Asymmetric Duopoly with Product Differentiation: A Case of Retail Chain Concentration in Slovakia

By

Kristina Poliakova

Submitted to
Central European University
Department of Economics

In partial fulfillment of the requirements for the degree of Master of Arts in Economics

Supervisor: Professor Andrzej Baniak

Budapest, Hungary
2008

Abstract

Recently, between the years 2005 and 2007, the merger between the undertakings Tesco and Carrefour was investigated by the Slovak Antimonopoly Office. Eventually, the merger was prohibited. Later, the Carrefour hypermarkets were purchased by a new owner in 2008. Therefore the question arises: What were the reasons for the hypermarket chain Carrefour to leave the market in Slovakia? In order to answer the question, I study the effects of asymmetry in a duopoly with differentiated products. The model analyzed is based on the model of Symmetric Duopoly with Differentiated Products (Shubik and Levitan, 1980). I then apply the theoretical results to analyze the case of Tesco and Carrefour in Slovakia. There are two important findings which explain the Tesco-Carrefour case and answer the research question. First, the profitability of Carrefour might have been very low due to the high level of substitutability between the goods in duopoly. This is shown in the analysis of the model on the variable – the profitability measure. Second, the ban on the merger according to the model is justified, since the merger would result in detrimental effects on the consumer's welfare.

Acknowledgements

First and foremost I wish to thank my thesis advisor, Dr. Andrzej Baniak, for his help, advice, support and guidance during the elaboration of the thesis. I would also like to thank the economists from the Antimonopoly Office for consulting the topic of the thesis.

Contents

List of Figures and Tables

Introduction

In 2005 Tesco announced the takeover of the four Carrefour hypermarkets in Slovakia, which raised the public interest, since the two biggest retail chain stores in the country were involved. In addition, the examination of the concentration was referred to the national competition authority by the European Commission. Moreover, Slovakia was the first country among the countries that joined the European Union in 2004 which the assessment of a competition problem was referred to. In the end, the concentration Tesco-Carrefour was banned by the Slovak Antimonopoly Office, and also because there are not many bans on mergers in general, this case was widely discussed in the European Union.

It took more than one year for the Slovak Antimonopoly Office to come to a conclusion of prohibiting the merger, because the case was too complex and required prolongation of the period of assessment both from the Office and Tesco side. Eventually, in 2008, one year after the ban on the merger, Carrefour sold its hypermarkets and left the Slovak market. Therefore, there arose the following puzzling issue. What were the reasons which motivated Carrefour to sell its business and leave the Slovak market? Economic intuition suggests that a company decides to leave the market if it can better use the financial proceedings from the sale of the business somewhere else – an investment motive. Thus, it can be argued that Carrefour must have been making low profit in the Slovak market as compared with its investors'expectations. Was it the bad economic situation in Slovakia that made Carrefour to suffer from low profit or did Tesco in a way squeeze Carrefour from the market? The economic situation in Slovakia has experienced steady improvements since 2003, so there had to be different reasons for the fall of the revenue. Or was it a strong

competition between the two biggest players (Tesco and Carrefour) on the retail chain market? The positive answer to the latter question is the assumption for answering the research question of this thesis that asks, what might have been the reasons for Carrefour to leave the retail chain market in Slovakia.

Therefore, I will first analyze the Tesco-Carrefour case in Slovakia from the available official sources dealing with this case, particularly the decisions of the competition authorities. Afterwards, I will analyze the case using the Shubik and Levitan model (1980) extended with the asymmetry in the form of different costs, because this asymmetric duopolistic market structure with product differentiation can describe the case properly. Further, I will link the model with the Tesco-Carrefour case to explain the puzzle, why Carrefour wanted to leave the Slovak market.

According to my knowledge, no previous research on this specific topic of the concentration Tesco – Carrefour has been done. However, there are papers that deal with the duopolistic market structure with product differentiation and some of them in its content resemble the problem discussed in this thesis. For example, in paper by Tyagi and Rajeev (2005) firms' preferences for product differentiation over its competitor is analyzed. They show that the level of asymmetry has influence on the firms' preferences.

The thesis is divided into three chapters. The Chapter 1 outlines the merger regulation framework into which the Carrefour-Tesco case is set. In Chapter 2 I will explain the details of the case in Slovakia. The explanation aims to justify the setting of the model presented in Chapter 3. Chapter 3 first presents the setting of the model, focusing on microeconomic aspects of the model. In Section 3.4.1. the simulation of the model is realized, showing that the high-cost firm (Carrefour) suffers from close substitutability, resulting in lower profits as compared to the other firm (Tesco). In conclusion I summarize the results.

1. Merger Regulation within the European Union

In this chapter I will explain the main aspects of the European merger regulation[1] to put the concentration case Tesco-Carrefour into the merger regulation framework.

At the time of establishment of the European Economic Communities, the Articles of the Treaty Establishing the European Economic Communities comprised the regulation of competition in the field of agreements restricting competition, abuse of dominant position by undertakings and state aid. According to the Treaty on European Economic Communities, the European Commission, namely the Competition Department, was the body which dealt with the competition issues. Over time, the European Commission managed to get the authority to decide on approval and ban on the concentrations thanks to the adoption of the Council Regulation (EEC) No. 4064/89.

1.1. Scope of Merger Regulation

According to the information from the portal site of the European Union (europa.eu), all concentrations with a Community dimension fall within the present European merger regulation. According to the European merger policy, concentration arises "where a change of control on a lasting basis results from:

- the merger of more than two previously independent undertakings or parts of undertakings or

[1] The exact name of the Merger Regulation is "Council Regulation (EC) No 139/2004".

- the acquisition by one or more persons (already controlling at least one undertaking) or by one or more undertakings of direct or indirect control of one or more other undertakings“ (europa.eu)

Further, a concentration has a Community dimension provided that the combined and individual aggregate worldwide turnover of all the undertakings concerned exceed some given threshold. Also, concentrations with a Community dimension must be notified to the Commission prior to their implementation according to the portal site of the European Union (europa.eu). Moreover, the parties have to follow the conclusion of the decisions of European Commission.

1.2. Purpose of the European Merger Regulation

Jones and Suffrin (2004, p. 847) assert that the purpose of merger control is to enable competition authorities to regulate changes in market structure by deciding whether two or more commercial companies may merge, combine, or consolidate their businesses into one. Further, they claim that mergers naturally create a more permanent and lasting change on the market than agreements, and therefore, it might be expected that many mergers, especially horizontal mergers, would be forbidden. However, they cannot be totally forbidden, as the owners of the assets should retain the right to sell their business, otherwise they would not start to make any business.

The task of the competition authorities is to identify and to prohibit those mergers, as stated in Jones (2004, p. 848), which have such an adverse impact on competition or society that any benefits resulting from them are outweighed or should be ignored. Therefore, an effective merger control is needed to identify why and when a merger should be prohibited.

In a simplified way, it could be said that the European Commission is the arbiter that watches the playground (market) on which two or more players (competitors) want to get a more favorable position (thanks to the merger), which allows them to act independently from the other competitors. However, the European Commission bans such mergers which allow some players to act independently from the other players. This was the reason for the Slovak Antimonopoly Office to ban the Tesco-Carrefour merger, as it will be explained in the next chapter.

1.3. Referral Procedure

There is a system of referral procedure within the European merger regulation on the basis of the principle of subsidiarity. This simplified procedure ensures that the concentration will be handled by such national competition authority which can best analyze the relevant market aggrieved by the concentration. On the portal site of the European Union (europa.eu) it is explained that in line with this approach, a member state may declare that a concentration significantly affects competition in a domestic market of that member state. The Commission then, following the notification of the concentration, has to decide whether to deal with concentration itself under this regulation or to refer the whole or part of the case to the competent authorities of the member state.

In the Tesco-Carrefour case the national competition authority of the Slovak Republic (hereinafter as SAO – Slovak Antimonopoly Office) proposed that SAO itself would deal with the case, as this merger, according to SAO, would significantly affect competition in the market in Slovakia. The main reason for this proposal was that Tesco represents a chain of supermarkets and hypermarkets with the largest market share in Slovakia.

1.4. Horizontal Mergers

In general, mergers can be divided into vertical, horizontal and conglomerate ones. A vertical merger comprises an economic integration of two or more undertakings which pursue their business in different levels of production, i.e. a retail shop and distributor or producer and distributor or the like. A horizontal merger, on the other hand, comprises an integration of two or more undertakings which could be regarded as direct competitors, i.e. merger of two producers of dairy products. Lastly, a conglomerate merger comprises the integration of two or more undertakings that pursue business in such markets which are not directly interconnected, for example a merger of a producer of dairy products and a chain of travel agencies.

Because horizontal merger involves two firms in the same market, Hovenkamp (1999, p. 494) says that mergers produce two consequences that do not flow from vertical or conglomerate mergers: 1) after the merger the relevant market has one firm less than before; 2) the post-merger firm ordinarily has a larger market share than either of the partners had before the merger. Therefore, the Tesco-Carrefour case, as will be explained in the next chapter, represents a typical horizontal merger.

1.4.1 Relevant Market

When a competition authority evaluates a merger or other competition problem, the relevant market has to be defined. In case of mergers, market definition is a tool to identify the boundaries of competition between firms, which is needed for the analysis of the impact of the merger. The relevant market is a combination of the geographic and product dimension.

European Commission published guideline, a notice on the definition of the Relevant Market (1997). According to the guideline, relevant product markets are defined as follows:

> „A relevant product market comprises all those products and/or services which are regarded as interchangeable or substitutable by the consumer, by reason of the products' characteristics, their prices and their intended use." (Commission Notice, 97/C 372/03).

Also, in the guideline relevant geographic markets are defined as follows:

> "The relevant geographic market comprises the area in which the undertakings concerned are involved in the supply and demand of products or services, in which the conditions of competition are sufficiently homogeneous and which can be distinguished from neighboring areas because the conditions of competition are appreciably different in those areas."(Commission Notice, 97/C 372/03)

During the evaluation period of the merger, on the basis of the preliminary information and the information submitted by the merging parties, the relevant competition authority establishes several definitions of the markets. Further, the competition authority is free to contact or address written requests to the relevant parties (customers, competitors, professional associations) to enquire into their views or to carry out visits to the premises of the parties. Hence, the definition of the relevant market is crucial.

This section is needed for better understanding of the product and geographic dimension analysis summarized in the following chapter. And that is because the definition of the relevant market in both its product and geographic dimensions identifies the market structure and the products characteristics. This information is needed for the justification of the duopolistic model with product differentiation.

1.5. Concluding Remarks on Merger Regulation

Indubitably, merger control is important in a free market, as free competition could lead to formation of dominant firms, which could expel other, smaller competitors from the market. This may lead to blocking of the entry to the market and/or to increase of prices to the detriment of the consumers. The competition authorities, therefore, have the power to prevent such a situation in the market by assessing the planned mergers. They have to carefully assess the merger on the basis of sufficient economic and legal analysis of the relevant market and weigh the pros and cons of the announced merger.

The goal of merger control is to protect the consumers and not to promote the interests of the undertakings. Therefore, when assessing the model in Chapter 3, the welfare of the consumers is analyzed before and after the merger.

However, as the ban on a merger of type Always restricts the ownership rights of the shareholders (as they cannot sell their business), the competition authorities should adequately substantiate their decisions when they forbid a merger upon a detailed analysis of the relevant market, the possible behavior of the competitors and the possible effect of the merger onto the consumers. In the given Tesco-Carrefour case, the horizontal merger was forbidden as it will be described in Chapter 2. However, the main contribution of this thesis is the explanation of the reasons Carrefour wanted to leave the market in Slovakia for good. The reason I assume the decision of Carrefour to leave the market is the fact that Carrefour suffered from a decreasing level of its sales, which might have been unpleasant for its investors. The first alternative for Carrefour was the merger with the undertaking Tesco, which was banned, and therefore, Carrefour took a second alternative – to sell its business to independent investors, as happened in March 2008 (The Slovak Spectator, 2008).

2. The Tesco-Carrefour Case in Slovakia

According to the official Tesco webpage (tescocorporate.com), Tesco and Carrefour announced in September 2005 an asset swap involving stores and operations in the Czech Republic, Slovakia and Taiwan, subject to the usual regulatory approvals. As part of the deal, 11 Carrefour stores in the Czech Republic and 4 stores in Slovakia would be transferred to Tesco for a combined enterprise value of Euro189.4m. In return, Carrefour would receive 6 Tesco stores and 2 sites in Taiwan, of an enterprise value of Euro132m. This swap was a part of a strategic move by Tesco to strengthen its businesses in Central Europe.

In November 2005, the Commission received a notification of a proposed concentration pursuant to European merger regulation by which the undertaking Tesco wanted to acquire control over the Czech and Slovak businesses of Carrefour by way of purchase of shares, as stated in the decision of Case No COMP/M.3905[2]. Furthermore, the decision declares that Slovakia requested at the end of November 2005 the referral to its competent authorities of the part of the proposed concentration relating to Slovakia[3] with a view to assess it under the Slovak national competition law. The Slovak Antimonopoly Office (SAO) considered that the notified transaction would affect competition in three separate local markets for retail sale of food and non-food products in supermarkets and hypermarkets in Slovakia in the cities of Bratislava, Zilina and Kosice (Case No COMP/M.3905, p. 3). Consequently, the concentration was referred to SAO to the extent it concerned the markets for retail sale of daily consumer goods in Slovakia.

[2] Case No COMP/M.3905 from 22nd December 2005 is the decision of the European Commission on the case Tesco-Carrefour in Slovakia and this decision addresses decision fully only for the Czech market, where the concentration was allowed, since the decision for the Slovak market was referred to SAO.
[3] The part of the proposed concentration relating to Slovakia is denoted as *Slovak case* hereinafter.

The summary of the Slovak case follows in Section 2.2. The Czech case is not discussed within this thesis, however, the main difference between the cases (Slovak and Czech) will be discussed in the Section 2.2.1.

2.1. The Parties

The following short summaries of Tesco and Carrefour follow in order to give economic description of the hypermarkets on the market. Later on in the text, whenever the word "parties" is used, both undertakings, Tesco and Carrefour, are meant.

1) Tesco

In the decision Case No COMP/M.3905, Tesco was described as being active in food and non-food retailing. Further, Tesco had over 2,300 stores worldwide including a wide variety of formats. Tesco entered the Czech and Slovak markets in 1996, where Tesco developed large format stores[4] in the larger towns and smaller format stores in the smaller towns. As of December 2005, Tesco owned and operated 27 stores in the Czech Republic and 31 stores in Slovakia (including 5 department stores and 8 stores of less than 3,000 sqm).

2) Carrefour

In the decision Case No COMP/M.3905, Carrefour was described as being active in food and non-food retailing and operating more than 11,000 stores worldwide. Moreover, in Slovakia and the Czech Republic Carrefour had targeted only large towns and had only developed large formats. As of December 2005, Carrefour operated 11 large-format stores in the Czech Republic and 4 large-format stores in Slovakia.

[4] Large format stores were defined as having net floorspace in excess of 7,000 sqm.

According to the press release (The Slovak Spectator, 2008) that referred to the SITA[5] newswire, on the 1st March 2008, hence more than one year after the ban on the merger, a new owner was found for the 4 Carrefour hypermarkets in Slovakia. The new investors are the consortium of companies comprising ECM Group and ICS that will continue to run the business under the Carrefour brand (franchising agreement). This means, that Carrefour operating in Slovakia under Carrefour Nederland B.V. was indeed willing to leave the Slovak market. According to a report from Securities Information, Carrefour Nederland B.V. is a corporation affiliated with Carrefour France and shareholder of Carrefour Chile S.A., which means that until 2008 Carrefour in Slovakia was owned and operated by the multinational Carrefour.

2.2. The Summary of the Slovak Case

The Slovak case[6] was referred by decision Case No COMP/M.3905 to the SAO to decide on the merger to the extent it concerned the markets for retail sale of daily consumer goods in Slovakia, as it was mentioned at the beginning of this chapter. The Act that deals with the merger regulation under the Slovak competition law is the Act No. 136/2001 Coll. from 21st February 2001, in the wording of latter regulations. It took SAO about one year to decide to prohibit the merger. Later on, I will try to explain what were the reasons that led to such a conclusion. The model in Chapter 3 is based on the reasoning of the SAO. The decision of SAO No. 2006/FH/3/1/146 (hereinafter as decision of SAO), which was released on the 29th December 2006, will be frequently cited, since this decision is the broadest document available that deals with the Tesco-Carrefour case.

[5] SITA is the Slovak Information and Press Agency.
[6] The Slovak case is the part of the proposed concentration from November 2005 relating to Slovakia.

To sum up, Tesco and Carrefour concentration dealt with the consequences of acquisition of 4 hypermarkets by the entrepreneur Tesco on three independent local markets related to the towns Bratislava, Zilina and Kosice. This concentration is a horizontal type of concentration on the local market, i.e. when a markedly dominant player connects with its closest and most important rival, with the simultaneous existence of barriers to entry the market. As stated by SAO, the concern of the merger was that effective competition might have been eliminated to the detriment of customers.

The SAO started to deal with the case in December 2005, after the legal representative of Tesco[7] officially registered the merger in Slovakia. On March 2006 SAO informed both Tesco and Carrefour representatives about the preliminary outcome of the competition review, where the preliminary definition of the relevant markets was stated. Moreover, SAO claimed that a more detailed analysis of the case is needed: first of all, the definition of the relevant markets should be done, as the merger induces competition concerns.

Afterwards, there was a correspondence between SAO and the legal representative so as to come to a common view of the case. Finally, on the 2nd June 2006, SAO officially informed Tesco about the competition risks. At the same time, SAO asked to propose conditions and obligations that would remove the Office's concerns about a violation of competition (antimon.gov.sk, Article 2007).

According to the decision of SAO, in the notice from 2nd June 2006, the product basket[8] was defined as:

- The product basket includes those consumable food and non-food products which are frequently purchased by consumers and meet their recurrent household needs (this

[7] From now on, the legal representative of Tesco will be denoted simply just "legal representative".
[8] Before the definition of product basket was established, there was a rich communication between SAO and Tesco, where Tesco was trying to promote a broader definition of the relevant market.

would include all food products and non-food products such as toiletries, cleaning products and disposable hygienic paper products)[9](Case No COMP/M.3905, p. 5).

In the decision of SAO, an important feature of the consumer behavior was presented, namely, consumers increased their spending for food between 2003 and 2004 in the supermarkets and hypermarkets by 28%, reaching the level of 69%, pushing out the smaller-sized providers of food products. Moreover, supermarkets are less popular in the more well-off regions (Kosice or Bratislava for example), where there is high competitive pressure enforced by hypermarkets, which take upmost of the market. For example, in Bratislava, consumers spend around 50 % of their overall spending on food in hypermarkets. Further, the decision of SAO presents the typical customers of hypermarkets as young and middle aged persons with a higher level of education and with a higher level of income. Another important information from the decision of SAO is that the revenue of Tesco after the entry of new competitors (discounters) on the Slovak market in 2004 did not decrease, which suggests that there was created a specific segment of the market oriented to customers sensitive to price.

Also, the product market was defined in decision of SAO as follows:

- A product market for daily consumer goods including hypermarkets, supermarkets and discounters with a floor space in excess of 400 or 1000 sqm. It was said that the closest competitor to hypermarkets are the supermarkets, followed by discounters.

Likewise, the geographic market was defined as:

- The geographic market for the retail sale of daily consumer goods (hypermarkets, supermarkets and discounters) was delineated by the boundaries of a

[9] This citation comes from the definition of the product basket for the Czech case, however it was the same as for the Slovak case.

territory where the stores (the hypermarkets of the merging parties) can be reached easily by consumers - a radius of at most 20 minutes driving time.

These definition helped SAO to identify the local markets. Thus, the local markets that would be influenced by the merger were the local markets in the following cities: Bratislava (2 Carrefour stores and 3 Tesco stores), Kosice (1 Carrefour store and 1 Tesco store) and Zilina (1 Carrefour store and 2 Tesco store).

The market shares[10] of the parties were presented only in ranges[11], and therefore, my conclusions from the tables presented in the decision of SAO, which present the market shares of the relevant stores, will be approximations. In the local market of Bratislava, the shares of Tesco seemed to be slightly increasing and the shares of Carrefour decreasing. The joined shares of the parties in Bratislava would reach about 50 %. In the local market of Kosice, the shares of Tesco seemed to be decreasing and the shares of Carrefour slightly decreasing. The joined shares in Kosice would reach about 50-60 %. In the local market of Zilina, the shares of Tesco seemed to be slightly decreasing and the shares of Carrefour decreasing. The joined shares in Zilina would have reached about 55-70 %. From these, one can conclude that the shares of Carrefour were decreasing in all the markets and that Tesco was losing much less of the market compared to Carrefour, or Tesco was even gaining shares of the market.

The conclusion from the decision of SAO was that Tesco had the leading position in the before defined three local relevant markets, with Carrefour being its closest rival, and the remaining business entities substantially lagging behind in the relevant markets. This can be inferred from the SAO's conclusion:

[10] The market shares were defined as were defined as the reatio of turnover of one firm over the total turnover for each local market.
[11] It is a business secret, therefore the precise number was omitted, however, the range is still helpful. The numbers were yearly market shares from the period 2003-2005

> "In view of the existing structure of the individual local markets, high barriers to entry (considerable direct and forced investments, sunk costs related to the required advertising and marketing support when entering the market, administrative barriers to entry, time necessary for entry into the market, and so forth), saturation of the individual relevant markets, and the nonexistence of potential competitors, if the concentration were carried out, the undertaking Tesco plc would establish or strengthen its dominant position. Consequently, the undertaking Tesco plc. would not be subject to substantial competition and, given its economic strength, it could act independently with respect to its suppliers, consumers, and competitors" (antimon.gov.sk, Article, 2007).

According to SAO Tesco submitted the Final Proposal for the Conditions and Obligations to SAO on 20th October 2006. Further it is said that legal representative requested an extension of the time limit three times. This made SAO release the decision after 4.5. months. During that time, Tesco had been communicating with the SAO submitting the relevant information concerning the remedies. Moreover, SAO conducted its own investigation, as it contacted the potential buyers and competitors.

According to SAO, in the Final Proposal for the Conditions, Tesco proposed as a remedy the sale of certain operations. Also, Tesco suggested potential buyers of the business to be transferred. Consequently, SAO conducted an investigation and came to the conclusion that there were no undertakings with adequate experience, resources, and interest in doing the business to be transferred. Therefore, it was deduced that if the merger was allowed, then there would be no new potential competitors capable of exerting competitive pressure on Tesco.

The conclusion is summarized as follows:

„Based on the obtained information and in view of the existing structure of the relevant markets and the character of the business subject to the sale as proposed by the undertaking Tesco plc., the Office arrived at the conclusion that there was a high risk as to whether an appropriate buyer existed for the proposed transfer of business in this case." (antimon.gov.sk, Article, 2007)

In consequence of the above mentioned facts, SAO prohibited the concentration between Tesco and Carrefour by decision[12] of 29th December 2006 in accordance with the Act on Protection of Competition, because the change in the market structure would be detrimental to the consumers. In the model in Chapter 3 the effects of the merger on the welfare of the consumers will be discussed. The parties could have appealed to the decision within 15 days after the delivery of the decision, but they did not exert their rights, so the Decision came into force on the 17th January 2007.

2.2.1. The Conclusion of the Tesco-Carrefour Case

Comparing the two cases in Slovakia and Czech Republic, according to SAO (antimon.gov.sk, Article, 2007), the situation on Czech market was diametrally different from the situation in Slovakia, particularly regarding the lower market shares being reached by the entrepreneurs Tesco and Carrefour and higher number of market players, according to which the European Commission approved the concentration of these entrepreneurs related to the Czech Republic. It means that the situation in the Slovak and Czech case is very different. Moreover, the consumer behavior is a complex issue and depends on the economic situation, culture, traditions, distribution of resources or the evolution of the market development as well.

[12] It is the same decision as the decision of SAO.

The model I will present in Chapter 3 is based on the Tesco-Carrefour case in Slovakia. I will use the fact that on all the three relevant markets there are two main competitors that take a substantial share of the market. Therefore, one can look at it as a duopolistic market with differentiated products. One of them, Carrefour, suffers from decreasing shares of the sales and the other, Tesco, on contrary, is getting a larger part of the market. By the analysis of the asymmetric duopolistic model with differentiated goods I will focus on the changes of the profits of the high-cost. My interest is to explain why Carrefour wanted to leave the market. My intuition is that since the goods are very close substitutes, the high-cost firm suffered from very low profits and therefore it is no longer profitable for the firm to stay on the market and it prefers to disinvest.

3. The Model

The analysis that follows is based on the model "Duopoly with Product Differentiation" developed by Shubik and Levitan (1980). In order to analyze the Carrefour – Tesco case, I will extend the Shubik and Levitan model by adding asymmetry in the costs. The important characteristic of the model is that it incorporates a measure of substitutability between the goods offered by two firms. Moreover, the form of the demand functions is especially suitable to describe the Tesco-Carrefour case in Slovakia. As I mentioned at the end of the Chapter 2, on the before mentioned three local markets in Slovakia there are two main competitors – Tesco and Carrefour - that take a substantial share of the market. In addition, the two competitors are the closest ones, which means that the products they offer are close substitutes. Therefore one can consider the market structure as a duopoly with differentiated products, like in Shubik-Levitan model.

I will assume that Tesco is a firm with lower unit costs (low-cost firm) and Carrefour a firm with higher unit costs. In this chapter the notation of the firms is also numerical, Tesco being denoted as firm 1 and Carrefour being denoted as firm 2. Besides, the words firm and hypermarket, are interchangeable. The notation hypermarket is preferred to be used in the parts where the intuition is being explained, whereas the notation firm is preferred to be used in the analysis.

The demands can be derived from the aggregate consumer[13] utility function, defined as follows (Shubik and Levitan, 1980, p. 69):

$$U = \frac{\alpha}{\beta} q - \frac{1}{2\beta} q^2 - \frac{(q_1 - q_2)^2}{2\beta(1+\gamma)} - p_1 q_1 - p_2 q_2 ,$$

[13] I will consider consumers to be the same as customers.

where q_2 is the demand for the good 2[14], q_1 is the demand for the good 1, q is the overall demand, so $q = q_1 + q_2$ and $\gamma \geq 0$ is the measure of substitutability of the goods. If $\gamma = 0$ the products are independent. As $\gamma \to \infty$, the products become perfect substitutes.

The first two elements of the aggregate utility function of the consumers represent concave function of the sum of the products, as if they were perfect substitutes. The third element of the utility function, the crucial one for this model, represents the fact that consumers prefer to consume the same amount of each of the product. The level of the preference for consuming the same amount of the products is incorporated in the measure of substitutability γ. To interpret it for the Tesco-Carrefour case, if the size of the hypermarkets is the same, it brings higher utility for consumers to divide the amount of products purchased in both hypermarkets in two, since if one hypermarket has no customers and the other is crowded, it is better for customers to move to the "empty" one[15]. The last two elements of the utility function represent the preference for the cheaper goods or the disutility from having to pay for the goods. Furthermore, another useful property of the utility function is its quadratic form, so the demands are linear and can be easily interpreted.

However, it is not the aggregate utility function that is analogous to the Tesco-Carrefour case, but the demands derived from the utility function. Under the condition that the prices of the products are equal, the sum of the demands is a classical demand function, which does not depend on the measure of substitutability. So we can think about individual demands as a special partition that includes the substitutability factor. Therefore, one might consider the two hypermarkets as being interrelated on the common market. Despite the fact that there are other competitors as well, one might consider those competitors as minor[16] ones with

[14] Clearly, the good 1 is produced by the firm 1 and good 2 is produced by the firm 2.
[15] At least from the time point of view, consumers prefer shorter queue.
[16] Minor not just in size and turnover, but also as what regards the degree of substitutability.

negligible importance. Therefore the analysis of the duopolistic model for the Tesco-Carrefour case is reasonable.

It is important to emphasize that the welfare of the consumers, denoted as W, is actually the value of their aggregate utility function and from the economics point of view, the welfare of the consumers is the same as the consumer surplus.

3.1. Demands in Equilibrium

This section derives the demands for the duopolistic market with product differentiation. In both the symmetric and the asymmetric case, the demands are derived in the same way. The consumers choose demands q_1, q_2 knowing the prices p_1, p_2 of the goods, so that their utility is maximized. The firms know the behavior of the consumers, so they take the demands as given. Moreover, there are several constraints that need to hold in the model: the prices p_1, p_2 and the demands q_1, q_2 have to be non negative.

Assuming that the prices are not too far away from each other, the demand functions for both products are derived by solving the first order conditions for the utility maximization:

$$\frac{\partial U}{\partial q_1} = \frac{\partial U}{\partial q_2} = 0 \Rightarrow \frac{\alpha}{\beta} - \frac{q}{\beta} - \frac{q_1 - q_2}{\beta(1+\gamma)} = p_1 \text{ and } \frac{\alpha}{\beta} - \frac{q}{\beta} + \frac{q_1 - q_2}{\beta(1+\gamma)} = p_2$$

Solving for q_1, q_2 in the previous equations, the demands are:

$$q_1 = \frac{1}{2}\alpha - \frac{1}{4}\beta(2+\gamma)p_1 + \frac{1}{4}\beta\gamma p_2$$

$$q_2 = \frac{1}{2}\alpha - \frac{1}{4}\beta(2+\gamma)p_2 + \frac{1}{4}\beta\gamma p_1$$

Moreover, the previous two equations only hold under the following constraints: $p_1, p_2, q_1, q_2 \geq 0$, because there can not be negative prices on the market or a

negative consumption of the goods. Figure 1 illustrates the demand for goods of firm 1 taking the price p_2^* of the goods offered by the firm 2 as given in this duopolistic market, where there are no capacity constraints assumed.[17] The formulas for the Figure 1 are included in the Appendix A.

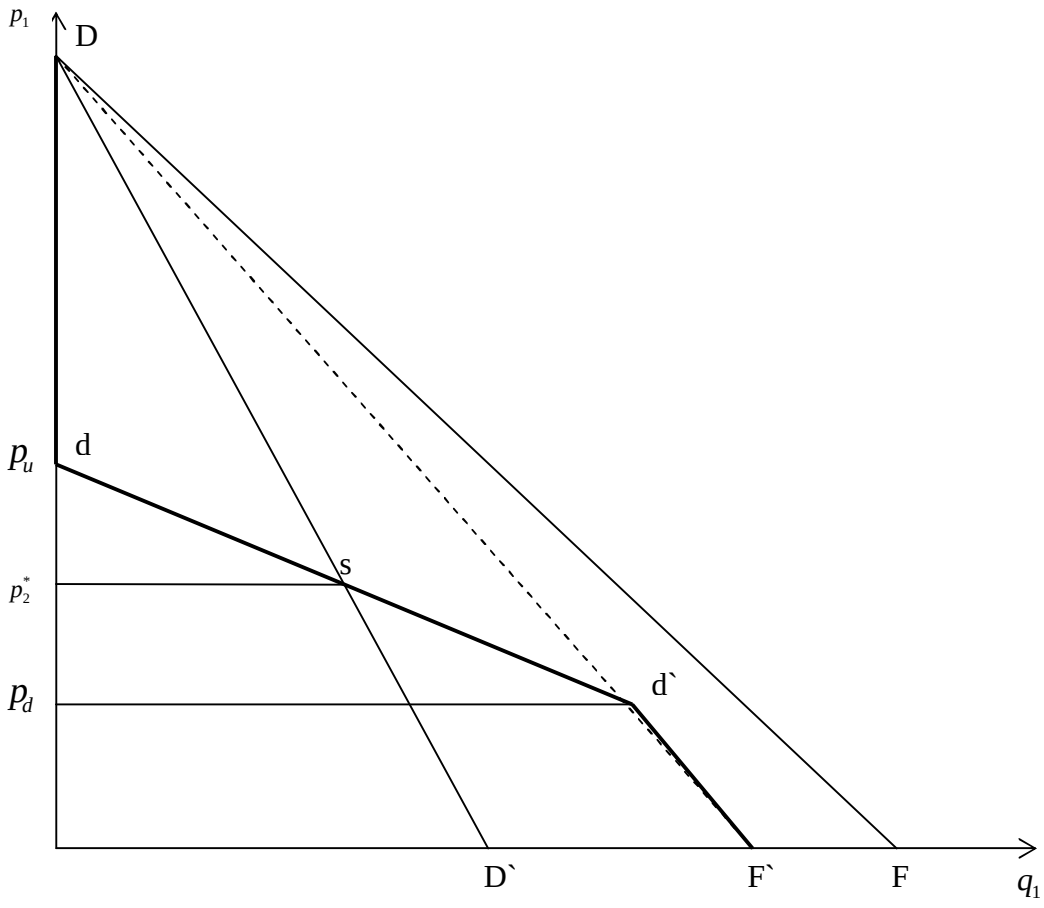

Figure 1 The demand function for the Duopoly with Product Differentiation

In Figure 1 the horizontal axis is the demand for the goods offered by firm 1 and the vertical axis is the price of good 1. The range DD` represents the demand when the prices are equal - $p_1 = p_2^*$. Range DF represents the joint demand if both demands are positive. Range

[17] In the book of Shubik and Levitan (1980), the capacity constraints were analyzed to a large extent. However, this is not relevant for the case Tesco-Carrefour.

DF`[18] represents the demand for the good offered by the first hypermarket if the second hypermarket leaves the market, or in other words, the second firm has just zero demand.

At point s both prices are equal. The interval dd` describes the demand for good 1 when the quantity demanded for good 2 is also positive. Above the price the demand for good 1 is zero. Similarly, below price , the demand for good 2 is zero. Therefore, for prices lower than , the demand for good 1 lies on the interval DF`.

The distance between the points F and F` is $\frac{\alpha}{2+\gamma}$, so if $\gamma = 0$ then F`=D`. And if $\gamma \to \infty$, F` approaches F. Further, as $\gamma \to \infty$, the range dd` becomes horizontal as the goods are becoming perfect substitutes.

To sum up, the demand for good 1, given the price for good 2, is described by the bold curve joining the points dsd`F`. Assuming that the prices set by the firms do not differ a lot, the demands are defined as in the range dd`.

3.2. Price Equilibrium

This section derives the price-quantity equilibrium. In the original version of the Shubik and Levitan model, only the symmetric case with the same costs $c_1 = c_2$ was considered. Thus the costs are constant. I will extend the model by assuming different costs - $c_2 \geq c_1$[19].

The basic condition that is assumed in the whole text is that in monopoly, the hypermarkets could satisfy demands, so $\alpha - \beta c_i > 0$ for $i = 1,2$. The profit functions of the firms are:

[18] The demand for this range was calculated when maximizing the aggregated utility function of the consumers given the quantity of the good 2 is zero.
[19] To remind, firm 1 is Tesco and firm 2 is Carrefour when making the analogy between the model and the case.

$$\Pi_1 = (p_1 - c_1)q_1 = (p_1 - c_1)\left(\frac{1}{2}\alpha - \frac{1}{4}\beta(2+\gamma)p_1 + \frac{1}{4}\beta\gamma p_2\right),$$

$$\Pi_2 = (p_2 - c_2)q_2 = (p_2 - c_2)\left(\frac{1}{2}\alpha - \frac{1}{4}\beta(2+\gamma)p_2 + \frac{1}{4}\beta\gamma p_1\right).$$

The hypermarkets choose the prices so as to maximize their profits. Therefore, the following first order conditions need to hold in the equilibrium: $\frac{\delta\Pi_1}{\delta p_1} = 0, \frac{\delta\Pi_2}{\delta p_2} = 0$. The solution to the first order condition is:

- $p_1 = \frac{1-K}{2-K}\frac{\alpha}{\beta} + \frac{K}{4-K^2}c_2 + \frac{2}{4-K^2}c_1$,
- $p_2 = \frac{1-K}{2-K}\frac{\alpha}{\beta} + \frac{K}{4-K^2}c_1 + \frac{2}{4-K^2}c_2$

  - where $K = \frac{\gamma}{2+\gamma}$, if $\gamma = 0 \Rightarrow K = 0$, $\gamma' > 0$ and if $\gamma \to \infty \Rightarrow K \to 1$

To interpret the prices, concerning p_1 for example, as products are becoming closer substitutes, the coefficient of $\frac{\alpha}{\beta}$ moves from $\frac{1}{2} \to 0$, the coefficient of c_1 moves from $0 \to \frac{1}{3}$, the coefficient of c_2 moves from $\frac{1}{2} \to \frac{2}{3}$.

The following implications are important for understanding of the model:

- If $\gamma = 0$, then $p_i = \frac{1}{2}\frac{\alpha}{\beta} + \frac{1}{2}c_i$ for $i = 1,2$. This means, that the solution is the same as for the monopoly, where the individual demands are independent.
- If $\gamma \to \infty$, then $p_i = \frac{1}{3}c_j + \frac{2}{3}c_i$ for $i, j = 1,2$ and $i \neq j$. This is analogous to the model of Bertrand Duopoly. If the costs are the same, the solution to both models is identical.
- If $c_1 = c_2 = c$, then $p_i = \frac{\alpha/\beta + c(1+\gamma/2)}{2+\gamma/2}$ for $i = 1,2$ (Shubik and Levitan, 1980, p. 74).

3.3. The Welfare Analysis – Symmetric Case

In this section equal costs are assumed: $c_1 = c_2 = c$, so in equilibrium the demands are:

$q_1 = \frac{1}{2}(\alpha - \beta c)\frac{1+\gamma/2}{2+\gamma/2}$, so the equilibrium profit is $\Pi_i = \left(\frac{1+\gamma/2}{2\beta}\right)\left(\frac{\alpha-\beta c}{2+\gamma/2}\right)^2$

It can be seen, that the profit is higher as the coefficient of substitutability γ is lower. At the same time, the welfare of the consumers $W = \frac{1}{2}\left(\frac{(\alpha-\beta c)^2(2+\gamma)^2}{\beta(4+\gamma)^2}\right)$ is higher as the coefficient of substitutability γ is higher. This means, that the measure of substitutability γ has positive effects on consumers, but negative on the firms.

The market structure might change after the two hypermarkets join, but the situation after the merger is not clear. There need to be set assumptions as to how the market might change. Intuitively, the merged firms might not change anything about their differentiated goods and just set the prices so as to maximize their joint profit.[20] Alternatively, and for the case Tesco–Carrefour more probably, just one hypermarket is left, which just takes as much from the market as possible, not having any closer competitor, while the demand is again derived from the aggregate utility function with the second demand equal 0.[21] In addition, the costs might lower as a result of the efficiency. However, since in the Tesco-Carrefour case there were no efficiency costs assumed, I decided not to analyze it here.

Case A)

[20] This is the case A) analyzed hereafter, denoted as the merger of type A.
[21] This is the case B) analyzed hereafter, denoted as the merger of type B.

In this case the merged firm sets the prices so as to maximize the joint profit. From the symmetry of the market, it is certain that the prices will be the same. As the prices are the same, the individual demands depend just on the price of the good the demand is related to. Therefore, new firm would set monopoly prices that are actually equivalent to the case when $\gamma = 0$. Therefore, for merger of type A, the results are as follows:

$$p_A = \frac{1}{2}\frac{\alpha}{\beta} + \frac{1}{2}c \ , \ \Pi_A = \left(\frac{1}{2\beta}\right)(\alpha - \beta c)^2 \text{ and } W_A = \frac{1}{8}\frac{(\alpha - \beta c)^2}{\beta} \text{ for all } \gamma \text{ possible,}$$

where W_A is the welfare of the consumers after the merger of type A. Profit Π_A of the merged firm is always higher than the sum of the profits of the pre-merged firms, so this merger is always favorable for the merging firms.

Iit can be seen from above that W_A does not depend on γ, so this welfare is the smallest possible as in the pre-merger case for $\gamma = 0$. Recall that for both hypermarkets on the market, W was increasing in γ. It is obvious that the welfare of the consumers decreases and the profits of the firms increase as γ becomes higher.

The conclusion is, as γ becomes higher, the detrimental effects on the welfare of the consumers are bigger after the merger. The intuition behind it is that if there are just two strong players on the market - Tesco and Carrefour - and if customers see their products as almost identical, then hypermarkets compete strongly in prices and the welfare of the consumers is almost maximized. However, if hypermarkets merge, the new firm would not feel any competition pressure and therefore the merged hypermarket would set much higher prices than before taking away a substantial part of the welfare of the consumers.

Case B)

In merger of type B there is just one firm left on market selling homogeneous goods. It is actually similar to the case when the second hypermarket decides to leave the market – as if

there was no merger. Still, this does not weaken the analysis because the whole analysis stems from the aggregate utility function of the consumers.

In the aggregate utility function of the consumers, the demand for good 2 is set to be zero. Denote $q_1 = q_B$, $p_1 = p_B$. The consumers maximize $U = \frac{\alpha}{\beta} q_B - \frac{{q_B}^2}{2\beta}\left(\frac{2+\gamma}{1+\gamma}\right) - p_B q_B$ by choosing q_B given p_B. The first order condition for this maximization problem is $p_B = \frac{\alpha}{\beta} - \frac{q_B}{\beta}\frac{2+\gamma}{1+\gamma}$, so $q_B = \left(\frac{1+\gamma}{2+\gamma}\right)(\alpha - \beta p_B)$. Knowing this, the merged firm will maximize its profit $\Pi_B = \left(\frac{1+\gamma}{2+\gamma}\right)(\alpha - \beta p_B)(p_B - c)$, and the solution for the price in this case will be the same as in merger of type A, $p_B = \frac{1}{2}\frac{\alpha}{\beta} + \frac{1}{2}c$. Yet, the quantity q_B will be always smaller than q_A, depending on the size of γ. The welfare of the consumers is $W_B = \frac{1}{8}\frac{(\alpha - \beta c)^2(1+\gamma)}{\beta(2+\gamma)}$. It is interesting to observe that if $\gamma \to \infty$, $q_B = q_A$ and $W_A = W_B$ or, in other words, the situation in A is the same as the situation in B, since the goods of the pre-merged hypermarkets became perfect substitutes.

On the other hand, if $\gamma = 0$, both the quantity and the welfare of the consumers in the case B will be two times smaller because one firm is out of business. The profit of the firm for $\gamma = 0$ after the merger is actually lower than the sum of the profits before the merger. This means that for a small γ, it is not profitable to perform the merger of type B and so there would be no initiative of the firms to merge, since they already benefit from the almost monopolistic market. It can be algebraically computed for which values of γ it is beneficial for the firms to merge. Interestingly, the result does not depend on any of the coefficients and

algebraically, for $\gamma > 3.150770243$[22] it is always beneficial for the firms to do a merger of type B.

To sum up, welfare W_B will be always smaller than welfare W_A and the welfare before the merger, W, will be always higher than W_A. When comparing the welfare before and after the merger:

- $W / W_A = \frac{4(2+\gamma)^2}{(4+\gamma)^2}$ is between 1 and 4 for all $\gamma \geq 0$
- $W / W_B = \frac{4(2+\gamma)^3}{(4+\gamma)^2(1+\gamma)}$ is between 2 and 4 for all $\gamma \geq 0$

However, the comparison of the relative values of the welfare is not relevant from economic point of view, because it can not be interpreted.

Figure 2 shows the comparison of the equilibrium demands from merger of type A and the demand from merger of type B. Apparently, the joined demand from merger of type A is higher than the demand from the merger of type B.

[22] This number is a solution to the following problem: $\Pi_B - 2\Pi_i = 0$, where the second profit is the pre-merger profit of the firms.

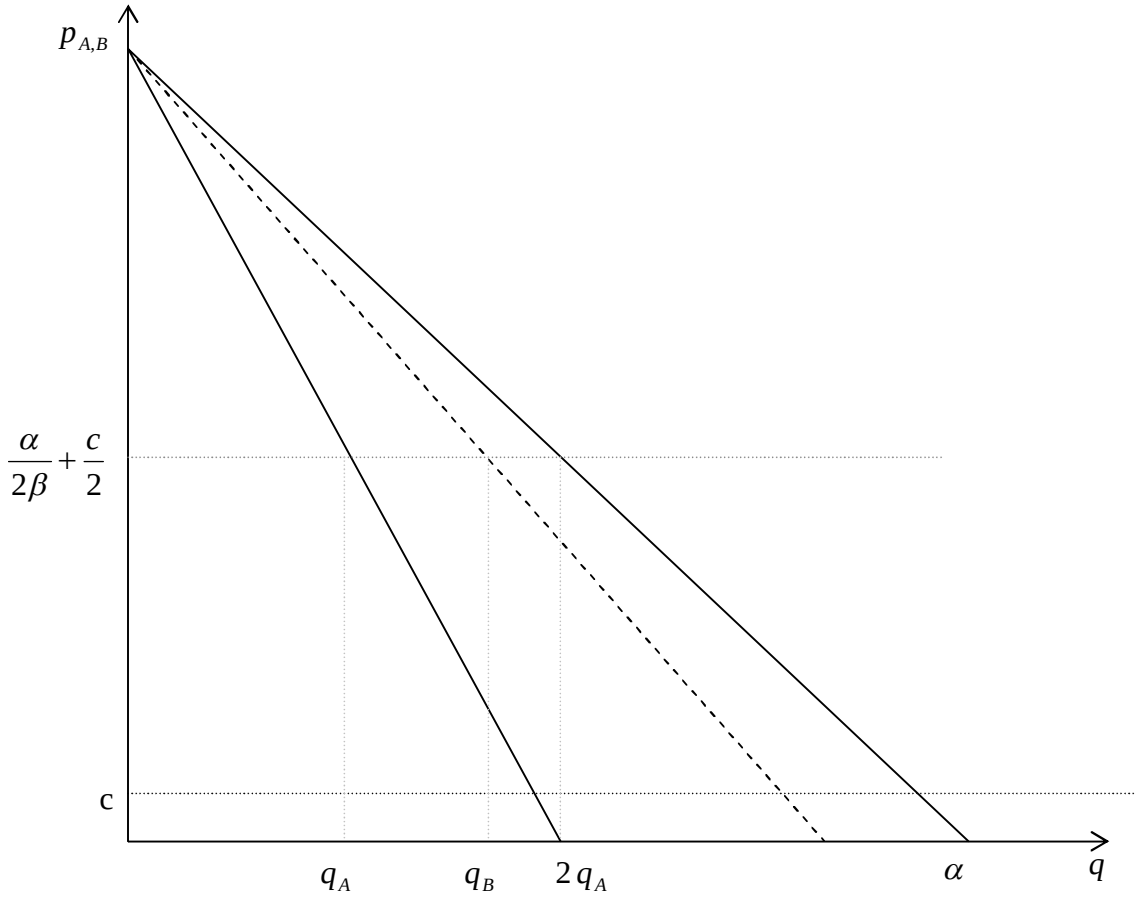

Figure 2 The demands after the merger for merger of type A and merger of type B

3.4. The analysis of Asymmetric Case

Assuming $c_2 > c_1$, in equilibrium, the demands can be computed using the prices p_1, p_2 from the Section 3.2. Thus, the demands are:

$$q_i = \frac{1}{2}\left(\alpha\frac{1}{2-K} - \beta\frac{K}{4-K^2}c_j - \beta\frac{2}{4-K^2}c_i + \beta\frac{\gamma}{2(2+K)}(c_j - c_i)\right), \text{ where } i, j = 1,2 \text{ and } i \neq j.$$

The equilibrium profit is therefore: $\Pi_i = \frac{1}{2}\frac{(\alpha(2-K-K^2) - \beta c_i(2-K^2) + \beta c_j K)^2}{\beta(4-K^2)^2(1-K)}$.

At the beginning, it was assumed that $p_1, p_2, q_1, q_2 \geq 0$. When I analyzed the full symmetric case, this did not cause any concerns (the constraints held), however, in the asymmetric case it can happen that the equilibrium price p_2 would be less than its cost c_2 or the equilibrium quantity q_2 would be negative. The following three results hold:

Lemma 1: If in equilibrium, the demand for the good i is positive, then the firm i does not make negative profit, for $i = 1,2$

The proof is in Appendix 2.

Lemma 2: There will be two firms operating on the market[23] if and only if $c_2 < \frac{(2+K)(1-K)}{(2-K^2)}\frac{\alpha}{\beta} + \frac{K}{2-K^2}c_1$, where $c_2 > c_1$

Lemma 3: If $c_2 > c_1$ and $c_2 < \frac{(2+K)(1-K)}{(2-K^2)}\frac{\alpha}{\beta} + \frac{K}{2-K^2}c_1$ then $p_2 > p_1$

Proofs of the Lemmas can be found in Appendix B. The first result, Lemma 1, says, that every firm which sells on the market, makes profits. This is an expected result in microeconomics. However, in reality the positive profit is not enough, since firms need profit to pay for investors in the form of dividends or the firms might have some fixed costs. In fact, firms expect some level of the profit. This fact might explain, why Carrefour decided to leave the market – Carrefour simply might have made low profit compared to the revenue. This fact is crucial for my thesis and I will come back to it in the Section 3.4.1.

The second result, Lemma 2, says that if the costs of two firms are different, then it might happen that one firm is pushed out of the market. It expresses that as the measure of substitutability γ increases the space of the costs c_1, c_2, under which there are both firms on

[23] In the Figure 3, the crossed area (upper triangle) for some γ actually represents such a combination of costs, for which q_2 is zero, so at the end the firm with the lower costs can profit from monopolistic market structure.

the market, narrows as a consequence of higher competition. Intuitively, if two firms compete, the difference between their costs can not be very large if both firms are to stay on the market.

The third result, Lemma 3, says, that the firm with higher unit costs charges in equilibrium higher prices than the firm with the lower costs.

In the Section 3.3 I analyzed welfare effects of the merger when the costs were equal. However, at this point with different costs, there is no need to conduct the analysis again. On the one hand, it would be very similar to the case when the costs are equal – since just one firm is left after the merger. On the other hand, the merger would certainly have detrimental effects on the consumers. Still, it is necessary to come back to the problem whether it is profitable for the firms to merge or not. Merger of type A certainly brings higher profits for the merged firms. The case B is a bit suspicious and in order to find out the values for which the merger for the firms is profitable, more complicated analysis is necessary[24]. Intuitively, there should exist such a combination of the variables γ, c_1, c_2, for which it is not profitable for the firms to merge and vice versa.

Coming back to the Tesco-Carrefour case, it was mentioned in the Chapter 2 that the profits for Carrefour were going down and for Tesco they were rising. Therefore, it can be assumed that the profits for Carrefour became low enough that Carrefour preferred to sell the business in Slovakia and use the money gained for investing somewhere else. Thus, using the model, I will show in the next section, that if two goods are close substitutes, hence γ is high, then if there is just a slight difference in their costs, c_1, c_2, the profit for the higher cost firm is much lower than the profit for the lower cost firm despite the fact that there is not big difference between the quantities q_1, q_2.

[24] Using the software Maple, the solution would be the root of the 6th order equation – this is above the scope of this thesis.

3.4.1. Simulation

This section presents a simulation of the model. First, I define the assumptions that the base model has to satisfy and a general solution to the model. Then I will present the results for which I chose proper coefficients and I will relate it to the Tesco-Carrefour case.

Assumptions:

1. $c_2 = c_1 + \varepsilon$, where $\varepsilon > 0$ is small,

2. the measure of substitutability of the goods γ is high,

3. $c_2 < \frac{(2+K)(1-K)}{(2-K^2)}\frac{\alpha}{\beta} + \frac{K}{2-K^2}c_1$, where K is defined as before: $K = \frac{\gamma}{\gamma+2}$.

The solution is:

$p_1 = \frac{1-K}{2-K}\frac{\alpha}{\beta} + \frac{1}{2-K}c_1 + \frac{K}{4-K^2}\varepsilon$ and $p_2 = \frac{1-K}{2-K}\frac{\alpha}{\beta} + \frac{1}{2-K}c_1 + \frac{2}{4-K^2}\varepsilon$.

The equilibrium profits are therefore:

$$\Pi_1 = \frac{1}{2}\frac{((\alpha-\beta c_1)(2+K)(1-K)+\beta K\varepsilon)^2}{\beta(4-K^2)^2(1-K)},$$

$$\Pi_2 = \frac{1}{2}\frac{((\alpha-\beta c_1)(2+K)(1-K)-\beta\varepsilon(2-K^2))^2}{\beta(4-K^2)^2(1-K)} \text{ and}$$

$$\Pi_1 - \Pi_2 = \frac{1}{2}\frac{K+1}{4-K^2}(2\alpha - 2\beta c_1 - \beta\varepsilon)\varepsilon,\ q_1 - q_2 = \frac{1}{2}\frac{\beta(K+1)}{(K+2)(K-1)}\varepsilon.$$

From the difference of the profits, it is obvious, that $\Pi_1 > \Pi_2$ and from the differences of the equilibrium demands one can see that $q_1 > q_2$, so the firm with the lower costs has higher profits and takes a larger part of the market.

Let φ_i be the *profitability measure of firm i,* as the ratio of the shares of the profits over the shares of the demand, so $\varphi_i = \frac{\Pi_i/(\Pi_i+\Pi_j)}{q_i/(q_i+q_j)}$, where $i, j = 1,2$ and $i \neq j$. This

profitability measure reveals how much higher the share of the profit of firm *i* is as compared to the share of the quantities sold. It can be understood as follows: if $q_i/(q_i+q_j)$ is the effort of the firm *i* exerted on the market and $\Pi_i/(\Pi_i+\Pi_j)$ is the pay-off of the firm *i* then as φ_i increases for the firm *i* the better for the firm *i* and its investors. In other words, it is some kind of measure of profitability that can serve for the firm to compare itself with the second firm on the same market. I will use this profitability measure φ_i to show, that in the case Tesco – Carrefour, Carrefour might have had this factor very low, which made the owners of the Carrefour to be willing to leave the market.

The properties of the profitability measure after a simple reasoning can be summarized as follows:

- always $\varphi_1+\varphi_2 \le 2$,
- $\varphi_1+\varphi_2 = 2$ if $q_1 = q_2$ and this is true just for $\varepsilon = 0$, which means $c_1 = c_2$,
- $\varphi_1, \varphi_2 \ge 0$ as an implication of the Lemma 1,
- If $\varphi_1 = 1$ then there just firm 1 on the market and $\varphi_2 = 0$.

It is not possible to see from the formulas that even if there is slight difference in costs, then the profitability measure φ_2 of the high-cost firm is much lower than the profitability measure φ_1 of the low-cost firm. However, this becomes apparent when simulating the model, using settings for the base model as follows: $\alpha = 10$, $\beta = 5$, $c_1 = 0.1$, $\varepsilon = 0.01$.

Figure 3 shows the result of the simulation for the base settings. The vertical axis represents the share of the profits for the second firm $\Pi_2/(\Pi_2+\Pi_1)$ - the lowest line, the share of the quantities $q_2/(q_2+q_1)$ - the second lowest line, the profitability measure φ_1 for low-cost firm – the highest line and the profitability measure φ_2. The horizontal axis represents the measure of the substitutability γ.

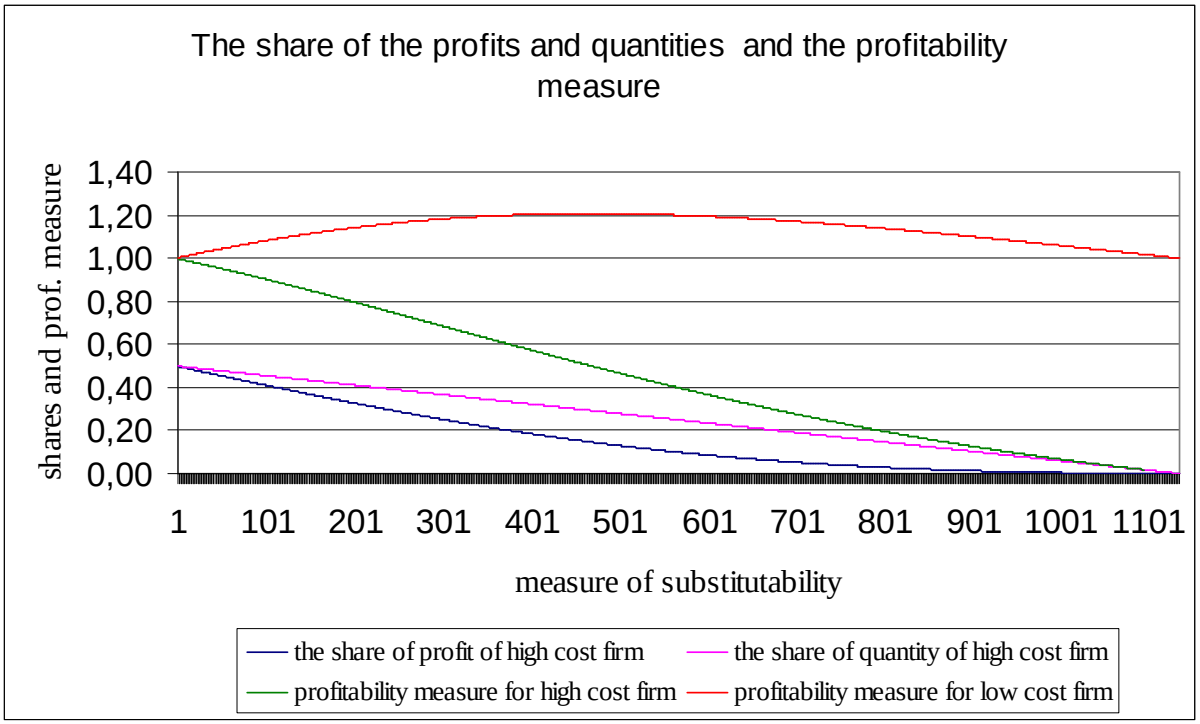

Figure 3 The share of the profits and quantities and the profitability measure

For this specific setting of the base model, for $\gamma > 1141$ (when the goods are very close substitutes there is strong price competition on the market) there is just one firm on the market, since for the firm 2 it is not anymore profitable to stay on the market. What regards the concentration case discussed, probably Carrefour reached some low level of profitability measure, not necessarily zero.

As goods are becoming close substitutes, the share of the profits for the high-cost firm is decreasing much sharply than the share of the quantities, as can be seen in the Figure 3. Also, the shape of the profitability measure is interesting to compare. For the low-cost firm the shape is concave, because there are following two effects influencing the profitability measure. First, as the goods are becoming closer substitutes, the prices decrease and this has negative effect on profitability measure of both firms. Second, as the goods are becoming closer substitutes, the high-cost firm has to put much lower profit margin[25] compared to the

[25] Profit margin is the difference between the price and the cost of the good.

low-cost firm, which has negative effect on the profitability measure of the high-cost firm but positive effect on the profitability measure of the low-cost firm.

Further I analyzed the model adding some slight changes – doubling each of the coefficients or halving them – just in one direction in each single new simulation. The results are in Table 1 for the profitability measure φ_1 of firm 1 and in Table 2 for the profitability measure φ_2 of firm 2. In both tables just the results for the specific measure of substitutability - $\gamma = 300, \gamma = 800$ - are presented.

			double α -20		halve α - 5		double β - 10		halve β - 2.5	
			γ / φ_1		γ / φ_1		γ / φ_1		γ / φ_1	
	base	γ / φ_1	300		300		300		300	
			1.11		**1.19**		**1.19**		**1.11**	
α	**10**	300	800		800		800		800	
β	**5**	**1.18**	**1.20**		**1**		**1**		**1.20**	
c	**0,1**	800	double ε - 0.02		halve ε - 0.005		double c - 0.2		halve c - 0.05	
ε	**0,01**	**1.14**	γ / φ_1		γ / φ_1		γ / φ_1		γ / φ_1	
			300		300		300		300	
			1.19		**1.11**		**1.19**		**1.18**	
			800		800		800		800	
			1		**1.20**		**1.12**		**1.15**	

Table 1 Simulation for low-cost firm – firm 1

			double α -20		halve α - 5		double β - 10		halve β - 2.5	
			γ / φ_2		γ / φ_2		γ / φ_2		γ / φ_2	
	base	γ / φ_2	300		300		300		300	
			0.86		**0.33**		**0.33**		**0.86**	
α	**10**	300	800		800		800		800	
β	**5**	**0.68**	**0.59**		**0**		**0**		**0.59**	
c	**0,1**	800	double ε - 0.02		halve ε - 0.005		double c - 0.2		halve c - 0.05	
ε	**0,01**	**0.20**	γ / φ_2		γ / φ_2		γ / φ_2		γ / φ_2	
			300		300		300		300	
			0.36		**0.85**		**0.67**		**0.69**	
			800		800		800		800	
			0		**0.58**		**0.16**		**0.21**	

Table 2 Simulation for high-cost firm – firm 2

In both tables, the bolded values under the measure of substitutability, which is 300 or 800, represent the values of the profitability measure for the setting of the model modified as described to the left of the value φ_2 or φ_1. The modification is made for the base model, the set up of which is defined on the left part of the table.

Results presented in the Table 1 support the hypothesis about the concavity of the shape of the profitability measure φ_1 for the low-cost firm. It can be seen from the Table 2 that as the products are becoming closer substitutes (as it was in the case of the concentration discussed), the profitability measure of the high-cost firm decreases. Further, in this specific asymmetric model with product differentiation, the effect on the profitability measure is the same for the multiplication of the size of the market, α, and the division of the price sensitivity coefficient β by the same number. Also, the change in the price c does not have any significant effect on the profitability measure. This is so because when the costs increase by the same amount for both firms, the competitive pressure on both firms does not change a lot. Accordingly, when the difference between the costs, ε, increases, the effect on the profitability measure is not negligible.

In the concentration case discussed, the important implication resulting from the model is the following. Since the hypermarkets were the closest competitors selling the products that were very close substitutes (as perceived by the customers that set the demand), Carrefour might have suffered from the low share of the profit that made the owners of Carrefour willing to leave the market. However, the concentration of the two closest competitors has detrimental effects on the welfare of the consumers, which was an argument of the SAO to prohibit the concentration. Still, after one year since the prohibition, Carrefour left the Slovak market by selling its four hypermarkets in March 2008.

At this point, the analogy between the Tesco-Carrefour case and the model can be seen. Because the hypermarkets were the closest competitors, one of them – Carrefour – had to face much lower profits that probably went under some threshold of their expected profitability so they decided to leave the market. From the point of view of Tesco, the leave of the biggest competitor would be advantageous. Moreover, since their goods were close substitutes, the merger would increase the profits of Tesco, but at the same time the merger

would increase prices and therefore it would have detrimental effects on the welfare of the consumers. This was shown in the Section 3.3. Therefore the merger from the point of view of the welfare of the consumers should not be allowed. The remedies offered by the merging parties were not convincing, since no investor was found at that time.

One may argue why Carrefour would have higher unit costs. The reason might be connected to the brand Carrefour that, in my opinion, everywhere in the world is famous for providing higher standards, i.e. always fresh vegetable, better illumination, higher sanitation standards, more staff working there etc. The suspicion is that customers in Slovakia do not value these benefits so much and for them the goods from Tesco and Carrefour are very close substitutes (γ is quite high). This makes the prices to go down, but to such a level, that one company makes low profits and wants to leave the market.

The retail chains as multinationals might be facing obstacles when they decide to disinvest and invest. That is, there is always a risk involved in the investment decisions and it is also a nature of the consumer preferences[26] that influences whether the retail chain can make enough profits to stay on the market. In my opinion, this reasoning explains the will of Carrefour to leave the market.

[26] Consumer preferences are reflected in the measure of substitutability which is a crucial variable in the model discussed.

Conclusion

To conclude, in this thesis I analyzed the Tesco-Carrefour case in Slovakia. First I introduced the framework behind the merger regulation, then I put this specific case into this framework, concentrating on the research question of the thesis, namely what might have been the motivation of Carrefour to leave the market of retail chains in Slovakia. Finally, in the last chapter about the microeconomics model, I showed that it might have been the low shares of the profits that made Carrefour to be willing to leave the Slovak market.

The contribution of my thesis is in the modeling of the case. The analysis of the Tesco- Carrefour case resulted in several observations that were crucial for setting up the model. The observation was that there were just two important players on the relevant market, namely Tesco and Carrefour, which leads to the duopoly setting of the model. Further, they were the closest competitors, and also the customers in Slovakia are rather price sensitive, which leads to the model with differentiated products. Also, the retail chains can not be equal, neither from the production and investors‘ point of view, which was nested in the inequality of the costs, assuming that Carrefour is the firm with higher unit costs and Tesco the firm with low unit costs. This leads to the asymmetry of the model. Therefore, the methodology used was the extension of the Shubik and Levitan (1980) model of Duopolistic Market with Product Differentiation.

Two important conclusions can be drawn. First, the ban on the merger of type According to the model is justified, since the merger would result in detrimental effects on the consumer’s welfare. Second, the puzzle was solved: The profitability of Carrefour might have been very low due to the high level of substitutability between the goods of the parties as shown on the variable – profitability measure in the Section *Simulation*.

However, there are some aspects of the model that might be extended to make the model more explanatory, so as to better reflect the Tesco-Carrefour case. First, the definition of the demands actually divides the market into two equal parts. This could be adjusted by different coefficients so as to reflect the size of the hypermarkets (in sqm), keeping the sum of the demands as before.

Second, there might be included more firms characterized by a unique measure of substitutability between each of them. However, this would make the model much more complicated and even with just three differentiated goods the algebra behind would be too cumbersome.

Third, the formulas of the demands used in this thesis were derived from the aggregate utility function. However, the consumers are not homogeneous and have different tastes, and claiming that in aggregate they behave in some specific way might be contested. Still, some other utility function might be used, from which more realistic demands would be derived. A new utility function might take into account the different "price-sensitiveness" of the consumers, or it might include a new factor - the distance among the retail chains and the consumer. Yet, in the Tesco-Carrefour case the fact was that the consumers mostly take the price as the most important factor.

However, despite the fact that there are ways to render the model more specific, the puzzle behind the case is explained sufficiently by the model. Moreover, for economists, this thesis presents a good example of a duopolistic model set in the real case.

.

Appendix A: The Formulas for the Figure 1

The price p_u: $p_u = (\frac{\alpha}{\beta} + \frac{\gamma}{2} p_2^*) / (1 + \frac{\gamma}{2})$

The price p_d: $p_d = ((1 + \frac{\gamma}{2}) p_2^* - \frac{\alpha}{\beta}) / \frac{\gamma}{2}$

The range DD`: $q_1 = ½(\alpha - \beta p_1)$

The range DF: $q_1 = (\alpha - \beta p_1)$

The range DF`: $q_1 = \left(\frac{1+\gamma}{2+\gamma}\right)(\alpha - \beta p_1)$

The range dd`: $q_1 = \frac{1}{2}\alpha - \frac{1}{4}\beta(2+\gamma) p_1 + \frac{1}{4}\beta\gamma p_2^*$

Appendix B: Proofs of Lemma 1, 2, 3

The proof of the Lemma 1:

The statement of the Lemma 1 is: "If in equilibrium the demand for the good i is positive, then the firm i does not make negative profit." This statement is equivalent to the following mathematical expression: : $q_i > 0 \Rightarrow p_i \geq c_i$ for $i = 1,2$

I will make the proof just for the demand and price of the good 2 without losing on generality. The proof will be based on the contradiction, so if I will prove that the following does not hold: $q_2 > 0 \wedge c_2 > p_2$, then Lemma 1 is proved.

I am interested into the fact, whether there exists such a combination of costs and the measure of the substitutability of the goods, γ, that in equilibrium the following holds: $p_2 < c_2$ and $q_2 > 0$. Thus, I am interested that for which combination of c_1, c_2, γ the previously mentioned conditions hold at the same time:

1. $p_2 < c_2$ implies, when using some simple algebraic operations, that

$$c_2 \succ \frac{(2+K)(1-K)}{(2-K^2)}\frac{\alpha}{\beta} + \frac{K}{(2-K^2)}c_1$$

2. $q_2 > 0$ implies $\alpha\frac{1}{2-K} - \beta\frac{K}{4-K^2}c_1 - \beta\frac{2}{4-K^2}c_2 + \beta\frac{\gamma}{2(2+K)}(c_1 - c_2) \succ 0$ or

equivalently after substituting for γ, $c_2 < \frac{(2+K)(1-K)}{(2-K^2)}\frac{\alpha}{\beta} + \frac{K}{2-K^2}c_1$

Both inequalities (1. and 2.) for c_2 differ in the direction of the sign, which means that there does not exist such a combination of c_1, c_2, γ that $p_2 < c_2$ and $q_2 > 0$ would hold. At this point I proved the Lemma 1.

The complement of the inequalities has the following form: $c_2 = s\alpha/\beta + (1-s)c_1$, where s is the coefficient of α/β and is always between 0 and 1. This relation is depicted in

the Figure 4 [27] for K=0, K=1 and some K between 0 and 1. The hashed area in Figure 4 represents such a combination of costs, for which the second firm is out of the market (the second firm puts $q_2 = 0$) for some γ.

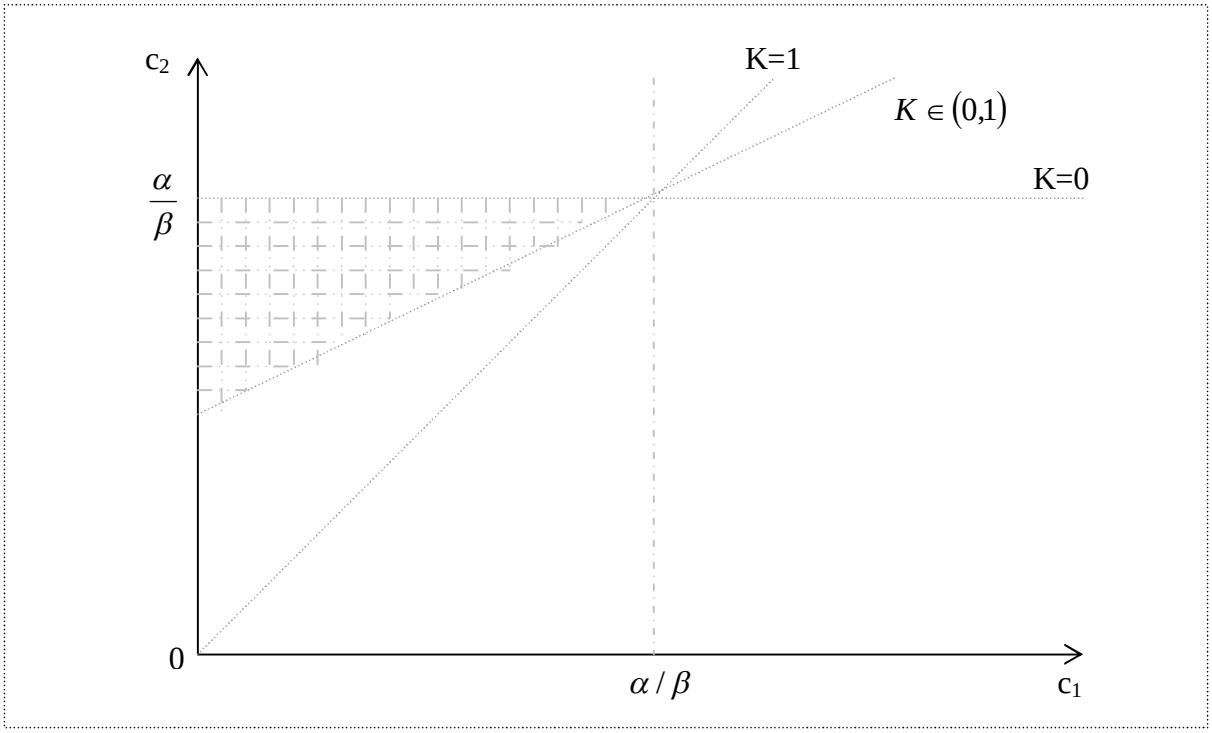

Figure 4 The combination of costs feasible for the model

The proof of the Lemma 2:

Having proved the Lemma 1, the proof of Lemma 2 is straightforward. There are two firms operating on the market if $q_2 > 0$ and $q_1 > 0$ at the same time. More, as I stated in the Section 3.4. *The analysis of Asymmetric Case*, I assume $c_2 > c_1$.

[27] Actually the interesting part of the space c_1, c_2 is just that one in the square (0,0), $(\frac{\alpha}{\beta}, \frac{\alpha}{\beta})$, where the costs are feasible as mentioned in the section *Price Equilibrium.*

$q_2 > 0$ and $q_1 > 0$ and $c_2 > c_1 \Leftrightarrow c_2 < \frac{(2+K)(1-K)}{(2-K^2)}\frac{\alpha}{\beta} + \frac{K}{2-K^2}c_1$, $q_1 > 0$ and $c_1 < \frac{(2+K)(1-K)}{(2-K^2)}\frac{\alpha}{\beta} + \frac{K}{2-K^2}c_2$ and $c_2 > c_1 \Leftrightarrow c_2 < \frac{(2+K)(1-K)}{(2-K^2)}\frac{\alpha}{\beta} + \frac{K}{2-K^2}c_1$ and $c_2 > c_1$, which proves the Lemma 2.

Moreover, in the last equivalence I used the fact $c_2 > c_1 \Rightarrow c_1 < \frac{(2+K)(1-K)}{(2-K^2)}\frac{\alpha}{\beta} + \frac{K}{2-K^2}c_2$, since when using the basic assumption $c_1 < \alpha/\beta$ and $c_2 > c_1$, then $\frac{(2+K)(1-K)}{(2-K^2)}\frac{\alpha}{\beta} + \frac{K}{2-K^2}c_2 > \frac{(2+K)(1-K)}{(2-K^2)}c_1 + \frac{K}{2-K^2}c_1 = c_1$

The proof of the Lemma 3:

Assuming $c_2 > c_1$ and $c_2 < \frac{(2+K)(1-K)}{(2-K^2)}\frac{\alpha}{\beta} + \frac{K}{2-K^2}c_1$ I will denote $\varepsilon = c_2 - c_1$, so in equilibrium, $p_1 = \frac{1-K}{2-K}\frac{\alpha}{\beta} + \frac{1}{2-K}c_1 + \frac{K}{4-K^2}\varepsilon$ and $p_2 = \frac{1-K}{2-K}\frac{\alpha}{\beta} + \frac{1}{2-K}c_1 + \frac{2}{4-K^2}\varepsilon$, then the difference between the prices $p_2 - p_1 = \varepsilon/(2+K) > 0$, which proves the Lemma 3.

Bibliography

Collection of Laws Act No 136/2001 Coll. on the protection of competition, Slovak language, *136/2001 Z. z. z 21.2.2001 o ochrane hospodárskej súťaže a o zmene a doplnení zákona Slovenskej národnej rady č. 347/1990 Zb. o organizácii ministerstiev a ostatných ústredných orgánov štátnej správy Slovenskej republiky v znení neskorších predpisov.*

European Commission 1997, *Commission notice on the definition of the Relevant Market for the purposes of Community competition law* [Internet], Official Journal C 372 of 09.12.1997. Available at http://www.legaltext.ee/text/en/T71346.htm [Accessed 7 June 2008].

European Commission 2006, *Case No COMP/M.3905 – TESCO / Carrefour (Czech Republic and Slovakia)* [Internet] Available at http://ec.europa.eu/comm/competition/mergers/cases/decisions/m3905_20051222_20310_en.pdf [Accessed 7 June 2008].

Hovenkamp, H.1999, *Federal Antritrust Policy: The Law of Competition and its Practice,*. Second Edition, West Publishing, St. Paul, Minnesota.

Jones, A., Suffrin, B. 2004, *EC Competition Law, Text, case and materials*, Second Edition, Oxford University Press.

Portal site of the European Union, *Control of concentrations between undertakings* [Internet] http://europa.eu/scadplus/leg/en/lvb/l26096.htm [Accessed 7 June 2008].

Securities Information, *Registration in the Securities Registry No. 0593* [Internet] , Report of Foreign Ussuer, retrieved on June 5th 2008, Available at: http://www.secinfo.com/dsvr4.2Dsp.htm [Accessed 7 June 2008].

Shubik, M., Levitan, R. 1980, *Market Structure and Behavior*, Harvard University Press, Cambridge, MA.

Slovak Antimonopoly Office 2006, *Rozhodnutie Číslo 2006/FH/3/1/146* [Internet], Bratislava, Available at http://www.antimon.gov.sk/files/28/2007/146.rtf [Accessed 7 June 2008].

Slovak Antimonopoly Office 2007, *Prohibition of the concentration between the undertakings Tesco and Carrefour* [Internet], Available at: http://www.antimon.gov.sk/eng/article.aspx?c=451&a=2607 [Accessed 7 June 2008].

Slovak Antimonopoly Office 2007, *The Antimonopoly Office of the SR reaction to Trend articles from the January 11, 2007 „Economical Darwinism" from R. Baťo and „Unnatural effort for natural market" from J. Horváthová* [Internet], Available at http://www.antimon.gov.sk/eng/article.aspx?c=135&a=2537 [Accessed 7 June 2008].

Tesco 30 Sep 2005, *TESCO - CARREFOUR ASSET SWAP* [Internet], Press Release, retrieved on June 5th 2008, Available at:

http://www.tescocorporate.com/page.aspx?pointerid=79A56E192507442AB81121B8991617A5 [Accessed 7 June 2008].

The Slovak Spectator 10 Mar 2008, *New owner for Carrefour retail chain in Slovakia* [Internet], Press Release, Available at: http://www.spectator.sk/articles/view/30981/3/new_owner_for_carrefour_retail_chain_in_slovakia.html [Accessed 7 June 2008].

Tyagi, Rajeev, (2005), *On Firms' Preferences for Product Differentiation*, Economics Bulletin, Vol. 12, No. 17 pp.