

Monopolistic Competition in the International Trade of Agricultural Products

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Anotace

Cílem článku je vyjádřit chování mezinárodních firem prostřednictvím modelu monopolistické konkurence využívajícího optimalizace počtu firem v odvětví, a jehož vlastnosti nejlépe odpovídají potřebám mezinárodní směny. Předpokladem aplikace modelu monopolistické konkurence v oblasti mezinárodní směny agroprodukce je tvrzení, že obchod rozšiřuje velikost trhu. V odvětvích, kde působí rostoucí výnosy z rozsahu, platí, že jak rozmanitost statků, které země vyrábí, tak rozsah jejich výroby jsou ovlivněny velikostí trhu. Analýza prokázala platnost modelu pro odvětví agroprodukce; při rozšíření trhu či zvýšení dotací a tedy poklesu nákladů zemědělců se zvýšil počet firem v daném odvětví.

Klíčová slova

Mezinárodní směna, monopolistická konkurence, firma, rovnováha, odvětví, biopotraviny.

Abstract

The aim of the paper is to describe the behavior of international firms using model of monopolistic competition, which is using optimizations of the number of firms in the sector and its characteristics, best corresponding to the needs of international trade. The assumption for application of the monopolistic competition model in the international trade area of agro production is the idea that trade increases the market size. In the sectors where increasing returns to scale apply it is valid that both heterogeneity of the goods the country produces and the extent of their production are influenced by the market size. The analysis has shown the validity of the model for the production of agricultural commodities; the expansion of the market or the increase of subsidies and thus decrease of the cost of farmers caused by an increase of the number of firms in the sector.

Key words

International exchange, monopolistic competition, firm, equilibrium, sector, organic foods.

Introduction

The term globalization was used by the American economist T. Levith for the first time in 1985 when analyzing the global economy development in the seventieth. Multinational firms play key role in the globalization process because they are the main bearers of technological innovations and carry out majority of the international transaction flows.

The impact of multinational firms may be characterized within the imperfect competition theory as oligopoly or as monopolistic competition (Helpman, Krugman, 1985). A frequent form of structure of the sector is an oligopoly, i.e. several competing firms, each of which is big enough to

be able to differentiate the prices of its production, but at the same time too small to fix the prices in the sector. The price policy within the oligopoly can be characterized by mutual dependence. The firms fix the prices of their production both with regard to the assumed consumers' behavior and with regard to the assumed competitors' behavior. Analysis of such behavior is complicated. "In the modern market economy where the supply exceeds demand, the importance of the „consumer's behaviour in the market analysis“ continuously increases (Šrédl, Soukup, Severová, 2013)". Analysis of the firms' behavior in another imperfectly competitive structure, which is also often common, namely in the monopolistic competition is much easier. "The monopolistic competition includes some of the features

of perfect competition and monopoly. Often there are many firms in the market, for which the entrance to (and the exit from) the sector is free, if they can compete by the deepened differentiation of their product or services (Soukup, Šrédli, 2011)."

However, the production sectors are commonly assumed to be perfectly competitive in most of the studies, whereas the monopolistically competitive feature of some sectors, especially of the sector for final good production, is mostly ignored. A few studies like Anwar (2006, 2008) feature the intermediate production sector with monopolistic competition when analyzing the relation between international factor mobility and skilled-unskilled wage gap, but Anwar (2006, 2008) also neglects to take the monopolistically competitive final-good production into consideration.

M. Páscoa characterized monopolist competition by this way: „According to Chamberlin what marks the contrast between monopolistic competition and perfect competition is the shape of the demand curve not the shape of the cost curve.“ (Páscoa, 1997)

V. Damjanovic writes about specific features of monopolistic competition in his last article. „We find that a U-shaped relationship between the probability of default and the degree of competitiveness exists in a monopolistically competitive market as well.“ (Damjanovic, 2013).

The aim of the paper is to describe the behavior of international firms using model of monopolistic competition, which is using optimizations of the number of firms in the sector and its characteristics, best corresponding to the needs of international trade.

Materials and methods

We have used in this article the model making use of optimization of the number of firms in the sector, the characteristics of which correspond best to the international trade needs. A lot of various models are used for monopolistic competition analysis. Bogliacino and Rampa summarize the basic approaches of the economic theory to this issue in their article (2010): “A satisfactory picture should be grounded on some essential building blocks. The first one is uncertainty: the very novelty of goods (ideas, technologies, behaviors, etc.) implies that agents must act using conjectures over some unknown feature, as in standard Bayesian approaches (Young, 2005). The second block is

heterogeneity: individual models are necessarily different at the outset, since they summarize personal conjectures, previous learning and priori ideas (Cowan, Jonard, 2003, 2004; Lopez, Pintado, Watts, 2006). The third block is interaction: the learning activity on the part of agents exploits past observations, stemming mainly from other agents' choices. Interaction thus shapes the overall process, making it path dependent. Coupling all this with some degree of non-linearity might finally allow for multiple equilibriums, and hence non-uniqueness of outcomes (Young, 2007)."

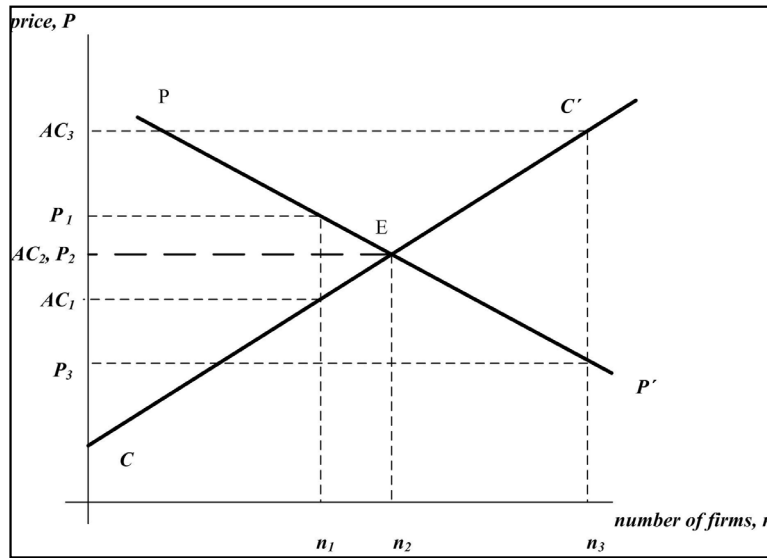
This article analyses a situation when a firm enters into international trade and the impacts of this entry on creation of the optimum number of the firms in the sector, of the equilibrium quantity and equilibrium price in the given sector.

The model of monopolistic competition of firms in the international trade of agricultural products

There are two key assumptions for monopolistic competition in the sector (Kierzkowski, 1984). It is differentiation of the product and the assumption that each firm considers the competitors' price as given. The firm manufactures and sells the more the higher the demand in the sector is and the higher the competitors' prices are. It manufactures and sells the less the higher the number of firms in the sector is and the higher its price is.

Average costs (AC) depend on the number of the firms in the sector (n). We assume according to Krugman (2006) that all firms in the sector are symmetric; it means that the demand and cost curves are the same for all firms in spite of the fact that they produce and sell differentiated products. If the individual firms are symmetric, it is easy to find out the sector's status. If we assume symmetry of the firm models, under equilibrium they shall sell for the same price, which means that each firm's share in the production and sale of goods is $1/n$ of the total sale volume in the sector. At the same time we know that the average costs are inversely proportional to the number of products manufactured by the firm. The more firms there are in the sector, the higher the average costs are since each firm produces less.

The situation in the sector may be expressed graphically with two curves (Figure 1): growing CC' and falling PP' . CC' curve expresses the relation among the number of the firms in the sector, the sale volumes and the average costs. PP' curve expresses the relation among the number



Source: own processing

Figure 1: Equilibrium of the sector under monopolistic competition.

of the firms in the sector and the price. The equilibrium state is thus situated in their intersection point, in point E, which corresponds to the number of firms in the sector n_2 . In case of this number of firms, the profit in the sector is zero (we have in mind the economic profit). If there are n_2 firms in the sector, then the price maximising the profit is P_2 .

The total firm's costs may be expressed by the relation

$$TC = \beta q + \alpha \quad (1)$$

For the average costs, it results thereof

$$AC = \beta + \frac{\alpha}{q} \quad (2)$$

where α, β are coefficients of the cost function.

It is valid

$$q = \frac{\bar{q}}{n} \quad (3)$$

where \bar{q} is the number of products in the sector, n is the number of firms, q is the number of one firm's products. By means of connecting these two relations we shall receive:

$$AC = \beta + \frac{\alpha}{\bar{q}} \cdot n \quad (4)$$

The price, for which a typical firm sells its goods, depends also on the number of firms in the sector. The more firms there are, the stronger the competition shall be among them and the

lower the price shall be. In Fig. 2 this is shown by the relation

$$P = \beta + \frac{f}{n} \quad (5)$$

where f expresses intensity of this competition.

The intersection point of both curves corresponds to the average costs AC_2 . It means that in a long period of time the number of firms in the sector shall approach n_2 , E thus represents the long-term equilibrium point. If the number of firms n_1 was smaller than n_2 , then the price of a piece of goods the firm offers would be P_1 while the average costs would be only AC_1 and the firms would thus achieve monopoly profit, which would attract other firms to enter into this sector, and their number, i.e. n_1 would start increasing. In the same way - to the contrary - if the number of firms n_3 was higher than n_2 , the price P_3 would be lower than the average costs AC_3 , the firms would thus lose interest and leave this sector, and the number of firms in this sector would thus decrease. The economic profit is

$$\pi = \frac{\sqrt{\alpha \cdot f \cdot \bar{q}}}{n} - \alpha \quad (6)$$

$$\pi_1 > 0, \pi_2 = 0, \pi_3 < 0. \quad (7)$$

If $AC = P_2$, it must be valid in point E:

$$\beta + \frac{\alpha}{\bar{q}} \cdot n = \beta + \frac{f}{n_2} \quad (8)$$

$$\frac{\alpha}{\bar{q}} \cdot n_2 = \frac{f}{n_2} \quad (9)$$

$$\alpha \cdot n_2^2 = f \cdot \bar{q} \quad (10)$$

$$n_2 = \sqrt{\frac{f \cdot \bar{q}}{\alpha}} \quad (11)$$

It is possible to deduce from it:

$$q_2 = \sqrt{\frac{\alpha \cdot \bar{q}}{f}} \quad (12)$$

$$P_2 = \beta + \sqrt{\frac{\alpha \cdot f}{\bar{q}}} \quad (13)$$

Herewith also the quantity of the products of one firm and the equilibrium price of the final goods are determined.

Firm's involvement in international trade

Let's assume now that a firm under monopolistic competition enters international trade. Increased market size allows each of the firms to produce more and to have lower average costs. Therefore curve AC_1 shall shift to AC_2 in Fig. 2. At the same time, growth in the number of firms and product differentiation occur under the fall of the price of each of the products from P_1 to P_2 .

Growth of the total sale volumes shall decrease the average costs under any given quantity of firms n . The reason lies in the fact that if the market grows under the same number of firms, the extent of sale per one firm shall grow and the average costs of one

company shall fall.

If we thus compare two markets, where one has higher extent of sale than the other one, AC_2 curve of the bigger market shall lie below AC_1 curve of the smaller market. Meanwhile the other curve P , expressing the relation between the price for one product and the number of firms, shall not change.

In our model, the international trade influence is expressed by an increase in the magnitude \bar{q} and a decrease in the inclination of AC .

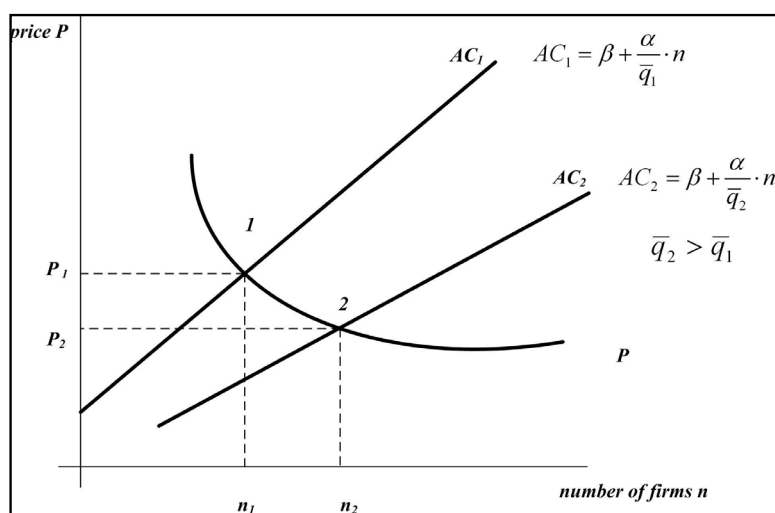
$$n_2 = \sqrt{\frac{f \cdot \bar{q}_2}{\alpha}} > n_1 = \sqrt{\frac{f \cdot \bar{q}_1}{\alpha}} \quad (14)$$

$$q_2 = \sqrt{\frac{\alpha \cdot \bar{q}_2}{f}} > q_1 = \sqrt{\frac{\alpha \cdot \bar{q}_1}{f}} \quad (15)$$

$$P_2 = \beta + \sqrt{\frac{\alpha \cdot f}{\bar{q}_2}} < P_1 = \beta + \sqrt{\frac{\alpha \cdot f}{\bar{q}_1}} \quad (16)$$

The average cost function shows us the long-term consequences of increased market extent. Originally, the equilibrium was achieved in point 1 under price P_1 and the quantity of firms was n_1 . Increased market extent shifts AC curve more to the right bottom and the new equilibrium is achieved in point 2. The number of firms increased from n_1 to n_2 and the price fell from P_1 to P_2 .

Our model assumes that production costs are the same in both countries that trade with each other and that the trade does not require any costs. These



Source: own processing

Figure 2: Extension of the market size (shifting of AC curve).

assumptions express the fact that even if we know that the integrated market shall support higher number of firms, we cannot say where these will be located. These are the sectors with monopolistic competition where a great number of firms produce differentiated goods.

Similar conclusions have been achieved also by Feenstra and Kee (2010): “We conclude that export variety in the monopolistic competition model with heterogeneous firms is quite effective at accounting for the time-series variation in productivity, but not the large absolute differences in productivity between countries.”

Monopolistic competition in long period of time

Let’s suppose now that during long period of time the quantity of both factors being used in creation of the final goods was changing, where X_1 is labour quantity, X_2 is capital value and r is a coefficient that expresses the level of technological progress. The production function shall have a simple form. The producers shall aim at occurrence of optimum combination of labour and capital minimising their total costs TC .

$$q = r X_1 X_2 \tag{17}$$

$$x_1 = \frac{q}{rx_2} \tag{18}$$

$$TC = Px_1 X_1 + Px_2 X_2 \tag{19}$$

$$TC = \frac{Px_1}{rPx_2} q + Px_2 X_2 \tag{20}$$

$$\frac{dTC}{dX_2} = Px_2 - \frac{Px_1}{rX_2^2} q = 0 \tag{21}$$

$$X_2 = \sqrt{\frac{Px_1}{Px_2}} \cdot \sqrt{\frac{q}{r}} \tag{22}$$

$$X_2 = \sqrt{\frac{Px_1}{Px_2}} \cdot \sqrt{\frac{q}{r}} \tag{23}$$

For the total cost function in the long period of time and the corresponding functions of the limit and average costs we shall receive

$$TC_d = 2\sqrt{Px_1 Px_2} \cdot \sqrt{\frac{q}{r}} \tag{24}$$

$$MC_d = \sqrt{\frac{Px_1 Px_2}{r}} \cdot \frac{1}{\sqrt{q}} \tag{25}$$

$$AC_d = 2\sqrt{\frac{Px_1 Px_2}{r}} \cdot \frac{1}{\sqrt{q}} \tag{26}$$

$$AC_d > MC_d \tag{27}$$

$$\beta = \frac{Px_1}{rX_2} \tag{28}$$

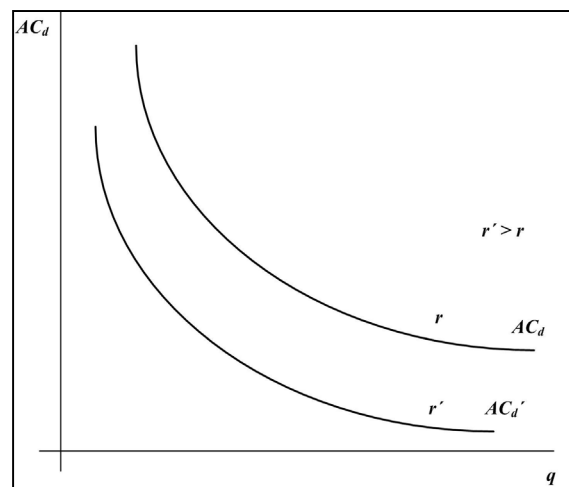
$$\alpha = Px_2 X_2 \tag{29}$$

In the long period of time we would thus receive for the price value and the production quantity of one firm

$$P_d = \frac{Px_1}{r\sqrt{X_2}} + \sqrt{\frac{f}{q}} Px_2 \tag{30}$$

$$q_d = \sqrt{\frac{q}{f}} Px_2 X_2 \tag{31}$$

This corresponds in Fig. 3 with the situation where the long-term average costs curve LAC shifts to the left bottom, thus the impact of external returns to scale.



Source: own processing

Figure 3: Influence of technology change in the monopolistic competition model in long period of time.

Results and discussion

Organic farming and farms

The model of international trade within the example of organic farming proves that if the adoption of state subsidies in the production occurs in the long run, then it will reduce AC of producers (organic farms) as a result and this reduction in average cost

will be reflected in the increasing number of farms and therefore increasing production.

An example of the monopolistic competition in the international agricultural products market can be organic food production on organic farms. Nowadays more than 32 million hectares of the agricultural land resources, 0.4 million hectares of aquacultures are farmed organically, and approximately 1.2 million organic farms are involved in the whole world. In spite of the fact that this area does not achieve even 1% of the global agricultural area share, the potential the organic agriculture brings is indisputable. From the point of view of the total area, the developing countries in Latin America, Africa and Asia have the biggest share in the organically farmed land resources. However, it is necessary to mention that a big part of these areas is intended for free picking and apiculture. In the mentioned areas, there's also the highest labour percentage representation in organic agriculture. Compared to this, the Western European countries have the highest relation of the organically farmed areas to their own area, in particular Liechtenstein, Austria and Switzerland. The Western Europe represents also the global market with organic food centre. Germany, Great Britain, France and Italy are the leading countries of this industry.

In 1990 implementation of the first subsidies for the organic farmers in Czech Republic started steep growth in the number of farms involved in the alternative way of farming. An important part of evaluating common economic politics of countries in the European Union (EU) is the observation of microeconomic consequences of governmental subsidies in agriculture (Prášilová, Severová, Chromý, 2011). Of the original 3 enterprises farming on the area of 482 ha, 135 farms farming on the area of 15.4 thousand ha were registered until the end of 1992. Since 1993, when the payment of subsidies was cancelled temporarily, the development of organic farming has occurred in particular in mountain and piedmont regions. Between 1994 and 1998 organic food market in our country stabilized and our firms became successful exporters of these products.

In support of the Czech organic farmers flowed more than 980 million in 2009, which is more than forty percent more than in 2008. The volume of grants has increased eleven times in ten years. Estimated number of organic farmers in 2010 has risen to 3500 and still growing. The acreage

of organic agricultural land increased by 50 thousands hectares and the share of organic agriculture land exceeded 10.5%. The number of organic farms increased year-on-quarter to 626 businesses (Prášilová, Severová, Chromý, 2011). The analysis has shown the validity of the model for the production of organic food; the increase of subsidies and thus decrease of the cost of farmers caused by an increase of the number of organic farms in the sector.

Livestock production

The production of meat products (Prague Ham)

The application of the model of monopolistic competition here is applied in the short run. The company produces (as a monopoly producer) family specialty Prague ham with a long tradition in monopolizing profit. The increase in the price of meat products as well as branded products exported to the EU and other countries lead to an increase in production capacity (see q in Figure 1 and 2).

The company which specializes in ham and smoked food was founded by the father of the current director Jiří Lenc in 1990. What was once a small family firm employing four people became a billion-dollar company employing 370 workers over the years. One of the largest independent manufacturers of sausages; the family-owned company Le & Co is planning further expansion six years after relocating to new premises in Jirny. They are planning to invest 30-40 million CZK into a new warehouse of 1,500 square meters (Kütner, Le&Co..., 2013). This is due to an increase in sales of company products and the consequent need for greater stocks of consumable items, as well as the increasing share of sliced meat products that are more difficult to package. There will be approximately five new job positions after the construction of the warehouse with a capacity of approximately 3,100 pallet spaces.

The increase in sales was also reflected by the company's revenue, which reached 1.43 billion CZK in 2011. The company recorded an increase in percentage in 2012; they also forecast the same increase in 2013. These figures have been influenced by several factors: an increase in the number of customers, an increase in mutual trade between the company and some of its contemporary customers and an increase in (sales) prices of meat products. The company

is therefore one of the promoters of the efforts of the Czech Meat Processors Association to get Prague ham on the list of traditional specialties guaranteed by EU.

Crop production

Beer

The decrease in the final price of exported Czech beer (by duty rate) concerning the accession of Russia to the WTO may be an example of the use of the model of monopolistic competition in the short run. The share of exports of domestic beer in Russia on the export of all beer exported from the Czech Republic to abroad has been slightly increasing, but many brewers expected it to be higher. This is because Russia entered the World Trade Organization (WTO) in August 2012 after eighteen years of negotiations. This should also bring a reduction in import duties and decrease the price of exports to the country, which is the third largest trading partner of the European Union. However exports have not significantly increased. Actions by the Russian government to reduce alcoholism in the country have stunted cheaper imports of Czech beer which is well-known and popular in Russia. Among other things this also means increasing excise taxes on alcohol and generally stricter rules for the sale and advertising of beer.

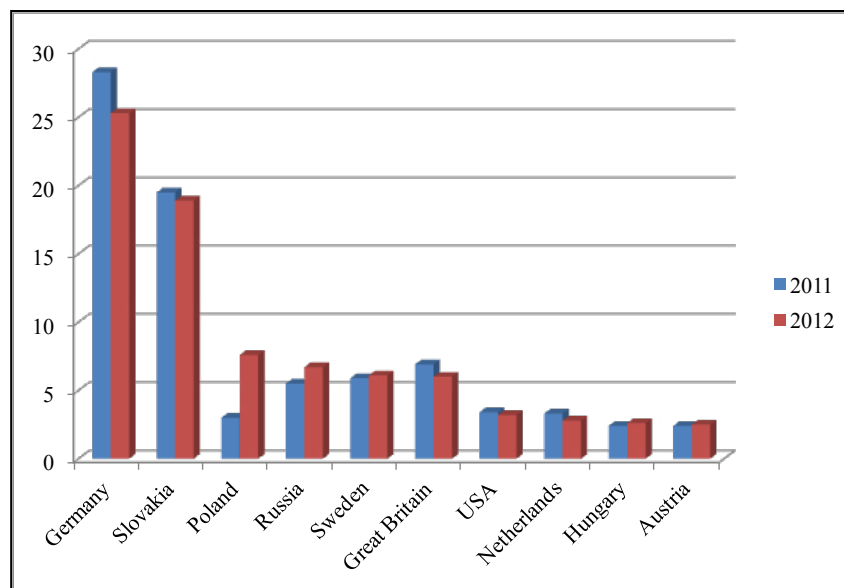
One of the few breweries that has a record growth in exports is the Lobkowicz Brewery which

groups together seven medium-sized domestic breweries. Not only Lobkowicz, but actually all exported brands are becoming similar to Russian and affordable licensed beers produced in Russia with an increase of excise tax on all beers and a reduction in duty. This is undoubtedly positive information. On the other hand, the Russian government increased the excise tax on beer, categorizing this as alcohol, on which they apply more stringent restrictions and rules. This is mainly related to the evidence within different documents, state registration, sale bans after 10PM, etc. This will slightly complicate sales, but will not become a big problem, if dealt with properly. (Kütner, Vstup ..., 2013).

Czech leader and dominant player in the market, Pilsner Urquell and Heineken ČR have not experienced an increase in exports to Russia. Despite the increasing excise tax in Russia, exports of other brands of beer have managed to hold the same cost as in previous years due to its quality and popularity.

Cocoa

There has been further extension of the cocoa bean market due to the growth in popularity of chocolate and increasing wealth of the middle class population in Asia (particularly in China) in the short run. The producers can't expand the growing-fields and the number of producing companies cannot be increased, this can be an example of an application



Source: Czech Malt and Beer Association

Graph 1: Countries' share in exports of beer produced in the Czech Republic.

of the model of monopolistic competition (see Figure 1). This consecutively leads to an increase in world prices.

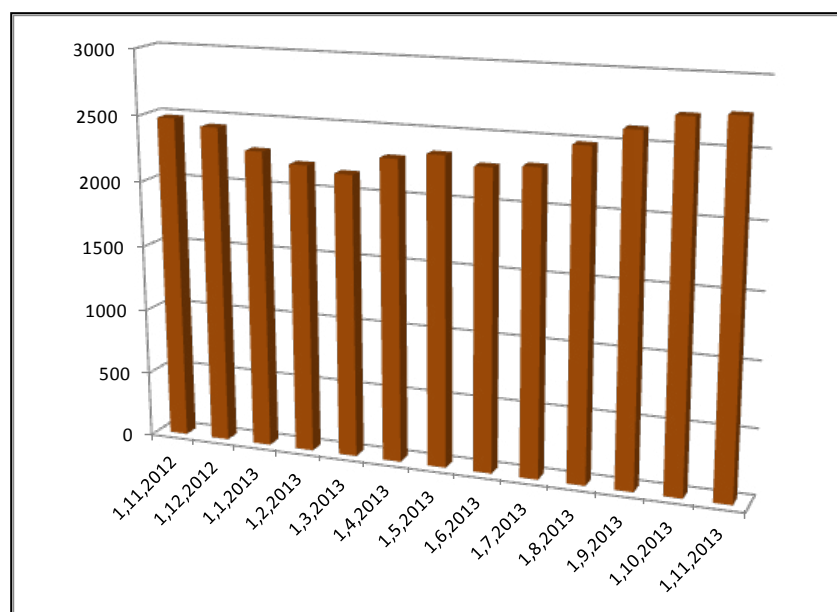
The world has been facing one of the biggest shortages of cocoa for the last few decades. This is due to a rapidly growing middle class population in Asia, which is increasingly enjoying chocolate. Meanwhile lack of cocoa has become a subject of interest for investors. Prices of cocoa raised by a quarter from last year's lows and has greatly exceeded most other commodities, and global stock, which managed to increase „only“ approximately 16 percent in the last year. Currently, producers of chocolate pay around \$ 2,800 per tonne of cocoa, but according to the experts this year's prices will continue to rise by approximately 15 %.

This year, 7.2 million tons of chocolate has been consumed in the world in total. Demand for chocolate is huge. Much of the world's population is becoming middle class, which tends to spend more. This is particularly true for emerging markets and Asia. The driving force behind global demand will be China, where there is a huge untapped market. Sales of chocolate products doubled here in 2013. However, confectioners earn the most in Europe, where the average citizen consumes almost five kilograms of chocolate per year; the consumption of Europe exceeds Asian continent consumption eleven times (Index Mundi, 2014).

According to the International Cocoa Organization (ICCO), the cocoa shortage will last until 2018. This is because farmers can't cover growing demand in the short run, besides; natural conditions are not favoring the crop. Plantations of cocoa in West Africa are getting older and less fertile, about three-quarters of the world's supply of cocoa comes from this area. The effect of rising input prices are being felt by chocolate producers. Strong competition prevents them from fully passing on the more expensive cocoa in the final prices of their products, so profit margins are dropping. For example the Nestlé Company confirmed a reduction in margins in the confectionery segment for the first half of 2013.

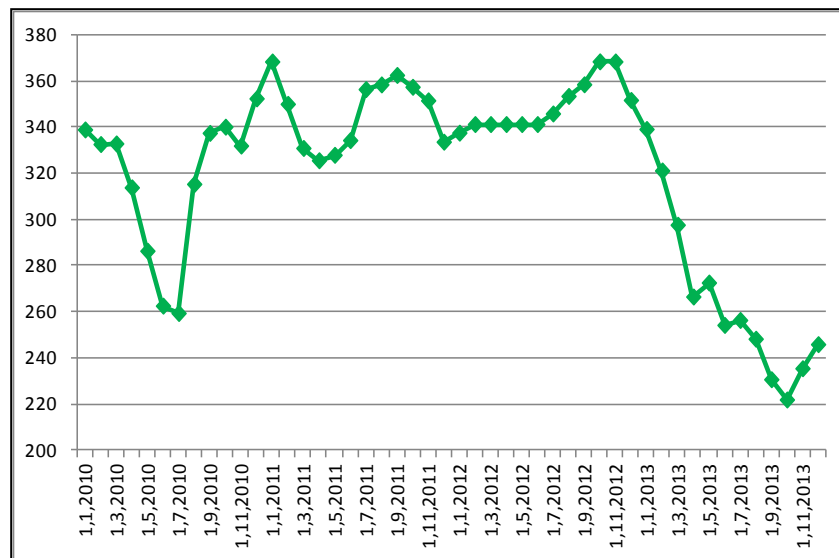
Tea

Production of black tea may be an example of a reduction in the size of the market due to the failure of an important customer (Egypt) in the long run in the model of monopolistic competition (see Figure 2). Low prices of tea undoubtedly threaten the economies of the largest exporters. Except for tourism and gardening it is the only product in Kenya that brings hard currency to the country, the same applies to Malawi, Uganda and Tanzania. The situation of tea producers is also aggravated by the fact that last year's crops were above expectations. The price of black tea fell to a three-year low due to the political upheaval in Egypt. Armed



Source: Index mundi, 2014

Graph 2: The development of the price of cocoa beans (USD per metric ton).



Source: Index mundi, 2014

Graph 3: The development of price of tea best pekoe fannings (US cents per kilogram).

interventions do not favor social rituals, thus the demand of the world's fifth largest importer of tea is rapidly decreasing. One of the ingredients used for preparing one of the most popular beverages lost more than a third of its value in the last year.

The wholesale price of medium quality black tea Pekoe Fanning, which is mass-produced in tea bags, dropped to 2.64 dollars per kilogram at the last auction in Mombasa, Kenya. This figure is approximately 34 percent less than in 2012 and the lowest value since mid-2010. Merchants say that if the crisis in Egypt continues, tea prices will continue to fall. Except politics, the stronger dollar, in which tea is bought, does not favor the local tea drinkers (Index mundi, 2014).

„We see no reason for optimism,“ said Dutch tea merchant Van Rees who is cited in the analysis by the Financial Times. However Czech tea lovers will not profit. Decline in prices is related only to teas of medium and low quality. „The perception of quality could be different because of the various reasons. Firstly, the consumer could be influenced by his/her vision or his/her experience of a low quality product“ (Horská, Ůrgeová, Prokeřinová, 2011). Tea of high quality, which is sold in specialized tea shops are faced with an increase in the price of labor at the location of harvest and increased costs for health checks on inputs into the EU, so a price reduction can't be expected here (see Graph 3).

The happiness of tea (bag) consumers may also be premature because the raw ingredient itself constitutes only a fraction of the total costs and a decline in prices of tea is negligible in the final price of the product. If the price decrease would continue, we can at least have the hope that prices of ordinary tea will rise a little slower than expected.

Conclusion

The firms' behavior in the monopolistic competition may be very heterogeneous and cannot be covered in a single model. Also, as mentioned study by Prášilová, Severová, Kopecká, Svoboda (2011) “the agricultural producers face (by clustering their firms into big trade cooperatives) a split between frequent fragmentation of production (also given by landscape sustainable development) and the oligopoly power of supranational food chain stores, which take over a notable part of their production”. The mentioned analysis describes the impacts of the firms entering international trade. In the sectors where increasing returns to scale apply it is valid that both heterogeneity of the goods the country produces and the extent of their production are influenced by the market size. Countries carry on trade among each other and thus create thus integrated global market that is bigger than any national market. By doing so, the countries get rid of their limitations. Each of them can specialize in production of a narrower spectrum of goods than if it were not for international trade,

it can also purchase goods it cannot manufacture itself from other countries. Thus each country can extend the spectrum of goods available to its consumers. The result is that international trade offers additional opportunities of mutual benefits, namely also in cases where the countries do not differ in their sources and technologies. Let's suppose there are two countries and each of them

has a market extent approximately for one million hectoliters of beer on average. When carrying on trade with each other, they may create combined market of two million hectoliters of beer. In this combined market, greater possibility of choice is achieved; more types of beer are produced under lower average costs compared to the situation, in which the national markets would be separated.

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