0.7 |
| AUSTRALIA | 32.3 | 0.1 | 277.2 | 0.4 | 244.9 | 309.5 | 0.2 |
| OTHER | 6,711.1 | 11.2 | 45.1 | 0.1 | -6,666 | 6,756.2 | 5.4 |
| | | | | | | | |
| Germany | 8,947.0 | 14.9 | 14,331.9 | 22.1 | 5,384.9 | 23,278.9 | 18.6 |
| Czech Republic | 6,284.7 | 10.4 | 8,294.3 | 12.8 | 2,009.6 | 14,579.0 | 11.7 |
| Poland | 2,862.8 | 4.8 | 5,199.7 | 8.0 | 2,336.9 | 8,062.5 | 6.5 |
| Russian Fed. | 4,913.4 | 8.2 | 2,076.9 | 3.2 | -2,836.5 | 6,990.3 | 5.6 |
| Hungary | 2,816.7 | 4.7 | 3,954.8 | 6.1 | 1,138.1 | 6,771.5 | 5.4 |
| Austria | 1,529.5 | 2.5 | 3,966.7 | 6.1 | 2,437.2 | 5,496.2 | 4.4 |
| China | 4,645.1 | 7.7 | 1,374.6 | 2.1 | -3,270.4 | 6,019.7 | 4.8 |
| France | 1,800.8 | 3.0 | 3,202.9 | 4.9 | 1,402.1 | 5,003.7 | 4.0 |
| Italy | 1,915.5 | 3.2 | 2,958.3 | 4.6 | 1,042.8 | 4,873.8 | 3.9 |
| Rep. of Korea | 4,379.3 | 7.3 | 108.8 | 0.2 | -4,270.6 | 4,488.1 | 3.6 |
| United Kingdom | 726.0 | 1.2 | 3,362.9 | 5.2 | 2,636.9 | 4,088.9 | 3.3 |
| Netherlands | 731.8 | 1.2 | 1,643.1 | 2.5 | 911.3 | 2,374.9 | 1.9 |
| Spain | 717.2 | 1.2 | 1,399.1 | 2.2 | 681.9 | 2,116.3 | 1.7 |
| Romania | 796.2 | 1.3 | 1,331.6 | 2.1 | 535.4 | 2,127.8 | 1.7 |
| United States | 656.5 | 1.1 | 1,255.4 | 1.9 | 598.9 | 1,911.9 | 1.5 |
| Belgium | 559.7 | 0.9 | 982.1 | 1.5 | 422.4 | 1,541.8 | 1.2 |
| Sweden | 309.8 | 0.5 | 946.4 | 1.5 | 636.5 | 1,256.2 | 1.0 |
| Turkey | 461.5 | 0.8 | 788.0 | 1.2 | 326.5 | 1,249.5 | 1.0 |
| Switzerland | 453.4 | 0.8 | 1,063.7 | 1.6 | 610.2 | 1,517.1 | 1.2 |
| Ukraine | 555.0 | 0.9 | 326.2 | 0.5 | -228.8 | 881.2 | 0.7 |
| Japan | 766.0 | 1.3 | 104.6 | 0.2 | -661.4 | 870.6 | 0.7 |
| Slovenia | 336.0 | 0.6 | 472.7 | 0.7 | 136.7 | 808.7 | 0.6 |
| Denmark | 236.9 | 0.4 | 540.3 | 0.8 | 303.4 | 777.2 | 0.6 |

http://portal.statistics.sk/showdoc.do?docid=21859

Finally, we are interested in the products that Slovakia imports and exports. This information is provided in Tables 17.4 and 17.5 for the years 2010 through 2013. Each table and sub-table is ranked according to the aggregate trade volume in that category in those years. The products are categorised according to the "Harmonised system" classification employed by European Union members.

**Table 17.4** Slovak's trade products, imports plus exports, 2010 – 2013

| | 2010 | 2011 | 2012 | 2013 | TOTAL | % |
|---|---|---|---|---|---|---|
| | (million € at current prices) | | | | | |
| TOTAL Imports plus Exports | 95,765.7 | 112,550.8 | 120,732.4 | 124,112.2 | 453,161.1 | 100 |
| Machinery, electr. equipment; sound recorders & reproducers, television image | 31,464.8 | 34,282.5 | 36,648.4 | 39,115.0 | 141,510.7 | 31.2 |
| Vehicles, aircraft, vessels and associated traffic equipment | 15,800.0 | 18,986.2 | 22,307.5 | 23,474.8 | 80,568.5 | 17.8 |
| Base metals and articles of base metals | 10,767.5 | 12,530.6 | 13,071.5 | 12,352.1 | 48,721.7 | 10.8 |
| Mineral products | 9,441.1 | 12,691.9 | 12,494.7 | 12,406.3 | 47,034.0 | 10.4 |
| Plastics and articles thereof; rubber and articles thereof | 5,304.9 | 6,491.4 | 6,728.8 | 6,956.5 | 25,481.6 | 5.6 |
| Products of the chemical or allied industries | 4,437.6 | 5,453.7 | 5,208.5 | 5,667.2 | 20,767.0 | 4.6 |
| Textiles and textile articles | 2,661.1 | 3,248.6 | 3,099.8 | 3,203.0 | 12,212.5 | 2.7 |
| Products of food industries; beverages; tobacco | 2,313.8 | 2,812.3 | 3,054.1 | 2,927.3 | 11,107.5 | 2.5 |
| Miscellaneous manufactured articles | 2,305.8 | 2,574.6 | 2,965.4 | 3,141.1 | 10,986.9 | 2.4 |
| Optical, photograp., measuring, medic. apparatus; clocks, watches; music instr. | 1,922.0 | 2,529.3 | 3,423.9 | 3,214.6 | 11,089.8 | 2.4 |
| Pulp of wood, cellulose; waste of paper; paper, paperboard & articles thereof | 2,011.2 | 2,112.3 | 1,912.7 | 1,981.0 | 8,017.2 | 1.8 |
| Vegetable products | 1,451.3 | 2,006.3 | 2,291.2 | 1,981.5 | 7,730.3 | 1.7 |

Source: SOSR[97]

Slovakia's trade in products is fairly widely distributed, although manufactured goods dominate Slovakia's trade, both its imports and its exports. The total trade volume in the two leading trade categories, both consisting of manufactured goods, constitutes almost half (49 percent) of Slovakia's total imports and exports between 2010 and 2013. The leading category, machinery and electrical equipment (HS-XVI), constitutes just over thirty percent of Slovakia's total trade from 2010 to 2013. This category contains 133 sub-categories, including computers and computing equipment, telecommunications equipment, television and sound systems and parts, and electrical machinery and equipment and parts. HS-XVI is the largest category for both imports (29.8 %) and exports (32.6 %)[98].

**Table 17.5a** Slovak's major import products, 2010 – 2013

| | 2010 | 2011 | 2012 | 2013 | TOTAL | % |
|---|---|---|---|---|---|---|
| | (million € at current prices) | | | | | |
| TOTAL IMPORTS | 47,493.6 | 55,767.6 | 58,588.4 | 59,939.9 | 221,789.5 | 100 |
| Machinery, electr. equipment; sound recorders & reproducers, television image | 14,948.8 | 16,153.5 | 16,963.0 | 18,052.1 | 66,117.4 | 29.8 |
| Mineral products | 6,827.8 | 8,769.0 | 8,542.9 | 8,545.2 | 32,684.9 | 14.7 |
| Vehicles, aircraft, vessels and associated traffic equipment | 5,486.5 | 6,561.5 | 7,249.7 | 7,416.8 | 26,714.5 | 12.0 |
| Base metals and articles of base metals | 4,659.3 | 5,535.7 | 5,800.9 | 5,637.5 | 21,633.4 | 9.8 |
| Products of food industries; beverages; tobacco | 1,426.1 | 1,658.6 | 1,728.8 | 1,754.8 | 6,568.3 | 3.0 |
| Vegetable products | 781.8 | 990.0 | 1,008.2 | 907.7 | 3,687.7 | 1.7 |

[97] Retrieved from <http://portal.statistics.sk/showdoc.do?docid=9145>
[98] Retrieved from <http://unstats.un.org/unsd/tradekb/Knowledgebase/HS-Classification-by-Section> and <http://www.foreign-trade.com/reference/hscode.htm>

**Table 17.5b** Slovak's major export products, 2010 - 2013

| | 2010 | 2011 | 2012 | 2013 | TOTAL | % |
|---|---|---|---|---|---|---|
| | (million € at current prices) | | | | | |
| TOTAL EXPORTS | 48,272.1 | 56,783.2 | 62,144.0 | 64,172.3 | 231,371.6 | 100 |
| Machinery, electr. equipment; sound recorders & reproducers, television image | 16,516.0 | 18,129.0 | 19,685.4 | 21,062.9 | 75,393.3 | 32.6 |
| Vehicles, aircraft, vessels and associated traffic equipment | 10,313.5 | 12,424.7 | 15,057.8 | 16,058.0 | 53,854.0 | 23.3 |
| Base metals and articles of base metals | 6,108.2 | 6,994.9 | 7,270.6 | 6,714.6 | 27,088.3 | 11.7 |
| Mineral products | 2,613.3 | 3,922.9 | 3,951.8 | 3,861.1 | 14,349.1 | 6.2 |
| Plastics and articles thereof; rubber and articles thereof | 2,582.5 | 3,225.8 | 3,253.4 | 3,477.1 | 12,538.8 | 5.4 |
| Products of food industries; beverages; tobacco | 887.7 | 1,153.7 | 1,325.3 | 1,172.5 | 4,532.9 | 2.0 |
| Vegetable products | 669.5 | 1,016.3 | 1,283.0 | 1,073.8 | 4,042.6 | 1.7 |

Source: SOSR[99]

The next largest total trade category, vehicles and transport equipment" (HS-XVII), amounts to 17.8 percent of Slovakia's total trade during this time period. The 38 sub-categories in this HS grouping include automobiles, motorcycles, tractors and trucks, plus rail, air and water transportation equipment and parts. This category is the second largest HS category for Slovakia's exports (23.3 %) and the third largest for its imports (12.0 %).

The third and fourth largest total trade categories are primarily non-manufactured goods, "base metals and articles of base metals" (HS-XV), 10.8 %, and "mineral products" (HS-V), 10.2 %. There are 157 sub-categories under HS-XV, covering a large variety of different metals, including iron and steel, copper, nickel, aluminium, lead, zinc, and tin, plus articles like silverware and miscellaneous tools made from these metals. The "base metals" category is Slovakia's third largest export category and fourth largest import category. "Mineral products" is a much smaller category than base metals, with only 67 sub-categories. This category includes energy products (coal, oil, gas, etc.), a number of different ores (e.g., iron, magnesium, copper, uranium, lead, zinc, tin), plus a number of naturally-occurring earth minerals, such as limestone, sulphur, calcium, marble, and granite. Mineral products is the second largest import category and the fourth largest export category.

These four leading categories constituted 70.2 percent of Slovakia's total trade between 2010 and 2013. No other category had more than 5.6 percent of Slovakia's total trade during this time period, although the next eight largest categories together amounted to 23.7 percent of Slovakia's total exports and imports. The other ten categories in the Harmonised System accounted for only 6.1 percent of Slovakia's total 2010-2013 trade.

[99] Retrieved from <http://portal.statistics.sk/showdoc.do?docid=9145>

# Chapter 18 EURO ADOPTION IN SLOVAKIA

## 18.1 Preparations for the euro

Slovakia's journey to the euro began in 1998. Pro-reform political forces that gained power in the 1998 parliamentary elections have over the next years successfully reintegrated Slovakia into the western structures (EU, OECD, NATO). These pro-reform forces had been re-elected in the 2002 election, which gave them strong mandate for further reforms and yet closer integration into the EU institutions. The government grasped the opportunity in full and introduced comprehensive structural reforms that made Slovakia an economic front-runner in the newly acceding EU member countries:

### Tax reform

The main objectives of the tax reform were: increase in the transparency of the tax system, reduction of work and entrepreneurship disincentives of taxation, reduction of distortions from tax exemptions and double taxation.

These objectives were achieved by the following means: Flat income tax rate of 19 % was introduced for both personal and corporate income effective January 2004 (previous rates ranged from 10 %-38 % and 25 %, respectively). VAT rates were unified at 19 % (from a two-rate system of 14 % and 20 %) and excise taxes raised closer to the levels prevailing in the EU. All tax exemptions and special regimes were abolished, except for deductible allowances for low income earners, which were increased to improve work incentives. Gift and inheritance taxes were abolished; dividend tax rate was set to zero.

### Pension reform

It was necessary to ensure long-term sustainability of the public pay-as-you-go (PAYG) pension scheme. In order to enhance viability of the pension system, privately funded schemes of 2$^{nd}$ and 3$^{rd}$ pillar were to be added. At the same time, parametric changes to PAYG were implemented. The statutory retirement age for both men and women was increased to 62 years from previous 60 and 55 years, respectively. System changes to PAYG, introducing the "merit" principle with benefits made dependent on work and contribution history (earning-related scheme). The second, privately funded pillar was introduced in 2005. Pension contributions, 18 % of gross wages, were equally split between the first pillar, PAYG, and the second pillar, run by private asset management companies.

### Social security reform

The Social security system had to cope with high unemployment. A reform was necessary in order to reduce abuse of the welfare system, and make it better targeted. Benefits were cut by half to able-bodied citizens who are voluntarily unemployed, to give unemployed more stimulation to work. Registration for unemployment benefit was made tighter to exclude employees working in the informal economy. Unemployed had to regularly visit labour offices to claim benefits or risk losing them. To increase motivation to find work, a part of child and family benefits was distributed as tax bonus to reward earned income.

Several other incentives were provided to unemployed who actively seek job, for example via accommodation payments for those willing to move, in order to lower down unemployment.

### Labour market reform

In order to reach lower unemployment, stimulation of both labour supply and labour demand was necessary. The stimulation was provided by several means: cut in social contributions rate by 3 percentage points, targeted employment subsidies for job creation in high-unemployment regions, simplified legal

requirements for enterprise registration introduced to encourage self-employment and small-scale businesses in job-intensive service activities, etc.

Labour Code approved in July 2003 provided more flexibility for employers by simplifying procedures for hiring and firing (however, modifications prepared by new government valid since September 2007 shifted the balance again towards labour unions and employees).

There were also other reforms planned, but were not fully implemented, or were reversed later on:

**Healthcare reform:** Reforms involved mainly measures to prevent further build-up of debt in the heavily indebted Slovak healthcare. These included, e.g. fixed payments for drug prescription, and stay in hospital, but were abolished anyway post 2006 election.

**Education reform:** Reform in the sector intended, for example, to motivate municipalities to economise on basic school financing and introduce fees for university education. However, consensus was formed very hard, the reform was eventually modified.

**Local governance:** Decentralization. Responsibility for the provision of the main public services was transferred to sub-central governments as of 2003. Funding set to motivate regions and municipalities to save and improve service

**Law enforcement:** The main goal of the reform was to optimise the judiciary system and make the judges' work more effective

## 18.2 Why Slovakia rushed to have the euro

Slovakia was the first country from among the Visegrad 4 Central European countries to adopt the euro, in January 2009. Why? There are several reasons: First, historically, there was high public support for the euro. In fact, as the Eurobarometer polls show (Figure 18.1 and 18.2), among Visegrad 4 countries, support for the euro was consistently the strongest in Slovakia. Second, there was a strong political commitment, as both the government and the central bank concluded that it is advantageous to adopt the euro as soon as possible. And third, the Slovak economy is the smallest and most open in the region, with great degree of synchronization of the business cycle with the Eurozone.

A separate question is why Slovakia still remains, as of this writing in late 2015, the only country in the V4 region to have adopted the euro. Particularly as all of the countries which joined the EU in 2004 have to adopt the euro at some point (i.e. there is no opt out as for Denmark or UK) and some countries (e.g. Czech Republic) already meet the Maastricht criteria necessary for admission to the Eurozone. The answer lies in the fact that after the onset of the Greek crisis in 2010 and Eurozone's response to it, public support for the euro declined across most all EU countries, Slovakia's neighbours notwithstanding.

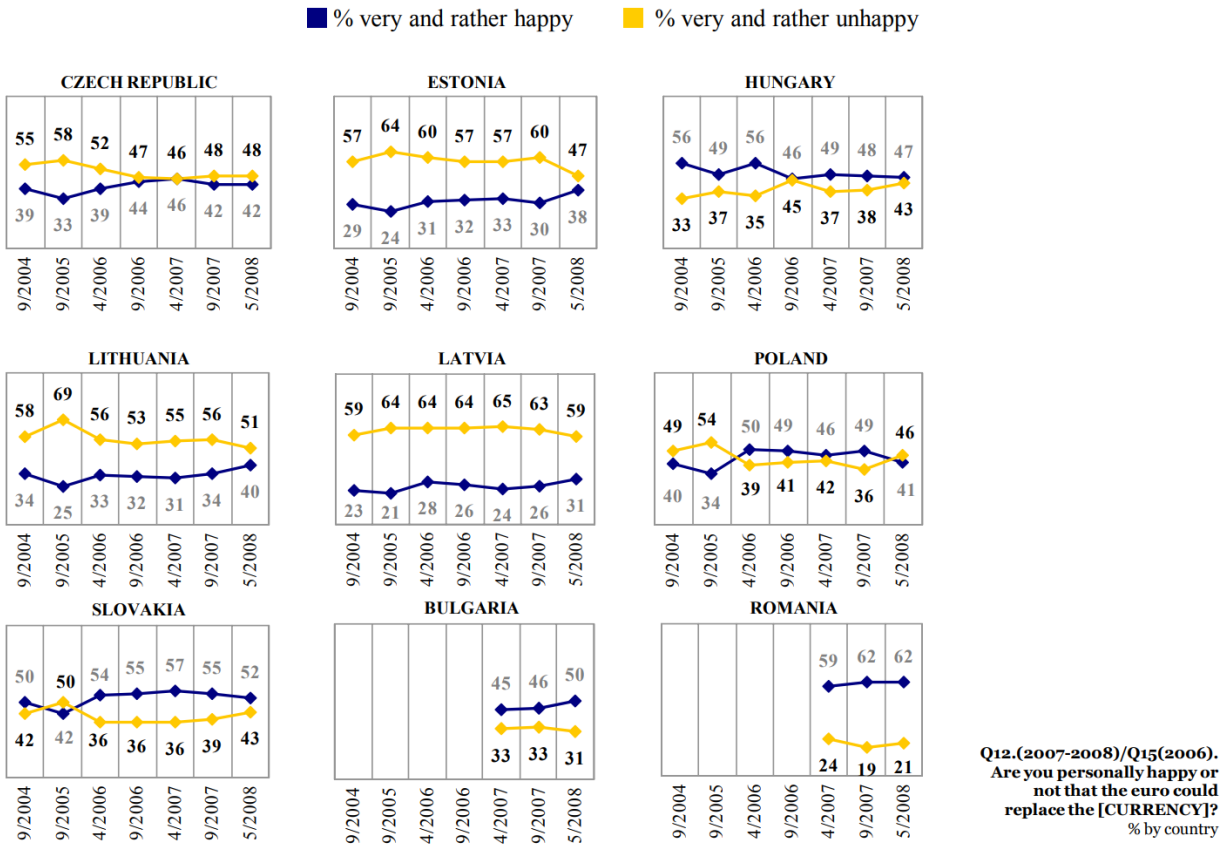



**Figure 18.1** Public support for the Euro
Source: Eurobarometer No 237

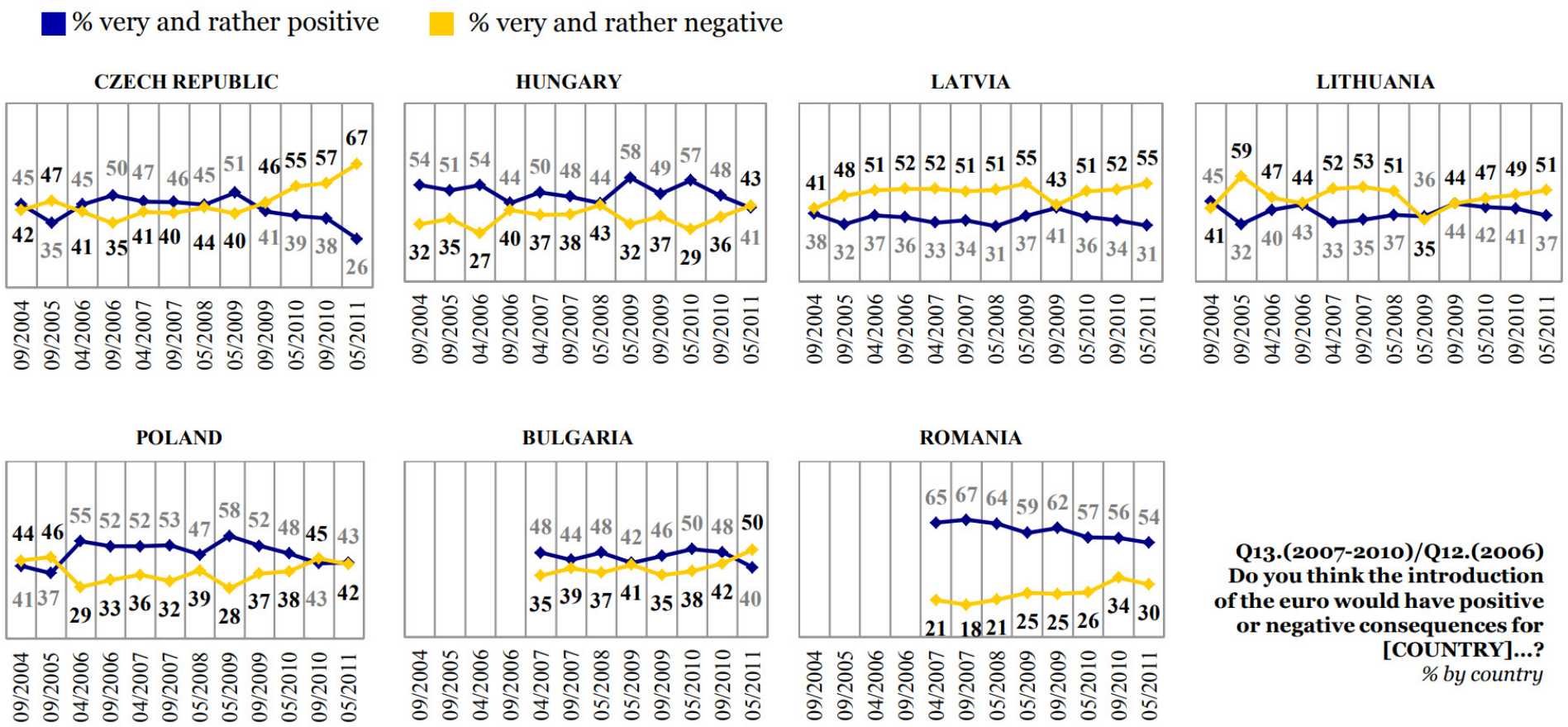



**Figure 18.2** Consequences of the euro´s introduction at a national level (%)
Source: Eurobarometer No 329

## 18.3 Pros and cons of euro for Slovakia

Hesitation of Slovakia's neighbours, particularly the Czech Republic, suggests that the advantages of joining the single European currency club may not necessarily outweigh the disadvantages. There, of course, is a vast academic literature on so-called optimum currency area, which gives precise arguments for and against joining such an area. In the Slovak case, the government and the national bank contemplated the pros and cons of joining the Eurozone as follows in Table 18.1 and concluded in 2003 that it is advantageous to adopt the euro as soon as possible after having met the Maastricht criteria in a sustainable way (2008 or 2009).

**Table 18.1** Advantages and disadvantages of joining the Eurozone, SR

| Advantages | Disadvantages |
|---|---|
| **Economic advantages:**<br>• Elimination of transaction costs<br>• Elimination of exchange rate risks<br>• Higher price transparency<br>• Increase of foreign trade<br>• Higher attractiveness for FDI inflow<br>• Acceleration in economic growth<br>**Non-economic advantages:**<br>• Higher credibility of Slovakia abroad<br>• Better cooperation on juridical and policy field, environmental and R&D projects | **Economic disadvantages:**<br>• Technical cost of currency changeover<br>• Loss of independent monetary policy<br>• Some increase in inflation<br>• Loss of forex revenues and temporarily higher expenses of the banking sector<br>**Economically unfounded fears:**<br>• Increase of prices because of changeover / price rounding |

Source: NBS

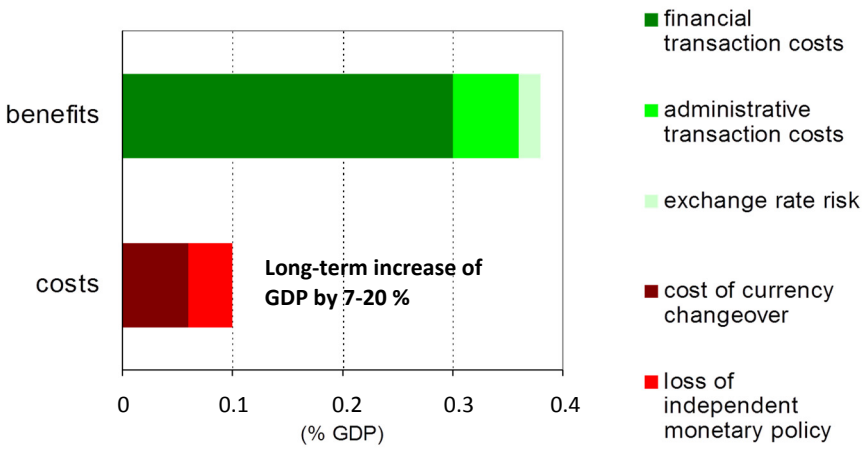



**Figure 18.3** Pros and cons of euro adoption summarised
Source: NBS

To be sure, there were some relevant arguments for delayed euro adoption. Namely, insufficient readiness of the economy for the common market, insufficient real convergence, insufficient competitiveness, insufficient cycle synchronization of the economies of Slovakia and EMU, Insufficient flexibility of the labour market (constrained movement of Slovak employees to some countries of EMU), insufficient consolidation of public finance, and incomplete liberalization of some markets. Yet, in retrospect, the Euro process and associated reforms put them aside, as they brought about accelerated real convergence, improved competitiveness (CGI ranking in 2007: 41 vs 2003: 49), improved flexibility of the local labour market, as well as improved consolidation of public finances and accelerated liberalization of remaining markets (see paragraphs on convergence below).

**BOX**

## Strategic documents of the Slovak government and the Slovak Central Bank

Signing the EU accession Treaty on April 16, 2003 in Athens, The Slovak Republic agreed on joining the European Monetary Union (EMU) and adopting the European currency: Euro. Both the government and the central bank have had a common interest in the euro. Consensus in the project was demonstrated by common submission of materials for the approval by the government.

In 2003, *Strategy of Euro Adoption in the Slovak Republic* was adopted. The government and the central bank concluded together that it is advantageous to adopt the euro as soon as possible after having met the Maastricht criteria in a sustainable way (2008, 2009).

Soon after, in 2004, *A Detailed Strategy of Euro Adoption* was signed. Precise goals were set:
1. The Maastricht criteria compliance in 2007,
2. The target date for euro adoption: 1.1.2009.

Government then submitted materials to the parliament. The Strategy was approved in parliament by votes of both coalition and opposition.
*National Plan of Euro Changeover* was adopted in 2005. It provided a detailed plan of practical steps toward smooth introduction of the euro currency.

## 18.4 Compliance with the Maastricht criteria (nominal convergence)

The euro convergence criteria are the criteria which European Union member states are required to meet to adopt the euro as their currency. There are five criteria set out in the Treaty of Maastricht:

1. **Public finance**

- Fiscal deficit below 3 % of GDP
- Fiscal debt below 60 % of GDP
- Inflation not higher than 1.5ppt above the average of three lowest member states (EU not EMU)
- Interest rates long term interest rates may not be higher than 2.0ppt above the average of three inflation-lowest member states
- Exchange rate stability: stay in ERM II, fluctuation range ±15 %, without devaluation of the parity, without significant strains.

As the table below shows, Slovakia managed to fulfil all of these criteria within the schedule. However, it was not an easy path and there were many pitfalls on the way.

**Table 18.2** Slovakia's compliance with Maastricht criteria

| Criteria | | 2003 | 2004 | 2005 | 2006 | 2007 | 2008e |
|---|---|---|---|---|---|---|---|
| Fiscal criterium (% GDP) | Public deficit including pension reform costs (max. 3 %)* | 2.7 | 2.3 | 2.8 | 3.5 | 1.9 | 2.3 |
| | Public deficit excluding pension reform costs (max. 3 %)** | 2.7 | 2.3 | 2.0 | 2.3 | 0.6 | 1.1 |
| | Public debt (max. 60 %) | 42.4 | 41.4 | 34.2 | 30.4 | 29.4 | 28.7 |
| Inflation (HICP, %) | | 8.4 | 7.5 | 2.8 | 4.3 | 1.9 | 3.9 |
| Maastricht inflation criterium | | 2.7 | 2.3 | 2.5 | 2.9 | 2.8 | 4.1 |
| Long term interest rates (%) | | 5.0 | 5.0 | 3.5 | 4.4 | 4.5 | 4.7 |
| Maastricht interest rate criterium | | 6.1 | 6.4 | 5.4 | 6.2 | 6.4 | 6.2 |
| Nominal exchange rate | | | | In ERM II since November 28, 2005 | | | |

Note: * Public deficit for 2005 and 2006 is evaluated without pension reform costs as allowed by transition period set by Eurostat;
** Public deficit for 2005 and 2006 includes also pension reform costs

Sources: NBS, Ministry of finance SR, EUROSTAT, NBS and VÚB calculations

2. **Pitfalls of the fiscal criterion**

As mentioned above, public pension system had to be reformed. The reform diverted a half of the worker's pension contributions to his/her private pension scheme (2nd pillar). This created a large gap in the public Pay-As-You-Go system. Negotiations had to be carried in order to prevent counting in the headline deficit the Pension Reform cost. Temporary allowance to treat privately funded pension pillar within public finance was granted in the end.

3. **Pitfalls of the inflation criterion**

Several problems occurred on our way to meet the inflation criterion. *First*, price convergence to 'European prices' was present (*Balassa-Samuelson effect*) in a fast growing, catching up economy converging to the rest of EU. *Next*, according to the Maastricht rules, "an average rate of inflation, observed over a period of one year before the examination, may not exceed by more than 1½ percentage points that of the three best performing Member States". That means, inflation of non-euro countries could be – and was, benchmark for our inflation (Poland was Slovakia's reference country in the period 4/06-4/07; Sweden, another non-

euro country was the benchmark during almost all of our two-and-a-half year ERMII stay). *Third*, Slovakia had to 'shoot on a moving target', since it did not know the reference level in advance. And finally, there was also a potential conflict with the exchange rate criterion.

### 4. Pitfalls of the exchange rate criterion

The exchange rate criterion proved to be the biggest challenge. "A Member State has respected the normal fluctuation margins provided for by the exchange-rate mechanism of the European Monetary System without severe tensions for at least the last two years before the examination. In particular, the Member State shall not have devalued its currency's bilateral central rate against the euro on its own initiative for the same period."

Slovakia, a small open converging economy with floating exchange rate regime was very vulnerable to speculative attacks on its currency. Maintaining stable exchange rate was an uneasy task. Besides, there was ongoing financial market liberalization, as part of our convergence. The liberalization of capital and financial flows was working against the exchange rate stability.

There was also a potential conflict with the inflation criterion (impact of the exchange rate pass-through on inflation).

### 5. Pitfalls of the interest rate criterion

The Maastricht criterion for the interest rate is critically dependent on the belief of financial markets in the success of the euro process. Anyway, if all the other Maastricht criteria are met, interest rate criterion will very likely be met as well.

## BOX
## Slovakia's experience with ERMII

**November 28, 2005, 08:00 a.m.: Slovakia's entry into the ERMII**
The decision was rather unexpected and came out of the blue: on Monday morning of November 28, 2005, Slovakia entered the ERMII. The central parity of the koruna was set to 38,455 SKK for 1 euro (the spot rate cob Friday Nov 25). The fluctuation range was set to ±15 % around the central parity. No unilateral commitments of the government and the NBS in the area of exchange rate regime were required.

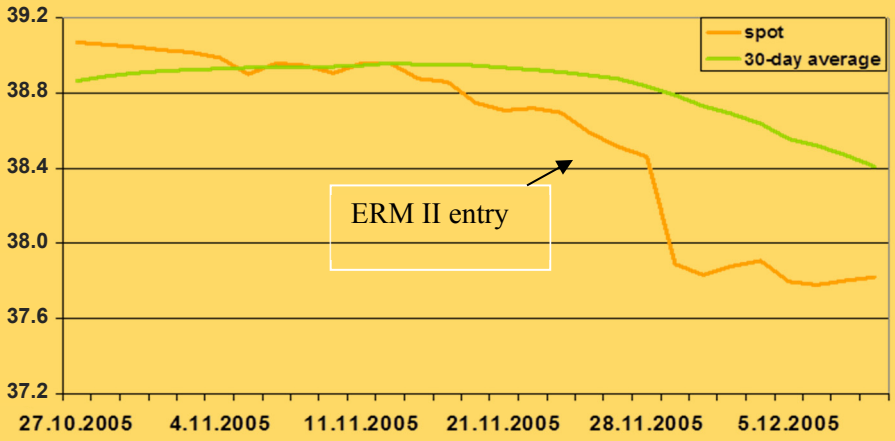



**Figure 18.4** Koruna exchange rate 1-month ahead of ERMI entry
Source: NBS

### Experience with the stay in the ERMII

**1st revaluation of the central parity in March 2007**
Shift of the parity by 8.5 %, realigning with the growth outperformance of the Slovak economy vis-a-vis EMU since the entry into the ERMI proved necessary. Parity was set weaker than current market spot, in line with the perceived equilibrium level. Market reacted dramatically, but in the direction of further appreciation, rather than depreciating toward the new parity. That is, market participants did not view the new parity as credible to sustain.

**2nd revaluation of the central parity in May 2008**
The parity was shifted again, by 15.0 % (the strongest bound of the previous fluctuation band) to allow for the future growth outperformance. Parity was set stronger than current market spot, actually stronger than market ever reached. Market reacted with move toward and stabilization around the new parity. That is, market participants accepted the new parity as the future level of the fixed conversion rate.

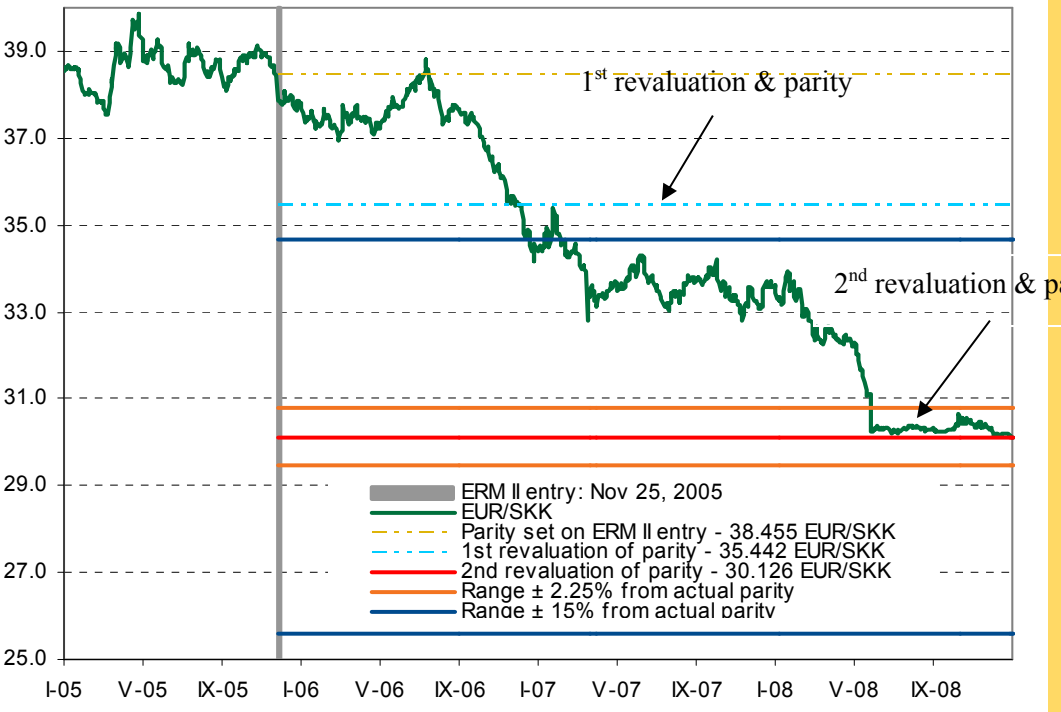



**Figure 18.5** Koruna exchange rate during ERMII stay
Source: NBS

**Concluding remarks on ERMII stage**

Slovakia has been a **pioneer** in a number of ways as it was a small open converging economy, with floating exchange rate regime and experienced two revaluations of the central parity.

ERMII proved a great disciplining tool on politicians, guarantor of continuity of sound economic policies, which contributed to faster convergence.

Maastricht criteria, however, are ill-defined for converging economies. It would be beneficial for the next euro adopters if at least some of the most open pitfalls are corrected, especially the inflation criterion.

## 18.5 Euro changeover

**On July 8, 2008,** the Council of the European Union approved Slovakia's application to join the euro zone on January 1, 2009. There were many steps on the way for smooth currency changeover:

- Dual prices: beginning on August 24, 2008, all the prices and money values (salaries, pensions...) had to be provided in both Slovak koruna and euro. This rule applied until the end of 2009.
- Euro banknotes and coins supply. To supply sufficient volume of new currency cash, 188 mil. of euro banknotes and 500 mil. of euro coins were delivered to Slovakia from July to December 2008.
- Commercial banks had to be stocked with the new currency cash – both banknotes and coins before end of December 2008.
- In December 2008, euro banknotes and coins were supplied to the retail stores
- All cash operating machines had to be converted to the new currency by December 31, 2008.

**January 1, 2009, euro introduction:** Euro became legal tender in Slovakia on January 1, 2009, and Slovakia thus became 16th country of the euro zone. Slovak koruna was replaced by euro at the fixed exchange rate of €1 = SKK30.1260.

The „Big-Bang Scenario" was applied: koruna was changed over to euro simultaneously in both cash and non-cash transfers with no transitional period. There was a short period of dual currency cash payments: from January 1 to January 16, cash payments can be made in Slovak korunas, which were then collected and destroyed by the central bank.

From January 17, 2009, only euro banknotes and coins could have been used for cash payments in Slovakia. Banks continue to exchange Slovak koruna banknotes until the end of 2009 and Slovak koruna coins until the end of June 2009, at the fixed conversion rate. The central bank exchanges Slovak koruna coins until the end of 2013, banknotes are exchanged for an unlimited time.

Although very complicated in technical terms, the actual changeover of the koruna into the euro was very smooth, actually the smoothest and most efficient from among the countries who joined the Eurozone in recent years.

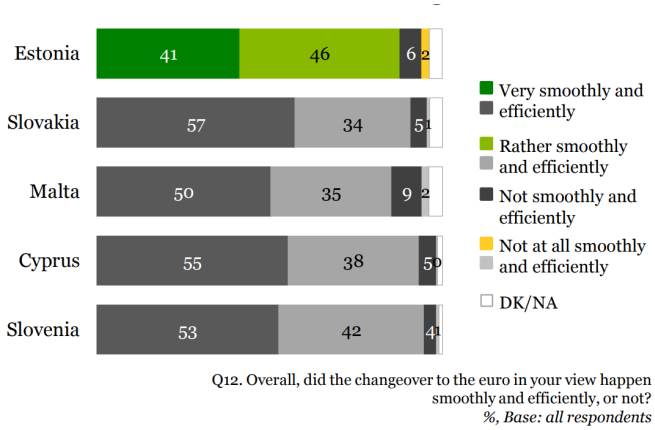



**Figure 18.6** The success of the changeover
Source: Eurobarometer, Nr 309, p.7

## 18.6 Early days with the euro

Euro was thought to be a Good Thing for Slovakia in the Good Times. It proved to be a Great Thing for Slovakia in the Bad Times! The global financial crisis of 2008 made the pros versus cons calculations even more convincing. Indeed, thanks to the forthcoming adoption of the euro, Slovakia has been to a large extent insulated from the pressure that stormed its regional neighbours, particularly in the aftermath of the demise of Lehman Brothers.

### Anchoring the currency

Koruna has been stable even since the announcement of the conversion rate in May 2008.

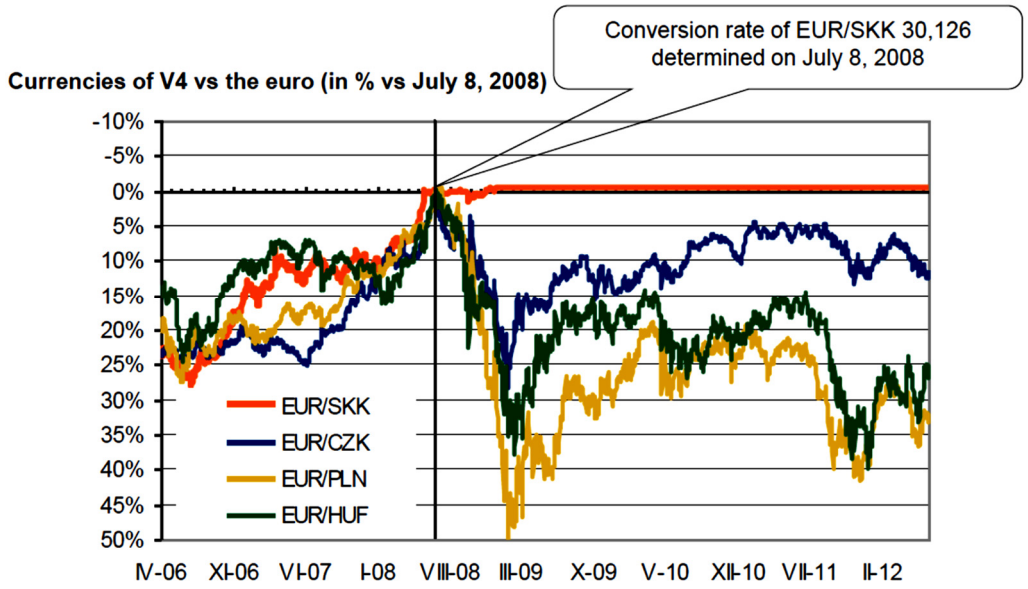



**Figure 18.7** Conversion rates of EUR/SKK in 2006-2012
Source: Bloomberg, VÚB Research

### Anchoring the interest rates

Long-term yields have raised much less relative to EMU benchmarks than was the case for Hungary or Poland.

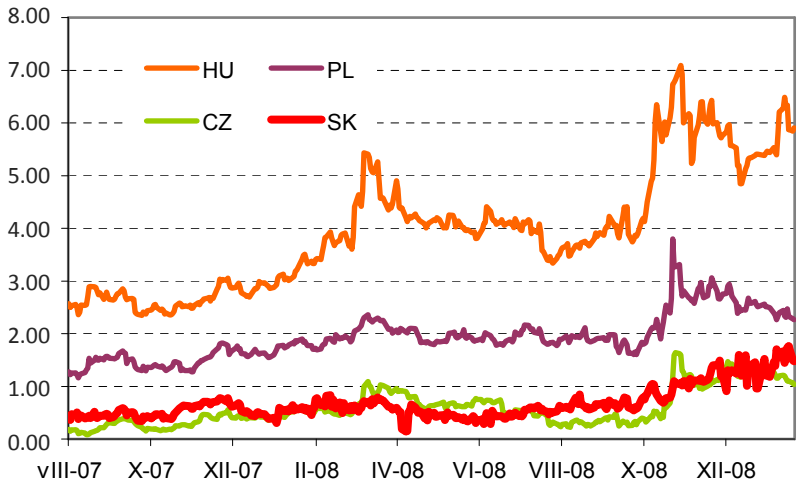



**Figure 18.8** Spread of 10-year V4 bonds vs Bund
Source: Bloomberg, VÚB Research

### Anchoring the rating

Thanks to reforms and the euro, rating of Slovakia overtook its regional neighbours. Bucking the trend worldwide, the sovereign rating of Slovakia was actually improved during the current crisis (to A+ by S&P).

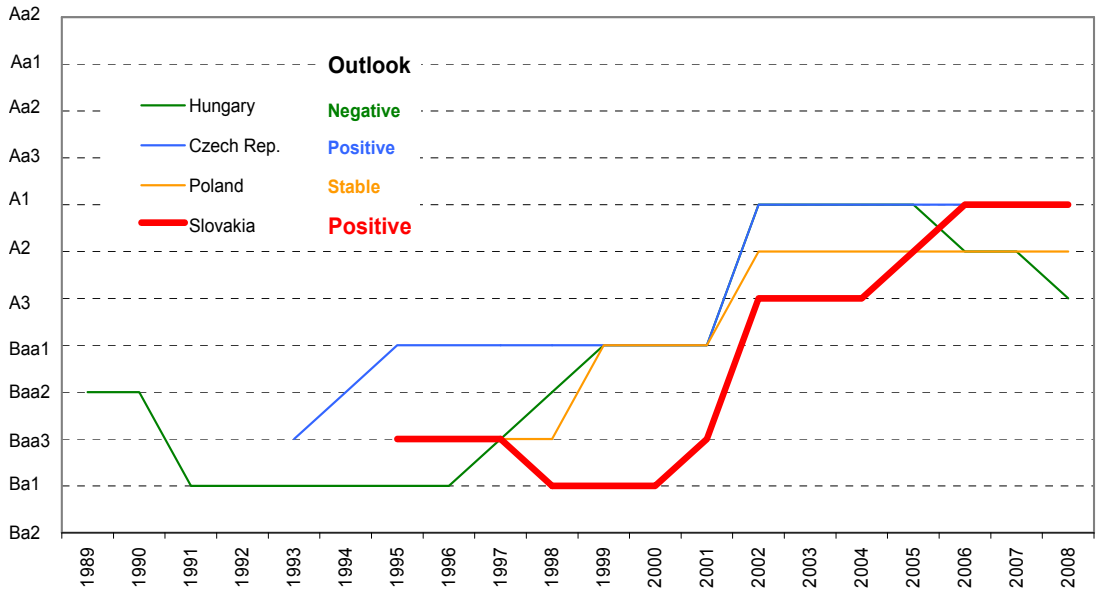



**Figure 18.9** Government bond rating
Source: Moody's

## 18.7 What do public, entrepreneurs, and academics think of euro adoption

Slovak public appreciated strongly the euro adoption. In a special survey by the European Commission done one year after the euro changeover, majority 78 % of Slovak population evaluated positively the decision to adopt the euro.

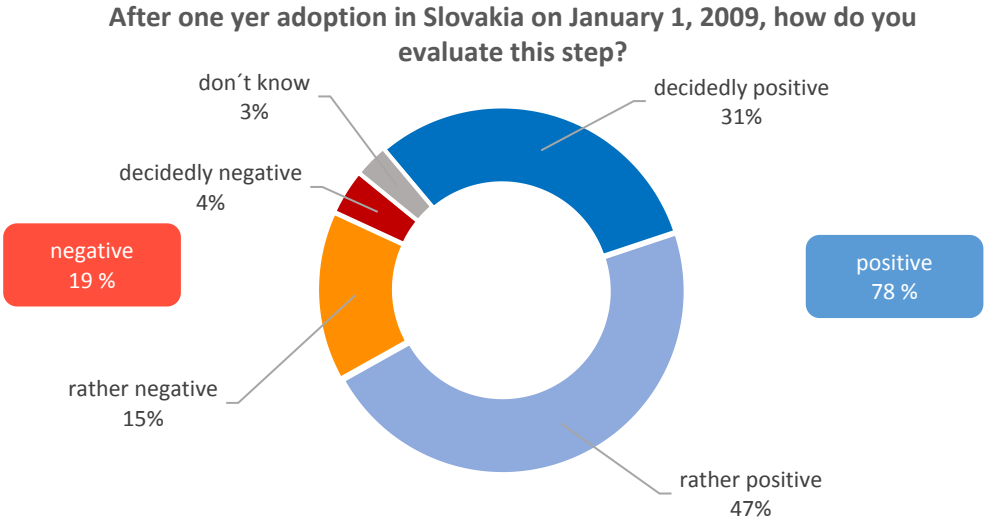



**Figure 18.10** Evaluation of euro adoption, 2009
Source: EC, October 2009[100]

Similarly, strong endorsement of the euro came from Slovak entrepreneurs. In a survey done by the Entrepreneur Alliance of Slovakia (PAS) three years after the euro adoption, 81 % of entrepreneurs were positive about the euro adoption. Their main arguments were that the euro brought them lower transaction costs, cheaper cost of raising capital, and increased potential for foreign trade.

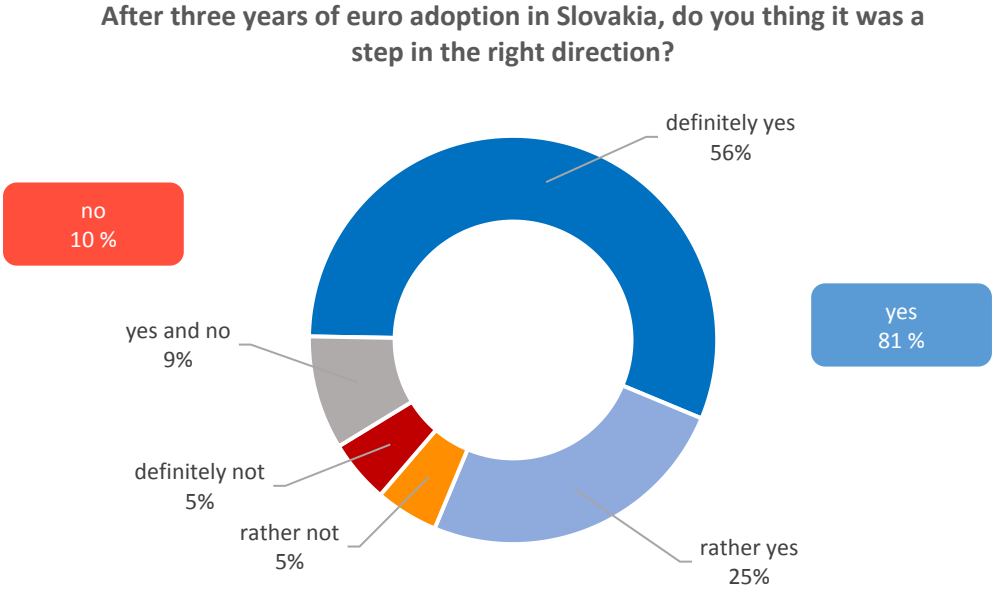



**Figure 18.11** Evaluation of euro adaption, 2011
Source: PAS Survey, September 2011

[100] Retrieved from <http://ec.europa.eu/slovensko/activities/rok_s_eurom__sk.htm>

From an academic point of view, a forthcoming paper by Melioris and Zudel (2016)[101] of the Institute of Financial Policy by the Slovak MinFin, argues that by adopting the euro, Slovakia gained up to 10 percent of its real GDP per capita. Large part of this gain, however, was realised in the years before the actual euro adoption in 2009 and was related to the structural reforms that Slovakia had to undertake to qualify for the euro membership.


**Figure 18.12** 10 % of GDP growth by 2011 due Slovakia's adoption of euro and percentage gap between actual and synthetic GDP
Source: Žúdel and Melioris, 2016

[101] Žúdel, B. – Melioris, L. 2016. Five years in a balloon: Estimating the effects of euro adoption in Slovakia using the synthetic control method. Retrieved from <https://www.oecd.org/fr/eco/Five-years-in-a-balloon-estimating-the-effects-of-euro-adoption-in-Slovakia-using-the-synthetic-control-method.pdf>

## 18.8 What was the euro impact on banks?

Clearly, banks were the key segment hit especially hard by the actual changeover of the koruna for the euro ("changeover" was nicknamed "hangover" by some bankers). Indeed, banks expected substantial cost of the koruna conversion to the euro, staff training, computer systems and ATMs upgrade etc. Banks also expected to suffer huge loss of commission income from foreign currency exchange.

On the other hand, banks also expected to gain additional banking deposit volume from increased cash deposits of households (cash stockpiled under mattresses had to get to a bank for the changeover). In the long term, the euro was though to bring about increased monetary and financial stability, faster growth of the economy, and rise in the demand for financial intermediation.

Banks also anticipated the euro to bring lower interest rates. Those would stimulate growth in demand for loans but also accelerate the shift of personal financial assets away from bank deposits into alternative financial products such are mutual funds, pension funds, life insurance etc. Hence banks expected the euro to serve as an accelerator on the convergence of Slovak life standards, real and financial, to those of western European countries.

### What was life under euro really like for banks?

Many things went as expected, in fact, in some cases even better than expected. The initial cost of the euro change-over was slightly lower than previously expected. Banks also experienced the increased deposit volume, albeit short-lived: The inflow of cash from people's mattresses was higher than experienced by earlier euro adopters, nonetheless lasted only for about a year. Indeed, koruna´s worth of some 3.5 billion euro or 15 % of the outstanding deposit volume at that time was brought by people to banks in the final months of 2008. Majority of this money was deposited on 12-month term deposits and withdrawn at the maturity one year later, see figure below.

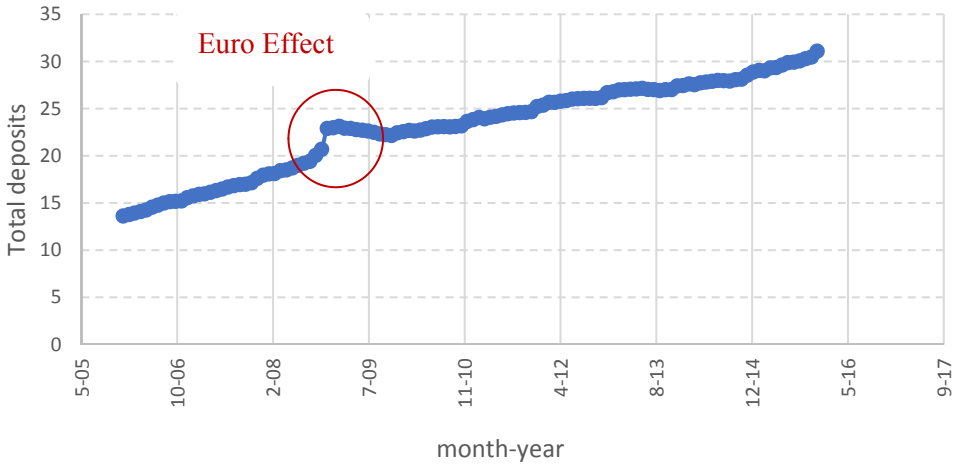



**Figure 18.13** Bank deposit of Slovak resident households (bn €)
Source: NBS

On the other hand, the loss of revenue from foreign currency conversion was higher than expected. Banks in Slovakia now earn on forex spot transactions only about 15-20 % of what they used to in the last three years of the koruna. To be sure though, this drop in fix income is partially due also to the global financial crisis, not solely to the demise of the national currency. And besides, while this income is lost from banks it is not lost from the whole economy point of view as corporates save the money previously paid for fix conversions.

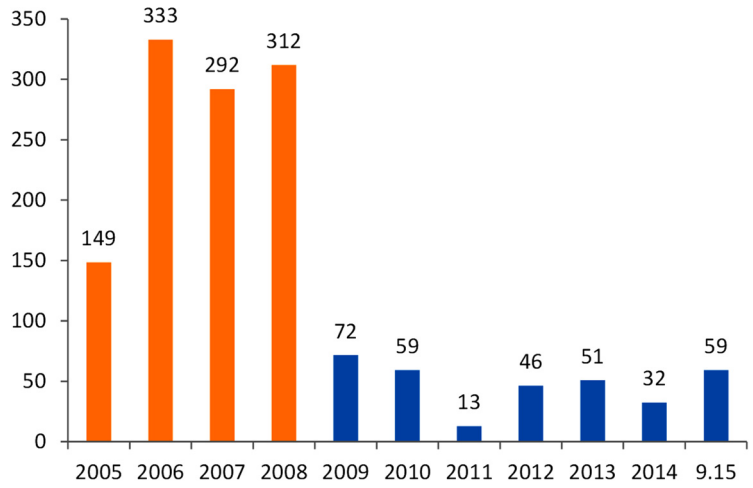
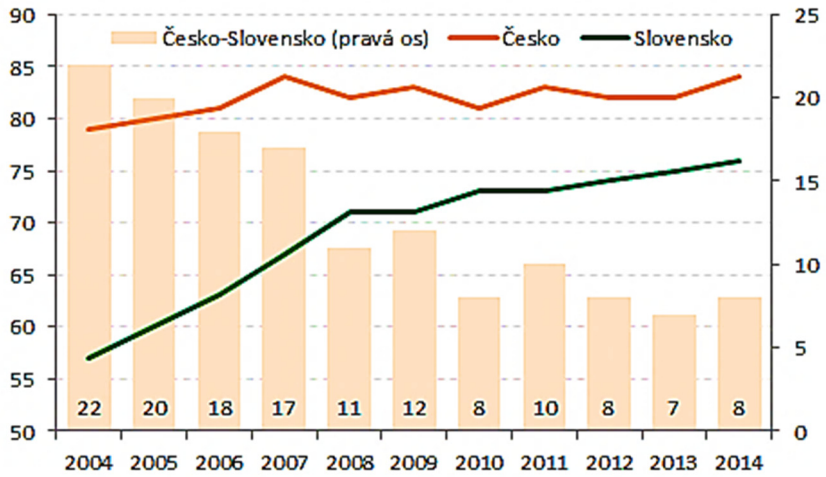


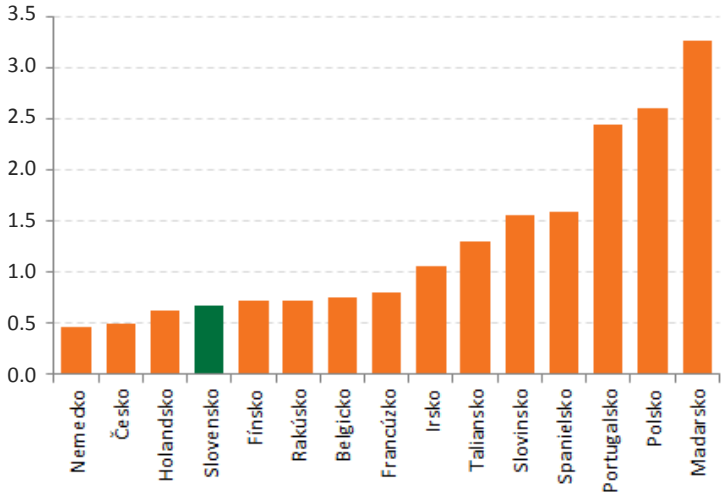

**Figure 18.14** Slovak banks' income from forex spot operations (mil. €)
Source: NBS

The faster economic growth also did come true, albeit bulk of it was realised in the years prior to the actual euro changeover (see Figure 18.15, which shows the biggest advance in the years 2006-2008).




Transl.: Česko – Czech Republic; Slovensko – Slovak Republic; Česko-Slovensko – Czechoslovakia (right axis)
**Figure 18.15** Convergence of GDP: SR to CZ (GDP per capita, PPP terms, EU28=100)
Source: NBS

Decline in interest rates also came along, even more pronounced than anybody expected. The decline, however, was primarily due to the ECB's aggressive conduct of monetary policy in the wake of EU debt crisis (see Chapter 16 on monetary policy).




Transl.: Nemecko – Germany; Česko – Czech Republic; Holandsko – Holland; Slovensko – Slovak Republic; Fínsko – Finland; Rakúsko – Austria; Belgicko – Belgium; Francúzsko – France; Írsko – Ireland; Taliansko – Italy; Slovinsko – Slovenia; Španielsko – Spain; Portugalsko – Portugal; Poľsko – Poland; Maďarsko – Hungary (horizontal axis)

**Figure 18.16** Comparison of long-term interest rates (10-year, % p.a., as of October 27, 2015)
Source: NBS

Additionally, Slovak adoption of the euro had also unforeseen costs related to the Eurozone's debt crisis. Albeit Slovakia refused to bail out Greece through bilateral loans, it did participate in the newly-created Eurozone rescue funds (e.g. EFSF, ESM), which may require substantial expenses in the future. For banks, the more direct and outright impact of the Eurozone's debt crisis is the increased regulatory pressure, which culminates in the creation of the EU Bank Union.

## Summary

Introduction of the euro is beneficial to the advancement of the Slovak economy. On some academic studies, by adopting the euro, Slovakia gained up to 10 percent of its real GDP per capita. Large part of this gain, however, was realised in the years BEFORE the actual euro adoption in 2009 and was related to the structural reforms that Slovakia had to undertake to qualify for the euro membership. Those reforms (e.g. flat tax reform, labour market, social security, and pension reform) attracted FDIs (automotive, electronics etc.) that lifted country's production capacity and accelerated real convergence of Slovakia to western standards.

In the years AFTER the euro introduction, the euro was beneficial to Slovakia primarily as an anchor of stability in the face of the financial crisis post the fall of Lehman Brothers. Of course, there are also costs related to Slovakia's euro membership, especially to the banking sector which lost a lot of trading income with the demise of the national currency. Even more importantly, there are costs that nobody really foresaw in the early days and those relate to the resolution of the EU debt crisis (e.g., Greece's bailout, establishment of ESFS, ESM etc.).

Still, we believe that the euro remains beneficial for the small and very open Slovak economy, which depends on the Eurozone for more than half of its exports. By being in the Eurozone, Slovakia gained an important competitive advantage relative to its CEE neighbours who are out of the single European currency club.

International Agricultural Economics

Authors:
Ján Pokrivčák
Eva Judinová
Ema Lazorčáková
Fred Ruppel
Zdenko Štefanides

Book editor:
Eva Judinová

Publisher:
Slovak University of Agriculture in Nitra

Edition:
First

Cover design:
Martin Lopušný
AQ-PQ:
25.54-26.01

ISBN 978-80-552-1757-4